Guidelines to Format Standards for NIOSH Criteria Documents

CHEMICAL HAZARDS

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Services and Mental Health Administration
National Institute for Occupational Safety and Health

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February 1973

The purpose of these guidelines is to provide an instrument to aid in the achievement of consistency and to facilitate timely preparation of criteria documents for publication. Lucette C. Nagourny, Lorice Ede, and Thomas T. Luginbyhl had primary responsibility for compiling these guidelines.

Direct assistance was provided by all members of the professional staff of the Office of Research and Standards Development.

CONTENTS

1. GENERAL

These guidelines are to be followed by anyone preparing a criteria document dealing with a chemical hazard for the National Institute for Occupational Safety and Health. They can be used without change whether the criteria document is prepared within NIOSH or under contract for NIOSH. Although the format and preparation instructions for criteria documents dealing with safety and physical hazards are virtually identical with those contained herein, necessary considerations and content differ. Therefore, guidelines for the preparation of safety and physical hazards documents appear under separate cover.

It is recognized that every element of the format presented herein will not apply to all criteria documents. It is expected, however, that each element will be considered in the order presented and the guidelines followed as applicable so that the criteria document submitted presents the recommended standard including the recommended sampling and analytical methods and the rationale for the recommendations as delivered in an exhaustive and comprehensive survey of the problem.

Questions concerning items not covered in these guidelines should be directed to the Information Resources Branch, Office of Research and Standards Development, 5600 Fishers Lane, Rockville, Maryland 20852.

Order of Elements. Elements included in a criteria document shall be in the following order:

			Pagination
~~Front matter~~		~~Preface~~	~~Use lower case~~
		Acknowledgements	Roman numerals
		Review Committees	
		Table of Contents	
	I.	Recommendation for a(n) _____ Standard	Use upper case
Body of document to consist of chapters entitled and numbered as shown.	II.	Introduction	Roman numeral of the chapter followed by Arabic numeral in sequence beginning with 1 for each chapter. EXAMPLE: The first page of Chapter I is I-1 followed by I-2.
	III.	Properties, Sources, and Uses	
	IV.	Biologic Effects of Exposure	
	V.	Environmental Data	
	VI.	Development of Standard	
	VII.	Work Practices	
	VIII.	Compatibility with other Standards	
	IX.	References	
Reference material	X. thru XIV. (as applicable)	Appendixes	Use same numbering system as in the body of the document.
	X-- (as needed)	Tables and Figures	

Body of Document. Start each chapter on a new page. Include in each chapter that information needed for a comprehensive presentation when the document is considered as a whole.

Composition. Use double-line spacing except for references, tables, figures, and listings. Use 8 x 10 1/2 inch white bond paper. Use margins of at least one inch on all sides of text pages. Use black ribbon to type reproducible copy. Prepare text pages with a single column.

Number pages by chapter (V-4, VII-1, etc.). Place the page number at the bottom center of each page. On all draft copies sequentially number each line used in the right-hand margin. Final copy to be sent for printing shall not contain line numbers.

Superscripts and Subscripts. Avoid the use of superscripts and subscripts except as needed in equations. EXAMPLE: For LD_{50}, use LD50; for cubic millimeter, use cu mm; for reference in text, use [3] or [6, 31-34,62].

Equations. Prepare mathematical matter with extreme care. Identify symbols after first use or in a separate list. Make opening and closing parentheses, brackets, and braces the same height as the tallest expression they enclose. Separate the numerator from the denominator with a line as long as the longer of the two. Center both numerator and denominator on the line.

Center a displayed equation in the line immediately following the first text reference to it. Break equations before an equal, plus, or multiplication sign. Align a group of separate but related equations by the equal signs and indent or center the group as a whole. Short equations, not part of a series, may be placed in the text rather than displayed.

Tables and Figures. Treat all tables, figures, and illustrations consistently throughout the document. Prepare them so that details and callouts (labels or legends) will be clearly legible after final reproduction. Present all art work as camera-ready copy. For camera-ready copy, submit only original clean tone or line art.

Place callouts horizontally, unboxed, and near the item called out. Make callouts consistent in size and typeface throughout the document. Strive for high contrast and readability.

For tables, place title above the table and number as follows: TABLE X-1 . . . where X denotes chapter and Arabic numeral is consecutive ordering within the chapter.

For figures, place figure title below the figure and number as follows: Figure X-1, Figure XV-2 . . . Accompany each table or figure by a descriptive caption following the number.

Do not use color. Screens, crosshatching, dots, or similar techniques can be used as effective substitutes for color. Oversized illustrations that must be folded will not be used.

The orientation of all tables and figures shall be right side up on the normal page.

Place tables or figures in any chapter where necessary for clarity of exposition; otherwise, place them in the final appendix.

Footnotes. Use footnotes sparingly. Denote footnotes in text with an asterisk. Place footnotes at the bottom of the page containing the asterisk immediately below a partial underline of 15 spaces. Use single spacing. When two footnotes are required on one page, denote the second with two asterisks in text. Avoid using more than two footnotes on one page. When a footnote is required in explanation of the contents of a table or figure, place the footnote below the table or figure.

2. PARTS OF THE CRITERIA DOCUMENTS

PREFACE (To be incorporated by NIOSH after document development)

ACKNOWLEDGEMENTS (To be incorporated by NIOSH after document development)

REVIEW COMMITTEES (To be incorporated by NIOSH after document preparation)

TABLE OF CONTENTS (Include all major components)

I. RECOMMENDATIONS FOR A(N) _____ STANDARD

Section 1 - Environmental

(a) Workplace air concentration

(b) Sampling and analysis (Procedures described in Appendices)

Section 2 - Medical (includes biologic monitoring and medical examinations)

(a) Biologic monitoring

(1) Body fluids level limits, or action levels

(2) Expired air limit

(3) Requirements for biological sampling and analytical and calibration methods (Procedures described in Appendices)

(b) Medical examinations

(1) Physical examinations: preplacement, periodic, and termination (as applicable)

~~(2) Laboratory examinations: preplacement and periodi~~

(3) Medical records: access and retention

Section 3 - Labeling (Posting)

In accordance with the proposed NIOSH Health Hazard Warning System

Section 4 - Personal Protective Equipment and Clothing

List the types of respirators and other protective equipment and clothing necessary for the safe performance of the work. List the exposure levels and work conditions under which each is to be used, and the maintenance necessary for its effectiveness. Describe the minimal or occasional exposure for which the wearing of protective equipment or clothing may not be necessary.

Section 5 - Informing the Employee of Hazards from _____

Include methods by which the employer would be required to inform the employee of the hazard to which he is exposed and the precautions to be taken by the employer and the employee.

Section 6 - Work Practices and/or Control Procedures

Include here requirements of a special nature that will have a significant impact on controlling the hazard, such as:

(a) Handling of the material

(b) Waste disposal

(c) Work area clean-up, including emergency procedures and equipment

(d) Access of nonworkers to work area

(e) Exhaust and ventilation requirements

(f) Changes in work regime, including decontamination procedures.

Section 7 - Sanitation Practices

Includes housekeeping, workroom, locker room, and personal hygiene requirements (as applicable).

Section 8 - Environmental Monitoring and Recordkeeping Requirements

Basic monitoring and recordkeeping; to include the frequency of monitoring and record retention requirements.

II. INTRODUCTION

A brief statement presenting the purpose of the document and NIOSH responsibility under the Occupational Safety and Health Act of 1970.

III. PROPERTIES, SOURCES, AND USES (Should be brief)

Include amounts used, produced, or found in the United States; list industries (by type) where found; list occupations in which exposure may occur; cite the industrial processes and chemical reactions involved; give estimate of U.S. employees exposed; list all compounds known which would be included under the proposed standard along with known physical properties such as boiling point, melting point, flash point, molecular weight, vapor pressure, vapor density, specific gravity and solubility in respresentative common solvents, e.g., water, acetone, benzene, carbon tetrachloride, etc.

IV. BIOLOGICAL EFFECTS OF EXPOSURE

Paragraph identifying the substance (followed by a consideration of all elements below)

Extent of exposure/hazard

Historical reports

~~Effects on humans~~

Epidemiological studies

Animal toxicity (If applicable, directly or by extrapolation or analogy to human exposure).

Include under the above, all reported toxic effects. A toxic effect is defined as any bodily injury - reversible or irreversible; any tumor, benign or malignant; any mutagenic or teratogenic effect; irritation; a lessening of mental alertness or motivation; or death which has been reported to have resulted from exposure to a chemical substance via the respiratory tract, skin, eye, mouth, or by any other route characteristic of an occupational exposure. Include combined effects resulting from exposure to potentiating agents commonly found in the workplace with the substance which is the subject of this document.

Correlation of Exposure and Effect

V. ENVIRONMENTAL DATA

A. Comprehensive and exhaustive discussion of sampling and analytical methods, including as a minimum: physical quantities to be measured; type and size of sample required and length of time sample is stable; range and sensitivity; precision and accuracy; degree of difficulty; interferences;

controllable and uncontrollable errors; error sensitive steps; time required for one analysis and for a series of analyses. compare with other methods; include a discussion of advantages and disadvantages. Provide reported modifications which may lead to an improved method. Is this method adaptable to large scale sampling and analysis? As it concerns biologic sampling, does it impose undue burden or discomfort on the worker (i.e., venipuncture)?

B. Discussion of engineering controls to limit exposure and air concentration levels achieved (where feasible, environmental levels encountered may be included here)

VI. DEVELOPMENT OF STANDARD

A. Basis for previous standards (including a brief discussion of foreign and state standards)

B. Basis for recommended environmental standard and biological monitoring. The basis shall include the rationale for accepting the data selected and rejecting potentially acceptable data not selected for the establishment of a standard

VII. WORK PRACTICES (Discussion of methods proposed in the work practices section, Chapter I)

Include when unusual factors prevail requiring a discussion.

VIII. COMPATIBILITY WITH OTHER STANDARDS (Where such Standards exist)

Include discussion of basis for similar and disparate standards.

IX. REFERENCES: See Section 6 of these Guidelines

X. APPENDIX I. Sampling and Calibration Methods: Environmental and Biological

XI. APPENDIX II. Analytical Methods: Environmental and Biological

XII. APPENDIX III. Control Specifications

XIII. APPENDIX IV. Material Safety Data Sheet

XIV. APPENDIX V. Definition of Terms and Abbreviations

~~If only a short glossary is needed, it may be included at the~~ beginning of the document

XV. TABLES AND FIGURES

3. CHAPTER FORMAT

General

The author of the document is responsible for the overall literary quality, accuracy and completeness of technical data.

Start each chapter on a new page.

Set chapter title in capital letters centered at top of page.

Note that Chapter I is the recommended standard and is formated differently from succeeding chapters.

THE FOLLOWING INSTRUCTIONS APPLY TO CHAPTER I ONLY*

Sections within the chapter (e.g., Environmental, Medical, etc.)

Indent five spaces from left-hand margin

Type in upper and lower case

Underline section titles

Subdivisions of sections shall be successively indented. The hierarchy of function outlining is: lower case letter in parentheses;

*See appendix for example of Chapter I.

Arabic numeral in parentheses; upper case letter in parentheses; lower case Roman numerals in parentheses.

Example:

Section 2 - Medical

(a) Biologic Monitoring

(1)

(2)

(A)

(B)

(i)

(ii)

(b) Medical examinations

(1) Physical examinations

(2) Laboratory examinations

(3) Medical records

THE FOLLOWING INSTRUCTIONS APPLY TO CHAPTERS 2 through 8

Enter title of major part of a chapter flush with the left hand margin in capitals and underline. Place on separate line.

Enter title of subpart of a chapter after indenting five spaces in upper and lower case. Place on separate line.

Do not use letters or numbers except for needed textual presentation.

If additional division needs to be indicated, set title in upper and

lower case and underline. Continue text on same line.

THE FOLLOWING INSTRUCTIONS APPLY TO CHAPTER 9 (References)

Use single space.

Follow examples shown in section 6, List of References

THE FOLLOWING INSTRUCTIONS APPLY TO APPENDICES

Conform format to matter being presented and in accordance with the general instructions given herein.

4. COPIES OF REFERENCES CITED

Two copies of each reference cited in a criteria document shall be furnished with the criteria document as noted below, either as a bound or unbound copy. Each copy furnished shall be fully identified as to source, volume number, year, etc. If from a book, the city in which published and full name of publisher shall also be included. Where a reference is listed as "unpublished data", a copy of the data shall be provided. For a reference listed as a "personal communication", a copy of such communication, including transcript of a telephone conversation, shall be provided and shall include the names of the correspondents, the date of the communication, and the data. These copies of the cited references shall be good, clean, reproducible grade copy. Care must be taken to insure that all pages of each document are included. All copyright and release requirements must be met.

Bound Copy. One copy of each referenced document shall be bound in order of the reference list number in a bound volume or volumes to accompany

the final copy of the criteria document. Ring or spiral binders will be acceptable. More than one binder of references may be utilized if necessary. References such as complete books are to be delivered separately, but should be included in the index of the spiral binder with a notation that they are complete works delivered separately.

Unbound Copy. A second copy (unbound) of each cited reference shall be provided, in random order, to the Information Resources Branch, Office of Research and Standards Development, 5600 Fishers Lane, Rockville, Maryland 20852, so that it is available for reference purposes.

5. LITERATURE CITATIONS IN TEXT

Literature citations in the text shall be numbered sequentially in brackets; e.g. "Perry and Weinberg [1] confirmed the results of Jerome [2] . . ." or "It has been shown [122] that . . . ."

List authors when there are no more than two. When there are three or more, use the first author's name followed by "et al", "and associates", or "and co-workers."

Where various sections of a book or other lengthy publication are cited, page numbers shall be added in the text citation; e.g., "Elkins has also shown [23, p 159] . . .." If, however, there is only one page or group of pages used from such a book, list the page or pages after the name of the book in the list of references. Underline book titles wherever they appear in the text.

6. LIST OF REFERENCES

List references by number in the sequence used in the text. List all authors and their initials. Except for the first word and proper nouns, do not capitalize words in the title when the reference is contained in a journal. Do not use ibid., loc. cit., op. cit., or other means of avoiding repetition of authors or journals. Abbreviations of journals should conform to the convention as listed in Index Medicus, January issue of each year. If a journal is not listed, do not abbreviate. The list of references must be made with care. Citations must be complete and accurate.

A. REFERENCES TO JOURNALS

One Author: Rubin ML: Congenital defects of color vision. Trans Am Acad Ophthalmol Otolaryngol 75:2091-94, 1971

Two or More Authors: Rawlings CA, Dean DF:

If Same Author Has Consecutive References: Repeat author's name and initials.

No Author: New sunscreens preparations. Drug Ther Bull 9: 95-96, 1971

Group: Committee on Anesthesia (National Academy Sciences, National Research Council):

Note: In list of references, list all authors. Words in title except for the first one, are not capitalized. Title is followed by a period. Page numbers are inclusive. For journal title abbreviations, see INDEX MEDICUS

B. REFERENCES TO BOOKS*

(a) Complete Data - A complete reference to a book includes:

(1) authors' names

(2) title of book, and subtitle if any

(3) number of edition, after the first

(4) name of editor or translator or both, if any

(5) place of publication

(6) name of publisher

(7) year of publication

(8) volume number, if there is more than one

(9) page number or numbers, if specific pages are cited

Example: Osler W: Modern Medicine, ed 3. DH Lee (ed.), Philadelphia, Lea & Febiger, 1927, vol 5, p 66

*Adapted from AMA Style Book/Editorial Manual, 1971

(b) Parts of Books

In some instances reference is made to a part of a book which has a number of contributors as well as major author(s) or editor(s). In the title of the part (chapter or section), capitalize as for a journal article; do not enclose in quotation marks. Either page numbers or numerical designation of the part should be given, but not both.

Examples: 1. Fullerton HW: Disorders of the blood, in Dunlop D, Alstead S, Macgregor AG (eds.): Textbook of Medical Treatment, ed 11. Edinburgh, E & S Livingston Ltd, 1968, pp 144-184

2. Keefer CS: Sulfonamides and antibiotics, in Smith A (ed.): Modern Treatment: A Guide for General Practice. New York, Paul B Hoeber Inc, 1953, chap 4

(c) Special Materials

Government Bulletins: Reference to bulletins published by departments or agencies of the U. S. Government should include the following information in the order indicated:

(1) name of author, if there is a byline;

(2) title of bulletin;

(3) number of bulletin, if any;

(4) site of publication; omit if Washington, D. C.;

(5) name of department, agency, or bureau, or all of these

(6) date;

(7) page numbers, if specified.

Examples: 1. Hoffman FL: Problem of Dust Phthisis in Granite-Stone Industry, bulletin 293. US Dept of Labor, Bureau of Labor Statistics, 1922

2. Hartwell JL: Survey of Compounds Which Have Been Tested for Carcinogenic Activity. Federal Security Agency, Public Health Service, 1941

3. Marinell LD, Hill RF: Studies in dosage in cancer therapy, Brookhaven conference report, in Symposium Radioiodine, unclassified document ACEU, BNL-C-5. Oak Ridge, Tenn, Atomic Energy Commission, Technical Information Branch, 1949, p 98

Serial Publications: If a monograph or report is one of a series, include the name of the series and the number of the publication.

Example: Pulaski EJ: Surgical Infections: Prophylaxis - Treatment - Antibiotic Therapy, publication 170. American lecture series, monograph in Bannerstone division of American Lectures in Surgery, McGraw-Hill Book Co Inc, 1961

Unpublished Material: References to unpublished materials may include the following:

(1) an article that has been presented before a society, but not published

(2) material which has been accepted for publication, but has not yet appeared (indicate name of publication)

If the author has indicated that a reference is to be published, he should be queried as to whether it has been published since submission of his manuscript.

Examples: 1. Spurling RG: Conservative treatment of third ventricle tumors. Read before the Harvey Cushing Society, Rochester, Minn. 1936

2. Kornetsky CH: Psychological effects of chronic barbiturate intoxication. To be published in Arch Neurol.

If there is included in the bibliography material that has been submitted but not yet accepted or personal communications, this material should be noted in the text as "unpublished data," or "personal communication" in accordance with the following examples:

Examples: 1. These findings have recently been corroborated (HE Marman, MD, unpublished data).

2. Similar findings have been noted by OR Roberts and HE Marman, MD (unpublished data).

3. According to an oral communication from HE Marman, MD, in August 1966

4. As noted by HE Marman, MD (oral communication, letter, or written communication, August 1966)

Note that the author should give the date of the communication and specify whether it was oral or written. Number these references in the text and list in the reference list noting only "unpublished data - see text.", or "personal communication - see text."

7. ABBREVIATIONS

ampere	amp
ampere-hour	amp-hr
Angstrom	A*
atmosphere	atm*
billion electron volts	bev+
British thermal unit(s)	BTU
calorie	cal
centigrade	C
centimeter	cm
cubic centimeter	cc
cubic foot	cu ft
cubic inch	cu in
cubic meter	cu m
cubic millimeter	cu mm
curie	Do not abbreviate
cycles per second	See hertz
decibel	dB
degree (of an arc of angle)	(use only with quantities above ten; do not use with temperature)
diopter	D*
electrostatic units	ESU±
Fahrenheit	F
foot	ft±
foot-pound	ft-lb
gallon	gal
(gamma)	Do not use as abbreviation for micrograms
grains	Do not abbreviate
gram	g
gravity	G
hertz	Hz*
horsepower	hp
hour	hr±

*Use abbreviation after spelling out the first time without abbreviation in parentheses
+Use abbreviation after spelling out the first time with abbreviation immediately following in parentheses
±Use only in tables and virgule construction

immunizing unit	I.U.+
inch	in (Tables only)
international unit(s)	ᵻᵻ+
Joule	J
Kelvin (or Kelvin scale)	K
kilocycle	kc
kiloelectron volt	kev
kilogram	kg
kilohertz	kHz*
kilometer	km
~~kilovolt~~	~~kv~~
kilovolt-ampere	kva+
kilowatt	kw
kilowatt-hour	kw-hr
(lambda)	Do not use as abbreviation for microliter
liter	Do not abbreviate
megacycle	Do not abbreviate
megahertz	MHz
mega units (1 million units)	Do not abbreviate
meter	Do not abbreviate
microcurie	Do not abbreviate
microfarad	µf*
microgram	µg
microliter	µl
micromicrogram	see picogram
micromicron	see picometer
micromole	µmol
micron	µ
microvolt	µV
miles per hour	mph
milliampere	ma
milliampere-minute	ma-min*
millicurie	Do not abbreviate
millicurie-hour	mc-hr+
milligram	mg
milligram-hour	mg-hr
milliliter	ml (approximately equivalent to 1 cc)
millimeter	mm
millimicrogram	see nanogram
millimicron	see nanometer
millimole	Do not abbreviate
million electron volts	mev
millirem	mrem
milliroentgen	mr+
millisecond	msec
millivolt	mv
minute	min±
molar	M
mole	Do not abbreviate
month	mo±

nanogram	ng
nanometer	nm
normal (re strength of a solution)	N
ounce	oz
parts per billion	ppb
parts per million	ppm
picogram	pg
picometer	pm
pint	pt
pound (avoirdupois; apothecary)	lb
pounds per square inch	psi+
pounds per square inch absolute	psia+
pounds per square inch gauge	psig+
quart	qt
rad (unit of absorbed radiation [100 erg/g])	Do not abbreviate
revolutions per minute	rpm
roentgen	R*
roentgen equivalents man	rem+
second (unit of time)	sec±
square centimeter	sq cm
square foot	sq ft
square inch	sq in
square meter	sq m
square millimeter	sq mm
unit(s)	Do not abbreviate
volt	v
volume percent	vol%
Watt	W
yard	yd±
year	yr±

Clinical Data and Technical Terms

albumin-globulin ratio	A/G ratio
alternating current	ac* (use only with units of measure)
aminosalic acid	Do not abbreviate

BCG vaccine	Use as is; do not expand
basal metabolic rate	BMR
Baume	Do not abbreviate
blood pressure	BP§
blood urea nitrogen	BUN
boiling point	bp§
central nervous system	CNS
cerebrospinal fluid	CSF
complete blood cell count	CBC
direct current	dc* (use only with unit of measure)
~~DNA~~	~~Use as is, do not expand~~
effective dose, median	ED50
electrocardiogram	ECG*
electroencephalogram	EEG*
electromotive force	EMF
erythrocyte sedimentation rate	ESR
hemoglobin	Hgb
infective dose, median	ID50
infrared	IR
intelligence quotient	IQ*
intramuscular, -ly	im
intraperitoneal, -ly	ip
intravenous, -ly	iv
lethal concentration, median	LC50
lethal dose, median	LD50
lupus erythematosus	LE* (use with reference to cells or tests)
meta	m- (use only in chemical formulas)
metabolic rate	MR
minimum effective concentration	MEC
minimal effective dose; minimal erythemal dose	MED
minimum lethal dose	MLD
molecular weight	mol wt*
nonvolatile	nv§
ortho	o- (use only in chemical formulas)
packed cell volume	PCV
para	p- (use only in chemical formulas)
paralytic dose	PD

*Use abbreviation after writing out the first time without abbreviation in parentheses.

§Use abbreviation only in tables, graphs, formulas or insertions in parentheses.

partial pressure, carbon dioxide	PCO_2
partial pressure, oxygen	PO_2
probability	P (use only with numbers)
protein-bound iodine	PBI
pulmonary venous capillary	PVC
relative biologic effectiveness (re radiation)	RBE
red blood cells; red blood cell count	RBC
RNA	Use as is; do not expand
sedimentation rate	sed rate§
serum glutamic oxaloacetic transaminase	SGOT
serum glutamic pyruvic transaminase	SGPT
standard deviation	SD
standard error of the mean	SE
sulfobromophthalein (Bromsulphalein)	BSP
temperature	temp§
tertiary	tert- (Use only in chemical formulas)
ultrahigh frequency	UHF*
ultraviolet	UV
weight by volume	W/V (use only with numbers)
white blood cells; white blood cell count	WBC

Supplementary List

American Chemical Society	ACS
American Conference of Government Industrial Hygienists	ACGIH
American Hospital Association	AHA
American Industrial Hygienists Association	AIHA
American Medical Association	AMA
Anno Domini	AD‖
ante meridiem	AM‖
approximately	approx (use only in tables)
association	assoc¶
Association of American Medical Colleges	AAMC
average	av (use only in tables)
before Christ	BC‖

‖Abbreviate when term occurs in its normal usage.
¶Abbreviate only in references and similar materials, including citations in the text or in tables.

chapter	chap
circa	c
compare	cf
doctor of dental surgery	DDS
edition	ed
editor	ed.
Environmental Protection Agency	EPA
et alii	et al
exempli gratia	eg
female	F#
figure	Fig (use only with numerical designation)
id est	ie
International Labor Organization	ILO
male	M#
maximum	max
National Academy of Sciences	NAS
National Institutes of Health	NIH
National Institute for Occupational Safety and Health	NIOSH+
National Research Council	NRC
Negro	N#
number	No. (use only before a numeral and in tables)
Occupational Safety and Health Administration (Dept of Labor)	OSHA+
page, pages	p, pp
part	pt
post meridiem	PM
Public Health Service	PHS
supplement	suppl
surgeon general	Do not abbreviate
ultimo	ult
United Nations	UN
US Department of Health, Education, and Welfare	DHEW

#Abbreviate only in tables

versus	vs//
Veterans Administration	VA
videlicet	viz//
white (racial designation)	W#
World Health Organization	WHO (use without the preceding)

Appendix I - Example of Chapter I Layout

I. RECOMMENDATION FOR AN INORGANIC LEAD STANDARD

The National Institute for Occupational Safety and Health (NIOSH) recommends that employee exposure to inorganic lead in the workplace be controlled by adherence to the following sections. The standard is designed to protect the health and safety of workers for an 8-hour day, 40-hour week over a working lifetime; compliance with the standard should therefore prevent adverse effects of lead on the health and safety of workers. The standard is measurable by techniques that are valid, reproducible, and available to industry and government agencies. Sufficient technology exists to permit compliance with the recommended standard. The criteria and standard will be subject to review and revision as necessary.

"Inorganic lead" means lead oxides, metallic lead, and lead salts (including organic salts such as lead soaps but excluding lead arsenate). "Exposure to inorganic lead" is defined as exposure above half the recommended workroom environmental standard. Exposures at lower environmental concentrations will not require adherence to the following sections, except for Section 7(a).

Section 1 - Environmental (workplace air)

(a) Concentration

Occupational exposure to inorganic lead shall be controlled so that workers shall not be exposed to inorganic lead at a concentration greater that 0.15 mg Pb/m^3 determined as a time-weighted average (TWA) exposure for an 8-hour workday.

(b) Sampling, Collection, and Analysis

Procedures for collection of environmental samples shall be as provided in Appendix I, or by an equivalent method. Analysis of samples shall be as provided in Appendix II, or by any method shown to be equivalent in precision and accuracy to the method specified in Appendix II.

Section 2 - Medical

Medical monitoring (biologic monitoring and medical examinations) shall be made available to workers as outlined below.

(a) Biologic monitoring

Biologic monitoring shall be made available to all workers subject to "exposure to inorganic lead." It consists of sampling and analysis of whole blood, or alternatively, of urine for lead content. Such monitoring shall be performed to ensure that no worker absorbs an unacceptable amount of lead. Unacceptable absorption of lead posing a risk of lead poisoning is demonstrated at levels of 0.080 mg Pb/100 g of whole blood or greater, or at levels of 0.20 mg Pb/liter of urine (with urine specific gravity corrected to 1.024) or greater.

Procedures for sampling and analysis of blood or urine for lead shall be as described in Appendix II, or by any method shown to be equivalent in precision and accuracy. In the case of urine, "spot" urine specimens of about 100 ml shall be collected during a workday, and urine specimens with a specific gravity less than 1.010 shall be discarded and another sample obtained.

Half of all workers subject to "exposure to inorganic lead" shall be offered biologic monitoring every 6 months, so that each worker

shall have blood sampling and analysis made available to him yearly. If urine sampling and analysis are chosen instead of blood lead sampling and analysis to satisfy the biologic monitoring requirement, every worker shall have urine sampling and analysis made available to him at 6 month intervals. The schedule of biologic monitoring, above, may be altered if indicated by a professional industrial hygiene survey. If environmental sampling and analysis show that environmental levels are at or greater than the environmental limit, the interval of biologic monitoring shall be halved, i.e. blood analysis shall be conducted quarterly, with each worker sampled semi-annually, or urinalysis shall be conducted quarterly on every worker. This increased frequency shall be continued for at least 6 months after the high environmental level has been shown.

If a worker's urine lead level is found to be 0.20 mg/liter or greater, calculated to a specific gravity of 1.024, a blood sample shall be obtained and analyzed within two weeks. If a blood lead level of 0.080 mg Pb/100 g or greater is found, and confirmed by a second sample to be taken within two weeks, steps to reduce his absorption of lead shall be taken as soon as the high levels are confirmed. Steps to be considered should include improvement of environmental controls, of personal protection or personal hygiene, and use of administrative controls. A medical examination for possible lead poisoning shall be made available, and the OSHA area industrial hygienist shall be informed of the results of the biologic

sampling of those workers with confirmed, high biologic levels of lead.

Biologic monitoring shall also be made available where the OSHA area industrial hygienist has reason to believe operations produce unusual exposure excursions or that environmental samples do not adequately describe worker exposure.

(b) Medical examination

Medical examinations shall be available when a variance has been granted permitting administrative controls or use of respiratory protection, for workers with unacceptable absorption of lead as judged by biologic monitoring, or when environmental levels are at or above the environmental standard.

These examinations should be made available prior to employee placement and annually thereafter. They should include a physical examination, complete blood counts, blood lead determinations, routine urinalysis (specific gravity, sugar and protein determinations, and microscopic examination), and should record any signs or symptoms of plumbism, if present. Where urine is selected instead of blood for biologic monitoring, the preplacement examination should also include a urinary lead determination. Each employee who absorbs unacceptable amounts of lead as indicated by biologic monitoring shall be examined as soon as practicable after such absorption is demonstrated and confirmed, and at least every 3 months thereafter until his blood or urine lead levels have returned to normal, i.e. below 0.080 mg/100 g of blood or 0.20 mg/liter of urine. If clinical evidence of plumbism

is developed from these medical examinations, the worker shall be kept under a physician's care, in accordance with applicable Workman's Compensation provisions, until the worker has completely recovered or maximal improvement has occurred.

Medical records shall include information on all biologic determinations and on all required medical examinations. These records shall be available to the medical representatives of the employer, of the Secretary of Labor, of the Secretary of Health, Education, and Welfare, and, at the employee's request, to the employee's physician. These records shall be kept for at least five years after the last occupational exposure to inorganic lead.

Section 3 - Labeling (Posting)

Areas where exposure to lead at levels over one-half the workroom air standard is likely to occur shall be posted with a sign reading:

LEAD (Pb)

DANGER!

High concentrations of fume or dust

may be hazardous to health.

Provide adequate ventilation.

If environmental levels are at or greater than the environmental limit, or if a variance permitting use of respiratory controls has been granted, add information to the label or placard describing the location of the respirators.

Section 4 - Personal Protective Equipment and Work Clothing

Subsection (a) shall apply whenever a variance from the standard recommended in Section 1 is granted under provisions of the Occupational Safety and Health Act, or in the interim period during the application for a variance. When the limits of exposure to lead prescribed in paragraph (a) of Section 1 cannot be met by limiting the concentration of lead in the work environment, an employer must utilize, as provided in subsection (a) of this Section, a program of respiratory protection to effect the required protection of every worker exposed.

(a) Respiratory Protection

Engineering controls shall be used wherever feasible to maintain lead dust and fume concentrations below the prescribed limits. Appropriate respirators shall be provided and used when a variance has been granted to allow respirators as a means of control of exposure to routine operations and while the application is pending. Administrative controls should also be used to reduce exposure. Respirators shall also be provided and used for nonroutine operations (occasional brief exposures above the TWA of 0.15 mg/m^3 and for emergencies); however, for these instances a variance is not required but the requirements set forth below continue to apply. Appropriate

respirators as described in Table I-1 shall only be used pursuant to the following requirements:

(1) For the purpose of determining the class of respirator to be used, the employer shall measure the atmospheric concentration of inorganic lead in the workplace when the initial application for variance is made and thereafter whenever process, worksite, climate or control changes occur which are likely to affect the lead concentration. The employer shall test for respirator fit and/or make lead measurements within the respiratory inlet covering to ensure that no worker is being exposed to inorganic lead in excess of the standard either because of improper respirator selection or fit.

(2) Employees experiencing breathing difficulty while using respirators shall be referred to a physician for evaluation. This evaluation should investigate if the employee has adequate ventilatory capacity and any evidence of obstructive lung disease. Employees with inadequate ventilatory capacity or evidence of obstructive lung disease shall not wear types A, B, and E respirators.

(3) A respiratory protective program meeting the general requirements outlined in section 3.5 of American National Standard for Respiratory Protection Z88.2-1969 shall be established and enforced by the employer.

(4) The employer shall provide respirators in accordance with the Table below and shall assure that the employee uses the respirator provided.

(5) If both fume and dust are present, the recommended usage is that for fume.

(6) Respiratory protective devices described in the following Table I-1 shall be either those approved under the following listed regulation or those approved under 30 CFR 11, published March 25, 1972. The termination date of currently approved respirators described in 30 CFR 11 shall apply.

(i) Reusable or replaceable filter-type air-purifying respirator - - - 30 CFR 14 (Bureau of Mines Schedule 21 B)

(ii) Powered air-purifying positive-pressure respirator - - - 30 CFR 14 (Bureau of Mines Schedule 21 B)

(iii) Type C positive-pressure supplied air respirator - - 30 CFR 12 (Bureau of Mines Schedule 19 B)

(7) Usage of a respirator specified for use in higher concentrations of lead is permitted in atmospheres of lower concentrations.

(8) Employees shall be given instruction on the use of respirators assigned to them, cleaning of the respirators, and how to test for leakage.

TABLE I-1

Requirements for Respirator Usage

at Concentrations Above the Standard

Exposure	8 Hr TWA mg/m^3	*Respirator type
Inorganic lead dust	less than 1.5	A,B
	less than 15.0	C
	greater than 15.0	D
Inorganic lead fume	less than 1.5	E
	less than 15.0	F
	greater than 15.0	D

* A - Reusable or replaceable filter-type air-purifying dust respirator

B - Single-use dust respirator

C - Powered air-purifying positive-pressure dust respirator

D - Type C positive-pressure supplied air respirator

E - Replaceable filter-type air-purifying fume respirator

F - Powered air-purifying positive-pressure fume respirator

(b) Work Clothing

(1) Each employee subject to exposure above the environmental standard of Section 1 should wear coveralls or similar full body work clothing and hat, which should be worn during the working hours in areas where there is exposure to lead. Workers subject to "exposure to inorganic lead" at or below the recommended standard should change into work clothing before starting work, and should remove work clothing before leaving work. This work clothing need not afford full body coverage.

(2) Work clothing should be vacuumed before removal. Clothes shall not be cleaned by blowing or shaking.

(3) Work clothing should be changed at least twice a week and more frequent changes, especially in high exposure areas, are suggested.

(4) Adequate shower facilities should be available and used.

(5) When in the judgment of the OSHA area industrial hygienist contamination of clothing or exposed body surfaces can produce significant secondary exposures, items (1), (2), (3), and (4) above shall be mandatory.

Section 5 - Apprisal of Employees of Hazards from Lead

(a) Each employee exposed to lead shall be apprised at the beginning of his employment or assignment to a lead area of all hazards, relevant symptoms, appropriate emergency procedures, and proper conditions and precautions for safe use or exposure and shall be instructed as to availability of such information which shall be kept on file including that prescribed in (b) below and shall be accessible to the worker at each place of employment where lead is involved in unit processes and operations.

(b) Information as specified in Appendix III shall be recorded on U. S. Department of Labor Form OSHA-20, "Material Safety Data Sheet", (see page IX-4 and IX-5), or on a similar form approved by the Occupational Safety and Health Administration, U. S. Department of Labor.

Section 6 - Work Practices

(a) Emergency Procedures

(1) Procedures including fire fighting procedures shall be established and implemented to meet foreseeable emergency events.

(2) Respirators shall be available for wearing during evacuation procedures if long distances need to be traversed; supplied air respirators shall be available for employee use where equipment or operations cannot be abandoned.

(b) Exhaust Systems

Where a local exhaust ventilation and collection system is used, it shall be designed and maintained to prevent the accumulation of lead dust and fume.

(1) Hazardous types of exposure should not be scattered throughout a plant but, rather, concentrated in a single area where special control procedures can be utilized.

(2) Air from the exhaust ventilation systems shall not be recirculated into the workroom, and should not be discharged outside the plant so as to create an air pollution problem.

(c) General Housekeeping

(1) Vacuuming shall be used wherever practicable and no dry sweeping or blowing shall be performed.

(2) Emphasis shall be placed upon cleanup of spills, periodic repair of equipment and leaks, proper storage of materials, and collection of lead-containing dust.

Section 7 - Sanitation Practices

(a) Food Facilities

Food preparation, dispensing (including vending machines), and eating shall be prohibited in lead work areas.

(b) Locker Facilities

Work and street clothing should not be stored in the same locker.

Section 8 - Monitoring, Recordkeeping, and Reporting Requirements

Workroom areas where it has been determined, on the basis of an industrial hygiene survey or the judgment of a compliance officer, that environmental levels do not exceed half the environmental standard shall not be considered to have inorganic lead exposure. Records of these surveys, including the basis for concluding that air levels are below half the environmental standard, shall be kept.

Requirements set forth below apply to inorganic lead exposures.

(a) Employers shall monitor environmental levels of lead at least every 6 months, except as otherwise indicated by a professional industrial hygiene survey. If environmental levels are at or above the standard, environmental levels shall be monitored every 3 months. This increased frequency of monitoring shall be continued at least 6 months (i.e. two more quarterly monitoring periods) after the last sampling that demonstrated levels at or above the environmental limit.

Periodic environmental sampling shall be performed to coincide with periodic biologic sampling, i.e. shall be performed within 2 weeks of biologic sampling.

Breathing zone samples shall be collected to permit construction of a time-weighted average exposure for every operation. The following number of samples shall be collected and analyzed, as a minimum, based on the number of workers exposed in any given work area:

Number of Employees Exposed	Number of Samples
1-20	50% of the number of workers
20-100	10 samples plus 25% of the excess over 20 workers
over 100	25 samples plus 5% of the excess over 100 workers

(b) When any time-weighted average exposure is at or above the environmental standard, the OSHA area industrial hygienist shall be notified.

(c) Records shall be maintained for all sampling schedules to include the sampling methods, analytical methods, type of respiratory protection in use (if applicable), and the concentrations of lead in each work area. Records shall be maintained so that they can be classified by employee. Each employee shall be able to obtain information on his own environmental exposure.

(d) Medical records shall include information on all biologic determinations and of all required medical examinations. These records shall be kept for at least five years following the last occupational exposure to inorganic lead.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1973— 759-576/1416