

2009

TLVs[®] and BEIs[®]

Based on the Documentation of the

Threshold Limit Values

for Chemical Substances
and Physical Agents



Biological Exposure Indices



ACGIH[®]

*Defining the Science of
Occupational and Environmental Health[®]*

Signature Publications

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ACGIH® is a member-based organization that advances occupational and environmental health. The organization has contributed substantially to the development and improvement of worker health protection. The organization is a professional society, not a government agency.

The *Documentation of the Threshold Limit Values and Biological Exposure Indices* is the source publication for the TLVs® and BEIs® issued by ACGIH®. That publication gives the pertinent scientific information and data with reference to literature sources that were used to base each TLV® or BEI®. For better understanding of the TLVs® and BEIs®, it is essential that the *Documentation* be consulted when the TLVs® or BEIs® are being used. For further information, contact The Science Group, ACGIH®. The most up-to-date list of substances and agents under study by the Committees is available at www.acgih.org/TLV/Studies.htm.

Comments, suggestions, and requests for interpretations or technical information should be directed to The Science Group at the address below or to the following E-mail address: science@acgih.org. To place an order, visit our website at www.acgih.org/store, contact Customer Service at the address or phone number below, or use the following E-mail address: customerservice@acgih.org.

***Help ensure the continued development of
TLVs® and BEIs®. Make a tax deductible donation to
the FOHS Sustainable TLV®/BEI® Fund today!***

<http://www.fohs.org/SusTLV-BEIPrgm.htm>

**ACGIH®
1330 Kemper Meadow Drive
Cincinnati, OH 45240-4148
Telephone: 513-742-2020; Fax: 513-742-3355
www.acgih.org**

**In the event significant errata are required, they
will be listed on the ACGIH® website at
<http://www.acgih.org/TLV/>.**

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STATEMENT OF POSITION REGARDING THE TLVs® AND BEIs®

The American Conference of Governmental Industrial Hygienists (ACGIH®) is a private, not-for-profit, nongovernmental corporation whose members are industrial hygienists or other occupational health and safety professionals dedicated to promoting health and safety within the workplace. ACGIH® is a scientific association. ACGIH® is not a standards-setting body. As a scientific organization, it has established committees that review the existing published, peer-reviewed scientific literature. ACGIH® publishes guidelines known as Threshold Limit Values (TLVs®) and Biological Exposure Indices (BEIs®) for use by industrial hygienists in making decisions regarding safe levels of exposure to various chemical and physical agents found in the workplace. In using these guidelines, industrial hygienists are cautioned that the TLVs® and BEIs® are only one of multiple factors to be considered in evaluating specific workplace situations and conditions.

Each year, ACGIH® publishes its TLVs® and BEIs® in a book. In the introduction to the book, ACGIH® states that the TLVs® and BEIs® are guidelines to be used by professionals trained in the practice of industrial hygiene. The TLVs® and BEIs® are not designed to be used as standards. Nevertheless, ACGIH® is aware that in certain instances the TLVs® and the BEIs® are used as standards by national, state, or local governments.

Governmental bodies establish public health standards based on statutory and legal frameworks that include definitions and criteria concerning the approach to be used in assessing and managing risk. In most instances, governmental bodies that set workplace health and safety standards are required to evaluate health effects, economic and technical feasibility, and the availability of acceptable methods to determine compliance.

ACGIH® TLVs® and BEIs® are not consensus standards. Voluntary consensus standards are developed or adopted by voluntary consensus standards bodies. The consensus standards process involves canvassing the opinions, views, and positions of all interested parties and then developing a consensus position that is acceptable to these parties. While the process used to develop a TLV® or BEI® includes public notice and requests for all available and relevant scientific data, the TLV® or BEI® does not represent a consensus position that addresses all issues raised by all interested parties (e.g., issues of technical or economic feasibility). The TLVs® and BEIs® represent a scientific opinion based on a review of existing peer-reviewed scientific literature by committees of experts in public health and related sciences.

ACGIH® TLVs® and BEIs® are health-based values. ACGIH® TLVs® and BEIs® are established by committees that review existing published and peer-reviewed literature in various scientific disciplines (e.g., industrial hygiene, toxicology, occupational medicine, and epidemiology). Based on the available information, ACGIH® formulates a conclusion on the level of exposure that the typical worker can experience without adverse health effects. The TLVs® and BEIs® represent conditions under which ACGIH® believes that nearly all workers may be repeatedly exposed without adverse health effects. They are not

fine lines between safe and dangerous exposures, nor are they a relative index of toxicology. The TLVs® and BEIs® are not quantitative estimates of risk at different exposure levels or by different routes of exposure.

Since ACGIH® TLVs® and BEIs® are based solely on health factors, there is no consideration given to economic or technical feasibility. Regulatory agencies should not assume that it is economically or technically feasible for an industry or employer to meet TLVs® or BEIs®. Similarly, although there are usually valid methods to measure workplace exposures at the TLVs® and BEIs®, there can be instances where such reliable test methods have not yet been validated. Obviously, such a situation can create major enforcement difficulties if a TLV® or BEI® was adopted as a standard.

ACGIH® does not believe that TLVs® and BEIs® should be adopted as standards without full compliance with applicable regulatory procedures, including an analysis of other factors necessary to make appropriate risk management decisions. However, ACGIH® does believe that regulatory bodies should consider TLVs® or BEIs® as valuable input into the risk characterization process (hazard identification, dose-response relationships, and exposure assessment). Regulatory bodies should view TLVs® and BEIs® as an expression of scientific opinion.

ACGIH® is proud of the scientists and the many members who volunteer their time to work on the TLV® and BEI® Committees. These experts develop written *Documentation* that includes an expression of scientific opinion and a description of the basis, rationale, and limitations of the conclusions reached by ACGIH®. The *Documentation* provides a comprehensive list and analysis of all the major published peer-reviewed studies that ACGIH® relied upon in formulating its scientific opinion. Regulatory agencies dealing with hazards addressed by a TLV® or BEI® should obtain a copy of the full written *Documentation* for the TLV® or BEI®. Any use of a TLV® or BEI® in a regulatory context should include a careful evaluation of the information in the written *Documentation* and consideration of all other factors as required by the statutes which govern the regulatory process of the governmental body involved.

- *ACGIH® is a not-for-profit scientific association.*
- *ACGIH® proposes guidelines known as TLVs® and BEIs® for use by industrial hygienists in making decisions regarding safe levels of exposure to various hazards found in the workplace.*
- *ACGIH® is not a standard-setting body.*
- *Regulatory bodies should view TLVs® and BEIs® as an expression of scientific opinion.*
- *TLVs® and BEIs® are not consensus standards.*
- *ACGIH® TLVs® and BEIs® are based solely on health factors; there is no consideration given to economic or technical feasibility. Regulatory agencies should not assume that it is economically or technically feasible to meet established TLVs® or BEIs®.*
- *ACGIH® believes that TLVs® and BEIs® should NOT be adopted as standards without an analysis of other factors necessary to make appropriate risk management decisions.*
- *TLVs® and BEIs® can provide valuable input into the risk characterization process. Regulatory agencies dealing with hazards addressed by a TLV® or BEI® should review the full written Documentation for the numerical TLV® or BEI®.*

ACGIH® is publishing this Statement in order to assist ACGIH® members, government regulators, and industry groups in understanding the basis and limitations of the TLVs® and BEIs® when used in a regulatory context. This Statement was adopted by the ACGIH® Board of Directors on March 1, 2002.

TLV®/BEI® DEVELOPMENT PROCESS: AN OVERVIEW

Provided below is an overview of the ACGIH® TLV® and BEI® development process. Additional information is available on the ACGIH® website (www.acgih.org). Please also refer to the attached Process Flowchart (Figure 1).

1. **Under Study:** Each committee determines its own selection of chemical substances or physical agents for its Under Study list. A variety of factors is used in this selection process, including prevalence, use, number of workers exposed, availability of scientific data, existence/absence of a TLV® or BEI®, age of TLV® or BEI®, input from the public, etc. The public may offer input to any TLV® or BEI® committee by e-mail to science@acgih.org.

When a substance or agent is selected for the development of a TLV® or BEI® or for review of an adopted value, the appropriate Committee places it on its Under Study list. This list is published each year by February 1 on the ACGIH® website (www.acgih.org/TLV/Studies.htm), in the ACGIH® Annual Reports, and later in the annual *TLVs® and BEIs®* book. In addition, the Under Study list is updated by July 31 into a two-tier list.

- Tier 1 entries indicate which chemical substances and physical agents **may** move forward as an NIC or NIE in the upcoming year, based on their status in the development process.
- Tier 2 consists of those chemical substances and physical agents that **will not** move forward, but will either remain on or be removed from the Under Study list for the next year.

This updated list will remain in two-tiers for the balance of the year. ACGIH® will continue this practice of updating the Under Study list by February 1 and establishing the two-tier list by July 31 each year.

The Under Study lists published in the ACGIH® Annual Reports and the annual *TLVs® and BEIs®* book are current as of January 1. All updates to the Under Study lists and publication of the two-tier lists are posted on the ACGIH® website (<http://www.acgih.org/TLV/Studies.htm>).

The Under Study list serves as a notification and invitation to interested parties to submit substantive data and comments to assist the Committee in its deliberations. Each Committee considers only those comments and data that address the health science, not economic or technical feasibility. Comments must be accompanied by copies of substantiating data, preferably in the form of peer-reviewed literature. Should the data be from unpublished studies, ACGIH® requires written authorization from the owner of the studies granting ACGIH® permission to (1) use, (2) cite within the *Documentation*, and (3) upon request from a third party, release the information. All three permissions must be stated/covered in the written authorization. (See endnote for a sample permission statement.) Electronic submission of all information to the ACGIH® Science Group at science@acgih.org greatly increases the ease and efficiency with which the Committee can consider the comments or data.

2. Draft Documentation: One or more members of the appropriate Committee are assigned the task of collecting information and data from the scientific literature, reviewing results of unpublished studies submitted for review, and developing a draft TLV® or BEI® *Documentation*. The draft *Documentation* is a critical evaluation of the scientific literature relevant to recommending a TLV® or BEI®; however, it is not an exhaustive or broad-based critical review of the scientific literature. Particular emphasis is given to papers that address minimal or no adverse health effect levels in exposed animals or workers, that deal with the reversibility of such effects, or in the case of a BEI®, that assess chemical uptake and provide applicable determinant(s) as an index of uptake. Human data, when available, are given special emphasis. This draft *Documentation*, with its proposed TLV® or BEI®, is then reviewed and critiqued by additional Committee members, and eventually by the full Committee. This often results in several revisions to the draft *Documentation* before the full Committee accepts the proposed TLV® or BEI® and *Documentation*. The draft *Documentation* is not available to the public through this stage of the development process and is not released until it is at the Notice of Intended Changes (NIC) stage. Authorship of the *Documentation* is not disclosed.

3. Notice of Intended Changes (NIC):

[Notice of Intent to Establish (NIE): *The physical agents section of the TLVs® and BEIs® book also uses the term Notice of Intent to Establish (NIE) in addition to NIC. An NIE follows the same development process as an NIC. For purposes of this process overview, only the term NIC is used.]*

When the full Committee accepts the draft *Documentation* and its proposed TLV® or BEI®, the *Documentation* and proposed values are then recommended to the ACGIH® Board of Directors for ratification as an NIC. If ratified, each proposed TLV® or BEI® is published as an NIC in the *Annual Reports of Committees on TLVs® and BEIs®*, which is published in the ACGIH® member newsletter, *Today! Online* and is also available online for purchase at <http://www.acgih.org/store>. At the same time, the draft *Documentation* is made available through ACGIH® Customer Service or online at <http://www.acgih.org/store>. All information contained in the Annual Reports is integrated into the annual *TLVs® and BEIs®* book, which is usually available to the general public in February or March of each year. The proposed TLV® or BEI® is considered a trial limit by ACGIH® for approximately one year following the NIC ratification by the ACGIH® Board of Directors. Interested parties, as well as ACGIH® members, are invited to provide data and substantive comments, preferably in the form of peer-reviewed literature, on the proposed TLVs® or BEIs® contained in the NIC. Should the data be from unpublished studies, ACGIH® requires written authorization from the owner of the studies granting ACGIH® permission to (1) use, (2) cite within the *Documentation*, and (3) upon request from a third party, release the information. All three permissions must be stated/covered in the written authorization. (See endnote for a sample permission statement.) The most effective and helpful comments are those that address

specific points within the draft *Documentation*. Changes or updates are made to the draft *Documentation* as necessary. If the Committee finds or receives substantive data that change its scientific opinion regarding an NIC TLV® or BEI®, and possibly change its proposed TLV® or BEI® values or notations, the Committee may revise the proposal(s) and recommend to the ACGIH® Board of Directors that it be retained on the NIC.

Important Notice: The comment period for an NIC or NIE draft *Documentation* and its respective TLV(s)®, notation(s), or BEI(s)® is limited to a firm 6-month period, running from February 1 to July 31 of each year. ACGIH® restructured the comment period effective January 1, 2007 to ensure all comments are received by ACGIH® in time for full consideration by the appropriate Committee before its fall meeting. Because of the time required to review, evaluate, and consider comments during the fall meetings, any comments received after the July 31 deadline will not be considered in that year's committee deliberations regarding the outcome for possible adoption of an NIC or NIE. As general practice, ACGIH® reviews all comments regarding chemical substances and physical agents on the Under Study list, as well as NICs or NIEs, or currently adopted TLV(s)® or BEI(s)®. All comments received after July 31 will be fully considered in the following year. Draft *Documentation* will be available for review during the full 6-month period.

When submitting comments, ACGIH® requires that the submission be limited to 10 pages in length, including an executive summary. The submission may include appendices of citable material not included as part of the 10-page limit. It would be very beneficial to structure comments as follows:

- A. **Executive Summary** – *Provide an executive summary with a limit of 250 words.*
- B. **List of Recommendations/Actions** – *Identify, in a vertical list, specific recommendations/actions that are being requested.*
- C. **Rationale** – *Provide specific rationale to justify each recommendation/action requested.*
- D. **Citable Material** – *Provide citable material to substantiate the rationale.*

The above italicized procedure is requested to permit ACGIH® to more efficiently and productively review comments.

4. **TLV®/BEI® and Adopted Documentation:** If the Committee neither finds nor receives any substantive data that change its scientific opinion regarding an NIC TLV® or BEI®, the Committee may then approve its recommendation to the ACGIH® Board of Directors for adoption. Once approved by the Committee and subsequently ratified by the Board, the TLV® or BEI® is published as adopted in the *Annual Reports of the Committees on TLVs® and BEIs®* and in the annual *TLVs® and BEIs®* book, and the draft TLV® or BEI® *Documentation* is finalized for formal publication.
5. **Withdraw from Consideration:** At any point in the process, the Committee may determine not to proceed with the development of a TLV® or BEI® and withdraw it from further consideration. Substances or physical agents that have been withdrawn from consideration can be reconsidered by placement on the Under Study List (step 1 above).

There are *several important points* to consider throughout the above process:

- i. The appropriate method for an interested party to contribute to the TLV® and BEI® process is through the submission of literature that is peer-reviewed and public. ACGIH® strongly encourages interested parties to publish their studies, and not to rely on unpublished studies as their input to the TLV® and BEI® process. Also, the best time to submit comments to ACGIH® is in the early stages of the TLV® and BEI® development process, preferably while the substance or agent is on the Under Study list.
- ii. An additional venue for presentation of new data is an ACGIH®-sponsored symposium or workshop that provides a platform for public discussion and scientific interpretation. ACGIH® encourages input from external parties for suggestions on symposium topics, including suggestions about sponsors, speakers and format. ACGIH® employs several criteria to determine the appropriateness of a symposium. A key criterion is that the symposium must be the most efficient format to present the Committee with information that will assist in the scientific judgment used for writing the *Documentation* and in setting the respective TLVs® or BEIs®. A symposium topic should be suggested while the substance/agent is Under Study, as symposia require considerable time, commitment, and resources to develop. Symposium topic suggestions submitted while a substance is on the NIC will be considered, but this is usually too late in the decision-making process. A symposium topic will not be favorably considered if its purpose is to provide a forum for voicing opinions about existing data. Rather, there must be ongoing research, scientific uncertainty about currently available data, or another scientific reason for the symposium. Symposium topic suggestions should be sent to the ACGIH® Science Group (science@acgih.org).
- iii. ACGIH® periodically receives requests from external parties to make a presentation to a committee about specific substances or issues. It is *strictly by exception* that such requests are granted. While there are various reasons for this position, the underlying fact is that the Committee focuses on data that have been peer-reviewed and published and not on data presented in a private forum. A committee may grant a request when the data is significantly new, has received peer review, is the best vehicle for receipt of the information, and is essential to the committee's deliberations. The presentation is not a forum to voice opinions about existing data. In order for a committee to evaluate such a request, the external party must submit a request in writing that, at a minimum, addresses the following elements: (a) a detailed description of the presentation; (b) a clear demonstration of why the information is important to the Committee's deliberations; and (c) a clear demonstration of why a meeting is the necessary method of delivery. This request must be sent to the ACGIH® Science Group (science@acgih.org).

Also, the Committee may initiate contact with outside experts (a) to meet with the Committee to discuss specific issues or to obtain additional knowledge on the subject, and (b) to provide written input or review of a *Documentation*. This is only done on an as needed basis, and not as a routine practice.

- iv. ACGIH® does *not* commit to deferring consideration of a new or revised TLV® or BEI® pending the outcome of proposed or ongoing research.

Important dates to consider throughout each calendar year of the TLV®/BEI® Development Process:

First Quarter:

- The TLV®/BEI® Annual Reports and the *TLVs® and BEIs®* book are published.

Year Round:

- Public comments are accepted.*
- Committees meet.

* Note: It is recommended that comments be submitted as early as practical, and preferably no later than July 31st to allow sufficient time for their proper consideration/review. This is essential for an NIC or NIE TLV®/BEI®.

Important Notice: The comment period for an NIC or NIE draft *Documentation* and its respective TLV(s)®, notation(s), or BEI(s)®, is limited to a firm 6-month period, running from February 1 to July 31 of each year. ACGIH® restructured the comment period effective January 1, 2007 to ensure all comments are received by ACGIH® in time for full consideration by the appropriate Committee before its fall meeting.

Third Quarter:

- Two-tier Under Study list published on website (<http://www.acgih.org/TLV/Studies.htm>).

Fourth Quarter: **

- TLV®/BEI® Committees vote on proposed TLVs®/BEIs® for NIC or final adoption.
- ACGIH® Board of Directors ratifies TLV®/BEI® Committee recommendations.

** Note: These actions typically occur early in the fourth quarter, but may occur during other periods of the quarter or year.

Endnote: Sample permission statement granting ACGIH® authorization to use, cite, and release unpublished studies:

[Name], [author or sponsor of the study*] grants permission to ACGIH® to use and cite the documents listed below, and to fully disclose them to parties outside of ACGIH® upon request.

Permission to disclose the documents includes permission to make copies as needed.

Example: Joseph D. Doe, PhD, co-author of the study, grants permission to ACGIH® to use and cite the document listed below, and to fully disclose this document to parties outside of ACGIH®. Permission to disclose the document includes permission to make copies as needed.

"Effects of Quartz Status on Pharmacokinetics of Intratracheally Instilled Cristobalite in Rats, March 21, 2003."

*This statement must be signed by an individual authorized to give this permission, and should include contact information such as title and address.

Last Revised January 31, 2008

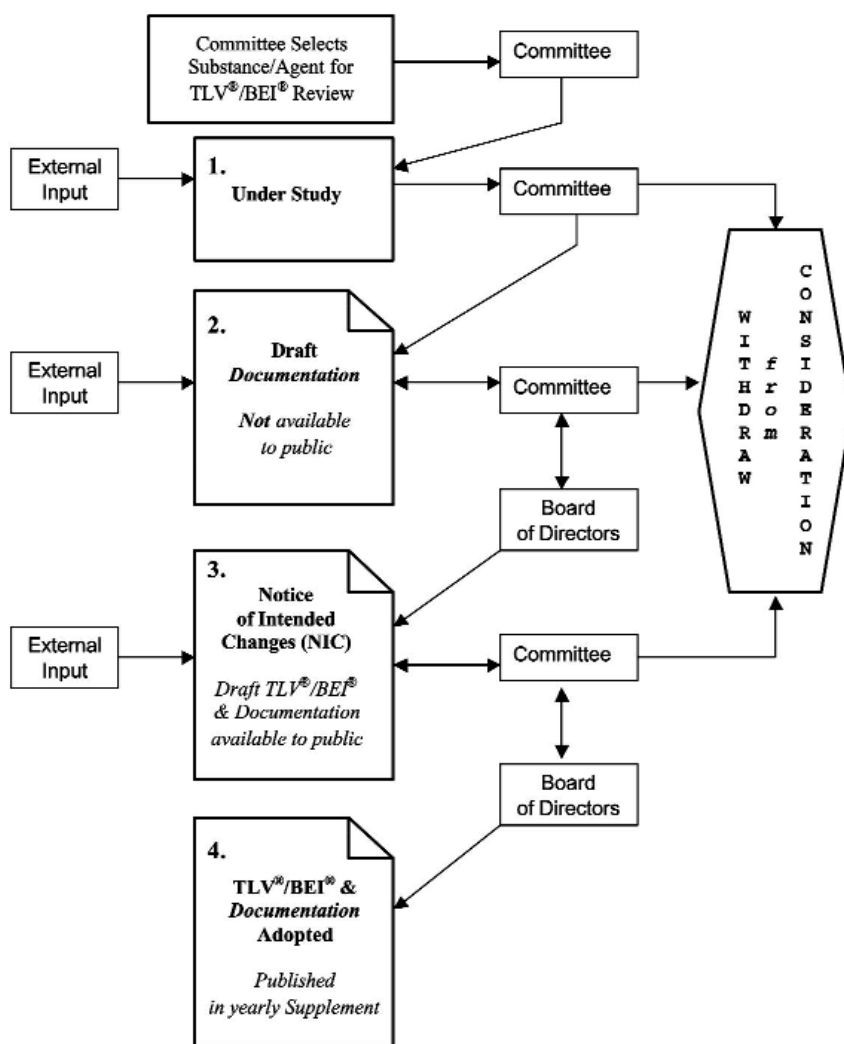


FIGURE 1. The TLV®/BEI® Development Process Flow Chart.

December 20, 2004

ONLINE TLV® AND BEI® RESOURCES

In an effort to make the threshold limit values (TLVs®) and biological exposures indices (BEIs®) guideline establishment process more transparent, and to assist ACGIH® members, government regulators, and industry groups in understanding the basis and limitations of the TLVs® and BEIs®, ACGIH® has an online TLV®/BEI® Resources Section on its website at www.acgih.org/TLV/.

The TLV®/BEI® Resources Section is divided into eight categories, each containing clear and concise information. The categories are:

- **Conflict of Interest Policy** — applies to the Board of Directors, Committee Chairs, and Committee members (including consultant members), and safeguards the integrity and credibility of ACGIH® programs and activities. The Policy, as well as ACGIH®'s oversight and review, each play an important part in the protection of ACGIH®'s programs and activities from inappropriate influences. (www.acgih.org/TLV/COIPolicy.htm)
- **Notice of Intended Changes (NIC)** — a listing of the proposed actions of the TLV®-CS, TLV®-PA, and BEI® Committees. This Notice provides an opportunity for public comment. Values remain on the NIC for approximately one year after they have been ratified by ACGIH®'s Board of Directors. The proposals should be considered trial values during the period they are on the NIC. If the Committee neither finds nor receives any substantive data that change its scientific opinion regarding an NIC TLV® or BEI®, the Committee may then approve its recommendation to the ACGIH® Board of Directors for adoption. If the Committee finds or receives substantive data that change its scientific opinion regarding an NIC TLV® or BEI®, the Committee may change its recommendation to the ACGIH® Board of Directors for the matter to be either retained on or withdrawn from the NIC. [Note: In the Physical Agents section of this book, the term Notice of Intent to Establish (NIE) is used in addition to NIC. For the purpose of this process overview, only the term NIC is used.]
- **TLV®/BEI® Policy Statement** — states what the TLVs® and BEIs® are and how they are intended to be used. While the TLVs® and BEIs® do contribute to the overall improvement in worker protection, the user must recognize the constraints and limitations subject to their proper use and bear the responsibility for such use. (www.acgih.org/TLV/PolicyStmnt.htm)
- **TLV®/BEI® Position Statement** — expresses ACGIH®'s position on the TLVs® and BEIs® process. ACGIH® is proud of the positive impact that the TLVs® and BEIs® have had on workers worldwide, and stands behind the hard work of its Committees to make the process more transparent and accessible. This section is presented in its entirety on pages v through vii. (www.acgih.org/TLV/PosStmnt.htm)
- **TLV®/BEI® Development Process** — gives an overview of the process the Committees go through when establishing a TLV® or BEI®. This section is presented in its entirety on pages viii through xiii. (www.acgih.org/TLV/DevProcess.htm)

- **Committee Operations Manuals** — portable data files (PDF) of the Threshold Limit Values for Chemical Substances, the Threshold Limit Values for Physical Agents, and the Biological Exposure Indices Committees' Operations Manuals. Each Manual covers such areas as the Committee's mission, membership in the Committee, Committee make-up, internal and external communications with the Committee, flow of information, procedures for development of symposia and workshops, etc. (www.acgih.org/TLV/OpsManual.htm)
- **TLV®/BEI® Process Presentations** — stand-alone PowerPoint presentations from the annual American Industrial Hygiene Conference and Exposition (AIHce) are offered. These forums are open to all AIHce registrants and focus on the process used by ACGIH® and its TLV®, BEI®, and Bioaerosols Committees. These presentations are posted on the ACGIH® website (www.acgih.org/TLV/TLVPresentation.htm).
- **Under Study List** — contains substances, agents, and issues that are being considered by the Committees. Each Committee solicits data, comments, and suggestions that may assist in their deliberations about substances, agents, and issues on the Under Study list. (www.acgih.org/TLV/Studies.htm). Further, each Committee solicits recommendations for additional chemical substances, physical agents, and issues of concern to the industrial hygiene and occupational health communities.

REVISIONS OR ADDITIONS FOR 2009

All pertinent endnotes, abbreviations, and definitions relating to the materials in this publication appear on the inside back cover.

Chemical Substances Section

- Proposed TLVs® that appeared on the 2008 NIC are adopted for the following substances:

Beryllium and compounds	Ferbam
Bromoform	Methyl parathion
Dibutyl phosphate	Propyleneimine
Diethanolamine	Sulfur dioxide
Endosulfan	Sulprofos
Ethanol	Vanadium pentoxide
Ethyleneimine	

- Appendix H: Reciprocal Calculation Method for Certain Refined Hydrocarbon Solvent Vapors is adopted.
- Documentation* and adopted TLVs® are withdrawn for the following substances [see also Appendix G]:

Lead arsenate	VM & P Naphtha
Rubber solvent (Naphtha)	

- The following chemical substance and proposed TLV® new to this section is placed on the NIC:

Citral

- Revisions to adopted TLVs® are proposed for the following substances and placed on the NIC:

Cotton dust, raw	Manganese and inorganic compounds, as Mn
Dieldrin	Tantalum and Tantalum oxide dusts, as Ta
Ethyl benzene	Thallium and compounds, as Tl
Maleic anhydride	

- The following substances have been withdrawn from the NIC:

Soapstone	Talc
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- The following substances are retained on the NIC with revised TLV® recommendations or notations:

Cresol, all isomers	Mineral oil
Methyl isobutyl ketone	Thionyl chloride
α-Methyl styrene	

- Previously proposed TLVs® are retained on the NIC for the following substances:

Hydrogen sulfide	Toluene-2,4- or 2,6-
Portland cement	diisocyanate
4,4'-Thiobis(6-tert-butyl-m-cresol)	

- The following substance remains on the NIC as a withdrawal until the time its replacement is adopted:

Oil mist, mineral [see the NIC entry for Mineral oil]

- *Documentation* were updated for the following without change to the recommended TLV[®]. See the 2009 Supplement to the *Documentation* of the TLVs[®] and BEIs[®], 7th ed.:

Acetophenone	Methanol
Chlorobromomethane	m-Phthalodinitrile

Biological Exposure Indices (BEIs[®]) Section

- Proposed BEIs[®] that appeared on the 2008 Notice of Intended Changes (NIC) are adopted for the following substances:

Carbon disulfide	Tetrachloroethylene
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- First-time BEI[®] is recommended for the following substance:

Uranium

- Revision to the BEIs[®] for the following are proposed and placed on the NIC:

2-Methoxyethanol and	Methyl isobutyl ketone
2-Methoxyethyl acetate	Toluene

- *Documentation* and adopted BEI[®] for the following substance are proposed to be withdrawn due to new data:

Vanadium pentoxide

Physical Agents Section

- The “Electromagnetic Radiation Spectrum and Related TLVs[®]” figure, found in the *Electromagnetic Radiation and Fields* section, has been moved to the front of the section.

- An editorial revision has been made to Note 1 in Ultraviolet Radiation.

- The following agent that appeared on the 2008 NIC with revisions/additions is adopted:

- **STATIC MAGNETIC FIELDS**

- The following agent is retained on the NIC with revisions/additions:

- **RADIOFREQUENCY AND MICROWAVE RADIATION** — The reason for this NIC is to add Note 9 to the TLV[®]; to add the section entitled “Radiofrequency Interference Effects on Equipment and Medical Devices” to the

Documentation; to update the TLV®; and to present the TLV® units in W/m² instead of W/cm².

- The following agent is retained on the NIC without revisions/additions:
 - **LASERS**
- Under the *Electromagnetic Radiation and Fields* section, changes to the TLV® for the following are proposed:
 - **SUB-RADIOFREQUENCY AND STATIC ELECTRIC FIELDS** — The reason for this NIC is to modify ramp in TLV® ceiling values at frequencies from 220 Hz to 3 kHz; ceiling values from 3 to 30 kHz have been increased to match the electric field TLV® at 30 kHz in the Radiofrequency and Microwave Radiation TLVs®; and the “Other Exposure Guidelines” section has been deleted.
 - **ULTRAVIOLET RADIATION** — The reason for this NIC is to substantially revise text and notes, and to add Figures 1 and 2.
 - **IONIZING RADIATION** — The reason for this NIC is to update guidance on occupational exposure levels with new information from ICRP, NCRP, and national and international recommendations.
- *Documentation* was updated for the following without change to the recommended TLV®. See the 2009 Supplement to the *Documentation* of the TLVs® and BEIs®, 7th ed.:
 - **HAND ACTIVITY LEVEL**
 - **HEAT STRESS AND STRAIN**

Biologically Derived Airborne Contaminants Section

No new information for 2009.

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