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DEPARTMENT OF EMPLOYMENT AND LABOUR

NO. R. 4598 **5 April 2024**

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993 (ACT NO. 85 OF 1993)

DRAFT REGULATIONS FOR HAZARDOUS CHEMICAL AGENTS

I, Thembelani W Nxesi, Minister of Employment and Labour hereby give notice that I intend, in terms of section 43 of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), and after consultation with the Advisory Council for Occupational Health and Safety, to made regulations in the Schedule.

Interested persons who wish to comment on the draft regulations are invited to do so in writing within 90 days from the date of publication of this notice, in the prescribed format. All representations and comments must be sent to the Director-General of the Department of Employment and Labour.

By hand: The Department of Employment and Labour – attention: E Lourens
Laboria House, 215 Francis Baard Street
Pretoria, CBD

By post: The Director General
The Department of Employment and Labour – attention: E Lourens
Private Bag X117, Pretoria 0001.

By email: DraftComments.OHH@labour.gov.za

MR TW NXESI, MP
MINISTER OF EMPLOYMENT AND LABOUR
DATE: 23/01/2024

Kindly provide inputs, corrections and / or comments in writing on the proposed Draft Regulations in the following format.

Name and Surname:					E-Mail:					Phone number:	
Company name (where applicable)											
Government		Industry		Union		Consultancy		Private		Other	
1	Regulation and/or Sub regulation from draft, referring to		Comment/Input/Correction/Proposal Plus Motivation								
Will the proposal have an impact on any other regulation? If so, which regulation and what will be the impact?											
2	Regulation and/or Sub regulation from draft, referring to		Comment/Input/Correction/Proposal Plus Motivation								
Will the proposal have an impact on any other regulation? If so, which regulation and what will the impact be?											
3	Regulation and/or Sub regulation from draft, referring to		Comment/Input/Correction/Proposal Plus Motivation								
Will the proposal have an impact on any other regulation? If so, which regulation and what will the impact be?											
General Comments:											

Signature:_____

Date:_____

Provide inputs to the Department of Employment and Labour by e-mailing this completed document to: DraftComments.OHH@labour.gov.za

Draft Regulations For Hazardous Chemical Agents

CONTENT

1. Definitions-

In these regulations any word or expression to which a meaning has been assigned in the Act must have the meaning so assigned and, unless the context otherwise indicates –

"air monitoring" means the measurement of employee exposure to airborne hazardous chemical agents, for comparison against occupational exposure limits;

"Asbestos Abatement Regulations" means the Asbestos Abatement Regulations published by Government Gazette No. R.11196 of 10 November 2020 as amended under section 43(1) of the Act;

"assessment" means a programme to determine any risk from exposure to a hazardous chemical agent associated with any hazard thereof at the workplace, in order to identify the steps needed to be taken to remove, reduce or control such hazard;

"BEI" or "biological exposure index" is a reference value for assessing biological monitoring results, intended as a guideline for the likelihood of adverse health effects and generally represents the level of determinants that are most likely to be observed in specimens collected from healthy employees who have been exposed to chemicals with inhalation exposure at the Occupational Exposure Limit, as listed in Table 4 of Annexure 2 hereby as revised from time to time and listed in the Government Gazette;

"CAS number" or "chemical identity" means the number or name respectively, that will uniquely identify a chemical, given in accordance with the nomenclature systems of the International Union of Pure and Applied Chemistry or the Chemical Abstracts Service, or a technical name;

"carcinogen" or "carc" means any agent or mixture which induces cancer or increases its incidence, classified by GHS as-

(a) Category 1: known or presumed human carcinogens;
(b) Category 2: suspected human carcinogens;

"CE marking" means the marking on RPE that indicates "Conformite Europeenne" certifies that a product has met European Union health, safety, and environmental requirements;

"chemical agent" means a GHS aligned agent, substance or mixture;

"chief director, provincial operations" means the chief director, provincial operations as defined in the General Administrative Regulations;

"competent person" means a person in relation to this regulation, who: has, in respect of the work or task to be performed, the required knowledge, training and experience and, where applicable, qualifications specifically including appropriate content on chemical agents or related tasks: Provided that, where appropriate qualifications and training are registered in terms of the National Qualifications Framework Act, 2008 (Act No. 67 of 2008), those qualifications and that training must be regarded as the required qualifications and training; and is familiar with the Act and the regulations, made under the Act, applicable to the scope of work performed;

"**compressed air**" means air that is delivered via a compressor, to a pressure greater than atmospheric pressure;

"consumer product" means a product containing an HCA that is-

(a) packed or repacked primarily for use by a household consumer or for use in an office;
(b) a packed or repacked product, primarily for use by a household consumer, is packed in the way and quantity in which it is intended to be used by a household consumer; and
(c) a packed or repacked product, primarily for use in an office, is packed in the way and quantity in which it is intended to be used for office work;

"container" means in relation to an HCA, anything in or by which an HCA is, or has been, wholly or partly covered, enclosed or packed, including anything necessary for the container to perform its function as a container;

"engineering control measures" means physical changes in process equipment or the installation of auxiliary equipment directed at enclosing, blocking, reducing or capturing emissions with the aim of controlling exposures;

"exposed" means contact through any route of entry whilst at the workplace to a hazardous chemical agent, quantified as the amount of chemical available at the exchange boundaries of the employee and available for absorption and includes potential, accidental or possible, exposure;

"exposure monitoring" means both air monitoring and biological monitoring;

"GHS classification" means the GHS hazard classes and hazard categories assigned to a hazardous chemical agent;

"hazard category" means a division of criteria within a hazard class in the GHS, where these categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally;

"hazard class" means the nature of a physical, health or environmental hazard under the GHS;

"hazard pictogram" means a graphical composition, including a symbol plus other graphical elements, such as a boarder, background pattern or colour that is intended to convey specific information, that is assigned in the GHS to a hazard class or hazard category;

"hazard statement" means a statement assigned in the GHS to a hazard class or hazard category describing the nature of the hazards of a hazardous chemical including, if appropriate, the degree of hazard;

"hazardous chemical agent" or **"HCA"** means a GHS aligned chemical agent as provided in Annexure 1;

"importer" means an employer or self-employed person who imports an HCA into the republic by any means, that is to be used, or could reasonably be expected to be used at a workplace;

"intake" includes inhalation, ingestion or absorption through the skin or mucous membranes, "routes of intake" has a corresponding meaning;

"in transit" means in relation to an HCA that-
(a) is supplied to, or stored at, a workplace in containers that are not opened at the workplace; and
(b) is not used at the workplace;

"Lead Regulations" means the Lead Regulations published under Section 43 of the Act;

"manufacturer" means an employer or self-employed person manufacturing an HCA that is to be used, or could reasonably be expected to be used, at a workplace;

"medical certificate of fitness" means a written statement issued by an occupational health practitioner, or in prescribed cases by an occupational medicine practitioner, in which the practitioner certifies an employee's medical fitness to perform a particular job function, after consideration of the inherent requirements of the job and the hazards to which the employee may be exposed;

"medical screening" means the systematic application of a test or inquiry to identify individuals at sufficient risk of a specific disorder because of exposures in the workplace, identifying potential health effects before the employee exhibits any symptoms, to benefit from further investigation or direct preventive action;

"monitoring" means the planning, carrying out and recording of the results of a measurement programme;

"NIOSH marking" means a marking on RPE that indicates National Institute for Occupational Safety and Health (NIOSH) approval;

"OEL" or "occupational exposure limit" means a limit value set by the Minister, which represents the airborne concentration for an HCA and where the exposure standard can be of three forms-

(a) 8-hour Time-weighted Average;
(b) ceiling limit; and
(c) short term exposure limit.

"OEL ceiling limit" or "ceiling limit" or "C" means a maximum or peak airborne concentration of an HCA determined over the shortest analytically practicable period of time which does not exceed 15 minutes;

"OEL-ML" or "occupational exposure limit-maximum limit" means an occupational exposure limit, as listed in Table 2 of Annexure 2;

"OEL-RL" or "occupational exposure limit-recommended restricted limit" means an HCA as listed in Table 3 of Annexure 2;

"OEL-Short Term Exposure Limit" or "STEL" means the time-weighted average maximum airborne concentration of an HCA calculated over a fifteen-minute period;

"OEL 8-hour Time-weighted average" or "TWA" means the maximum average airborne concentration of an HCA when calculated over an eight-hour working day, for a five-day working week;

"ototoxic chemical agents" means chemical agents that can cause hearing impairment alone or in combination with noise, even below 85dBA;

"personal protective equipment" means in relation to HCA's, specialised clothing or equipment, including respiratory protective equipment, conforming to a standard which will adequately protect the health of a person when used or worn for reducing exposure, as contemplated in the General Safety Regulations;

"prohibited agent" means a hazardous chemical agent prohibited by the Minister and listed in Table 1 of Annexure 2, where the agents prohibited may be revised from time to time, by notice in the Government Gazette;

"precautionary statement" means a phrase prescribed by the GHS that describes recommended measures that should be taken to minimise or prevent-

(a) adverse effects resulting from exposure to an HCA; or
(b) improper storage or handling of an HCA;

"reasonably" means in a sensible and practical way;

"reasonably control or reasonably controlled" with respect to an HCA, means -

(a) considering and reducing the likelihood of exposure to the hazard with reference to duration and concentration of exposure;
(b) applying available knowledge of the health effects of exposure concerning that hazard with reference to the OEL, and of any means of removing or mitigating exposures related to the hazard;
(c) applying available and suitable of controls, to remove or mitigate that hazard or risk, aligned to the hierarchy of controls;
(d) considering the cost of implementing controls, to remove or mitigate that hazard or risk, relative to the anticipated reduction in exposure risk.

"respirator zone" means an area where a respirator is used during normal operations, in which the concentration of an airborne HCA exceeds the OEL-RL or OEL ML for that HCA;

"retailer" means an employer or self-employed person who supplies consumer products, containing an HCA, to members of the public, who are not primarily engaged in the further supply of those products;

"respiratory protective equipment or respirator" means a type of personal protective equipment, which is a device used as a form of control, including respirators which filter the air to remove harmful HCAs, as well as breathing apparatus which supply clean air for the employee to breathe and-

(a) conforms to the technical requirements necessary to obtain CE or NIOSH marking, and
(b) have fulfilled the requirements of the SANS 10338 Homologation of Respiratory Equipment;

"SDS" or "Safety Data Sheet" means a document aligned to GHS, that provides information on the hazard classification, properties of hazardous chemicals and procedures for handling or working with hazardous chemicals in a safe manner and how they affect the health and safety in the workplace;

"SEG" or "Similar Exposure Group" means one or more employees having the same general exposure profile, because of the similarity and frequency of the tasks performed, the materials and processes with which they work, the controls in place as well as the similarity of the way they perform tasks;

"sensitizer including: DSEN and RSEN" means a HCA that causes a substantial proportion of exposed people to develop an allergic reaction in normal tissue after repeated exposure, which includes Dermal Sensitizer (DSEN), Respiratory Sensitizer (RSEN);

"shutdown maintenance" means a planned down period for a plant or machinery for scheduled or emergency maintenance for an extended period of time;

"signal word" means the word "danger" or "warning" used on a GHS aligned label, to indicate to the reader of a potential hazard as well as the relative severity level of a hazard;

"skin" means that the HCA might be absorbed in toxicologically significant amounts through direct contact with skin, or mucous membranes and eyes, from airborne exposure to gases, vapours, or liquids, where conclusions about exposures and health effects, based solely on airborne concentrations may be incomplete;

"supplier" means an employer or self-employed person who conducts a business or undertaking of supplying any HCA, including supply to a retailer;

"temporary respirator zone" means an area where respiratory protective equipment must be used during abnormal operations for a limited time period, in which the concentration of an airborne HCA exceeds the OEL-RL or OEL ML for that HCA;

"the Act" means the Occupational Health and Safety Act, 1993 as amended (Act No.85 of 1993);

"UN IMO International Maritime Dangerous Goods Code" means the International Maritime Organisation, International Maritime Dangerous Goods (IMDG) Code, which was developed as an international code, as an agency of the United Nations, for the maritime transport of dangerous goods in packaged and bulk form, with particular reference to the segregation of incompatible substances, as may be updated from time to time;

"UN Globally Harmonized System" or "GHS" means the International Maritime Organisation, International Maritime Dangerous Goods (IMDG) Code, which was developed as an international code, as an agency of the United Nations, for the maritime transport of dangerous goods in packaged and bulk form, with particular reference to the segregation of incompatible substances, as may be updated from time to time;

"UN Number" means the HCA four figure identification number in the UN Transport of Dangerous Goods Model regulations, as may be updated from time to time;

"UN Proper Shipping Name" means the HCA name in the UN Transport of Dangerous Goods Model regulations, most accurately describing the goods, as may be updated from time to time;

"UN Transport of Dangerous Goods" means the UN Recommendations on the Transport of Dangerous Goods Model Regulations Volumes 1 and 2 and, which are guidance documents developed by the United Nations to harmonize dangerous goods transport regulations, as may be updated from time to time, commonly known as the UN Orange Book;

"vulnerable employee" means an employee who is at a higher risk of injury, disease or complications caused by exposure to an HCA;

2. Scope of application

(1) Subject to the provisions of subregulation (2), these regulations apply to-
   (a) an employer or a self-employed person who carries out work at a workplace which may expose any person to an HCA at the workplace; and
   (b) a manufacturer, importer, supplier or retailer of an HCA that is intended for use at a workplace;

(2) The provisions of regulations 14 and 17(1), do not apply to:
   (a) a self-employed person; or

(b) a person who visits a workplace as contemplated in subregulation (1).

(3) The provisions of these regulations do not apply in the case where the Lead Regulations or Asbestos Abatement Regulations, apply.

3. Classification of Hazardous Chemical Agents

(1) The manufacturer or importer of a chemical agent must, before it is supplied to a workplace-

(a) determine whether the chemical agent is an HCA by carrying out a hazard assessment referencing the building blocks provided in Annexure 1; and

(b) review the GHS classification, should a change in composition of the HCA be made.

(2) The classification and review of GHS classification contemplated in subregulation (1) must be carried out by a competent person.

4. Safety Data Sheet

(1) Subject to section 10(3)(b) of the Act and regulation 3, a safety data sheet for an HCA must be-

(a) prepared by an importer or, manufacturer before manufacture and if not reasonably practicable, immediately after manufacture but before import, provided that the safety data sheet is-

(i) GHS compliant;

(ii) developed by a competent person;

(iii) classified for the HCA, in accordance with regulation 3;

(iv) reviewed at least once every 5 years;

(v) amended whenever necessary to ensure that it contains correct and current information, aligned to its GHS classification required in regulation 3, which includes new data regarding the hazard presented by an HCA, that changes its classification in a category or subcategory of a hazard class, or results in its classification in another hazard class; and

(vi) given the most recent applicable date which, may be the date of first issue, review or amendment.

(b) provided by the manufacturer or importer to-

(i) a supplier of an HCA to a workplace; and

(ii) any person who is likely to be affected by an HCA;

(c) provided by the supplier of an HCA-

(i) when the HCA is first supplied to the workplace;

(ii) if the SDS for the HCA is amended; and

(iii) to any person at the workplace if they request the SDS;

(d) obtained by the employer from the manufacturer, importer or supplier of the HCA and provided to-

(i) any person who is involved in using, handling or likely to be exposed to the HCA at the workplace;

(ii) any person at the workplace who needs the information to assess risk related to health and safety;

(iii) any health practitioner who needs the information to treat a person who has been exposed to the HCA; or

(iv) an emergency service professional who requires the information to fulfil their duties as an emergency respondent.

(2) Subregulation (1) does not apply to a manufacturer or importer of an HCA who has not manufactured or imported the HCA in the past 5 years.

(3) The information in the GHS compliant safety data sheet should be presented using the following 16 headings in the order given below, as may be updated from time to time-

(a) 1: identification of the substance/mixture and of the company/undertaking;
(b) 2: hazards identification;
(c) 3: composition/information on ingredients;
(d) 4: first aid measures;
(e) 5: firefighting measures;
(f) 6: accidental release measure;
(g) 7: handling and storage;
(h) 8: exposure controls/personal protection;
(i) 9: physical and chemical properties;
(j) 10: stability and reactivity;
(k) 11: toxicological information;
(l) 12: ecological information;
(m) 13: disposal considerations;
(n) 14: transport information;
(o) 15: regulatory information; and
(p) 16: other information.

(4) With the exception of heading 16, no heading may be left blank, if specific information is not applicable or available this should be indicated.

(5) Under heading 8 any applicable OEL -ML or OEL –RL in Annexure 2 must be provided.

(6) Every page of an SDS must be numbered.

(7) The GHS product identifier must appear on each page of an SDS.

5. Labelling of Hazardous Chemical Agents

(1) With regard to labelling of an HCA-

(a) a manufacturer or importer of an HCA must ensure that the HCA is correctly labelled as soon as practicable after manufacturing or importing;
(b) a supplier of an HCA must not supply an HCA, if it is not correctly labelled;
(c) a retailer of an HCA must not supply consumer products containing HCAs, to be used in a workplace, if they are not correctly labelled; and
(d) an employer must-

(i) ensure that an HCA used, handled or stored at the workplace is correctly labelled;
(ii) ensure that a container labelled for a HCA is used only for the use, handling or storage of that HCA;
(iii) ensure that when an HCA is transferred or decanted at the workplace, from its original container into a destination container, the destination container is correctly labelled for that HCA; and
(iv) an HCA within pipework is identified by a label, sign or any other suitable manner, on or near the pipework, subject to:

(aa) where the product is a mixture of more than one HCA, the intermediate or finished product name may be used for identification;

(bb) sampling or loading points or any other termination point of a pipe where during normal operations employees may be exposed to an HCA, must be identified; and

(cc) pipework including the splitting of flanges, where employees may be exposed during routine maintenance activities, should be identified as far as is reasonably practicable.

(2) Subject to the provisions of subregulation (1) an HCA is correctly labelled, if the selection and use of label elements is in accordance with the GHS and is packed in a container that has a label-

(a) that includes-

(i) the product identifier;
(ii) here applicable the UN proper shipping name;
(iii) the chemical identity of all ingredients, contributing to the final GHS classification of the HCA;
(iv) the name, address, business and telephone number of the manufacturer; or the importer;
(v) an emergency telephone number;
(vi) applicable signal word;
(vii) hazard statement;
(viii) precautionary statement; and
(ix) hazard pictogram consistent with the GHS;

(b) which may include-

(i) the quantity of the HCA in the package, unless this quantity is specified elsewhere on the package;
(ii) the quantity of each HCA ingredient;
(iii) any information about the hazards, first aid and emergency procedures relevant to the HCA, not otherwise included in the hazard statement or precautionary statement;
(iv) first aid measures;
(v) classification of the HCA, made in accordance with regulation 3; and
(vi) an expiry date, where applicable.

6. Packaging of Hazardous Chemical Agents

(1) Packaging for an HCA must satisfy the relevant requirements of the UN Transport of Dangerous Goods, with respect to packaging and fastenings, or where applicable the UN IMO International Maritime Dangerous Goods Code, including the following requirements-

(a) The manufacturer or importer of an HCA must ensure that the HCA is correctly packed, as soon as reasonably practicable after manufacturing or importing, where correctly packed means-

(i) it is in sound condition;
(ii) durably and legibly marked;
(iii) will safely contain the chemical for the time the chemical is likely to be packed;
(iv) is made of material that is compatible with, and will not be adversely affected by the chemical;
(v) the packaging and fastenings are strong and solid throughout, to ensure that they will not loosen and will meet the normal stresses and strains of handling; and
(vi) it does not usually contain food or beverages and cannot be mistakenly identified as containing food or beverages.

(b) The employer or self-employed person must only receive, use, handle or store an HCA if it is correctly packed, as contemplated in subregulation (1).

(c) An employer or self-employed person must as far as reasonably practicable, ensure that a container or a vehicle in which an HCA is transported, is clearly identified and in compliance with the National Road Traffic Act, 1996 (Act No. 93 of 1996).

7. Disclosure of ingredient identity

(1) Where an ingredient in an HCA causes the correct classification of the chemical agent, in terms of regulation 3 to include a hazard class and hazard category referred to in-
   (a) Table 4 of Annexure 1, then the chemical identity of the ingredient detailed must be disclosed; or
   (b) Table 5 of Annexure 1, then the chemical identity of the ingredient may be disclosed by its generic name if-
      (i) the identity of the ingredient is commercially confidential;
      (ii) the ingredient does not cause the correct classification of the hazardous chemical to include any other hazard class and hazard category in Table 4 of Annexure 1; and;
      (iii) an OEL for the ingredient has not been established;
   (c) For all other cases not included in subregulation (1)(b), the ingredient must be disclosed by its chemical identity.

(2) Where an ingredient of an HCA must be disclosed in terms of subregulation (1)(a), the proportion of the ingredient to the hazardous chemical must be disclosed if-
   (a) the exact proportion of the ingredient is not commercially confidential, where the exact proportion of the chemical is expressed as a percentage by weight or volume; or
   (b) the exact proportion of the ingredient is commercially confidential in terms of the following ranges within which the exact proportion fits, expressed as a percentage by weight or volume-
      (i) <15%;
      (ii) 15 to 70%;
      (iii) >70%; or
      (iv) a range that is narrower than the ranges provided for in (i), (ii) or (iii).

8. **Disposal of Hazardous Chemical Agents**

(1) An employer must, as far as is reasonably practicable, ensure that all HCA waste is classified and disposed of as waste in terms of the following legislation, as updated from time to time-
   (a) National Environmental Management: Waste Act, 2008, (Act no 59 of 2008),
   (b) Waste classification and management regulations, 2013;
   (c) National norms and standards for the assessment of waste for landfill disposal, 2013; and
   (d) National norms and standards for disposal of waste to landfill, 2013;

(2) Ensure that all collectable HCA waste is placed into containers that will prevent the likelihood of exposure during handling.

(3) Ensure that all vehicles, re-usable containers and covers which have been in contact with HCA waste, are cleaned and decontaminated after use in such a way that the vehicles, containers or covers do not cause a hazard inside or outside the premises concerned.

(4) Ensure that all employees involved in the collection, transport and disposal of HCA waste, who may be exposed to that waste, are provided with suitable personal protective equipment.

(5) Ensure that if the services of a waste disposal contractor are used, a provision is incorporated into the contract stating that the contractor must also comply with the provisions of these regulations.

9. Inventory for Hazardous Chemical Agents

(1) An employer must ensure as far as reasonably practicable that-
  (a) an inventory of HCAs used, handled or stored at the workplace is prepared and kept at the workplace; and
  (b) the inventory is maintained to ensure the information is up to date.

(2) The inventory must include-
  (a) a list of HCAs used, handled or stored;
  (b) the current SDS for each HCA; and
  (c) the work area where the HCA is used.

(3) The employer must ensure that the inventory is readily accessible to-
  (a) an employee involved in using, handling or storing an HCA; and
  (b) anyone else who is likely to be affected by an HCA at the workplace.

(4) An inventory is not required if-
  (a) the HCA is in transit, in which case the employer must ensure that they are in possession of the dangerous goods transport information specified in the UN Transport of Dangerous Goods and a SDS for the HCA; or
  (b) the HCA is a consumer product where the employer is a retailer, or it is reasonably foreseeable that the consumer product will be used at the workplace only in-
    (i) quantities that are consistent with household use;
    (ii) a manner that is consistent with household use; and
    (iii) a manner that is incidental to the nature of the work carried out by an employee using the HCA.

10. Hazardous chemical agent risk assessment

(1) Where an HCA is present in the workplace the employer must cause a documented risk assessment of an HCA to be carried out -
  (a) immediately;
  (b) thereafter at intervals not exceeding 24 months;
  (c) by a competent person;
  (d) using the information gathered in subregulation (d)(i) and (ii), develop named SEGs for the workplace and assess HCA risk for each SEG; and
  (e) taking into account at least the following-
    (i) the scope of the risk assessment including work area, job and position classification, and inventory of tasks within a job;
    (ii) nature of task specific exposure, considering HCA exposure concentration;
    (iii) duration and frequency of the tasks;
    (iv) where available, implementation of recommendations contained in the previous assessment through a documented action plan;
    (v) where available, previous results of exposure monitoring in accordance with regulation 13;
    (vi) information provided by the manufacturer or importer or supplier of the HCA;
    (vii) the hazardous properties of the HCA, including the health class and categories, which are contained in any relevant SDS that is compliant with regulation 4;
    (viii) ototoxic chemical agents acting synergistically with noise to cause hearing loss;
    (ix) potential HCA exposure during confined space entry;

(x) additional information on health effects, including where available the OEL for that HCA;
(xi) the circumstances of the work, including the amount of the HCA involved;
(xii) the level, frequency and duration of exposure as well as route of intake;
(xiii) in circumstances where the work will involve exposure to more than one HCA, the risk presented by exposure to such HCA in combination;
(xiv) activities, such as preventative and breakdown maintenance, carried out during standard operating conditions;
(xv) the effectiveness of preventive and control measures which have been or will be taken in accordance with regulation 11, including the experience of employees regarding the effectiveness of controls;
(xvi) the steps recommended to be taken to control exposures, in accordance with regulation 11, aligned with the hierarchy of control;
(xvii) records of adverse medical surveillance outcomes, required by regulation 14(7), and where needed seek guidance from any Occupational Health Practitioner appointed by the employer;
(xviii) the differing effects of exposure to HCA to men, women, young employees and vulnerable employees, where such difference may exist;
(xix) where compressed air is used to clean surfaces;
(xx) such additional information as may be needed in order to complete the HCA risk assessment;
(xxi) where shutdown maintenance is conducted or an incident occurs.

(2) The employer must review the assessment required by subregulation (1) forthwith if-
(a) there has been a change in a process involving an HCA or in the methods, equipment or procedures in the use, handling, control or processing of the HCA;
(b) there is a change indicating that potential exposure is not reasonably controlled in terms of regulation 11;
(c) there is a failure or deterioration of a control measure in terms of regulation 12;
(d) an inspector is of the opinion that that the risk assessment does not adequately assess risk; or
(e) an incident occurred involving HCA.

(3) The employer must indicate appropriate controls in the HCA risk assessment, in terms of regulation 11, where there is a risk to health indicated by-
(a) the risk assessment conducted in terms of subregulation (1);
(b) the review conducted in terms of subregulation (2);
(c) the results of any exposure monitoring carried out in accordance with regulation 13;
(d) medical surveillance carried out in accordance with regulation 14;
(e) if after implementation of controls for the SEG, in terms of regulation 11, the review conducted in terms of subregulation (2) indicates potential exposure is likely to exceed 50% of the OEL;
(f) air monitoring alone is unlikely to reflect total uptake through all exposure pathways; or
(g) where the BEI is likely to be exceeded, then in terms of regulation 13(1) exposure monitoring must be conducted.

11. Prevention or Control of Exposure to HCA

(1) An employer must prevent the exposure to an HCA or, where this is not reasonably practicable, control of that exposure must only be considered as adequate if-
(a) for an HCA with a restricted limit, the OEL for the SEG is not exceeded and exposure is reasonably controlled;

(b) for an HCA with a maximum limit, exposure is reasonably controlled, and-

(i) the OEL for the SEG is not exceeded; or

(ii) if practicable elimination or substitution have been implemented in line with subregulations (2)(a) and (2)(b) respectively and;

(iii) engineering controls have been implemented in line with subregulation (2)(c), but have not reduced exposure to below the OEL, where additionally the employer may use administrative controls specified in subregulation (2)(d) or personal protective equipment controls as provided for in regulation 15.

(2) When determining whether exposure is reasonably controlled, the employer must apply control measures consistent with the risk assessment of HCA, or if applicable exposure monitoring of HCA carried out in terms regulation 13, in order of priority-

(a) elimination of the HCA or process in which it is used;

(b) substitution of the HCA with an HCA or process which, under the conditions of its use, either eliminates or reduces the risk to the health of employees;

(c) the design and use of engineering controls, including-

(i) the control of exposure at source;

(ii) enclosure of the process and handling systems;

(iii) isolation of the work to control the emission of HCA; and

(iv) modification of process parameters that minimise emissions with the intent of reducing exposure;

(d) the use of administrative controls including-

(i) arrangements for the safe handling, storage and transport of HCA, and waste containing such HCA, at the workplace;

(ii) a safe system or method of work, a process or a procedure including the adoption of suitable maintenance procedures, designed to minimise risk;

(iii) minimising the quantity of HCA at the workplace, which could result in exposure;

(iv) appropriate hygiene measures, including personal hygiene;

(v) information instruction and training;

(vi) reduction of the number of employees exposed; and

(vii) reduction of exposure duration.

(3) When developing control measures ensure that-

(a) all relevant routes of exposure are considered including inhalation, skin absorption and ingestion;

(b) the introduction of control measures does not increase the overall risk to health and safety;

(c) personal protective equipment must be provided in accordance with regulation 15; and

(d) subject to subregulation (1), where reasonably practicable a ventilation system provided to control the concentration of an airborne HCA, must be so designed, constructed and installed, that the concentration of the HCA does not exceed the OEL.

12. Use, maintenance, examination and testing of control measures

(1) Every employer or self-employed person who provides any control measure as contemplated in regulation 11, must ensure that-

(a) reasonable steps are taken to enforce the proper use and application;

(b) where relevant, is maintained in effective working order;

(c) it is maintained in a clean condition; and

(d) inspection, examination and testing of controls, is carried out at appropriate intervals.

(2) Where ventilation controls as a form of engineering control, are provided to meet the requirements of regulation 11, the employer must ensure that-

(a) ventilation controls are operated and maintained, to reasonably control exposure to OEL-RL and OEL-ML agents, subject to regulation 11(1);

(b) written instructions are established, which specify the nature and frequency of inspections, tests and maintenance to be performed on the ventilation system; and

(c) testing of the ventilation system is carried out at least once every 24 months by an approved inspection authority, who must record in writing whether performance of the ventilation plant conforms to an appropriate standard or guideline.

(3) The employer must review and as necessary revise a control measure, where it is indicated that an existing control measure does not achieve reasonable control as contemplated-

(a) in the assessment of HCA risk, provided for in regulation 10;

(b) in the results of exposure monitoring, provided for in regulation 13; and

(c) in the request for a review of a control by a health and safety representative or committee.

13. Exposure monitoring of HCA

(1) Based on the HCA risk assessment for an SEG carried out in accordance with regulation 10, the employer must ensure that exposure monitoring is conducted -

(a) for air monitoring for an HCA with an OEL ML or RL, at least every 24 months: Provided an inspector may direct an employer to conduct or re-conduct the exposure monitoring or part thereof;

(b) by an approved inspection authority;

(c) if the risk assessment indicates potential exposure is evaluated to exceed 50% of the OEL;

(d) by collecting a minimum of three personal air monitoring measurements for each SEG;

(e) for biological monitoring of an HCA with a BEI listed in table 4 of Annexure 2, when-

(i) air monitoring alone is not likely to reflect total uptake through all exposure pathways and the BEI is likely to be exceeded;

(ii) air monitoring results contemplated in subregulation (1)(a) exceed 50% of the OEL; or

(iii) recommended by an occupational medicine practitioner.

(2) The results of air monitoring carried out in terms of subregulation (1) must be used to determine-

(a) the need for controls, in terms of regulation 11;

(b) whether to conduct medical screening and surveillance, in terms of regulation 14; and

(c) validation of respirator protection factor selection, in terms of regulation 15.

(3) An employer must develop an action plan with appropriate corrective actions based on the recommendations in the risk assessment and exposure monitoring report.

(4) Enter the results of the exposure monitoring programme, contemplated in subregulation (1), into the record required by regulation 19.

(5) Based on the risk assessment for an SEG, every employer or self-employed person must ensure that exposure monitoring for crystalline silica, is conducted, -

(a) at least every 12 months: Provided an inspector may direct an employer to re-conduct the exposure monitoring or part thereof;

(b) by an approved inspection authority; and

(c) an employer or self-employed person contemplated in subregulation 5 must-

(i) develop a documented silicosis elimination plan;

(ii) submit annually to the Department, a report on crystalline silica exposure in the format of Annexure 3, by 31 March of each year.

14. Medical screening and surveillance

(1) Where the HCA risk assessment, including consideration of all routes of intake, or the exposure monitoring for HCA, comparative to an OEL or BEI as the case may be, identifies a significant exposure risk for an employee carrying out work using, handling, generating of storing HCA, the employer must obtain the opinion of an occupational medicine practitioner to determine whether it is necessary to conduct medical screening of employees.

(2) Where significant exposure risk is identified in terms of subregulation (1), the occupational medicine practitioner must consider if-

(a) there is significant risk to an employee's health;

(b) an employee has a health condition that makes the employee vulnerable to an HCA, or which impacts the proper use of personal protective equipment;

(c) there is an identifiable occupational disease or adverse effect related to the HCA;

(d) there is a reasonable likelihood that the disease or effect may occur under the particular exposure conditions of their work; and

(e) there are valid techniques to diagnose indications of the disease or the effect, as far as is reasonably practicable.

(3) Where the need for medical surveillance has been determined as necessary by the occupational medicine practitioner, as contemplated in subregulation (2), the occupational medicine practitioner must specify requirements for medical screening including-

(4) an evaluation of the employee's medical, occupational and exposure history;

(a) the appropriate clinical examination and medical tests;

(b) the intervals at which medical screening must be conducted, appropriate to the health risks and health status of the employee.

(4) The employer must ensure that medical screening contemplated in subregulation (3) is carried out by an occupational health practitioner-

(a) immediately before or within 14 days after a person commences employment as is practicable; and

(b) subsequently, at intervals recommended by the occupational medicine practitioner, but not exceeding 24 months.

(5) After the initial or periodic medical screening evaluation has been conducted, the occupational medicine practitioner must notify the employer in writing by means of a medical certificate of fitness, and inform the employee accordingly, if-

(a) the employee has a medical condition which;

(i) prevents the wearing of other personal protective equipment, where the employee's job requires the wearing of respiratory protective equipment or other any other personal protective equipment; or

(ii) is likely to be aggravated by the exposures at that workplace;

(b) the medical screening evaluation identified an adverse health effect caused by exposure to an HCA at that workplace.

(6) With respect to the medical certificate of fitness contemplated in subregulation (5)-

(a) The certificate must indicate-

(i) recommendations pertinent to the employee's fitness to perform the inherent requirements of the job, or the presence of an occupational disease, without including confidential medical information;

(ii) if any restrictions or conditions apply to any specified duties performed by the employee;

(iii) the period for which any restrictions or conditions, as applicable, should be applied;

(b) The employer must, as far as is reasonably practicable-

(i) accommodate the conditions or restrictions recommended; and

(ii) only permit an employee who has been medically certified for restricted duties to return to normal duties if the employee has been certified fit for those duties by an occupational medicine practitioner.

(7) The employer must, where medical screening has been determined necessary by the occupational medicine practitioner as contemplated in subregulation (3), establish and maintain a documented system of medical surveillance including-

(a) an analysis of the screening results over time, to look for abnormal trends in health status, potentially resulting from adverse effects of exposure to an HCA; and

(b) must be overseen by an occupational medicine practitioner;

(c) using the results of subregulation 7(a) to identify the need for targeted exposure prevention in the workplace.

(8) The employer must investigate and report the occupational disease contemplated in subregulation (6)(a) in compliance with regulation 8 of the General Administrative Regulations, and section 25 of the Occupational Health and Safety Act, 85 of 1993.

(9) The employer must-

(a) ensure that the employee provides written informed consent for inclusion in the medical screening;

(b) ensure that the employee provides written informed consent for inclusion in the surveillance programme.

(10) The employer must ensure that an exit medical screening is carried out by an occupational health practitioner on termination of an employee's service.

(11) An employee may appeal any finding of an occupational medical practitioner stipulated in the medical certificate of fitness to the chief inspector, in writing within 60 days of receiving the certificate.

15. Personal protective equipment and facilities

(1) Personal protective equipment must be provided by an employer to adequately control the HCA to which the employee is exposed-

(a) where reasonable control of exposure cannot be achieved for an HCA by means contemplated in regulation 11(2)(a), (b), (c) or (d);

(b) for an HCA with an OEL ML, the additional requirements of Regulation 11(1)(b) apply;

(c) as an interim control measure, for an HCA, while other preferred control measures are being designed and installed; and

(d) whilst conducting preventative or breakdown maintenance or shutdown maintenance work.

(2) The employer must ensure that personal protective equipment provided under subregulation (1), is selected to minimise risk to health by ensuring that the personal protective equipment is-

(a) suitable having regard to the nature of the work and any hazard associated with the work, with consideration of the SDS recommendations as contemplated in regulation 4(3)(h) and exposure risk determined in regulations 10 and 13;

(b) capable of controlling exposure to the HCA;

(c) in the case of an HCA which can be absorbed through the skin, is impermeable to HCAs

(d) readily available to employees who require personal protective equipment;

(e) properly used, worn and maintained by the employee, by enforcing its use through providing adequate information, instruction, training and supervision;

(f) in relation to issuing of respiratory protective equipment, ensure the equipment is appropriate for-

(i) controlling the exposure to below the OEL - RL for the relevant HCA;
(ii) achieving a good seal to the face, where tight fitting respiratory protective equipment is required to control exposure;
(iii) the size and fit for the employee who has to use it;
(iv) the type of work to be done;
(v) the physical effort required to do the work;
(vi) the length of time it will have to be worn;
(vii) the requirements in relation to the work for visibility, comfort and employee communication;
(viii) compatibility with any other personal protective equipment that may be needed; and
(ix) any recommendations made by the occupational health practitioner.

(3) Reusable personal protective equipment must be maintained, repaired or replaced so that it continues to minimise risk to health of the employee who uses it, including by ensuring that the equipment is-
(a) clean, decontaminated and sanitised;
(b) examined at suitable intervals and if found to be defective, make repairs before further use or replace the equipment; and
(c) when not in use during breaks, respiratory protective equipment must only be stored in a designated readily accessible container, limiting HCA contamination of the respiratory protective equipment.

(4) An employer must as far as is reasonably practicable, ensure that all contaminated personal protective equipment is cleaned and handled in accordance with the following-
(a) where the equipment is cleaned on the premises of an employer, care must be taken to prevent contamination during handling, transport and cleaning;
(b) where the equipment is sent off the premises to a contractor for cleaning purposes-
(i) the equipment must be packed in impermeable containers;
(ii) the containers must be tightly sealed and have a clear indication thereon that the contents thereof are contaminated; and
(iii) the relevant contractor must be fully informed of the requirements of these regulations and the precautions to be taken for the handling of the contaminated equipment.

(5) Subject to the provisions of subregulation (4)(b) an employer must ensure that no person removes dirty or contaminated personal protective equipment from the premises: Provided that where contaminated personal protective equipment has to be disposed of, it must be treated as HCA waste as contemplated in regulation 8.

(6) Subject to the provisions of the Facilities Regulations, an employer must, where reasonably practicable, provide employees using personal protective equipment as contemplated in subregulation (1), with-
(a) adequate washing facilities which are readily accessible and located in an area where the facilities will not become contaminated, in order to enable the employees to meet a standard of personal hygiene consistent with the adequate control of exposure, and to avoid the spread of an HCA;
(b) two separate lockers separately labelled 'personal protective equipment' and 'personal clothing', and ensure on completion of work for that day, that the personal protective equipment is stored separately in the personal protective equipment locker; and
(c) separate 'clean' and 'dirty' change rooms if the employer uses or processes an HCA to the extent that the HCA could endanger the health of persons outside of the workplace.

16. Respirator zones

(1) An employer must ensure, subject to regulation 11(1), that a respirator zone or temporary respirator zone is declared for any workplace or part of a workplace under their control, where the concentration of an HCA in the air is or may be, such that the exposure of employees working in that workplace exceeds the OEL without the wearing of respiratory protective equipment.

(2) A respirator zone may be declared, during normal operations, including when-
   (a) it is not possible to achieve reasonable control; or
   (b) control is not reasonable or practical due to frequency, duration or nature of the operation or task.

(3) A temporary respirator zone may be declared, during abnormal operations, including when engineering controls are-
   (a) rendered ineffective due to a temporary breakdown;
   (b) being installed or repaired; or
   (c) ineffective to control exposures in an emergency situation, such as a spill or other temporary situations resulting in increased exposure.

(4) The respirator zone or temporary respirator zone must be clearly demarcated and identified by relevant symbolic safety signage.

(5) The employer must ensure that no person enters or remains in a respirator zone or temporary respirator zone unless they are wearing the required respiratory protective equipment and other personal protective equipment, as contemplated in regulation 15.

17. Information, instruction and training

(1) An employer who undertakes work which exposes an employee to an HCA, must inform and consult the relevant health and safety representatives or health and safety committee established for that workplace, of the-
   (a) intention to conduct-
      (i) a risk assessment contemplated in regulation 10;
      (ii) exposure monitoring contemplated in regulation 13;
      (iii) medical screening and surveillance contemplated in regulation 14; and
      (iv) training contemplated in subregulation (2).
   (b) documented outcomes of the-
      (i) risk assessment contemplated in regulation 10;
      (ii) exposure monitoring contemplated in regulation 13; and
      (iii) medical surveillance contemplated in regulation 14.
   (c) an employer must provide suitable and adequate information, instruction and training, to any employee, prior to any potential exposure to an HCA.

(2) The information, instruction and training contemplated in subregulation (1)(c), must include-
   (a) the contents and scope of these regulations including but not limited to-
      (i) OELs in place; and
      (ii) duties of persons who are likely to be exposed to an HCA, as contemplated in regulation 18;
   (b) details of the HCA to which the employee is likely to be exposed at the workplace including-
      (i) where the HCAs, can be found and potential sources of exposure;
      (ii) information on the potential risk to health and safety;
      (iii) and the outcomes of the HCA risk assessment contemplated in regulation 10 and exposure monitoring contemplated in regulation 13;

(c) how to access the relevant SDS's, risk assessment, exposure monitoring records and personal medical records;
(d) the information that each part of an SDS provides;
(e) the information that each part of the label on containers provides and why the information is being provided;
(f) the work practices and procedures to be followed in the use, handling, storage, transportation, spill clean-up, disposal, emergency situations, good housekeeping and personal hygiene for HCAs;
(g) the differing effects of exposure to HCA to men, women, young employees and vulnerable employees, where such difference may exist;
(d) the necessity of personal exposure monitoring, biological monitoring and medical surveillance;
(h) the need for personal protective equipment including respiratory protective equipment as well as the correct use, storage and maintenance;
(i) the necessity, correct use, maintenance and limitations of safety equipment, facilities and engineering control measures provided.

(3) The employer must provide suitable and adequate refresher information and training, as contemplated in subregulation (2), at least annually or-

(a) when there is a significant change in the type of work carried out or methods of work used by the employer,

(b) when recommended by the health and safety committee or health and safety representative, or

(c) the need for training is identified within the risk assessment.

(4) An employer must give written instructions of the procedures to be followed in the event of spillages, leakages or any similar emergency situation, to the drivers of vehicles transporting the HCA.

(5) As contemplated in section 37(2) of the Act, the employer must agree in writing to the arrangements and procedures to ensure compliance by the mandatory, to information and training requirements.

(6) An employer or self-employed person must ensure, as far as is reasonably practicable, persons other than employees who may be affected by HCA exposure at the workplace, are appropriately informed and instructed.

18. Duties of persons who may be exposed to HCA

(1) Any person who is or may be exposed, must obey a lawful instruction, which may be given as part of information, instruction and training as contemplated in regulation 17, by or on behalf of the employer or a self-employed person, regarding-
(a) preventative measures to avoid the uncontrolled release of an HCA;
(b) making full and proper use of any control measure or facility provided by the employer;
(c) inspecting, using, cleaning, wearing, storing or disposing of personal protective equipment, including respiratory protective equipment and protective clothing;
(d) removing contaminated personal protective equipment when leaving the working area and keeping it apart from uncontaminated personal protective equipment;
(e) ensuring personal protective equipment is returned after use and correctly stored, if not of the disposable type;
(f) immediately informing the employer of any damage to, defect in, or need to clean or decontaminate or replace any personal protective equipment of which the employee becomes aware;

(g) not intentionally misusing or damaging any control measure including personal protective equipment or facility provided by the employer;
(h) determining personal exposure, which may include the wearing of monitoring equipment to measure exposure;
(i) attending scheduled medical screening or medical surveillance and associated biological monitoring or biological effect monitoring, as required by these regulations;
(j) permitting medical screening, medical surveillance and associated biological monitoring or biological effect monitoring as required by these regulations to be carried out, including for biological specimens to be collected;
(k) the cleaning up and disposal of materials containing HCA, in a way that will limit personal exposure;
(l) housekeeping at the workplace, personal hygiene and environmental and health practices; and
(m) attending and participating as needed in information, instruction and training provided by the employer.

19. Records

(1) An employer or self-employed person must-
(a) keep written or electronic records of-
(i) risk assessments;
(ii) exposure monitoring;
(iii) medical screening and surveillance reports;
(iv) the action plan as contemplated in regulations 10(1) (d) and 13 (3);
(v) information, instruction and training, as contemplated in regulation 17(2);
(vi) refresher information and training, as contemplated in regulation 17(4);
(vii) maintenance of control measures, as contemplated in regulation 12(2); and
(viii) reported occupational diseases as contemplated in regulation 14(5).
(b) keep records for a minimum period of 40-years for the records contemplated in regulations 10, 12, 13, 14 and 17;
(c) make records, contemplated in regulations 12, 13, 14 and 17, available to the relevant health and safety representative, health and safety committee or to an inspector.
(d) he availability of the records contemplated in regulation 14, are subject to formal written consent of the relevant employee; and

(2) If an employer or self-employer person ceases activities, the employer or self-employer person must inform the relevant chief director: provincial operations of -

(a) where the records listed in sub-regulation 1 (a) will be kept; and
(b) how those records will be accessed, when required.

20. Prohibitions

(1) No person must-
(a) smoke, eat, drink or keep food or beverages in a respirator zone or temporary respirator zone, or permit any other person to smoke, eat, drink or keep food or beverages in that zone;
(b) use compressed air or permit the use of compressed air to remove particles of an HCA from any person or a person's clothing;

(c) use compressed air at a pressure of more than 207 Kilopascals; Provided that air of a lower pressure may be used to clean hard to reach equipment or hot equipment where other methods are not practicable and the risk assessment indicated that the risk to health and safety caused by the use can be mitigated;
(d) use statements such as 'non-toxic', 'non-harmful', 'non-hazardous' or other statements indicating that the HCA is not hazardous or any other statements that are inconsistent with its GHS classification, on the label or packaging of any HCA;
(e) use any OEL-ML HCA as a cleaning agent, where it is reasonably practicable to use an OEL- RL HCA;
(f) use nuisance dust masks to protect against any HCA, where nuisance dust masks are not classified as personal protective equipment, including respiratory protective equipment, and are not NIOSH or CE marked;
(g) declare a permanent respirator zone for an HCA with a OEL ML;
(h) use any dry method to cut or grind crystalline silica containing materials;
(i) manufacture, procure, use, handle or store within the workplace, HCAs that are-
(i) prohibited HCAs listed in Table 1 of Annexure 2;
(ii) ozone depleting substances, provided for in the Regulations Regarding the Phasing-out and Management of Ozone-depleting Substances, GN351 of 8 May 2014"; and
(iii) persistent Organic Pollutants prohibited by the Prohibition on the Import, Export, Possession, Acquisition, Sale, Use and Disposal Of Agricultural Remedies, under the Fertilizers, Farm Feeds, Agricultural Remedies And Stock Remedies Act, 1947 (Act No. 36 Of 1947), and published under Government Notice No. R.862 of 29 July 2016.

21. HCA Technical Committee

(1) The Advisory Council must establish an HCA health and safety technical committee which must consist of-
(a) a chairperson designated by the chief inspector from the Department of Employment and Labour;
(b) two persons designated by the chief inspector from the employees of the Department of Employment and Labour;
(c) three persons designated by employer's organisations to represent employers;
(d) three persons designated by employee's organisations representing the federation ofunions;
(e) one person from the field of HCA representing a higher educational institution;
(f) one person to represent a professional body recognised by the chief inspector;
(g) one person representing occupational medicine; and
(h) persons who are competent in respect of the matters to be dealt with by the HCA technical committee who have been co-opted by the committee with the authorisation of the council.
(2) The Advisory Council must appoint members of the HCA health and safety technical committee for a period determined at the time of appointment: Provided that the Advisory Council may after having afforded a member a reasonable opportunity to respond, discharge a member at any time, for reasons that are fair and just, and appoint a new member to the committee.
(3) The HCA health and safety Technical Committee must –
(a) advise the Advisory Council on HCA related matters, including but not limited to codes, standards and training requirements;
(b) make recommendations and submit reports to the Advisory Council regarding any matter to which these regulations relate;

(c) advise the Advisory Council regarding any matter referred to the HCA health and safety technical committee by the Advisory Council;

(d) perform any other function for the administration of a provision of these regulations that may be requested by the Advisory Council; and

(e) conduct its work in accordance with the instructions and rules of conduct framed by the Advisory Council.

(f) advise the chief inspector regarding appeals lodged in writhing regarding medical certificate of fitness as contemplated in regulation 14 (11).

22. Offences and penalties

Any person who contravenes or fails to comply with any provision of regulation 3,4,5,6,7,8,9, 10, 11, 12, 13,14 ,15, 16, 17, 18, 19 and 20 shall be guilty of an offence and liable on conviction to a fine or to imprisonment for a period not exceeding six months and, in the case of a continuous offence, to an additional fine of R200 for each day on which the offence continues or additional imprisonment of one day for each day on which the offence continuous: Provided that the period of such additional imprisonment must in no case exceed 90 days.

23. Repeal of regulations

The Regulations for Hazardous Chemical Agents, 2021 published under Government Notice No. R. 11263 of 29 April 2021, and Occupational Exposure for Silica in Table 1 of the Hazardous Chemical Agents Regulation, published under Government Notice No. 32930 of 5 February 2012, are repealed 18 months after the date of promulgation.

24. Short title

These regulations shall be called the Regulations for Hazardous Chemical Agents, 202X.

ANNEXURE 1

TABLE 1: GHS HAZARD CLASSES – PHYSICAL HAZARDS

HAZARD CLASSES	CATEGORIES/DIVISIONS/TYPES					
Explosives	Unstable	Div 1.1	Div 1.2	Div 1.3	Div 1.4	Div 1.5
Flammable gases	Cat 1A & B	Cat 2				
Aerosols, flammable and non-flammable	Cat 1	Cat 2				
Oxidising gases	Cat 1					
Gases under pressure Compressed gas Liquefied gas Refrigerated liquefied gas Dissolved gas	 Cat 1 Cat 1 Cat 1 Cat 1					
Flammable liquids	Cat 1	Cat 2	Cat 3			
Flammable solids	Cat 1	Cat 2				
Self-reactive substances and mixtures	Type A	Type B	Type C	Type D	Type E	Type F
Pyrophoric liquids	Cat 1					
Pyrophoric solids	Cat 1					
Self-heating substances and mixtures,	Cat 1	Cat 2				
Substance and mixtures which, in contact with water, emit flammable gases	Cat 1	Cat 2	Cat 3			
Oxidising liquids	Cat 1	Cat 2	Cat 3			
Oxidising solids	Cat 1	Cat 2	Cat 3			
Organic peroxides	Type A	Type B	Type C	Type D	Type E	Type F
Corrosive to metals	Cat 1					
Desensitized explosives	Cat 1		Cat 2		Cat 3	

Table 2: GHS HAZARD CLASSES – HEALTH HAZARDS

HAZARD CLASSES	CATEGORIES			
Acute toxicity				
Oral	Cat 1	Cat 2	Cat 3	Cat 4
Dermal	Cat 1	Cat 2	Cat 3	Cat 4
Inhalation	Cat 1	Cat 2	Cat 3	Cat 4
Skin corrosion/irritation	Cat 1, 1A, B & C[a]	Cat 2		
Serious eye damage/eye irritation	Cat 1	Cat 2/ 2A		
Respiratory sensitizer	Cat 1	Cat 1A[a]	Cat 1B[a]	
Skin sensitizer	Cat 1	Cat 1A[a]	Cat 1B[a]	
Germ cell mutagenicity	Cat 1, 1A & B	Cat 2		
Carcinogenicity	Cat 1, 1A & B	Cat 2		
Reproductive toxicity	Cat 1A & B	Cat 2	Lactation	
Specific target organ toxicity - single exposure	Cat 1	Cat 2	Cat 3	
Specific target organ toxicity - repeated exposure	Cat 1	Cat 2		
Aspiration hazard	Cat 1			

[a] sub-categories may be applied where data are sufficient and where required by a competent authority.

Table 3: GHS HAZARD CLASSES – ENVIRONMENTAL HAZARDS*

HAZARD CLASSES	CATEGORIES	
Hazardous to the aquatic environment short-term (Acute)	Acute 1	
Hazardous to the aquatic environment long-term (Chronic)	Chronic 1	Chronic 2
Hazard to the ozone layer	Cat 1	

* the hazard classes and categories provided in Table 3 for environmental hazards are intended as references and a guideline for the classification of chemicals.

For Annexure 1, Table 1 and 2, the classes and categories provided are based on GHS, Rev. 10, 2022, they will be adjusted with changes to the GHS, as may be updated from time to time.

Table 4: IDENTITY OF INGREDIENTS TO BE DISCLOSED

HAZARD CLASSES	CATEGORIES			
Acute toxicity				
Oral	Cat 1	Cat 2	Cat 3	Cat 4
Dermal	Cat 1	Cat 2	Cat 3	Cat 4
Inhalation	Cat 1	Cat 2	Cat 3	Cat 4
Respiratory or skin sensitisation	Cat 1			
Germ cell mutagenicity	Cat 1A & B	Cat 2		
Carcinogenicity	Cat 1A & B	Cat 2		
Reproductive toxicity	Cat 1A & B	Cat 2	Lactation	
Specific target organ toxicity - single exposure	Cat 1	Cat 2	Cat 3	
Specific target organ toxicity - repeated exposure	Cat 1	Cat 2		
Aspiration hazard	Cat 1			
Skin corrosion or irritation	Cat 1A, B & C			
Serious eye damage or eye irritation	Cat 1	Cat 2A		

Table 5: GENERIC NAMES USED TO DISCLOSE IDENTITY OF INGREDIENTS

HAZARD CLASSES	CATEGORIES			
Acute toxicity				
Oral				Cat 4
Dermal				Cat 4
Inhalation				Cat 4
Aspiration hazard	Cat 1			
Serious eye damage or eye irritation		Cat 2A		
Skin corrosion or irritation		Cat 2		
Specific target organ toxicity - single exposure			Cat 3	

ANNEXURE 2

Table 1: PROHIBITED HAZARDOUS CHEMICAL AGENTS

HAZARDOUS CHEMICAL AGENT	**CAS NUMBER**
4-AMINOPHENYL and its salts	92-67-1
BENZIDINE and its salts	92-87-5
2-NAPHTYLAMINE and its salts	91-59-8
4-NITROPHENYL	92-93-3
POLYCHLORINATED BIPHENYLS (PCB), except MONO- and DICHLORINATED BIPHENYLS	1336-36-3
POLYCHLORINATED TERPHENYLS (PCT)	61788-33-8
PREPARATIONS with a PCB or PCT content higher than 0,01% by weight	

Table 2: OCCUPATIONAL EXPOSURE LIMITS – MAXIMUM LIMITS FOR HAZARDOUS CHEMICAL AGENTS

AGENT	CAS NUMBER	FORMULA	RHCA – OEL ppm	RHCA – OEL mg/m³	RHCA – STEL/C ppm	RHCA – STEL/C mg/m³	NOTATIONS
A							
Acrylamide	79-06-1	CH_2=CHCONH$_2$	-	0,06(IFV)	-	-	CARC, SKIN, DESEN
Acrylonitrile	107-13-1	CH_2=CHCN	4	-	-	-	SKIN
Arsenic and compounds, except arsine [as As]	7440-38-2	As	-	0,02	-	-	CARC
Asbestos, all forms (see Asbestos Regulations)	1332-21-4	-	-	-	-	-	CARC
B							
Benzene	71-43-2	C_6H_6	1	-	5	-	CARC, SKIN
Bis(chloromethyl) ether [BCME]	542-88-1	$(CH_2Cl)_2O$	0,002	-	-	-	CARC
1,3-Butadiene [buta-1,3-diene]	106-99-0	$CH_2=(CH)_2=CH_2$	4	-	-	-	CARC
2-Butoxyethanol [EGBE]	111-76-2	-	40	-	-	-	
C							
Cadmium and compounds [as Cd]	7440-43-9 (metal)	Cd (metal)					CARC (cadmium metal, cadmium chloride, fluoride and sulphate)
			-	0,004(R)	-	-	
Total particulate			-	0,02	-	-	
Carbon disulphide	75-15-0	CS_2	2	-	-	-	SKIN

AGENT	CAS NUMBER	FORMULA	RHCA – OEL ppm	RHCA – OEL mg/m³	RHCA – STEL/C ppm	RHCA – STEL/C mg/m³	NOTATIONS
Chromium, and inorganic compounds	7440-47-3						
Trivalent chromium compounds: water-soluble compounds		Cr(III)	-	0,006(I)	-	-	CARC, RSEN
Hexavalent chromium compounds: water-soluble compounds		Cr(VI)	-	0,0004(I)	-	0.001(I)	CARC, RSEN, SKIN
Chromyl chloride	14977-61-8	Cr(VI)	0,0002(IFV)	-	0,0005(IFV)	-	CARC, RSEN, SKIN
Chromite ore processing		See hexavalent and trivalent chromium compounds					
D							
1,2-Dibromoethane	106-93-4	$BrCH_2CH_2Br$	0,5	-	-	-	CARC, SKIN
Dichloromethane	75-09-2	CH2Cl2	100	-	-	-	SKIN, CARC
2,2'-Dichloro-4,4'-methylene dianiline [MbOCA]	101-14-4	$CH_2(C_6H_3ClNH_2)_2$	0,02	-	-	-	CARC, SKIN
E							
2-Ethoxyethanol [EGEE], [ethylene glycol monoethyl ether]	110-80-5	$CH_3CH_2OCH_2CH_2OH$	10	-	-	-	SKIN
2-Ethoxyethyl acetate [EGEEA], [ethylene glycol monoethyl ether acetate]	111-15-9	$C_2H_5OCH_2CH_2OOCCH_3$	10	-	-	-	SKIN
Ethylene oxide	75-21-8	CH_2CH_2O	2	-	-	-	CARC
F							
Formaldehyde	50-00-0	HCHO	0,2	-	0,6	-	CARC, DSEN, RSEN

AGENT	CAS NUMBER	FORMULA	RHCA – OEL ppm	RHCA – OEL mg/m³	RHCA – STEL/C ppm	RHCA – STEL/C mg/m³	NOTATIONS
G							
Grain dust (oat, wheat, barley, maize, rye)	-	-	-	8	-	-	RSEN
H							
Hydrogen cyanide [as CN]	74-90-8	HCN	-	-	C 9,4	-	SKIN
L							
Lead and compounds (see Lead Regulations)		Pb	See Lead Regulations				CARC (lead compounds, inorganic)
Tetraethyl lead [as Pb]	78-00-2		See Lead Regulations				
Tetramethyl lead [as Pb]	75-74-1		See Lead Regulations				
N							
Nickel and its inorganic compounds [as Ni]	7440-02-0						
Soluble inorganic compounds (NOS)				0,1[I]			CARC
				0,02[R]			CARC
Insoluble inorganic compounds (NOS)				0,1[I]			CARC
				0,02[R]			CARC

AGENT	CAS NUMBER	FORMULA	RHCA – OEL ppm	RHCA – OEL mg/m³	RHCA – STEL/C ppm	RHCA – STEL/C mg/m³	NOTATIONS
R							
Rubber fume	-	-	-	0,6	-	-	CARC
S							
*Silica, crystalline							
Cristobalite	14464-46-1	SiO	-	0,1(R)	-	-	CARC
Quartz	14808-60-7	SiO_2	-	0,1(R)	-	-	CARC
Tridymite	15468-32-3	SiO_2	-	0,1(R)	-	-	
Tripoli	1317-95-9	SiO_2	-	0,1(R)	-	-	
Styrene, monomer	100-42-5	$C_6H_5CH=CH_2$	20	-	40	-	CARC, OTO
T							
Talc (containing asbestos fibres)	14807-96-6	$Mg_3Si_4O_{10}(OH)_2$	See Asbestos Regulations				CARC
1,1,1-Trichloroethane	71-55-6	CH_3CCl_3	700	-	900	-	
Trichloroethylene	79-01-6	$CCl_2=CHCl$	20	-	50	-	CARC, SKIN
V							
Vinyl chloride	75-01-4	$H_2C=CHCl$	2	-	-	-	CARC
W							
Wood dust species: oak, beech, birch, mahogany, teak and walnut	-	-	-	2(I)	-	-	CARC, RSEN

Abbreviations:

mg/m³: milligrams per cubic meter
OEL-ML: occupational exposure limit – maximum limit
ppm: parts per million
RHCA: Regulations for Hazardous Chemical Agents

STEL/C: short-term exposure limit, ceiling limit. Ceiling limit is differentiated by a C next to the limit

Notations:

CARC: denotes carcinogenicity, which is based on GHS categorisation, including category 1A and 1B;
DSEN: dermal sensitisation, potential to produce dermal sensitisation;
E: the value is for particulate matter containing no asbestos and ≤ 1% crystalline silica;
F: respirable fibres: length > 5 µm; aspect ratio ≥ 3:1 as determined by the membrane filter method at 400-450X magnification (4 mm objective), using phase-contrast illumination;
H: aerosol only;
I: inhalable fraction;
IFV: inhalable fraction and vapour;
Inhalable particulate matter (IPM): for those materials that are hazardous when deposited anywhere in the respiratory tract;
OTO: Ototoxicant
R: respirable fraction;
RSEN: respiratory sensitisation, potential to produce respiratory sensitisation;
SKIN: danger of cutaneous absorption – refers to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes, and the eyes by contact with vapours, liquids and solids; overexposure may also occur following dermal contact with liquids and aerosols, even when airborne exposures are at or below the OEL;
T: thoracic fraction; and
V: vapour fraction.

RSEN and DSEN do not imply that sensitisation is the critical effect on which the OEL is based, nor do they imply that this effect is the sole basis for the agent's OEL.

Note:
*All industries handling, manufacturing and producing silica dust are required to submit biennial reports that include the information on Annexure 3.

Table 3: OCCUPATIONAL EXPOSURE LIMITS - RESTRICTED LIMITS FOR HAZARDOUS CHEMICAL AGENTS

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
A							
Acetaldehyde	75-07-0	CH_3CHO	-	-	50	-	CARC
Acetic acid	64-19-7	CH_3COOH	20	-	30	-	
Acetic anhydride	108-24-7	$(CH_3CO)_2O$	2	-	6	-	
Acetone	67-64-1	$(CH_3)_2CO$	500	-	1000	-	
Acetonitrile	75-05-8	CH_3CN	40	-	-	-	SKIN
Acetylsalicylic acid [aspirin]	50-78-2	$CH_3COOC_6H_4COOH$	-	10	-	-	
Acrolein [Acrylaldehyde]	107-02-8	$CH_2=CHCHO$	-	-	0,2	-	SKIN
Acrylic acid	79-10-7	$CH_2=CHCOOH$	4	-	-	-	SKIN
Aldrin	309-00-2	$C_{12}H_8Cl_6$	-	0,1 (IFV)	-	-	SKIN
Allyl alcohol	107-18-6	$CH_2=CHCH_2OH$	-	1	-	-	SKIN
Allyl chloride	107-05-1	$CH_2=CHCH_2Cl$	2	-	4	-	SKIN
Allyl glycidyl ether [AGE]	106-92-3	$C_6H_{10}O_2$	2	-	-	-	
Aluminium metal and insoluble compounds [as Al]	7429-90-5 (metal)	Al (metal)	-	2 (R)	-	-	
Aminodimethylbenzene	95-64-7				See xylidine		
2-Aminoethanol	141-43-5	$NH_2CH_2CH_2OH$			See ethanolamine		
Ammonia, anhydrous	7664-41-7	NH_3	50	-	70	-	
Ammonium chloride, fume	12125-02-9	NH_4Cl	-	10	-	20	
Ammonium sulphamate	7773-06-0	$NH_2SO_3NH_4$	-	10	-	-	
Aniline	62-53-3	$C_6H_5NH_2$	4	-	-	-	SKIN
Anisidines, o- and p-isomers	90-04-0, 104-94-9	$NH_2C_6H_4OCH_3$	-	1	-	-	CARC, SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Antimony and compounds [as Sb], except antimony trisulphide, antimony hydride	7440-36-0	Sb	-	1	-	-	CARC
Antimony hydride	7803-52-3				See stibine		
Antimony trioxide	1309-84-4			0.04(I)			CARC
Arsine	7784-42-1	AsH_3	0,01	-	-	-	
Asphalt, petroleum fumes	8052-42-4	-	-	1(I)	-	-	CARC
Atrazine	1912-24-9	$C_8H_{14}ClN_5$	-	4	-	-	CARC, SKIN
Azinphos-methyl B	86-50-0	$C_{10}H_{12}O_3PS_2N_3$	-	0,4(IFV)	-	-	DSEN, SKIN
Barium and soluble compounds [as Ba]	7440-39-3	-	-	1	-	-	
Barium sulphate	7727-43-7	$BaSO_4$	-	10(I, E)	-	-	
Benomyl	17804-35-2	$C_{14}H_{18}N_4O_3$	-	2(I)	-	-	DSEN
Benzene-1,2,4,-tricarboxylic acid 1,2-anhydride	552-30-7	$C_9H_4O_5$	-	0,001(IFV)	-	0,004(IFV)	DSEN, RSEN, SKIN
p-Benzoquinone	106-51-4	$C_6H_4O_2$	0,2	-	-	-	
Benzoyl peroxide	94-36-0	$(C_6H_5CO)_2O_2$	-	10	-	-	
Benzyl chloride	100-44-7	$C_6H_5CH_2Cl$	2	-	-	-	CARC
Beryllium and compounds [as Be]	7440-41-7	Be	-	0,0001(I)	-	-	DSEN, RSEN, SKIN
Biphenyl	92-52-4	$C_6H_5C_6H_5$	0,4	-	-	-	
Bismuth telluride [as Bi_2Te_3]							
Undoped	1304-82-1	Bi_2Te_3	-	10	-	-	
Selenium-doped	-		-	10	-	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Borates, tetra, sodium salts							
Anhydrous	1330-43-4	$Na_2B_4O_7$	-	4	-	10	
Decahydrate	1303-96-4	$Na_2B_4O_7.10H_2O$	-	4	-	10	
Pentahydrate	12179-04-3	$Na_2B_4O_7.5H_2O$	-	4	-	10	
Boron oxide	1303-86-2	B_2O_3	-	10	-	-	
Boron tribromide	10294-33-4	BBr_3	-	-	1,4	-	
Boron trifluoride	7637-07-2	BF_3	-	-	1,4	-	
Bromacil	314-40-9	$C_9H_{13}BrN_2O_2$	-	10	-	-	
Bromine	7726-95-6	Br_2	0,2	-	0,4	-	
Bromine pentafluoride	7789-30-2	BrF_5	0,2	-	-	-	
Bromoethane	74-96-4	CH_3CH_2Br	10	-	-	-	SKIN
Bromoethylene	593-60-2	$CH_2=CHBr$			See vinyl bromide		
Bromoform	75-25-2	$CHBr_3$	1	-	-	-	
Bromomethane	74-83-9	CH_3Br			See methyl bromide		
n-Butane	106-97-8	$CH_3CH_2CH_2CH_3$	-	-	2000	-	
2-Butanol [sec-butyl alcohol]	78-92-2	$CH_3CH(OH)CH_2CH_3$	200	-	-	-	
tert-Butanol [tert-butyl alcohol]	75-65-0	$(CH_3)_3COH$	200	-	-	-	
trans-But-2-enal					See crotonaldehyde		SKIN
n-Butyl acetate	123-86-4	$CH_3COO(CH_2)_3CH_3$	100	-	300	-	
sec-Butyl acetate	105-46-4	$C_6H_{12}O_2$	100	-	300	-	
tert-Butyl acetate	540-88-5	$CH_3COOC(CH_3)_3$	100	-	300	-	
Butyl acrylate	141-32-2	$CH_2=CHCOOC_4H_9$	4	-	-	-	DSEN
n-Butylamine	109-73-9	$CH_3(CH_2)_3NH_2$	-	-	C 10	-	SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
n-Butyl glycidyl ether [BGE]	2426-08-6	$C_4H_9OCH_2CHCH_2O$	6	-	-	-	DSEN, SKIN
n-Butyl lactate	138-22-7	$CH_3CH(OH)COOC_4H_9$	10	-	-	-	
o-sec-Butylphenol C	89-72-5	$C_2H_5(CH_3)CHC_6H_4OH$	10	-	-	-	SKIN
Calcium cyanamide	156-62-7	$CaNC{\equiv}N$	-	1	-	-	
Calcium hydroxide	1305-62-0	$Ca(OH)_2$	-	10	-	-	
Calcium oxide	1305-78-8	CaO	-	4	-	-	
Calcium silicate, [naturally occurring as wollastonite]	1344-95-2	$CaSiO_3$	-	$2^{(I, E)}$	-	-	
Calcium sulphate [including plaster of Paris and gypsum]	7778-18-9, 10034-76-1, 10101-41-4, 13397-24-5	$CaSO_4$	-	$10^{(I)}$	-	-	
Camphor, synthetic	76-22-2	$C_{10}H_{16}O$	4	-	6	-	
Caprolactam	105-60-2	$NH(CH_2)_5CO$		$10^{(IFV)}$			
Captafol	2425-06-1	$C_{10}H_9Cl_4NO_2S$	-	$0,2^{(IFV)}$	-	-	DSEN, RSEN, SKIN
Captan	133-06-2	$C_9H_8Cl_3NO_2S$	-	$10^{(I)}$	-	-	DSEN,
Carbaryl	63-25-2	$CH_3NHCOOC_{10}H_7$	-	$1^{(IFV)}$	-	-	SKIN
Carbofuran	1563-66-2	$C_{12}H_{15}NO_3$	-	$0,2^{(IFV)}$	-	-	
Carbon black	1333-86-4	C	-	$6^{(I)}$	-	-	CARC
Carbon dioxide	124-38-9	CO_2	10000	-	60000	-	
Carbon monoxide	630-08-0	CO	50	-	-	-	
Carbon tetrabromide	558-13-4	CBr_4	0,2	-	0,6	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Carbon tetrachloride	56-23-5	CCl_4	10	-	20	-	CARC, SKIN
Catechol	120-80-9	$C_6H_4(OH)_2$	10	-	-	-	CARC, SKIN
Cellulose	9004-34-6	$(C_6H_{10}O_5)_n$	-	10	-	-	
Cement [Portland cement]	-	-	-	$2^{(E, R)}$	-	-	
Chlordane	57-74-9	$C_{10}H_6Cl_8$	-	$1^{(IFV)}$	-	-	CARC, SKIN
Chlorine	7782-50-5	Cl_2	0,2	-	0,8	-	
Chlorine dioxide	10049-04-4	ClO_2		-	C 0,2	-	
Chlorine trifluoride	7790-91-2	ClF_3	-	-	C 0,2	-	
2-Chloroacetophenone	532-27-4	$C_6H_5COCH_2Cl$	0,1	-	-	-	
Chloroacetyl chloride	79-04-9	$ClCH_2COCl$	0,1	-	0,3	-	SKIN
Chlorobenzene	108-90-7	C_6H_5Cl	20	-	-	-	SKIN
Chlorobromomethane	74-97-5	CH_2BrCl	400	-	-	-	
Chlorodifluoromethane	75-45-6	$CHClF_2$	2000	-	-	-	
Chlorodiphenyl [PCBs]			-	-	-	-	CARC, SKIN
Chlorodiphenyl (42% chlorine)	53469-21-9	$C_6H_4ClC_6H_3Cl_2$ (approx.)	-	2	-	-	CARC, SKIN
Chlorodiphenyl (54% chlorine)	11097-69-1	$C_6H_3Cl_2C_6H_2Cl_3$ (approx.)	-	1	-	-	CARC, SKIN
1-Chloro-2,3-epoxy-propane	106-89-8	C_3H_5OCl			See epichlorohydrin		
Chloroethane	75-00-3	CH_3CH_2Cl			See ethyl chloride		
2-Chloroethanol	107-07-3	CH_2ClCH_2OH			See ethylene chlorohydrin		
Chloroethylene	75-01-4	$H_2C=CHCl$			See vinyl chloride		
Chloroform	67-66-3	$CHCl_3$	20	-	-	-	CARC, SKIN
1- Chloro-nitropane	600-25-9	C3H6ClNO2	4				
Chloropentafluoroethane	76-15-3	$CClF_2CF_3$	2000	-	-	-	
Chloropicrin	76-06-2	CCl_3NO_2	0,2	-	-	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
beta-Chloroprene	126-99-8	$CH_2=CClCH=CH_2$	2	-	-	-	CARC, SKIN
alpha-Chlorotoluene	100-44-7	$C_6H_5CH_2Cl$			See benzyl chloride		
2-Chlorotoluene [o-Chlorotoluene]	95-49-8	$ClC_6H_4CH_3$	100	-	-	-	
2-Chloro-6-(trichloromethyl)pyridine	1929-82-4	ClC5H3NCCl3			See nitrapyrin		
Chlorpyrifos	2921-88-2	$C_9H_{11}Cl_3NO_3PS$		0,2(IFV)			SKIN
Chromium, metal							
Metallic chromium as Cr [0]	7440-47-3 (metal)	Cr (metal)	-	1(I)	-	-	
Coal dust:	-	-					
Anthracite			-	0,8(R)	-	-	
Bituminous or lignite			-	1,8(R)	-	-	
Coal tar pitch volatiles [as cyclohexane soluble fraction]	65996-93-2	-	-	0,4	-	-	CARC
Cobalt and cobalt inorganic compounds [as Co]	7440-48-4 (metal)	Co (metal)	-	0,04(I)	-	-	CARC, RSEN
Copper:							
Fume (copper oxide) [as Cu]	1317-38-0	CuO	-	0,4	-	-	
Dusts and mists [as Cu]	7440-50-8 (metal)	Cu (metal)	-	2	-	-	
Cotton dust, raw, untreated	-						

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
Cotton dust (less fly)			-	0,2$^{(T)}$	-	-	
Cotton dust		-	-	2,5	-	-	
Cresols, all isomers	95-48-7, 106-44-5, 108-39-4, 1319-77-3	$CH_3C_6H_4OH$	-	40$^{(IFV)}$	-	-	SKIN
Crotonaldehyde	4170-30-3	$CH_3CH=CHCHO$	-	-	0,6	-	SKIN
Cumene	98-82-8	$C_6H_5CH(CH_3)_2$	10	-	-	-	CARC, SKIN
Cyanamide	420-04-2	NH_2CN	-	4	-	-	SKIN
Cyanide salts [as CN]							
Calcium cyanide	592-01-8	$Ca(CN)_2$	-	-	-	5	SKIN
Potassium cyanide	151-50-8	KCN	-	-	-	5	SKIN
Sodium cyanide	143-33-9	NaCN	-	-	-	C 5	SKIN
Cyanogen	460-19-5	$(CN)_2$	-	-	C 10	-	
Cyanogen chloride	506-77-4	ClCN	-	-	C 0,6	-	
Cyclohexane	110-82-7	C_6H_{12}	200	-	-	-	
Cyclohexanol	108-93-0	$C_6H_{11}OH$	100	-	-	-	SKIN
Cyclohexanone	108-94-1	$C_6H_{10}O$	40	-	100	-	SKIN
Cyclohexene	110-83-8	C_6H_{10}	40	-	-	-	
Cyclohexylamine	108-91-8	$C_6H_{11}NH_2$	20	-	-	-	
Cyclonite [RDX]	121-82-4	$C_3H_6N_6O_6$	-	1	-	-	SKIN
Cyhexatin	13121-70-5	$(C_6H_{11})_3SnOH$	-	10	-	-	SKIN
D							
DMDT [p,p'-dimethoxydiphenyltrichloroethane]	-	-		See methoxychlor			
Diacetone alcohol	123-42-2	$CH_3COCH_2C(CH_3)_2OH$	100	-	-	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Diazinon	333-41-5	$C_{12}H_{21}N_2O_3PS$	-	0,02(IFV)	-	-	CARC, SKIN
Diazomethane	334-88-3	CH_2N_2	0,4	-	-	-	
Dibenzoyl peroxide	94-36-0	$(C_6H_5CO)_2O_2$			See benzoyl peroxide		
Diborane	19287-45-7	B_2H_6	0,2	-	-	-	
Diboron trioxide	1303-86-2	B_2O_3			See boron oxide		
Dibromodifluoromethane [difluorodibromomethane]	75-61-6	CBr_2F_2	200	-	-	-	
Dibutyl phenyl phosphate	2528-36-1	$C_{14}H_{23}O_4P$	0,6	-	-	-	SKIN
Dibutyl phosphate	107-66-4	$(C_4H_9O)_2(OH)PO$	-	10(IFV)	-	-	SKIN
Dibutyl phthalate	84-74-2	$C_6H_4(CO_2C_4H_9)_2$	-	10	-	-	
Dichloroacetylene	7572-29-4	ClC=CCl	-	-	0,2	-	
Diesel particulate matter as elemental C				0,16			
1,2-Dichlorobenzene [o-Dichlorobenzene]	95-50-1	$C_6H_4Cl_2$	50	-	100	-	SKIN
1,4-Dichlorobenzene [p-Dichlorobenzene]	106-46-7	$C_6H_4Cl_2$	20	-	-	-	CARC
Dichlorodifluoromethane [difluorodichloromethane]	75-71-8	CCl_2F_2	2000	-	-	-	
1,3-Dichloro-5,5-dimethyl hydantoin	118-52-5	$C_5H_6Cl_2N_2O_2$	-	0,4	-	0,8	
1,1-Dichloroethane	75-34-3	CH_3CHCl_2	200	-	-	-	SKIN
1,2-Dichloroethane	107-06-2	$ClCH_2CH_2Cl$	20	-	-	-	CARC, SKIN
1,1-Dichloroethylene	75-35-4	$CH_2=CCl_2$	-	10	-	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
1,2 Dichloroethylene, cis and trans isomers	540-59-0	ClCH=CHCl	400	-	-	-	
Dichlorofluoromethane	75-43-4	$CHCl_2F$	20	-	-	-	
1,3-Dichloropropene (cis and trans isomers)	542-74-6		2	-	-	-	CARC, SKIN
1,3-Dichloropropene, cis and trans isomers	542-75-6	$ClHC=CHCH_2Cl$	2	-	-	-	CARC, SKIN
1,2-Dichlorotetrafluoro ethane	76-14-2	$CClF_2CClF_2$	2000	-	-	-	
Dichlorvos [DDVP]	62-73-7	$(CH_3O)_2POOCH=CCl_2$	-	0,2(IFV)	-	-	CARC, DSEN, SKIN
Dicyclopentadiene including Cyclopentadiene	77-73-6	$C_{10}H_{12}$	1	-	2	-	
Dicyclopentadienyl iron (as Fe)	102-54-5	$(C_5H_5)_2Fe$	-	10	-	-	
Dieldrin	60-57-1	$C_{12}H_8Cl_6O$	-	0,2(IFV)	-	-	SKIN
Diethanolamine	111-42-2	$(CH_2CH_2OH)_2NH$	-	2(IFV)	-	-	CARC, SKIN
Diethylamine	109-89-7	$(C_2H_5)_2NH$	10	-	30	-	SKIN
2-Diethylaminoethanol	100-37-8	$(C_2H_5)_2NCH_2CH_2OH$	4	-	-	-	SKIN
1,4-Diethylenediamine	110-85-0	$C_4H_{10}N_2$			See piperazine		
Diethylenetriamine [DETA]	111-40-0	$(NH_2CH_2CH_2)_2NH$	2	-	-	-	SKIN
Di-(2-ethylhexyl) phthalate [DEHP]	117-81-7	$C_6H_4(COOC_8H_{17})_2$	-	10	-	-	CARC
Diethyl ketone	96-22-0	$CH_3CH_2COCH_2CH_3$	400	-	600	-	
Diethyl phthalate	84-66-2	$C_6H_4(COOC_2H_5)_2$	-	10	-	-	
Diglycidyl ether [DGE]	2238-07-5	$(OCH_2CHCH_2)_2O$	0,02	-	-	-	
o-Dihydroxybenzene		$C_6H_4(OH)_2$			See catechol		

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
m-Dihydroxybenzene	108-46-3	$C_6H_4(OH)_2$			See resorcinol		
p-Dihydroxybenzene		$C_6H_4(OH)_2$			See hydroquinone		
Diisobutyl ketone	108-83-8	$[(CH_3)_2CHCH_2]_2CO$	50	-	-	-	
Diisopropylamine	108-18-9	$(CH_3)_2CHNHCH(CH_3)_2$	10	-	-	-	SKIN
N,N-Dimethylacetamide	127-19-5	$CH_3CON(CH_3)_2$	20	-	-	-	SKIN
Dimethylamine	124-40-3	$(CH_3)_2NH$	10	-	30	-	DSEN
N,N-Dimethylaniline	121-69-7	$C_6H_5N(CH_3)_2$	10	-	20	-	SKIN
1,3-Dimethylbutyl acetate	108-84-9	$C_8H_{16}O_2$	40	-	100	-	
N,N-Dimethylformamide	68-12-2	$HCON(CH_3)_2$	20	-	-	-	CARC, SKIN
Dimethyl phthalate	131-11-3	$C_6H_4(COOCH_3)_2$	-	10	-	-	
Dimethyl sulphate	77-78-1	$(CH_3)_2SO_4$	0,2	-	-	-	CARC, SKIN
Dinitolmide	148-01-6	$C_8H_7N_3O_5$	-	2	-	-	
Dinitrobenzene, all isomers	25154-54-5	$C_6H_4(NO_2)_2$	0,3	-	-	-	SKIN
Dinitro-o-cresol	534-52-1	$CH_3C_6H_2(OH)(NO_2)_2$	-	0,4	-	-	SKIN
Dinitrotoluene	25321-14-6	$CH_3C_6H_3(NO_2)_2$	-	0,4	-	-	CARC, SKIN
1,4-Dioxane	123-91-1	$OCH_2CH_2OCH_2CH_2$	40	-	-	-	CARC, SKIN
Dioxathion	78-34-2	$C_{12}H_{26}O_6P_2S_2$	-	$0,2^{(IFV)}$	-	-	SKIN
Diphenylamine	122-39-4	$(C_6H_5)_2NH$	-	10	-	-	
Diquat [diquat]	85-00-7	$C_{12}H_{12}Br_2N_2$					SKIN
	2764-72-9	-	-	$1^{(I)}$	-	-	
	6385-62-2	-	-	$0,2^{(R)}$	-	-	
Disulfoton	298-04-4	$C_8H_{19}O_2PS_3$	-	$0,1^{(IFV)}$	-	-	SKIN
6,6-Di-tert-butyl-4,4'-thiodi-m-cresol	96-69-5	$C_{22}H_{30}O_2S$	-	-	-	-	
Diuron	330-54-1	$C_9H_{10}Cl_2N_2O$	-	10	-	-	
Divinyl benzene [DVB]	1321-74-0	$C_6H_4(HC=CH_2)_2$	20	-	-	-	
E							
Endosulfan	115-29-7	$C_9H_6Cl_6O_3S$	-	$0,2^{(IFV)}$	-	-	SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Endrin	72-20-8	$C_{12}H_8Cl_6O$	-	0,2	-	-	SKIN
Enflurane	13838-16-9	$CHFClCF_2OCHF_2$	150	-	-	-	
Epichlorohydrin	106-89-8	C_3H_5OCl	-	1	-	-	CARC, SKIN
1,2-Epoxy-4-epoxyethyl-cyclo-hexane	106-87-6	$C_8H_{12}O_2$			See 4-vinyl cyclohexene dioxide		
2,3-Epoxypropyl isopropyl ether	4016-14-2	$C_6H_{12}O_2$			See isopropyl glycidyl ether [IGE]		
Ethanethiol	75-08-1	CH_3CH_2SH			See ethyl mercaptan		
Ethanol [ethyl alcohol]	64-17-5	CH_3CH_2OH	-	-	2000	-	
Ethanolamine	141-43-5	$NH_2CH_2CH_2OH$	6	-	12	-	
Ethyl acetate	141-78-6	$CH_3COOC_2H_5$	800	-	-	-	
Ethyl acrylate	140-88-5	$CH_2=CHCOOC_2H_5$	10	-	30	-	CARC
Ethylamine	75-04-7	$CH_3CH_2NH_2$	10	-	30	-	SKIN
Ethyl amyl ketone	541-85-5	$C_8H_{16}O$	20	-	-	-	
Ethyl benzene	100-41-4	$CH_3CH_2C_6H_5$	40	-	-	-	CARC, SKIN, OTO
Ethyl bromide	74-96-4	CH_3CH_2Br			See bromoethane		
Ethyl butyl ketone	106-35-4	$CH_3CH_2CO(CH_2)_3CH_3$	100	-	150	-	SKIN
Ethyl chloride	75-00-3	CH_3CH_2Cl	200	-	-	-	SKIN
Ethylene chlorohydrin	107-07-3	CH_2ClCH_2OH	-	-	C 2	-	SKIN
Ethylenediamine	107-15-3	$NH_2CH_2CH_2NH_2$	20	-	-	-	
Ethylene dibromide	106-93-4	$BrCH_2CH_2Br$			See 1,2-dibromoethane		
Ethylene dichloride	107-06-2	$ClCH_2CH_2Cl$			See 1,2-dichloroethane		
Ethylene glycol	107-21-1		50(V)	-	100(V)	20(H)	SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
Ethylene glycol dinitrate [EGDN]	628-96-6	$O_2NOCH_2CH_2ONO_2$	0,1	-	-	-	SKIN
Ethylene glycol methyl ether	109-86-4	$CH_3OCH_2CH_2OH$	0,2	-	-	-	
Ethylene glycol monomethyl ether acetate [EGMEA]	110-49-6	$CH_3COOCH_2CH_2OCH_3$	0,2	-	-	-	SKIN
Ethyleneimine	151-56-4	CH_2NHCH_2	0,1	-	0,2	-	CARC, SKIN
Ethyl ether [diethyl ether]	60-29-7	$C_2H_5OC_2H_5$	800	-	1000	-	
Ethyl formate	109-94-4	CH_3CH_2OCHO	-	-	200	-	
Ethylidene dichloride	75-34-3	CH_3CHCl_2	-	-	See 1,1Dichloroethane	-	
Ethyl mercaptan	75-08-1	CH_3CH_2SH	1	-	-	-	
4-Ethylmorpholine [N-ethylmorpholine]	100-74-3	$C_4H_8ONCH_2CH_3$	10	-	-	-	SKIN
Ethyl silicate F	78-10-4	$Si(OC_2H_5)_4$	20	-	-	-	
Fenchlorphos	299-84-3	$(CH_3O)_2PSOC_6H_2Cl_3$	-	10	-	-	
Ferbam	14484-64-1	$[(CH_3)_2NCSS]_3Fe$	-	10[(i)]	-	-	
Ferrocene	102-54-5	$(C_5H_5)_2Fe$			See dicyclopentadienyl iron		
Fluorides [inorganic as F]	16984-48-8	F	-	5	-	-	
Fluorine	7782-41-4	F_2	0,2	-	C 1	-	
Formamide	75-12-7	$HCONH^2$	2	-	-	-	SKIN
Formic acid	64-18-6	HCOOH	10	-	20	-	
Furfural [2-furaldehyde]	98-0101	$C_5H_4O_2$	0,4	-	-	-	SKIN
Furfuryl alcohol	98-00-0	$OCH=CHCH=CCH_2OH$	0,4	-	30	-	SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
G							
Germanium tetrahydride [germane]	7782-65-2	GeH_4	0,4	-	-	-	
Glutaraldehyde	111-30-8	$OCH(CH_2)_3CHO$	-	-	C 0,1	-	DSEN, RSEN
Graphite, natural and synthetic	7782-42-5	C	-	4(R)	-	-	
Guthion	86-50-0	$C_{10}H_{12}O_3PS_2N_3$		0,2	0,6	-	SKIN
H							
Hafnium	7440-58-6	Hf	-	1	-	-	
Halothane	151-67-7	$CF_3CHClBr$	100	-	-	-	
Heptachlor and	76-44-8,	$C_{10}H_5Cl_7$	-	0,1	-	-	CARC, SKIN
heptachlor epoxide	1024-57-3						
Heptane, all isomers	142-82-5, 590-35-2, 565-59-3, 108-08-7, 591-76-4, 589-34-4	$CH_3(CH_2)_5CH_3$ (for n-heptane)	800	-	1000	-	
Heptan-3-one	106-35-4	$CH_3CH_2CO(CH_2)_3CH_3$			See ethyl butyl ketone		
Hexachloroethane vapour	67-72-1		2	-	-	-	CARC, SKIN
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	$C_3H_6N_6O_6$	-	1,5	-	3	SKIN
Hexamethylene diisocyanate [HDI]	822-06-0	$OCN(CH_2)_6NCO$	0,01	-	-	-	
Hexane, all isomers except n-hexane	75-83-2, 79-29-8, 96-14-0,	C_6H_{14}	1000	-	2000	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
	107-83-5						
n-Hexane	110-54-3	$CH_3(CH_2)_4CH_3$	100	-	-	-	SKIN
2-Hexanone [hexan-2-one]	591-78-6	$CH_3CO(CH_2)_3CH_3$			See methyl-n-butyl ketone		
Hexone	108-10-1	$CH_3COCH_2CH(CH_3)_2$			See methyl isobutyl ketone [MIBK]		
sec-Hexyl acetate	108-84-9	$C_8H_{16}O_2$			See 1,3-dimethylbutyl acetate		
Hexylene glycol	107-41-5	$C_6H_{14}O_2$	50$^{(V)}$	-	100$^{(V)}$	20$^{(I, H)}$	
Hydrazine [diamine]	302-01-2	H_2NNH_2	0,02	-	-	-	CARC, SKIN
Hydrogen bromide	10035-10-6	HBr	-	-	C 4	-	
Hydrogen chloride (gas and aerosol mists)	7647-01-0	HCl	-	-	C 4	-	
Hydrogen fluoride [as F]	7664-39-3	HF	1	-	4	-	CARC, SKIN
Hydrogen peroxide	7722-84-1	H_2O_2	2	-	-	-	
Hydrogen selenide [as Se]	7783-07-5	H_2Se	0,1	-	-	-	
Hydrogen sulphide	7783-06-4	H_2S	2	-	10	-	
Hydroquinone	123-31-9	$C_6H_4(OH)_2$	-	2	-	-	DSEN
2-Hydroxypropyl acrylate [Propylene glycol monoacrylate]	999-61-1	$C_6H_{10}O_3$	1	-	-	-	DSEN, SKIN
I							
Indene [Indonaphthene]	95-13-6	C_9H_8	10	-	-	-	
Indium and compounds [as In]	7440-74-6	In	-	0.2	-	-	CARC (indium phosphide)
Iodine	7553-56-2	I_2	0,02$^{(IFV)}$	-	0,2$^{(V)}$	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Iodoform	75-47-8	CHI_3	1,2	-	-	-	
Iodomethane	74-88-4	CH_3I	4	-	-	-	SKIN
Iron oxide fume [as Fe]	1309-37-1	Fe_2O_3	-	10(R)	-	-	
Iron pentacarbonyl [as Fe]	13463-40-6	$Fe(CO)_5$	0,2	-	0,4	-	
Iron salts [as Fe]	-	-	-	2	-	-	
Isoamyl alcohol	123-51-3	$(CH_3)_2CHCH_2CH_2OH$	200	-	250	-	
Isobutanol [isobutyl alcohol]	78-83-1	$(CH_3)_2CHCH_2OH$	100	-	-	-	
Isooctyl alcohol	26952-21-6	$C_8H_{17}OH$	100	-	-	-	SKIN
Isophorone	78-59-1	$C_9H_{14}O$	-	-	C 10	-	
Isophorone diisocyanate [IPDI]	4098-71-9	$C_{12}H_{18}N_2O_2$	0,01	-	-	-	
Isopropyl acetate	108-21-4	$CH_3COOCH(CH_3)_2$	200	-	400	-	
Isopropyl benzene	98-82-8	$C_6H_5CH(CH_3)_2$			See cumene		
Isopropyl ether	108-20-3	$(CH_3)_2CHOCH(CH_3)_2$	500	-	620	-	
Isopropyl glycidyl ether [IGE]	4016-14-2	$C_6H_{12}O_2$	100	-	150	-	
K							
Ketene	463-51-4	$CH_2=CO$		-	C 0.1	-	
L							
Liquefied petroleum gas [LPG]	68476-85-7	Mixture: C_3H_6; C_3H_8; C_4H_{10}; C_4H_8	-	Asphyxiant	-	-	
Lithium hydride	7580-67-8	LiH	-	-	-	C 0,1	
M							
Magnesium oxide [as MgO]	1309-48-4	MgO	-	10	-	-	
Malathion	121-75-5	$C_{10}H_{19}O_6PS_2$	-	2(IFV)	-	-	CARC, SKIN
Maleic anhydride	108-31-6	$C_4H_2O_3$	-	0,02(IFV)	-	-	DSEN, RSEN
Manganese	7439-96-5	Mn					

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
inorganic compounds [as Mn]	-	-	-	0,2[I]	-	-	
elemental	-	-	-	0,04[R]	-	-	
Manganese cyclopentadienyl tricarbonyl [as Mn]	12079-65-1	$C_5H_5Mn(CO)_3$	-	0,2	-	-	SKIN
Mercaptoacetic acid	68-11-1	$HSCH_2COOH$	2	-	-	-	SKIN
Mercury and divalent inorganic mercury compounds, including mercuric oxide and mercuric chloride [as Hg]	7439-97-6	Hg					
Alkyl compounds			-	0,02	-	0,06	CARC, SKIN
Aryl compounds			-	0,2	-	-	SKIN
Elemental and inorganic forms			-	0,05	-	-	SKIN
Mesityl oxide	141-79-7	$(CH_3)_2C=CHCOCH_3$	30	-	50	-	
Methacrylic acid	79-41-4	$CH_2=C(CH_3)COOH$	40	-	-	-	
Methanol [methyl alcohol]	67-56-1	CH_3OH	400	-	500	-	SKIN
Methomyl	16752-77-5	$C_5H_{10}N_2O_2S$	-	0,4[IFV]	-	-	SKIN
Methoxychlor	72-43-5	$(C_6H_4OCH_3)_2CHCCl_3$	-	10	-	-	
1-Methoxypropan-2-ol	107-98-2	$CH_3CHOHCH_2OCH_3$			See propylene glycol monomethyl ether		
Methyl acetate	79-20-9	CH_3COOCH_3	400	-	500	-	
Methyl acrylate	96-33-3	$CH_2=CHCOOCH_3$	4	-	-	-	DSEN, SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
Methylacrylonitrile [methacrylonitrile]	126-98-7	$CH_2=C(CH_3)CN$	2	-	-	-	SKIN
Methylal	109-87-5	$CH_2(OCH_3)_2$	2000	-	-	-	
Methylamine	74-89-5	CH_3NH_2	10	-	30	-	
Methyl n-amyl ketone	110-43-0	$CH_3CO(CH_2)_4CH_3$	100	-	-	-	
N-Methylaniline	100-61-8	$C_6H_5NHCH_3$	1	-	-	-	SKIN
Methyl bromide	74-83-9	CH_3Br	2	-	-	-	SKIN
Methyl-n-butyl ketone	591-78-6	$CH_3CO(CH_2)_3CH_3$	10	-	20	-	SKIN
Methyl chloride	74-87-3	CH_3Cl	100	-	200	-	SKIN
Methyl chloroform	71-55-6	CH_3CCl_3			See 1,1,1-trichloroethane		
Methyl 2-cyanoacrylate	137-05-3	$CH_2=C(CN)COOCH_3$	0,4	-	-	-	
Methyl ethyl ketone [MEK]	78-93-3	$CH_2COC_2H_5$	400	-	600	-	SKIN
Methylcyclohexane	108-87-2	$CH_3C_6H_{11}$	800	-	-	-	
Methylcyclohexanol	25639-42-3	$CH_3C_6H_{10}OH$	100	-	-	-	
2-Methylcyclohexanone	583-60-8	$CH_3CHCO(CH_2)_3CH_2$	100	-	150	-	SKIN
Methylene bis(4-cyclohexylisocyanate)	5124-30-1	$CH_2[(C_6H_{10})NCO]_2$	0,01	-	-	-	
Methylcyclopentadienyl manganese tricarbonyl [as Mn]	12108-13-3	$CH_3C_5H_4Mn(CO)_3$	-	0,4	-	-	SKIN
4,4'-Methylenebis(2-chloroaniline) [MbOCA]	101-14-4	$CH_2(C_6H_4ClNH_2)_2$			See 2,2'-dichloro-4,4'-methylene dianiline [MbOCA]		
Methylene chloride	75-09-2				See dichloromethane		

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
4,4'-Methylenedianiline [MDA]	101-77-9	$CH_2(C_6H_4NH_2)_2$	0,2	-	-	-	
4,4'-Methylene-diphenyl diisocyanate [MDI]	101-68-8	$CH_2(C_6H_4NCO)_2$	0,01	-	-	-	
Methyl formate	107-31-3	$HCOOCH_3$	100	-	200	-	SKIN
Methyl hydrazine	60-34-4	CH_3NHNH_2	0,02	-	-	-	SKIN
Methyl iodide	74-88-4	CH_3I			See iodomethane		
Methyl isoamyl ketone	110-12-3	C7H14O	40	-	100	-	SKIN
Methyl isobutyl carbinol [4-Methylpentan-2-ol]	108-11-2	C6H14O	40	-	80	-	SKIN
Methyl isobutyl ketone [MIBK]	108-10-1	$CH_3COCH_2CH(CH_3)_2$	40	-	150	-	CARC, SKIN
Methyl isocyanate [MIC]	624-83-9	CH_3NCO	0,04	-	0,12	-	DSEN, RSEN, SKIN
Methyl mercaptan	74-93-1	CH_3SH	1	-	-	-	
Methyl methacrylate	80-62-6	$CH_2=C(CH_3)COOCH_3$	100	-	200	-	DSEN
Methyl parathion	298-00-0	$C_8H_{10}NO_5PS$	-	$0,04^{(IFV)}$	-	-	SKIN
Methyl propyl ketone	107-87-9	$CH_3(CH_2)_2COCH_3$	-	-	300	-	
Methyl silicate	681-84-5	$(CH_3O)_4Si$	2	-	-	-	
alpha-Methyl styrene	98-83-9	$C_6H_5C(CH_3)=CH_2$	20	-	-	-	CARC
Mevinphos	7786-34-7	$C_7H_{13}PO_6$			See phosdrin		
Mica	12001-26-2		-	$0,2^{R)}$	-	-	
Molybdenum compounds [as Mo]'	7439-98-7	Mo					
Soluble compounds	-	-	-	$1^{(R)}$	-	-	
Metal and insoluble compounds, total particulate	-	-	-	10	-	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Metal and insoluble compounds	-	-	-	5(R)	-	-	
Monochloroacetic acid	79-11-8	$ClCH_2CO_2H$	1(IFV)	-	-	-	SKIN
Morpholine	110-91-8	C_4H_9NO	40	-	-	-	SKIN
Naled	300-76-5	$C_4H_7Br_2Cl_2O_4P$	-	0,2(IFV)	-	-	DSEN, SKIN
Naphthalene	91-20-3	$C_{10}H_8$	20	-	-	-	CARC, SKIN
Nickel and its inorganic compounds [as Ni]	7440-02-0						
Elemental			-	3	-	-	CARC, SKIN
Nickel carbonyl [as Ni]	13463-39-3	$Ni(CO)_4$	-	-	C 0,1	-	CARC
Nickel, subsulphide [as Ni]	12035-72-2	Ni_3S_2	-	0,2	-	-	CARC
Nicotine	54-11-5	$C_{10}H_{14}N_2$	-	1	-	-	SKIN
Nitrapyrin	1929-82-4	$ClC_5H_3NCCl_3$	-	10(IFV)	-	20(IFV)	
Nitric acid	7697-37-2	HNO_3	4	-	8	-	
Nitric oxide	10102-43-9	NO			See nitrogen monoxide		
4-Nitroaniline [p-nitroaniline]	100-01-6	$NO_2C_6H_4NH_2$	-	6	-	-	SKIN
Nitrobenzene	98-95-3	$C_6H_5NO_2$	2	-	-	-	CARC, SKIN
p-Nitrochlorobenzene	100-00-5	$ClC_6H_4NO_2$	0,2	-	-	-	
Nitroethane	79-24-3	$C_2H_5NO_2$	200	-	-	-	
Nitrogen monoxide	10102-43-9	NO	50	-	-	-	
Nitrogen dioxide	10102-44-0	NO_2	0,4	-	-	-	
Nitrogen trifluoride	7783-54-2	NF_3	20	-	-	-	
Nitroglycerine [NG]	55-63-0	$_2NO_3CHNO_3CH_2NO_3$	0,1	-	-	-	SKIN
Nitromethane	75-52-5	CH_3NO_2	40	-	-	-	CARC
1-Nitropropane	108-03-2	$C_3H_7NO_2$	50	-	-	-	
2-Nitropropane	79-46-9	$(CH_3)_2CH(NO_2)$	20	-	-	-	CARC

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Nitrotoluene, all isomers	88-72-2; 99-08-1; 99-99-0	$CH_3C_6H_4NO_2$	4	-	-	-	SKIN
Nitrous oxide	10024-97-2	N_2O	100	-	-	-	
O							
Octachloronaphthalene	2234-13-1	$C_{10}Cl_8$	-	0,2	-	0,6	SKIN
Osmium tetroxide [as Os]	20816-12-0	OsO_4	0,0004	-	0,0012	-	
Oxalic acid	144-62-7	$COOHCOOH.2H_2O$	-	2	-	4	
Ozone	10028-15-6	O_3					
Heavy work			0,1	-	-	-	
Moderate work			0,16	-	-	-	
Light work			0,2	-	-	-	
Heavy, moderate or light workloads (< 2hrs)			0,4	-	-	-	
P							
Paraffin wax fume	8002-74-2	-	-	4	-	-	
Parathion	56-38-2	$(C_2H_5O)_2PSOC_6H_4NO_2$	-	0,1 (IFV)	-	-	CARC, SKIN
Particles not otherwise specified [PNOS]	-	-					
Total particulate	-	-	-	10	-	-	
	-	-	-	5 (R)	-	-	
Pentachlorophenol	87-86-5	C_6Cl_5OH	-	1 (IFV)	-	2	CARC, SKIN
Pentaerythritol	115-77-5		-	10	-	-	
Pentane, all isomers	78-78-4; 109-66-0; 463-82-1	C_5H_{12}	2000	-	-	-	
Pentyl acetate, all isomers	628-63-7; 626-38-0; 123-92-2;	$CH_3COO(CH_2)_4CH_3$	100	-	200	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
	625-16-1; 624-41-9; 620-11-1						
Perchloryl fluoride	7616-94-6	$ClFO_3$	1	-		-	
Persulphates, as persulfate		SO_5/S_2O_8	-	0,2	-	-	
Phenol	108-95-2	C_6H_5OH	10	-	-	-	SKIN
p-Phenylenediamine	106-50-3	$C_6H_4(NH_2)_2$	-	0,2	-	-	SKIN
Phenyl ether	101-84-8	$C_6H_5OC_6H_5$	2(V)	-	4	-	
Phenyl glycidyl ether [PGE]	122-60-1	$C_6H_5OCH_2CHOCH_2$	0,2	-	-	-	CARC, DSEN, SKIN
Phenylhydrazine	100-63-0	$C_6H_5NHNH_2$	0,2	-	-	-	SKIN
Phenyl mercaptan	108-98-5	C_6H_5SH	0,2	-	-	-	SKIN
2-Phenylpropene	98-83-9	$C_6H_5C(CH_3)=CH_2$			See alpha-methyl styrene		
Phorate	298-02-2	$C_7H_{17}O_2PS_3$	-	0,1(IFV)	-	-	SKIN
Phosdrin	7786-34-7	$C_7H_{13}PO_6$	-	0,02(IFV)	-	-	SKIN
Phosgene	75-44-5	$COCl_2$	0,2	-	-	-	
Phosphine	7803-51-2	PH_3	0,1	-	C 0,3	-	
Phosphoric acid	7664-38-2	H_3PO_4	-	2	-	6	
Phosphorus oxychloride	10025-87-3	$POCl_3$	0,2	-	-	-	
Phosphorus pentachloride	10026-13-8	PCl_5	0,2	-	-	-	
Phosphorus pentasulphide	1314-80-3	P_2S_5/P_4S_{10}	-	2	-	6	
Phosphorus trichloride	7719-12-2	PCl_3	0,4	-	1	-	
Phthalic anhydride	85-44-9	$C_6H_4(CO)_2O$	0,004(IFV)	-	0,01	-	DSEN, RSEN
Picloram	1918-02-1	$C_6H_3Cl_3N_2O_2$	-	10	-	-	
Picric acid	88-89-1	$(NO_2)_3C_6H_2OH$	-	0,2	-	-	
Piperazine and salts [as Piperazine]	110-85-0	$C_4H_{10}N_2$	0,06(IFV)	-	-	-	DSEN, RSEN
Platinum							

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Metal	7440-06-4	Pt	-	1	-	-	
Soluble salts [as Pt]	-	-	-	0,002	-	-	DSEN, RSEN
Polyvinyl chloride [PVC]	-	-	-	2(R)	-	-	
Potassium hydroxide	1310-58-3	KOH	-	-	-	C 4	
n-Propanol [n-propyl alcohol]	71-23-8	$CH_3CH_2CH_2OH$	200	-	-	-	SKIN
2-Propanol [propan-2-ol]	67-63-0	$(CH_3)_2CHOH$	400	-	800	-	
Propargyl alcohol [2-propyn-1-ol]	107-19-7	$HC{\equiv}CCH_2OH$	2	-	-	-	SKIN
Propionic acid	79-09-4	CH_3CH_2COOH	20	-	-	-	
Propoxur	114-26-1	$C_{11}H_{15}NO_3$	-	1(IFV)	-	-	
n-Propyl acetate	109-60-4	$CH_3COOC_3H_7$	200	-	300	-	
Propylene glycol dinitrate [PGDN]	6423-43-4	$I_3CHONO_2CH_2ONO_2$	0,1	-	-	-	SKIN
Propylene glycol monomethyl ether	107-98-2	$CH_3CHOHCH_2OCH_3$	100	-	200	-	SKIN
Pyrethrum	8003-34-7	-	-	10	-	-	
Pyridine	110-86-1	C_5H_5N	2	-	-	-	
Pyrocatechol	120-80-9	$C_6H_4(OH)_2$	5	20	-	-	
Q							
Quinone	106-51-4	C6H4O2			See p-benzoquinone		
Quintozene	82-68-8	$C_6Cl_5NO_2$			See pentachloronitrobenzene		
R							
Resorcinol	108-46-3	$C_6H_4(OH)_2$	20	-	40	-	SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Resin acids (as total Resin acid)	8050-09-07			0.002			
Rhodium							
Metal and insoluble compounds [as Rh]	7440-16-6	Rh	-	2	-	-	
Soluble compounds [as Rh]			-	0,02	-	-	DSEN
Rosin core solder thermal decomposition products [colophony]	8050-09-07	-	Exposure by all routes should be carefully controlled to ALARP				
S							
Selenium and compounds, except hydrogen selenide [as Se]	7782-49-2	Se	-	0,4	-	-	
Silicon carbide	409-21-2	SiC					
Total particulate (nonfibrous)	-	-	-	$10^{(I, E)}$	-	-	CARC
Respirable particulate (nonfibrous)	-	-	-	$5^{(R)}$	-	-	CARC
Fibrous (including whiskers)			-	0,1 f/ml$^{(F)}$	-	-	CARC
Silicon tetrahydride [silane]	7803-62-5	SiH_4	10	-	-	-	
Silver							
Metal	7440-22-4	Ag	-	0,2	-	-	
Soluble compounds [as Ag]	-	-	-	0,02	-	-	
Sodium azide	26628-22-8	NaN_3	-	-	-	C 0,6	SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
Sodium 2,4-dichlorophenoxy ethyl sulphate [2,4-DES], [sesone]	136-78-7	$C_8H_7Cl_2NaO_5S$	-	10	-	-	CARC
Sodium fluoroacetate	62-74-8	$CH_2FCOONa$	-	0,1	-	-	SKIN
Sodium hydrogen sulphite [sodium bisulphite]	7631-90-5	$NaHSO_3$	-	10	-	-	
Sodium hydroxide	1310-73-2	NaOH	-	-	-	C 4	
Sodium metabisulphate	7681-57-4	$Na_2S_2O_5$	-	10	-	-	
Starch	9005-25-8	-	-	10	-	-	
Stibine [antimony hydride]	7803-52-3	SbH_3	0,2	-	-	-	
Strychnine	57-24-9	$C_{21}H_{22}N_2O_2$	-	0,3	-	-	
Subtilisins (Proteolytic enzymes as 100% crystalline active pure enzyme)	1395-21-7, 9014-01-1	-	-	-	-	0,00012	RSEN
Sucrose	57-50-1	$C_{12}H_{22}O_{11}$	-	10	-	-	
Sulfotep	3689-24-5	$[(CH_3CH_2O)_2PS]_2O$	-	0,2$^{(IFV)}$	-	-	SKIN
Sulphur dioxide	7446-09-5	SO_2	-	-	0,5	-	
Sulphur hexafluoride	2551-62-4	SF_6	2000	-	-	-	
Sulphuric acid (mist)	7664-93-9	H_2SO_4	-	0,4$^{(T)}$	-	-	CARC
Sulphur monochloride	10025-67-9	S_2Cl_2	-	-	C 2	-	
Sulphur pentafluoride	5714-22-7	S_2F_{10}	-	-	C 0,02	-	
Sulphur tetrafluoride	7783-60-0	SF_4	-	-	C 0,2	-	
Sulphuryl fluoride [sulphuryl difluoride]	2699-79-8	SO_2F_2	10	-	20	-	
Synthetic vitreous fibres [SVF]:	-	-					

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Continuous filament glass fibres	-	-	-	2 f/ml(F)	-	-	
Continuous filament glass fibres			-	10	-	-	
Glass wool fibres	-	-	-	2 f/ml(F)	-	-	
Rock wool fibres	-	-	-	2 f/ml(F)	-	-	
Slag wool fibres	-	-	-	2 f/ml(F)	-	-	
Special purpose glass fibres			-	2 f/ml(F)	-	-	
Refractory ceramic fibres	-	-	-	0,4 f/ml(F)	-	-	CARC
T							
Talc (containing no asbestos fibres)	14807-96-6	$Mg_3Si_4O_{10}(OH)_1$	-	4(E, R)	-	-	
Tellurium and compounds, except hydrogen telluride [as Te]	13494-80-9	Te	-	0,2	-	-	
Terphenyls, all isomers	26140-60-3	$C_{18}H_{14}$	-	-	-	10	
1,1,2,2-Tetrabromoethane	79-27-6	$CHBr_2CHBr_2$	0,2	-	-	-	SKIN
Tetracarbonyl nickel [as Ni]	13463-39-3	$Ni(CO)_4$			See nickel carbonyl		
1,1,2,2-Tetrachloro-1,2-difluoroethane	76-12-0	CCl_2FCCl_2F	100	-	-	-	
1,1,1,2-Tetrachloro-2,2-difluoroethane	76-11-9	CCl_3CClF_2	200	-	-	-	
Tetrachloroethylene	127-18-4	$Cl_2C=CCl_2$	50	-	200	-	
Tetrachloronaphthalene	1335-88-2	$C_{10}H_4Cl_4$	-	4	-	-	
Tetraethyl Lead (as Pd)	78-00-2				See Lead Regulations		
Tetraethyl orthosilicate	78-10-4	Si(OC2H5)4			See ethyl silicate		

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Tetraethyl pyrophosphate [TEPP]	107-49-3	$[(CH_3CH_2O)_2PO]_2O$	-	0,02(IFV)	-	-	SKIN
Tetrahydrofuran	109-99-9	C_4H_8O	100	-	200	-	SKIN
Tetramethyl Lead (as Pd)	75-74-1				See Lead Regulations		
Tetramethyl succinonitrile	3333-52-6	$C_8H_{12}N_2$	1(IFV)	-	-	-	SKIN
Tetryl	479-45-8	$O^2)^3C^6H^2N(NO^2)CH^3$	-	3	-	-	
Thallium, soluble compounds [as Tl]	-	Tl	-	0,04	-	-	SKIN
4,4'-Thiobis(6-tert-butyl-m-cresol)	96-69-5	$C_{22}H_{30}O_2S$	-	2	-	-	
Thioglycolic acid	68-11-1	$HSCH_2COOH$			See mercaptoacetic acid		
Thionyl chloride	7719-09-7	$SOCl_2$	-	-	C 0,4	-	
Thiram	137-26-8	$-I_3)_2NCS_2CS_2N(CH_3)_2$	-	0,1(IFV)	-	-	DSEN
Tin compounds:		-					
Tin metal	7440-31-5	-	-	4	-	-	
Tin oxide and inorganic, except SnH_4 [as Sn]		-	-	4	-	-	SKIN
Organic except cyhexatin [as Sn]	-	-	-	0,2	-	-	SKIN
Titanium dioxide	13463-67-7	-	-	10		-	CARC
Toluene	108-88-3	$C_6H_5CH_3$	40	-	-	-	SKIN, OTO
2,4-Toluene diisocyanate [TDI]	584-84-9	$CH_3C_6H_3(NCO)_2$	0,002(IFV)	-	0,01(IFV)	-	
o-Toluidine	95-53-4	$CH_3C_6H_4NH_2$	4	-	-	-	CARC, SKIN
m-Toluidine	108-44-1	$CH_3C_6H_4NH_2$	4	-	-	-	SKIN
p-Toluidine	106-49-0	$CH_3C_6H_4NH_2$	4	-	-	-	SKIN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Tribromomethane	75-25-2	$CHBr_3$			See bromoform		
Tributyl phosphate, all isomers	126-73-8	$(C_4H_9)_3PO_4$	-	$10^{(IFV)}$	-	-	
Trichloroacetic acid	76-03-9	CCl_3COOH	1	-	-	-	CARC
1,2,4-Trichlorobenzene	120-82-1	$C_6H_3Cl_3$	-	-	C 10	-	SKIN
1,1,2-Trichloroethane	79-00-5	$CHCl_2CH_2Cl$	20	-	-	-	SKIN
Trichlorofluoromethane	75-69-4	CCl_3F	-	-	2000	-	
Trichloronitromethane	76-06-2	CCl_3NO_2			See chloropicrin		
2,4,5-Trichlorophenoxyacetic acid [2,4,5-T]	93-76-5	$Cl_3C_6H_2OCH_2COOH$	-	10	-	-	CARC
1,2,3-Trichloropropane	96-18-4	$CH_2ClCHClCH_2Cl$	0,01	-	-	-	CARC
1,1,2-Trichlorotrifluoroethane [1,1,2-trichloro-1,2,2-trifluoroethane]	76-13-1	CCl_2FCClF_2	2000	-	2500	-	
Tri-o-cresyl phosphate [Tri-o-tolyl phosphate]	78-30-8	$(CH_3C_6H_4O)_3P=O$	-	0,04	-	-	SKIN
Tricyclohexyltin hydroxide	13121-70-5	$(C_6H_{11})_3SnOH$			See cyhexatin		
Triethanolamine	102-71-6	$(CH_2OHCH_2)_3N$	-	10	-	-	
Triethylamine	121-44-8	$(C_2H_5)_3N$	1	-	2	-	SKIN
Trifluorobromomethane	75-63-8	CF_3Br	2000	-	-	-	
Trimellitic anhydride	552-30-7	$C_9H_4O_5$			See benzene-1,2,4,-tricarboxylic acid 1,2-anhydride		
Trimethylamine	75-50-3	$(CH_3)_3N$	10	-	30	-	

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m³	OEL-STEL/C ppm	OEL-STEL/C mg/m³	NOTATIONS
Trimethylbenzene, all isomers or mixtures	25551-13-7	$C_6H_3(CH_3)_3$	50	-	-	-	
Trimethyl phosphite	121-45-9	$(CH_3O)_3P$	4	-	-	-	
2,4,6-Trinitrotoluene [TNT]	118-96-7	$CH_3C_6H_2(NO_2)_3$	-	0,2	-	-	SKIN
Triphenyl phosphate	115-86-6	$(C_6H_5O)_3PO_4$	-	6	-	-	SKIN
Tungsten and compounds, in the absence of cobalt, as W	7440-33-7			$5^{(R)}$			
Turpentine	8006-64-2	$C_{10}H_{16}$ (approx.)	40	-	-	-	
U							
Uranium (natural), soluble and insoluble compounds [as U]	7440-61-1	-	-	0,4	-	1,2	
V							
Vanadium pentoxide	1314-62-1	V_2O_5	$0,1^{(I)}$	-	-	-	CARC
Vinyl acetate	108-05-4	$CH_2=CHOOCCH_3$	20	-	30	-	CARC
Vinyl benzene	100-42-5	$C_6H_5CH=CH_2$			See styrene, monomer		
Vinyl bromide	593-60-2	$CH_2=CHBr$	1	-	-	-	CARC
4-Vinyl cyclohexene	100-40-3	C_8H_{12}	0,2	-	-	-	CARC
4-Vinyl cyclohexene dioxide	106-87-6	$C_8H_{12}O_2$	0,2	-	-	-	CARC, SKIN
Vinyl toluene	25013-15-4	$CH_2=CHC_6H_4CH_3$	100	-	200	-	
W							
Warfarin	81-81-2	$C_{19}H_{16}O_4$	-	$0,02^{(I)}$	-	-	SKIN
Wood dust, all species, excluding oak, beech, birch,	-		-	5	-	-	CARC, RSEN

AGENT	CAS NUMBER	FORMULA	OEL eight-hour TWA ppm	OEL eight-hour TWA mg/m^3	OEL-STEL/C ppm	OEL-STEL/C mg/m^3	NOTATIONS
mahogany, teak and walnut							
X							
Xylene, o-, m-, p- or mixed isomers	1330-20-7	$C_6H_4(CH_3)_2$	200	-	300	-	SKIN, OTO
Xylidine, all isomers	1300-73-8	$(CH_3)_2C_6H_3NH_2$	1$^{(IFV)}$	-	-	-	CARC, SKIN
Y							
Yttrium and compounds [as Y]	7440-65-5	Y	-	2	-	-	
Z							
Zinc chloride, fume	7646-85-7	$ZnCl_2$	-	2	-	4	
Zinc oxide, fume	1314-13-2	ZnO	-	4$^{(R)}$	-	20$^{(R)}$	
Zirconium compounds [as Zr]	7440-67-7	Zr	-	10	-	20	

Abbreviations:

ALARP: as low as reasonable practicable

OEL eight-hour TWA: occupational exposure limit – eight-hour time-weighted average

OEL-RL: occupational exposure limit – restricted limit

OEL-STEL/C: occupational exposure limit – short-term exposure limit, ceiling limit Ceiling limit is differentiated by a **C** next to the limit

Notations:

CARC: denotes carcinogenicity, which is based on GHS categorisation, including category 1A, 1B;

DSEN: dermal sensitisation, potential to produce dermal sensitisation;

E: the value is for particulate matter containing no asbestos and ≤ 1% crystalline silica;

F: respirable fibres: length> 5 µm; aspect ratio ≥ 3:1 as determined by the membrane filter method at 400-450X magnification (4mm objective), using phase-contrast illumination;

H: aerosol only;

I: inhalable fraction;
IFV: inhalable fraction and vapour;
Inhalable particulate matter (IPM): for those materials that are hazardous when deposited anywhere in the respiratory tract;
OTO: Ototoxicant
R: respirable fraction;
RSEN: respiratory sensitisation, potential to produce respiratory sensitisation;
SKIN: danger of cutaneous absorption – refers to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes by contact with vapours, liquids and solids; overexposure may also occur following dermal contact with liquids and aerosols, even when airborne exposures at or below the OEL;
T: thoracic fraction; and
V: vapour fraction.

RSEN and DSEN do not imply that sensitisation is the critical effect on which the OEL is based, nor do they imply that this effect is the sole basis for the agent's OEL.

Note:
*All industries handling, manufacturing and producing silica dust are required to submit biennial reports that include the information on Annexure 3.

Table 4: BIOLOGICAL EXPOSURE INDICES (BEIs) FOR HAZARDOUS CHEMICAL AGENTS

AGENT/DETERMINANT	CAS NUMBER	SAMPLE MATRIX	SAMPLING TIME	VALUE	UNIT	NOTATION
A						
Acetone	**67-64-1**					
Acetone		urine	End of shift	25	mg/L	Ns
Acrylamide	**76-06-1**					
N-(2- Carbomoylethyl) valine		blood	Not critical	500	pmol/g	B
S-(Carbomoylethyl) mercapturic acid		urine		800	µg/g creatinine	B
Acetylcholinesterase inhibitors						
Cholinesterase inhibiting pesticides		blood	Discretionary	70	% of baseline	Ns
Aniline	**62-53-3**					
		urine	End of shift	50	mg/L	B, Ns, Sq
Arsenic, elemental and soluble inorganic compounds (excluding gallium arsenide and arsine)	**7440-38-2**					
Inorganic arsenic plus methylated metabolites		urine	End of workweek	35	µg/L	B
B						
Benzene	**71-43-2**					
S-phenylmercapturic acid (SPMA)		urine	End of shift	25	µg/g creatinine	B
t,t-Muconic acid (ttMA)		urine	End of shift	500	µg/g creatinine	B
1,3-Butadiene	**106-99-0**					

AGENT/DETERMINANT	CAS NUMBER	SAMPLE MATRIX	SAMPLING TIME	VALUE	UNIT	NOTATION
1,2-Dihydroxy-4-(N-acetylcysteinyl)-butane		urine	End of shift	2,5	mg/L	B, Sq
Mixture of N-1-and N-2-(hydroxybutenyl)valine haemoglobin adducts		blood	Not critical	2,5	pmol/g Hb	Sq
2-Butoxyethanol	**111-76-2**					
Butoxyacetic acid (BAA)		urine	End of shift	200	mg/g creatinine	-
C						
Cadmium and inorganic compounds	**7440-43-9**					
Cadmium		urine	Not critical	5	µg/g creatinine	B
Cadmium		blood	Not critical	5	µg/L	B
Carbon disulphide	**75-15-0**					
2-thiothiazolidine-4-carboxlyic acid (TTCA)		urine	End of shift	0,5	mg/g creatinine	B, Ns
Carbon monoxide	**630-08-0**					
Carboxyhaemoglobin		blood	End of shift	3,5	% haemoglobin	B, Ns
Carbon monoxide		end exhaled	End of shift	20	ppm	B, Ns
Chlorobenzene	**108-90-7**					
4-Chlorocatechol		urine	End of shift at end of workweek	100	mg/g creatinine	Ns
p-Chlorophenol		urine	End of shift at end of workweek	20	mg/g creatinine	Ns
Chromium (water-soluble fume)	**7440-47-3**					
Total chromium		urine	End of shift at end of workweek	0.7	µg/L	-
						-

AGENT/DETERMINANT	CAS NUMBER	SAMPLE MATRIX	SAMPLING TIME	VALUE	UNIT	NOTATION
Cobalt and inorganic compounds, including cobalt oxides but not combined with tungsten carbide	**7440-48-4**					
Cobalt		urine	End of shift at end of workweek	15	µg/L	Ns
Cyclohexane	**110-82-7**					
1,2- Cyclonhexanediol		urine	End of shift at end of workweek	50	mg/L	Ns
Cyclohexanone	**108-94-1**					
1,2-Cyclohexanediol		urine	End of shift at end of workweek	80	mg/L	Ns, Sq
Cyclohexanol		urine	End of shift	8	mg/L	Ns, Sq
D						
Dichloromethane	**75-09-2**					
Dichloromethane		urine	End of shift	0,3	mg/L	Sq
N,N-Dimethylacetamide	**127-19-5**					
N-Methylacetamide		urine	End of shift at end of workweek	30	mg/g creatinine	-
N,N-Dimethylformamide (DMF)	**68-12-2**					
N-methylformamide		urine	End of shift	30	mg/L	-
N-Acetyl-S-(N-methylcarbamoyl) cysteine Total N-methylformamide represents sum of N-methylformamide and N- (		urine	Prior to last shift of workweek	30	mg/L	Sq

AGENT/DETERMINANT	CAS NUMBER	SAMPLE MATRIX	SAMPLING TIME	VALUE	UNIT	NOTATION
Hydroxymethyl)- N-methylformamide						
E						
2-Ethoxyethanol (EGEE) and 2-Ethoxyethyl acetate (EGEEA)	**110-80-5; 111-15-9**					
2-Ethoxyacetic acid		urine	End of shift at end of workweek	40	mg/g creatinine	-
Ethyl benzene	**100-41-4**					
Sum of mandelic acid and phenylglyoxylic acid		urine	End of shift	0,15	g/g creatinine	Ns
F						
Fluorides	**16984-48-8**					
Fluoride		urine	Prior to shift	2	mg/L	B, Ns
Fluoride		urine	End of shift	3	mg/L	B, Ns
Furfural	**98-01-1**					
Furoic acid		urine	End of shift	200	mg/L	Ns
G						
H						
1,6-Hexamethylene diisocyanate	**822-06-0**					
1,6-Hexamethylene diamine		urine	End of shift	15	µg/g creatinine	Ns
n-Hexane	**110-54-3**					
2,5-Hexanedione		urine	End of shift at end of workweek	0,5	mg/L	-
L						
Lead and Inorganic compounds	**7439-92-1**					

AGENT/DETERMINANT	CAS NUMBER	SAMPLE MATRIX	SAMPLING TIME	VALUE	UNIT	NOTATION
Lead		blood	Not critical	See Lead Regulations		
M						
Mercury (Elemental)	**7439-97-6**					
Mercury		urine	Prior to shift	20	µg/g creatinine	-
Methanol	**67-56-1**					
Methanol		urine	End of shift	15	mg/L	B, Ns
Methemoglobin inducers						
Methemoglobin		blood	During or at end of shift	5	% haemoglobin	B, Ns, Sq
2-Methoxyethanol and 2-Methoxyethylacetate	**109-86-4; 110-49-6**					
2-Methoxyacetic acid		urine	End of shift at end of workweek	1	mg/g creatinine	-
Methyl n-butyl ketone	**591-78-6**					
2,5-Hexanedione		urine	End of shift at end of workweek	0,4	mg/L	-
Methyl chloroform	**71-55-6**					
Methyl chloroform		end exhaled	Prior to last shift of workweek	20	ppm	
Methyl chloroform in urine		urine	End of shift	700	ug/L	Ns, Sq
Methyl Ethyl ketone (MEK)	**78-93-3**					
Methyl ethyl ketone (MEK)		urine	End of shift	2	mg/L	Ns
Methyl isobutyl ketone (MIBK)	**108-10-1**					
Methyl isobutyl ketone (MIBK)		urine	End of shift	1	mg/L	-

AGENT/DETERMINANT	CAS NUMBER	SAMPLE MATRIX	SAMPLING TIME	VALUE	UNIT	NOTATION
N						
Nickel	**7440-02-0**					
Elemental Nickel and poorly soluble compounds		urine	End of shift at end of workweek	5	ug/L	B
Soluble compounds		urine	End of shift at end of workweek	30	ug/L	
Nitrobenzene	**98-95-3**					
Methemoglobin		blood	See methemoglobin inducers BEI			
P						
Parathion	**56-38-2**					
Total p-nitrophenol		urine	End of shift	0,5	mg/g creatinine	Ns
Cholinesterase activity in red blood cells		blood	Discretionary	70	% of baseline	Ns
Phenol	**108-95-2**					
Phenol		urine	End of shift	250	mg/g creatinine	B, Ns
2-Propanol	**67-63-0**					
Acetone		urine	End of shift at end of workweek	40	mg/L	B, Ns
S						
Styrene	**100-42-5**					
Mandelic acid and phenylglyoxylic acid		urine	End of shift	150	mg/g creatinine	Ns
Styrene		urine	End of shift	20	µg/L	-
T						
Tetrachloroethylene (Perchloroethylene)	**127-18-4**					
Tetrachloroethylene		end exhaled	Prior to shift	3	ppm	-
Tetrachloroethylene		blood	Prior to shift	0,5	mg/L	-

AGENT/DETERMINANT	CAS NUMBER	SAMPLE MATRIX	SAMPLING TIME	VALUE	UNIT	NOTATION
Tetrahydrofuran	**109-99-9**					
Tetrahydrofuran		urine	End of shift	2	mg/L	-
Toluene	**108-88-3**					
Toluene		blood	Prior to last shift of workweek	0,02	mg/L	-
Toluene		urine	End of shift	0,03	mg/L	-
o-Cresol		urine	End of shift	0,3	mg/g creatinine	B
Toluene diisocyanate-2,4, or as a mixture of isomers	**584-84-9**					
Toluene diamine		urine	End of shift	5	µg/g creatinine	Ns
Trichloroethylene	**79-01-6**					
Trichloroacetic acid		urine	End of shift at end of workweek	15	mg/L	Ns
Trichloroethanol		blood	End of shift at end of workweek	0,5	mg/L	Ns
U						
Uranium	**7440-61-1**					
Uranium		urine	End of shift	200	µg/L	-
X						
Xylenes	**95-47-6; 106-42-3; 108-38-3; 1330-20-7**					
Methylhippuric acids		urine	End of shift	1,5	g/g creatinine	-

Notations:

B: background

The determinant may be present in biological specimens collected from subjects who have not been occupationally exposed, at a concentration which could affect interpretation of the results. Such background concentrations are incorporated in the BEI value.

Nq: non-quantitative
Biological monitoring should be considered for this compound based on the review; however, a specific BEI could not be determined due to insufficient data.
Ns: non-specific
The determinant is non-specific, since it is also observed after exposure to other chemicals.
Sq: semi-quantitative
The biological determinant is an indicator of exposure to the chemical, but the quantitative interpretation of the measurement is ambiguous. These determinants should be used as a screening test if a quantitative test is not practical or as a confirmatory test if the quantitative test is not specific and the origin of the determinant is in question.

ANNEXURE 3

CRYSTALLINE SILICA EXPOSURE REPORTING TOOL

COMPANY/EMPLOYER DETAILS	
Company registered name	
Company registration number	
Company VAT number	
"Trading as" name	
Name of CEO	
Name of Managing Director	
Company postal address	
Company physical address	
Company contact phone number/s	
APPROVED INSPECTION AUTHORITY	
Name of AIA	
AIA Departmental registration number	
Name and SAIOH registration number of the responsible AIA Technical Signatory	
Sampling methodology used	
Crystalline Silica exposure monitoring	
Physical address where exposure takes place (one notification per site)	
Date of survey	
Short description of process which causes silica exposure	
Materials and sources of exposure	
Describe the area in the production process where the samples were taken	

Does the HCA risk assessment include the assessment of exposure to crystalline silica?	
Does the company have a documented silicosis elimination programme?	(If the answer is yes, please attach a copy)
What is the maximum exposure level (mg/m^2)?	
Number of results <50% of OEL	
Number of results between ≥50%, but < 100% than OEL	
Number of results ≥100% of OEL	
Total number of employees exposed to crystalline silica.	
Number of employees exposed to levels <50% of OEL	
Number of employees exposed to levels ≥50% <100% of OEL	
Number of employees exposed to levels ≥100% of OEL	

Note: Please attach AIA report which this reporting tool is referring to.

Please attach the action plan for the implementation of recommendations made in the AIA report.

This completed report must be submitted to: silicareports.ohh@labour.gov.za **on or before the 31st March each year.**

ANNEXURE 4

HAZARDOUS CHEMICAL AGENT GUIDELINES (*Complete draft guideline available on www.labour.gov.za or on request*)

Guideline Table of Contents:

- Prevention and control of exposure
- Globally Harmonised System (GHS)
- GHS Labelling
- Special labelling arrangements
- Additional SDS (safety data sheet) considerations
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Complete draft guideline available on www.labour.gov.za under - resource centre - publications

ANNEXURE 4
HAZARDOUS CHEMICAL AGENT GUIDELINES

Table of contents:

Prevention and control of exposure

1. The advice in this document should be taken in the context of the requirements of the Regulations for HCA, especially regulation 10 (Hazardous Chemical Agent Risk Assessment), regulation 11 (Prevention or Control of Exposure to and hazardous chemical agent [HCA]), regulation 12 (Use, Maintenance, Examination and Testing of Control Measures) and regulation 13 (Exposure Monitoring of HCA). Agents hazardous to health are defined in regulation 1 and Annexure 1. There are separate regulations for both lead and asbestos. These agents are not covered in detail in this document. This document also does not apply to exposure in mines or exposure to hazardous biological agents.
2. Exposure of employees to agents hazardous to health should be prevented or, where this is not reasonably practicable, adequately controlled. This is a fundamental requirement of the Regulations for Hazardous Chemical Agents (HCA), 202X. Exposure can occur by inhalation, ingestion or absorption through the skin, but inhalation is usually the main route of entry into the body. Tables 2 and 3 of Annexure 2 list the OELs, which should be used in determining the adequacy of control of exposure by inhalation, as required by the Regulations for HCAs.
3. Adequate control of exposure, (when prevention is not reasonably practicable) should be achieved by one or more of a range of control measures described in regulation 11. Control measures should follow the hierarchy of control as per regulation 11.

Globally Harmonised System (GHS)

4. The UN GHS Purple Book is updated biennially (every 2 years) by the United Nations Sub-committee on GHS. In order for importers and manufacturers in South Africa to transition to updated revisions of the GHS Purple Book, a “phase-in” period is granted. New revisions of the

GHS Purple Book have a 2-year phase-in from the date the changes are approved by the UN Sub-committee (not published) to the date applicable. The "phase–in" period for South African Industry for a new revision, is 2 years and 6 months, after approval by the UN GHS Sub-committee, until 30 June of the applicable year.

Table 1: Phase-in timeframes for GHS Purple Book new revisions

Approved by UN GHS Subcommittee	Published by UN	Transition cut-off date for South Africa
Revision 10 of the GHS December 2022	July 2023	June 2025
e.g Revision 11 of the GHS December 2024	July 2025	June 2027
e.g Revision 12 of the GHS December 2026	July 2027	June 2029*
*Follow illustrated timeframe for future implementation		

5. Expert judgement on human case reports must guide use of classification for corrosive agents if irreversible damage to the skin was observed.
6. In the case of respiratory or skin sensitizers, subcategories may be applied where sufficient data is available.
7. The GHS requirements for classification, labelling and SDSs are not applicable to low level pesticide residue in foodstuffs, cosmetics or pharmaceuticals in their final form.
8. Hazard classes and categories provided in Table 3 for Environmental Hazards, in Annexure 1, are intended as a guideline only for the classification of chemical agents.

GHS Labelling

9. On any label of an HCA, the pictogram size must be at least 16 mm x 16 mm where practicable, with a red border and minimum letter size of 1,2 mm. For further guidance on labelling refer to the European Chemicals Agency (ECHA), Guidance on labelling and packaging in accordance with Regulation (EC) N^{o}. 1272/2008, as may be updated from time to time.
10. GHS pictograms on hazardous chemical agents not intended for export, may be provided with black and white pictograms, otherwise the diamond frame of the pictogram must be in red.
11. The inclusion of all ingredients or elements of an alloy that contribute to the hazard of the mixture or alloy, should be included on the label.
12. Where a mixture is supplied exclusively for workplace use, the chemical identities may only be provided on the SDS for the chemical. All pictograms for physical hazards must be used where a substance or mixture is supplied exclusively for workplace use.
13. Where the packaging of a substance or a mixture is either in such a shape or form or is so small that it is impossible to provide all elements on the labelling, the following minimum information must be provided; product identifier, signal word, name plus telephone number of suppliers and hazard pictogram.
14. The GHS label for HCA at the workplace must be maintained on the supplied container in the workplace.

Special labelling arrangements

15. The communication of hazard information must be provided for carcinogens, reproductive toxicity and specific target organ toxicity (STOT) through repeated exposure, on the label and on

the SDS. For metals and alloys, communication of the hazard information may be provided through the SDS alone when supplied in the massive, non-dispersible, form.

16. Where a substance or mixture is classified as corrosive to metals but not corrosive to skin and/or eyes, the hazard pictogram linked to "corrosive to metals" must be provided on the label of such substances or mixtures which are packed in its finished state.

Additional SDS (safety data sheet) considerations

17. An SDS should be developed for mixtures which are not classified for acute toxicity or aquatic toxicity as a result of the application of the additivity formula, but which contain acutely toxic or toxic to the aquatic environment ingredients, in concentrations equal to or greater than 1 .
18. None of the 16 SDS headings /sections, except heading 16 (other information), may be left without text. Where information is not applicable or not available this should be indicated, thereby confirming that this information is either not applicable or not available.

Cut-off values for GHS

19. The term "cut-off" values are used and can also mean concentration limits. Generic cut-off values adopted in the UN GHS, apply. If a manufactures/classifier has information that the hazard of an ingredient will be evident below the generic cut-off, the mixture containing that ingredient must be classified accordingly.
20. An SDS must be provided based on the generic cut-off values in Table 2 of this guide. *(Table 1.5.1 in the UN GHS Purple book).*

Table 2: Generic cut-off values for health and environmental hazard class

Hazard class	Cut-off value
Acute toxicity	≥ 1.0 %
Skin corrosion/Irritations	≥ 1.0 %
Serious eye damage/eye irritation	≥ 1.0 %
Respiratory/Skin sensitization	≥ 0.1 %
Germ cell mutagenicity (Cat1)	≥ 0.1 %
Germ cell mutagenicity (Cat2)	≥ 1.0 %
Carcinogenicity	≥ 0.1 %
Reproductive toxicity	≥ 0.1 %
Specific target organ toxicity (Single exposure)	≥ 1.0 %
Specific target organ toxicity (Repeated exposure)	≥ 1.0 %
Aspiration Hazard (Cat 1)	≥ 1.0 %
Aspiration Hazard (Cat 2)	≥ 1.0 %
Hazardous to the aquatic environment	≥ 1.0 % (Guideline)

Precautionary statements

21. The GHS label should include appropriate precautionary statements, the choice of which is with the manufacturer/ labeller. General precautionary statements not linked to a certain hazard class or category shall also be used where relevant. Precautionary statements that appear on labels or in safety data sheets may incorporate minor textual variations if these variations assist in communicating safety information and do not compromise the information. These may include spelling variations or use of synonyms.

Cross reference between carcinogenic classification systems

22. The Regulations for Hazardous Chemical Agents uses the GHS carcinogenic classification as notations in the Tables in Annexure 2. Table 3 below provides a "read-across" to the classification systems of International Agency for Research on Cancer (IARC) and the American Conference of Governmental Industrial Hygienists (ACGIH).

Table 3: Approximate equivalences between carcinogenic classification systems

GHS	IARC	ACGIH
Category 1A	Group 1	A1
Category 1B	Group 2A	A2
Category 2	Group 2B	A3
	Group 3	A3
	Group 4	A5

23. Health hazards: Category 1 (skin corrosion) can be further divided into three sub-categories namely, 1A, 1B and 1C.

UN number and proper shipping name

24. The UN Number is a 4-digit number assigned to a specific chemical or article, or group of chemicals or articles, which can be found in the Dangerous Goods List (DGL) Chapter 3.2 of Volume I of the UN Transport of Dangerous Goods Orange book. Each UN number has a corresponding Proper Shipping Name – (PSN). The UN PSN is the standard technical name to describe the hazard properties and the composition of dangerous goods. Select the UN number (4 digits) and a proper shipping name from the UN Transport of Dangerous Goods, Dangerous Goods List that can most accurately describe the dangerous goods. The UN number and a proper shipping name should also be included in the Dangerous Goods Declaration and section 14 of the SDS.

GHS Competent Authorities

25. South African GHS Competent Authorities other than the Department of Employment and Labour;
    - Department of Forestry, Fisheries and the Environment: Environment House, Cnr. Steve Biko and Soutpansberg Road, Arcadia, Pretoria, South Africa e-mail: callcentre@environment.gov.za
    - Department of Agriculture, Land Reform and Rural Development: 20 Steve Biko (formerly Beatrix) Street, Arcadia, Pretoria. e-mail queries@dalrrd.gov.za
    - Department of Health: Dr AB Xuma Building, 1112 Voortrekker Rd, Pretoria Townlands 351-JR, Pretoria, South Africa. e-mail: healthhotline@health.gov.za

Exposure in mines

26. The Regulations for HCAs and the OELs in this publication do not apply to exposure to agents hazardous to health in mines where the Department of Mineral Resources and Energy has mandate.

Lead and asbestos

27. Work with asbestos or lead is not subject to the Regulations for HCA. The exposure limits for various types of asbestos and lead are specified in the Asbestos Abatement Regulations and the Lead Regulations.

Constitution of Similar Exposure Groups (SEGs)

28. In practice it is usually not possible to measure the exposure of each employee during each working day. To obtain quantitative data on exposure measurements that allows assessment for compliance with OEL's, an effective approach shall be taken that allows the most efficient use of resources. This approach, based on the observation of working conditions, permits measurement of exposure of a small number of employees belonging to an SEG for comparison with OEL's. Where exposure measurements on monitored employees of the SEG indicate that the OEL's are met, then it is considered that this is so for all employees in the SEG.

29. The SEG shall be constituted with information on the profile of exposure and duration of the tasks performed during the working shifts throughout the year. This requires occupational hygiene expertise. The information should include at least the following:
    (a) company industry sector;
    (b) the job classification of the SEG;
    (c) the inventory of tasks within a job;
    (d) the task specific exposure profile;
    (e) the duration and location of the exposure within the shift;
    (f) exposure history determined by the frequency and period of the tasks;
    (g) experience of the workforce.

30. For an SEG which is constituted by one employee, that employee's exposure is monitored in the same manner as a SEG, constituted by more than one employee.

Background to occupational exposure limits

31. Two types of OELs are defined in the Regulations for HCAs. These are OEL - Maximum Limit (OEL-ML) and OEL - Restricted Limit (OEL-RL), as listed in Tables 2 and 3 of Annexure 2.
32. There is no fixed timeframe for the update and publication of new or revised OELs or BEIs.
33. The lists of OELs given in Table 2 and Table 3 of Annexure 2, unless otherwise stated, relate to personal exposure to agents hazardous to health in the air of the workplace.

Setting occupational exposure limits

34. OEL-MLs and OEL-RLs are proposed by the Standing Technical Committee No. 7, (TC7). The OELs proposed by TC7 are reviewed by the Chief Inspector, approved by the Advisory Council for Occupational Health and Safety and promulgated by the Minister.
35. For both OEL-MLs and OEL-RLs, as listed in Tables 2 and 3 of Annexure 2, the intent is to provide a level of minimum protection for all employees within the mandate of the Department of Employment and Labour.
36. An OEL-ML is typically assigned to an agent with serious adverse implications for the health of employees exposed to the agent. Such effects are related to an agent being a carcinogen, sensitiser, teratogen or mutagen. However, those with lower orders of potency may not necessarily be assigned an OEL-ML.
37. The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) represent a scientific opinion, which are health-based values where exposure at these limits does not create an unreasonable risk of disease or injury. The TLVs and BEIs are established by committees that review existing published and peer

reviewed literature in various scientific disciplines. These disciplines include occupational hygiene, toxicology, occupational medicine and epidemiology.

38. The primary method for setting an OEL is to double the ACGIH TLV. This provides a uniform and systematic method that considers the principle of reasonably practicable, including both health risk and socio-economic impacts. Guideline values such as the ACGIH TLVs and NIOSH RELs consider only health risk and not socio-economic impacts, so it follows that these are not comparable to the OEL-ML and OEL-RL.
39. For exposure to agents that are predominantly associated with mining operations, consideration where practicable, will be given to align OEL-MLs and OEL-RLs with the Department of Mineral Resources and Energy. An example is setting of the OEL for crystalline silica. Whilst consideration has been given to align OEL-ML and OEL-RL values to the Department of Mineral Resources and Energy limits, it may not be practicable to do so, in which case the limits may differ.
40. With the extensive number of OELs and industry processes, it is beyond the resources of TC7 to consider all socio-economic impacts on industry as well as the range of use of the OELs within industry.
41. The final OEL-MLs and OEL-RLs will form a combination of these outcomes.

Units of measurement

42. For OELs, concentrations of gases and vapours in air are usually expressed in parts per million (ppm), a measure of concentration by volume, but may also be expressed in milligrams per cubic metre of air (mg/m^3), a measure of concentration by mass. Concentrations of airborne particles (fume, dust, etc.) are usually expressed in mg/m^3. In the case of airborne particulates, the limits, where applicable, in Annexure 2, Table 2 and Table 3 refer to the inhalable particulate matter, unless specifically indicated as referring to the respirable particulate matter. In the case of synthetic vitreous fibres (man-made mineral fibres), the limit is expressed as fibres per millilitre of air (f/ml).
43. OELs for prohibited agents are not provided, as these agents may not be used within the workplace.

Occupational exposure limit - maximum limit: OEL-ML (Table 2 of Annexure 2)

44. An OEL-ML is the maximum concentration of an airborne agent, averaged over a reference period, to which employees may be exposed by inhalation under any circumstances, and is specified together with the appropriate reference period in Table 2 of Annexure 2.
45. Regulation 11 of the Regulations for HCA, when read in conjunction with the Act, imposes a duty on the employer to take all reasonable precautions and to ensure that exposure is kept as far below an OEL-ML as is reasonably practicable.

Occupational exposure limit - restricted limit: OEL-RL (Table 3 of Annexure 2)

46. An OEL-RL is the concentration of an airborne agent, averaged over a reference period, at which, according to current knowledge, there is no evidence that it is likely to be injurious to employees if they are exposed by inhalation, day after day, to that concentration.
47. Control of a hazardous chemical agent, with an OEL-RL, as prescribed in regulation 11 can always be regarded as adequately controlled as far as exposure from inhalation is concerned. However, due to the variations in process control and fluctuations in agent concentrations in the workplace, it will be prudent for employers to reduce exposure below an OEL-RL to ensure that the exposure of all employees does not exceed that OEL-RL.

48. For an agent which has been assigned an OEL-RL, exposure by inhalation should be reduced to that limit. However, if exposure by inhalation exceeds the OEL-RL, the employer must identify the reasons for the exceedance, provide the appropriate RPE as an interim measure and take appropriate steps to reduce airborne concentrations to levels below the OEL-RL. The risk assessment as contemplated in regulation 10 will determine the urgency of the necessary action, considering the extent, cost and available technology of the required measures in relation to the nature and degree of exposure involved.

8 hour (long-term) and short-term exposure limits

49. Effects of exposure to agents hazardous to health vary considerably depending on the nature of the agent and the pattern of exposure. Some effects require prolonged or accumulated exposure. The long-term (eight-hour TWA) exposure limit is intended to control such effects by restricting the total intake by inhalation over one or more work shifts, depending on the length of the shift. Other effects may be seen after brief exposures. Short-term exposure limits (usually 15 minutes) may be applied to control these effects. For those HCAs without a short-term limit specified, it is recommended that a figure of three times the long-term limit be used as a guideline for controlling short-term peaks in exposure. Some workplace activities give rise to frequent short periods (less than 15 minutes) of elevated exposure which, if averaged over time, should not exceed either an eight-hour TWA or a 15-minute STEL. Such exposures have the potential to cause harm and should be subject to reasonably practicable measures to protect the employee.
50. Ceiling limits are set for HCAs that predominantly have acute effect and whose OELs are more appropriately based on this particular response. HCAs with this type of response are best controlled by a ceiling limit (OEL-C) that should not be exceeded at any time. It is implicit that the manner of sampling to determine non-compliance with the OEL-C for each similar exposure group must differ. Consequently, a single, brief sample that is applicable to an OEL-C is not appropriate for comparison with the OEL-TWA; here a sufficient number of samples are needed to permit determination of a TWA concentration throughout a complete cycle of operation or throughout the work shift. Whereas the OEL-C places a definite boundary that exposure concentrations should not be permitted to exceed, the OEL-TWA requires an explicit limit to the excursions which are acceptable to the promulgated OEL-TWAs. HCAs with ceiling limits are identified in Table 2 and 3 in Annexure 2, in the column "STEL/C", by means of a "C" notation.
51. Both the long-term and short-term exposure limits are expressed as airborne concentrations averaged over a specified period of time. The period for the long-term limit is normally eight hours, when a different period is used, this is stated. The averaging period for the short-term exposure limit (STEL) is normally 15 minutes, such a limit applying to any 15-minute period throughout the working shift. Exposure to agents hazardous to health should be calculated according to the approved method.

Limitations to the application of exposure limits

52. The list of OELs, unless otherwise stated, relates to personal exposure to agents hazardous to health in the air of the workplace. The limits cannot be adapted readily to evaluate or control non-occupational exposure, e.g. levels of contamination in the non-industrial environment. OELs are approved only for application to people at work. Although OELs are developed for atmospheric pressures between 85 kPa and 101,325 kPa, there are areas in South Africa where the atmospheric pressures are below 85 kPa. For practical purposes, uncorrected OELs may be used at atmospheric pressures as low as 80 kPa. Where higher atmospheric pressures may be

encountered, for example, in tunnelling or underwater hyperbaric chambers, such situations will require special assessments. Guidance may be sought in the Health and Safety Executive (HSE) guidance document from the United Kingdom, "Occupational exposure limits for hyperbaric conditions", which is a hazard assessment document.

53. The OELs, as set out in Tables 2 and 3 of Annexure 2, are intended to be used for normal working conditions in workplaces. Employers should also take into account their duties and the provisions of the National Environmental Management Act, 1998 (Act No. 107 of 1998). OELs are not however, designed to deal with serious accidents or emergencies, particularly where employees may be exposed to rapidly rising concentrations of gas, as may arise from a major escape due to plant failure. Over and above their responsibilities to ensure that the requirements of the Regulations for HCAs are met, employers also have a clear responsibility to ensure that the plant is designed, operated and maintained in a way that avoids accidents and emergencies. Where appropriate, detection, alarm and response measures should be used in order to minimise the effect of any such unplanned events. To help maintain adequate operational control, employers may find it helpful to select their own indicators of control when undertaking investigations or corrective action.

Calculation of exposure for specified reference periods

54. The following guidance is provided as an approved method for the calculation of exposure in relation to the eight-hour and short-term reference periods.

The 8-hour reference period

55. The term "8-hour reference period" relates to the procedure whereby the occupational exposures in any 24-hour period are treated as equivalent to a single uniform exposure for eight hours [the 8-hour time weighted average (TWA) exposure].

The eight-hour TWA may be represented mathematically by:

$$\frac{C_1T_1 + C_2T_2 + \ldots C_nT_n}{8}$$

where C_1 is the occupational exposure value (concentration) and T_1 is the associated exposure time in hours in any 24-hour period.

Examples

56. An operator works for 7 hours 20 minutes on a process in which he is exposed to an agent hazardous to health. The average exposure during that period is measured as 0,12 mg/m³. No exposure occurred during the remaining 40 minutes of the shift.

The 8 – hour TWA therefore is calculated as follows:

7h20min (7.33h) at 0.12mg/m^3 and 40min (0.67h) at 0mg/m^3

$$\frac{(0.12 \times 7.33) + (0 \times 0.67)}{8}$$

= 0.11mg/m^3

57. An operator works for eight hours on a process in which he is exposed to an agent hazardous to health. The average exposure during that period is measured as 0,15mg/m³.

The eight-hour TWA therefore is:

$$\frac{0.15 \times 8}{8}$$

$= 0.15 mg/m^2$

58. Working periods may be split into several sessions for the purpose of sampling to take into account e.g. rest and meal breaks. This is illustrated by the following example:

Table 4: Eight hour TWA calculation

Exposure is assumed to be zero during the period 10:30 to 10:45, 12:45 to 13:30 and 15:30 to 15:45.

Working period	Exposure (mg/m³)	Duration of sampling (hrs)
08:00-10:30	0,32	2,5
10:45-12:45	0,07	2
13:30-15:30	0,20	2
15:45-17:15	0,10	1,5

The 8-hour TWA therefore is:

$$\frac{(0.32 \times 2.5) + (0.07 \times 2) + (0.20 \times 2) + (0.10 \times 1.5) + (0 \times 1.25)}{8}$$

$= 0.19 mg/m^3$

59. An employee works for eight hours during the night shift on a process in which he is intermittently exposed to an agent hazardous to health. The employee's work pattern during the working period should be known and the best available data relating to each period of exposure should be applied in calculating the eight-hour TWA. This data should be based on direct measurement, estimates based on data already available or reasonable assumptions.

Table 5: Eight hour TWA calculation

Working period	Task	Exposure (mg/m³)
22:00-24:00	Helping in workshop	0,1 (known to be the exposure of full-time group in the workshop)
24:00-01:00	Cleaning elsewhere in factory	0 (assumed)
01:00-04:00	Working in canteen	0 (assumed)
04:00-06:00	Cleaning up after breakdown in workshop	0,21 (assumed)

The 8-hour TWA therefore is:

$$\frac{(0.10 mg/m^3 \times 2hrs) + (0.21 mg/m^3 \times 2hrs) + (0 mg/m^3 \times 4hrs)}{8}$$

= 0.078 mg/m^3

60. An employee works a 12-hour shift each day for five days, and then has seven days' rest. The exposure limits are based on an eight-hour reference period in each 24 hours in which an exposure occurs; the seven days' rest makes no difference. While at work, the employee is exposed to 4 $mg.m^{-3}$.

$$\frac{(4 \times 12)}{8}$$

The eight-hour TWA = 6 mg/m^3

The short-term reference period

61. Exposure should be recorded as the average over the specified short-term reference period, normally 15 minutes, and should be determined by sampling over that period. For short emissions of less than the reference period, which still may have the potential to cause harm, appropriate action should be taken to ensure that a suitable and sufficient risk assessment is carried out to ensure that there is no risk to health from such exposures.

Example where the short-term reference period is 15 minutes.

Exposure period is less than 15 minutes

62. The sampling result should be averaged over 15 minutes. For example, if a 5-minute sample produces a level of 600 ppm and is immediately followed by a period of zero exposure, then the 15-minute average exposure will be 200 ppm.

Exposure period 15 minutes or longer

63. Measurements should be taken over a 15-minute period and the result is the 15-minute average exposure. Measurements for periods greater than 15 minutes should not be used to calculate a 15-minute average exposure. If the average exposure over the longer period exceeds the 15-minute exposure limit (OEL STEL), then OEL STEL must have been exceeded over some 15-minute period within the longer sampling time period.

Airborne particulates

64. Airborne particulate matter is a mixture of particles and droplets in the air, consisting of a variety of components such as organic compounds, metals, acids, soil and dust. The general approach necessary to control occupational exposure to airborne particulates is as follows: Not all airborne particulates have been assigned OELs, but the lack of such limits should not imply an absence of hazard. In the absence of a specific exposure limit for a particulate, exposure should be reasonably controlled, as defined in the HCA Regulations. Where there is no indication of the need for a lower value, personal exposure to Particulates Not Otherwise Specified (PNOS) should be kept below both 10 mg/m^3, eight-hour time-weighted average for inhalable airborne particulates and 5 mg/m^3, eight-hour time-weighted average for respirable particulates. Such, or greater particulate concentrations should be taken as excessive concentrations.
65. Where airborne particulates contain components which have their own assigned OELs, all the relevant limits should be complied with.

66. The employer may provide respiratory protective equipment as an additional layer of control even when exposure to an HCA is reasonably controlled, with particular consideration given to an HCA with an OEL-ML.

Particle size selective criteria for sampling of total airborne particulates and respirable particulates

Inhalable Particulate Matter

67. Unless specified otherwise, OELs for all airborne particulates (HCAs comprising of airborne particulates) refer to the inhalable particulate matter of that agent. Sampling of these airborne particulates must be carried out with a method specifically designed to collect the inhalable particulate matter of the HCA. Inhalable particulate matter approximates to the particle size fraction of particulates that can be suspended in air, with an upper size limit of approximately 100 micrometres (µm) in aerodynamic diameter.

Respirable particulate matter

68. Respirable particulate matter refers to materials that are hazardous when deposited in the gas exchange region of the lung. Respirable particulates generally have an aerodynamic diameter of less than 10 µm and a median of 4 µm. These materials are sampled with a respirable particulate matter sampler with a median cut point of 4 µm.

Inhalable fraction:

The mass fraction of total airborne particles which is inhaled through the nose and mouth, measured by a size-selective device conforming to a sampling efficiency curve which passes through the points in Table 6 below.

Table 6: Aerodynamic diameter and inhalable fraction

Aerodynamic diameter (µm)	Inhalable fraction (%)
0	100
1	97
2	94
5	87
10	77
20	65
30	58
40	54,5
50	52,5
100	50

Thoracic fraction:

The mass fraction of inhaled particles which penetrate beyond the larynx, measured by a size-selective device conforming to a sampling efficiency curve which passes through the points in the Table 7 below.

Table 7: Aerodynamic diameter and thoracic fraction

Aerodynamic diameter (µm)	Thoracic fraction (%)
0	100

Aerodynamic diameter (µm)	Thoracic fraction (%)
2	94
4	89
6	80,5
8	67
10	50
12	35
14	23
16	15
18	9,5

Respirable fraction:

The mass fraction of inhaled particles which penetrate to the unciliated airways, measured by a size-selective device conforming to a sampling efficiency curve which passes through the points in Table 8 below.

Table 8: Aerodynamic diameter and respirable fraction

Aerodynamic diameter (µm)	Respirable fraction (%)
0	100
1	97
2	91
3	74
4	50
5	30
6	17
7	9
8	5
10	1

Wood dust

69. Wood dust is a general term covering a wide variety of airborne wood dusts. The health effects of wood dust differ between the dust generated from the processing of different species of trees. Specific species of both hard and soft woods induce sensitisation and so the categorisation of woods into hard and soft woods to indicate relative toxicity is not useful. For this reason, OELs are indicated by species and not hard/soft wood categorisation. Oak and beech are listed under Group 1 by the International Agency for Research on Cancer (IARC) and Category 1A (confirmed human carcinogenic potential) by GHS. Birch, mahogany, teak and walnut are listed under Group 2B (IARC) and Category 2, (suspected human carcinogenic potential) by GHS. Reference table 1 of paragraph 7. for further information on the health effects of woods the ACGIH TLVs and BEIs, which provides information on tree species suspected of inducing sensitisation. Dust is generated by the machining and working of wood and wood-containing materials such as chipboard and fibreboard. Operations such as sawing, turning and routing produce relatively coarse dust, while sanding and assembly operations generate fine dust.

Fume

70. The word fume is often used to include gases and vapours. This is not the case for exposure limits where fume should normally be applied to solid particles generated by chemical reactions or condensed from the gaseous state, usually after volatilisation from melted substances. The generation of fume is often accompanied by a chemical reaction such as oxidation or thermal breakdown.

Absorption through the skin

71. In general, for most agents the main route of entry into the body is by inhalation. The OELs given in these regulations relate solely to exposure by this route. Certain agents such as phenol, aniline and certain pesticides have been identified in Tables 2 and 3 of Annexure 2, with a SKIN notation. These HCAs have the ability to penetrate intact skin and thus become absorbed into the body. Absorption through the skin can result from localised contamination, for example, from a splash on the skin, clothing or footwear, or in certain cases from exposure to high atmospheric concentrations of vapour. Serious effects may result with little or no warning; therefore, it is necessary to take special precautions to prevent skin contact when handling these agents. Where the properties of the agents and the methods of use provide a potential exposure route via skin absorption, these factors should be considered in determining reasonably controlled.

    The absorbed dose of skin exposure of agents such as phenol, aniline, and acetone may be monitored in body fluids such as urine or blood. This is known as biological monitoring. Chemical agents with these properties are listed in Table 4 of Annexure 2 with their Biological Exposure Indices.

Sensitisers

72. Certain agents may cause sensitisation of the respiratory tract if inhaled or if skin contact occurs. Respiratory sensitisers can cause asthma, rhinitis or extrinsic allergic alveolitis. Skin sensitisers cause allergic contact dermatitis. Agents which cause skin sensitisations are not necessarily respiratory sensitisers or vice versa. Only a proportion of the exposed population will become sensitised, and those who do become sensitised will not have been identified in advance. Individuals who become sensitised may produce symptoms of ill health even after exposure to minute concentrations of the sensitiser.
73. Exposure to sensitisers should be prevented. Where this cannot be achieved, exposure should be kept as low as is reasonably practicable and activities giving rise to short-term peak-concentrations should receive particular attention. As with other agents, the spread of contamination by sensitisers to other working areas should also be prevented.
74. RSEN and DSEN notations (Tables 2 and 3 of Annexure 2) have been assigned only to those sensitisers that may cause sensitisation by inhalation and skin respectively. Other agents not contained in these Tables may act as sensitisers.

Interaction with physical agents

75. Working conditions which impose additional stress on the body, such as exposure to ultra-violet radiation and high temperatures, pressures and humidity, may increase the toxic response to an agent. In such cases, specialist advice may be necessary to evaluate the effect of these factors.

Mixed exposures

General

76. The majority of OELs listed in Tables 2 and 3 of Annexure 2 are for single compounds or for HCAs containing a common element or radical, e.g. tungsten and compounds, and isocyanates. A few of the limits relate to HCAs commonly encountered as complex mixtures or compounds, e.g., rubber fume, coal tar pitch volatiles and asphalt as petroleum fumes. However, employees are frequently subject to other mixed exposures involving solids, liquids, fumes, aerosols or gases. These exposures can arise as a result of work with materials containing a mixture of agents, or from work with several individual HCAs, simultaneously or successively, in a work shift. Mixed exposures require careful assessment of their health effects and the appropriateness of control standards. The following paragraphs provide a brief summary of the advice on the application of exposure limits in these circumstances. In all cases of doubt, specialist advice should be sought.

Effects of mixed exposures

77. The ways in which the constituent agents of a mixed exposure interact, vary considerably. Some mixed exposures involve agents that act on different body tissues or organs, or by different toxicological mechanisms, these various effects being independent of each other. Other mixtures will include agents that act on the same organs, or by similar mechanisms, so that the effects reinforce each other and the agents are *additive in their effect*. In some cases, the overall effect is considerably greater than the sum of the individual effects and the system *is synergistic*. This may arise from mutual enhancement of the effects of the constituents or because one agent potentiates another, causing it to act in a way which it would not do alone.

Assessment and control

78. With all types of mixed exposures, it is essential that assessments be based on the concentrations of each of the constituents in air to which employees are exposed. Depending on the nature of the constituents and the circumstances of use, the relative concentrations of the constituents in air may differ considerably from those in the liquid or solid source material. The composition of the bulk material should not be relied on for assessment unless there is good evidence for doing so.

(a) Additive agents:

Where there is reason to believe that the effects of the constituents are additive, and where the exposure limits are based on the same health effects, the mixed exposure can be assessed by means of the following formula:

$$E_m = \frac{(C1)}{(OEL1)} + \frac{(C2)}{(OEL2)} + \frac{(Cn...)}{(OELn...}$$

Here E_m is the exposure for the mixture, and C1, C2, etc. are the time-weighted average (TWA) concentrations of constituents in air. OEL1, OEL2, etc. are the corresponding exposure limits. The use of this formula is only applicable where the additive agents have been assigned OELs which relate to the same reference period in the list of promulgated OELs. If the equation generates a result that is > 1, then the exposure limit for the mixture (E_m) has been exceeded. If one of the constituents has been assigned an OEL-ML, and the result is <1, then the additive effect should be taken into account and exposure should be controlled to a ALARP;

***(b) Independent agent**:*

Where no synergistic or additive effects are known or considered likely, the constituents can be regarded as acting independently. It is then sufficient to ensure compliance with each of the OELs individually.

79. The above steps provide basic protocol for assessment of mixed exposures. All non-synergistic systems should be treated as if they were additive. This avoids the need to distinguish between additive and independent systems and can be regarded as the most prudent course, particularly where the toxicity data are scarce or difficult to assess.

Monitoring mixed exposure

80. The number of components of a mixed exposure for which routine air monitoring is required can be reduced if their relative concentrations in air can be shown to be representative. This involves the selection of a key or marker, which may be one of the constituents, as a measure of exposure. Exposure to the marker is controlled at a level selected so that exposures to all components will be assessed in accordance with the criteria in paragraphs 78. However, if one of the components has been assigned an OEL-ML, the level of the exposure to that agent should always be reasonably controlled. If this approach is to be used, it should take place under the guidance of a competent person.

Complicating factors

81. Several factors that complicate the assessment and control of exposure to individual agents will also affect cases of mixed exposures and will require similar special consideration. Such factors include:
    (a) exposure to an agent for which there is no established limit or for which an OEL-ML has been set;
    (b) the relevance of factors such as alcohol, medication, smoking, noise and additional stresses;
    (c) exposure of the skin to one or more agents that can be absorbed by this route, as well as by inhalation; and
    (d) agents in mixture may mutually affect the extent of their absorption, as well as their health effects, at a given level of exposure.

Monitoring exposure by inhalation

82. Aspects such as the frequency of sampling, number of samples to take and percentiles with associated confidence levels (as guided in EN 689 by 5.5.2 Preliminary test and 5.5.3 Statistical test, or guided in AIHA use of an upper 90^{th}, 95^{th} or 99^{th} percentile exposure at a chosen confidence level such as 95% for an SEG), covered in these guidance documents DO NOT override requirements embedded in the regulation. Rather both the percentile and confidence level are embedded in Regulation 13(2)(a) and (b), specifically: "at least three air measurements must be taken for each SEG and if all three air measurement results are below the OEL ML or RL, then it is considered that there is compliance with the limit".

    Percentile and confidence levels are embedded in Regulation 13(2)(a) and (b), specifically: "*at least three air measurements must be taken for each SEG and if all three air measurement results are below the OEL ML or RL, then it is considered that there is compliance with the limit*".

Any aspects of exposure monitoring by inhalation, that are not provided within regulation 13 should be guided by good occupational hygiene practice. There are several documents that provide guidance (not mandatory requirements) on testing compliance with exposure limits and are considered to represent good occupational hygiene practice. These documents include but are not limited to:

(a) EN: 689 Workplace exposure - Measurement of exposure by inhalation to chemical agents - Strategy for testing compliance with occupational exposure limit values

(b) AIHA: A Strategy for Assessing and Managing Occupational Exposures

The frequency of sampling, the number of samples to be taken and the statistical percentiles along with their associated confidence levels, as delineated in these guidance documents, shall not be construed as obligatory mandates under this regulation.

Methods of measurement and calculation for determining fibre concentrations of synthetic vitreous fibre

Refractory ceramic fibre (RCF)

83. RCFs are synthetic vitreous (silicate) fibres with random orientation with alkaline oxide and alkali earth oxide ($Na_2O+K_2O+CaO+MgO+BaO$) content less or equal to 18% by weight. The term RCF also includes non-oxide ceramic fibres such as boron and silicon carbides and nitrides.

Cotton dust

84. Cotton is the cellulose fibre that grows inside the seed pods (or bolls) of the cotton plant. When mature, the boll breaks and the cotton appears as a soft wad of fine fibres. After picking, the cotton is separated from the seed, packed and compressed into bales.

85. The OELs, which are based on personal sampling, applies to exposure to dust during the handling of raw and waste cotton, including blends containing raw or waste cotton, with the following exceptions:

(a) cotton dust from weaving, knitting, braiding and subsequent processes;

(b) cotton dust from bleached or dyed cotton; and

(c) cotton dust from finished articles, for example, garments.

(*Where the OEL does not apply, exposure should still be adequately controlled*.)

Two OELs apply:

(a) Cotton dust less fly (thoracic fraction); and

(b) Cotton dust inhalable airborne particulate **Cotton dust less fly**

86. Area concentrations of cotton dust less fly must be measured using a vertical elutriator in accordance with OSHA Analytical Method, Appendix A 29 CFR 1910.1043, as updated from time to time.

Cotton dust inhalable airborne particulate

87. Personal exposure concentrations must be measured by means of an Institute of UK Occupational Medicine (IOM) inhalable dust sampler in accordance with MDHS14/3 or any other sampler giving equivalent results, as updated from time to time.

Confined Space entry / Toxicity

88. It is important to note that the presence and accumulation of toxic chemical agents in the form of gases, vapours and fumes, can have serious health effects, including respiratory problems, eye and skin irritation and even death. In addition to the typical confined space safe entry protocols, it is critical to also assess the potential chemical toxicity of a confined space before entry, and to take appropriate measures to prevent employee exposures to hazardous chemical agents. This may include using the appropriate personal protective equipment, sufficient ventilation and air monitoring, to ensure that the atmosphere inside the confined space is safe for entry. The employer must ensure that the appropriate respiratory equipment is worn, that employees have been trained on the hazards associated with confined spaces and the appropriate measures are taken to reduce the risk of chemical toxicity exposure.

Compressed Air

89. Consequences of use of compressed air in the workplace include but are not limited to, causing air embolisms under the skin of employees. The use of compressed may also cause HCA particles to become airborne thereby increasing inhalation exposure.
90. The hazardous chemical agent risk assessment must assess the use of compressed air in the workplace. It is permitted in the workplace to use compressed air to clean equipment that has high operational heat or is difficult to access, where it is not possible to clean the equipment by any other method. Where these specified criteria are met and the risks associated with the use of compressed air have been assessed, recommendations should be made to mitigate risk.
91. No HCA provided with a RSEN (respiratory sensitization) notation may be removed from equipment using compressed air.

Ototoxicant

92. The designation “OTO” for hearing disorders in the “Notations” column highlights the potential for a chemical to cause hearing impairment alone or in combination with noise, even below 85 dBA. The OTO notation is reserved for chemicals that have been shown, through evidence from animals or humans, to adversely affect anatomical structure or auditory function, manifested as a permanent audiometric threshold shift and/or difficulties in processing sounds. Some substances appear to act synergistically with noise, whereas others may potentiate noise effects. The OTO notation is intended to focus attention, not only on engineering controls, administrative controls and PPE needed to reduce airborne concentrations, but also on other means of preventing excessive combined exposures with noise to prevent hearing disorders. Specifically, affected employees may need to be enrolled in hearing conservation and medical surveillance programs to closely monitor auditory capacity, even when noise exposures do not exceed the OEL for Audible Sound.

Pesticides/ Agrochemicals

93. Agents used as active ingredients in pesticides (including herbicides, insecticides and fungicides) and fertilisers are listed under their chemical names and/or their common names. These names may sometimes be used as parts of the names of proprietary pesticide formulations. In all cases, the exposure limit applies to the specific active ingredients and not to the formulation as a whole.

Simple Asphyxiants

94. Some gases and vapours, when present at high concentration in air, act as simple asphyxiants by reducing the oxygen content by dilution or displacement to such an extent that life cannot be supported. Many asphyxiants are odourless, colourless and not readily detectable. Monitoring

the oxygen content of the air is often the best means of ensuring safety. The oxygen content of air in the workplace should never be allowed to fall below a minimum of 19% by volume under normal atmospheric pressure. Particular care is necessary when dense asphyxiants, e.g. argon, are used since very high localised concentrations can arise due to their collecting in pits, confined spaces and other low-lying areas where ventilation is likely to be poor. Additionally, many asphyxiants present a fire or explosion risk. The concentrations at which these risks can arise are likely to be well below those levels at which asphyxiation is likely to occur and should be considered when assessing the hazards.

Chemical asphyxiants

95. In addition to reducing the oxygen content by dilution or displacement to such an extent that life cannot be supported. Chemical asphyxiants can be highly toxic and cause serious health effects, such as respiratory problems, headaches, dizziness, unconsciousness and death. Some chemical asphyxiants are flammable and pose a fire hazard in the presence of an ignition source. Chemical asphyxiants can accumulate in confined spaces, such as tanks, vessels, silos, pipelines, road transport tankers and in particular sewerage systems i.e. manholes, pump stations, sewage tanks and pits wherein hazardous atmospheric conditions are often encountered. Chemical asphyxiants can also have unpredictable reactions with other chemicals and cause hazardous reactions, such as the release of toxic gases. It is important to assess the potential hazards of chemical asphyxiants and to take appropriate measures to reduce the risk of injury or death before entering a confined space.

Rubber fume and rubber process dust

96. Rubber fume is fume evolved in the mixing, milling and blending of natural rubber or synthetic elastomers, or of natural rubber and synthetic polymers combined with chemicals, and in the processes which convert the resultant blends into finished products or parts thereof, and including any inspection procedures where fume continues to be evolved.
97. Rubber process dust is evolved during the manufacture of intermediates or articles from natural rubber and/or synthetic elastomers. This definition does not include dusts, which, for occupational purposes, can be dealt with individually. In each case the relevant OEL will apply.
98. Dust produced by the abrasion of cured rubber should be dealt with as particles (insoluble or poorly soluble) not otherwise specified [PNOS], i.e. dust of any kind when present at a substantial concentration in air.

Flour dust

99. Flour dust is taken to be finely ground particles of cereals or pulses (including contaminants) that result from any grinding process and from any subsequent handling and use of that flour. Any additives (e.g. flour improvers) are included in this definition only after they have been added to the final product mix.
100. Flour dust may contain allergens such as proteins from wheat, rye, barley and other grains. When inhaled, these allergens can trigger an immune response in susceptible individuals, causing inflammation and damage to the respiratory tract. The allergens in flour dust can also cause the release of histamine and other chemicals that can irritate the airways and cause symptoms such as coughing, wheezing and shortness of breath. Over time, repeated exposure to flour dust can result in the development of Baker's lung, a type of occupational lung disease characterized by chronic bronchitis, asthma and fibrosis (scarring) of the lung tissue.

Grain dust

101. Grain dust is taken to be dust arising from the harvesting, drying, handling, storage or processing of barley, wheat, oats, maize and rye, including contaminants.

102. Grain dust can contain various hazardous components, including:
    (a) Allergens: Grain dust can contain proteins from the grain that can trigger an allergic reaction in susceptible individuals, causing symptoms such as itching, sneezing and runny nose.
    (b) Microorganisms: Grain dust can contain mould spores, yeast and bacteria that can cause respiratory infections and other health problems.
    (c) Toxins: Some strains of mould that are commonly found in grain dust can produce toxic substances such as mycotoxins that can pose serious health risk if inhaled or ingested.
    (d) Dust particles: The dust particles in grain dust can irritate the respiratory tract and cause symptoms such as coughing, wheezing, and shortness of breath. Over time, repeated exposure to grain dust can result in the development of occupational lung diseases, such as Farmer's lung.

Halogeno-platinum compounds

103. These are co-ordination compounds in which a platinum atom or ion is directly co-ordinated to one or more halide (i.e. fluoride, chloride, bromide or iodide) ions. These compounds are subject to an OEL and cause sensitisation.

104. For substances which, although they contain platinum and halide ions, the halogen is not directly co-coordinated by a chemical bond to the platinum, the OEL for soluble platinum compounds is applicable.

Welding Fumes and gases

105. Welding fumes and gases are by-products produced during the welding process. Welding fumes are tiny particles that are generated when the metal is heated and volatilised. They then condense in the air as very fine solid particles. Welding gases on the other hand, are gaseous by-products such as toxic oxides of nitrogen, ozone and carbon monoxide. Both welding fumes and gases could pose serious health risks to employees if they are inhaled in high concentrations over a prolonged period. The composition of welding fumes and gases may vary depending on the type of metal being used for welding and the type of metal being welded.

Silicosis Elimination Plan

106. A documented silicosis elimination plan outlines the employer’s commitment to silicosis elimination and must include at least the role and responsibilities of the following stakeholders in the elimination of silicosis; the employer, employees, OHS representatives and committees, suppliers, manufacturers and approved inspection authorities. Timeframes for the assessment, monitoring, reporting, control and reduction or elimination of crystalline silica exposure must be indicated.

Medical surveillance, medical screening and biological monitoring

Medical screening

107. Medical screening and medical surveillance are two fundamental strategies for optimizing employee health. Although the terms are often incorrectly used interchangeably, they are quite

distinct concepts. Medical screening is only one component of a comprehensive medical surveillance program. It focuses on the individual worker and may consist of a detailed personal and work history, physical exam, and any number of tests such as blood tests, radiological imaging, pulmonary function tests (spirometry), and more. It is performed prior to employment and periodically during employment. It provides a snapshot in time which may be useful in identifying potential health effects of an employee potentially exposed to a known workplace hazard before the employee even exhibits any symptoms or has any idea that there may be an issue. The fundamental purpose of screening is early diagnosis and intervention for the individual and thus has a clinical focus.

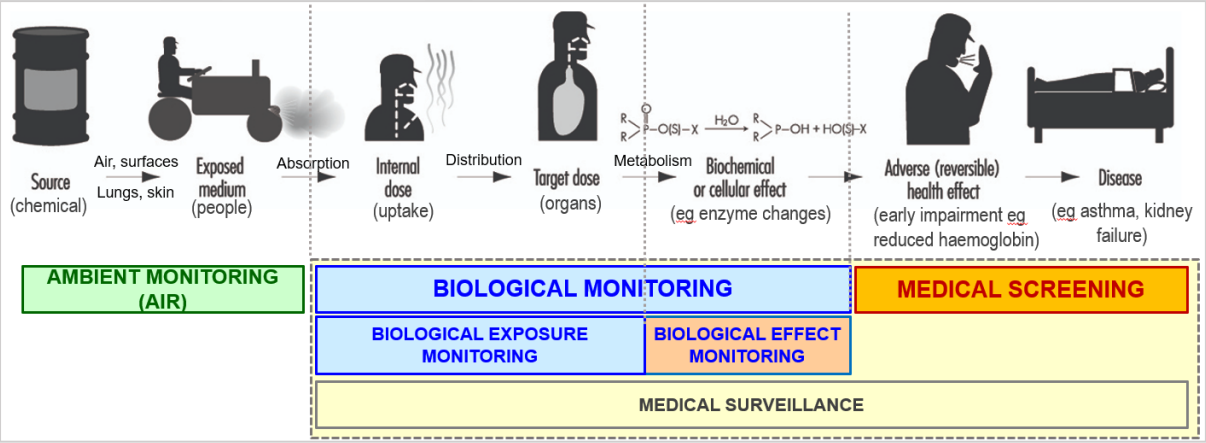
108. Medical surveillance refers to the overall monitoring of employees to identify changes in their health status because of exposure to chemical agents. Monitoring activities are not limited to only medical testing, but also importantly include the monitoring and analysis of the individual and group outcome data, including historical data, derived from the medical testing.

Medical surveillance

109. Medical surveillance is a broader activity, and its focus is on the entire group, not just the individual. It is a systemic process of collecting health information (such as the outcomes of medical screening in conjunction with outcomes of risk assessments and exposure monitoring) over time, and this information is used to analyse trends in work groups. Review of group results helps to identify potential problem areas and the effectiveness of existing worksite preventive strategies and controls. Thus, medical surveillance serves as a feedback loop to the employer. Not only is medical surveillance useful in evaluating known exposures, but it can be critical in identifying new and emerging trends in the workplace. The fundamental purpose of surveillance is to detect and eliminate the underlying hazards or exposures of any discovered trends and thus has a prevention focus.

110. This information is included in this section only to highlight the relationship between biological monitoring, medical screening and medical surveillance.

Figure 1: The relationship between biological monitoring, medical screening and medical surveillance.



Source: https://www.iloencyclopaedia.org/part-iv-66769/biological-monitoring-65407.

111. From figure 1 above, the following important features are evident:

(a) Biological monitoring comprises two categories of tests; biological exposure monitoring which estimates the absorbed or target organ dose of a HCA, and biological effect monitoring which estimates the earliest biochemical effects of exposure to an HCA.

Biological monitoring therefore provides an additional means to assess the exposure to an HCA; it does not represent an adverse health effect or an occupational disease.

(b) Medical screening aims to identify adverse effects of exposure, from the earliest signs of impaired function or structural damage, to established disease.

(c) Medical surveillance includes the evaluation of the outcomes of all biological monitoring as well as medical screening.

(d) The distinction between early biological effects and established disease is not always clear, there tends to be a severity gradient in which biological effects blend into established disease. An occupational disease is present when the adverse biological effect progresses to clinically detectable organ damage requiring treatment or permanent impaired function. The categorisation of the condition is at the discretion of the occupational medicine practitioner.

(e) The decision to categorise an outcome as a disease has important statutory implications because in terms of Section 25 of the Occupational Health and Safety Act, 85 of 1993 as amended and Compensation for Occupational Injuries and Diseases Amendment Act, N^{o}. 10 of 2022, all occupational diseases must be reported by the medical practitioner to the Chief Inspector.

112. The presence of chemical agents in the workplace does not automatically require medical screening to be carried out. Certain criteria must be met for medical screening to be necessary.

113. Work-related adverse health findings, identified by medical surveillance, must trigger certain actions by the employer, as described below under "outcomes management".

Indications for conducting medical screening

114. Medical screening must be provided if an employee:

(a) is generating, using, handling, storing, transporting, disposing or otherwise exposed to an HCA that is known to cause adverse health effects;

(b) the level of exposure is such that an occupational disease or adverse effect may reasonably be expected to occur; and

(c) valid medical testing techniques are available to detect the adverse effect on the employee's health.

115. This means the employer must ensure that a health risk assessment is conducted to determine the likelihood of exposure to an HCA, in conjunction with the known health effects of the HCA, which the occupational medicine practitioner can use to decide if medical screening is necessary.

Designing and implementing a programme of medical surveillance

116. The following steps should be included in any programme of medical surveillance:

(a) ***Risk assessment*****:** this will determine the potential exposure to and routes of absorption of an HCA, and identify potential target-organ toxicity to inform medical surveillance requirements.

(b) ***Test selection:*** medical screening & biological monitoring tests should have the desirable operating characteristics of appropriate sensitivity, specificity, reliability and predictive value.

(c) ***Test schedule:*** the frequency of testing is laid down in general terms by regulation 13, but should in any case be based on an understanding of the nature of the hazard and the natural history of any adverse effects that may develop in specific target organs.

(d) ***Development of action criteria:*** interpretative criteria for various types of medical tests have been published in the medical literature. However, the occupational medicine practitioner must develop pragmatic action criteria in the context of the specific workplace.

(e) ***Standardisation of test process:*** quality control needs to be exercised both at the testing site and in the laboratory contracted to carry out analyses. Consistency over time should be sought to make longitudinal measurements comparable.

(f) ***Ethical considerations:***

i. Information and training of employees as required by regulation 17 should include the rationale for doing medical surveillance, and the consequence of abnormal findings.

ii. Written informed consent should be obtained for medical tests to be conducted, in accordance with requirements prescribed by the National Health Act (61 of 2003) and regulation 14.

iii. An employee must be notified of the results and interpretation of his/her tests and any recommendations made, including, where appropriate, the need for medical referral for confirmation of diagnosis and related actions.

iv. The confidentiality of personal medical records is laid down by regulation 14 of these regulations.

(g) ***Outcomes management - determination of steps to be taken in the event of identifying a work-related health problem:*** Cooperation of employees can be best secured by a policy of protection of conditions of service in case of medical removal from a particular job.

(h) ***Evaluation of exposure controls:*** an abnormal finding in an employee, or a pattern of findings in a group of employees, may point to inadequate primary control of exposure(s). In such cases the employer needs to be notified of such details of the medical findings as are necessary to evaluate the workplace problem and take remedial action to prevent the continued exposure of the employee and yet unexposed employees.

(i) ***Record keeping:*** this includes both medical records and exposure information for every employee. While the employer is responsible for record keeping in terms of regulation 20, access to the contents of personal medical records should be restricted to the occupational health practitioner, the employee, and any person nominated by the employee in writing.

(j) ***Data Analysis***: conduct an analysis of the biological monitoring and medical screening results over time, to look for evidence of excessive exposure or trends in exposure-related health status and use this to identify the need for targeted exposure prevention.

117. The medical surveillance programme should be described in a written document with the key issues addressed.

118. The employer must provide the occupational health practitioner with the following information about the work to be performed, which has triggered the requirement for medical surveillance:

(a) the work the employee is, or will be, carrying out;

(b) if the employee has started that work, how long the employee has been carrying it out;

(c) a list of the HCAs to which the employee is, or will be, exposed, as detailed in the risk assessment and relevant SDSs;

(d) relevant risk assessment reports and results of air monitoring carried out at the workplace; and

(e) the type of personal protective equipment being used by the employee.

Outcomes Management: Non-work-related findings

119. Non-work-related findings include various health conditions that may be identified by the medical testing process, such as hypertension and diabetes. These findings should be shared with the employee (preferably in writing) by the occupational health practitioner to enable the employee to take appropriate action to improve his or her general health. In addition, the occupational health practitioner should refer the employee to their own healthcare provider for further treatment, if necessary.
120. Where the non-work-related health condition increases the affected employee's vulnerability to a workplace hazard, this may require additional actions.
121. The presence of non-occupational disease does not require notification to the employer.

Outcomes Management: Work-related findings

122. Work-related findings include two categories:
    (a) ***Occupational disease:*** These are adverse health effects related to exposure to a HCA. Section 25 of the Occupational Health and Safety Act requires that those health effects which have progressed to occupational disease must be communicated to the employee, employer and the Chief Inspector of the Department of Employment and Labour.
    (b) ***Medical fitness to work:*** Health conditions either caused by work or not caused by work may impact on an employee's medical fitness for work. Additionally, health conditions not caused by work may impact on the vulnerability of the employee who may be exposed to an HCA, or which may be aggravated by workplace exposures. For example, an employee who has had asthma since childhood and is performing work that may result in exposure to a respiratory irritant or allergen. In these circumstances, the occupational medicine practitioner must carefully consider the risks and convey the appropriate task or workplace restrictions to the employer in the form of a written certificate of fitness, without disclosing the actual diagnosis. The employer may not allow the employee to return to normal duties until cleared by an occupational medicine practitioner.

Medical fitness and Incapacity

123. A medical incapacity is present when an employee is unable to fulfil the inherent requirements of a job for the reasons of ill health. This is the case whether or not the underlying health condition was caused by exposure to workplace hazards. The presence of an occupational disease is not necessarily an incapacity and therefore not a reason to automatically declare that the employee is medically unfit to perform their job.
124. Where a medical incapacity is present all options for accommodation should be considered, as prescribed by the Labour Relations Act, 1995 Act No. 66 of 1995 and the Employment Equity Act, 1998 Act No. 55 of 1998.

Legal duties in occupational disease identification

125. The medical practitioner must notify the chief inspector as prescribed in section 25 of the Act. The prescribed format is the use of the WCL forms used for the submission of claims for an occupational disease under the Compensation for Occupational Injuries and Diseases Amendment Act, N^{o} 10 of 2022.
126. The medical practitioner (usually an occupational medicine practitioner) must facilitate the submission of a claim for compensation under the Compensation for Occupational Injuries and Diseases Amendment Act, N^{o} 10 of 2022, by completing the necessary medical reports and following the procedure prescribed by the Compensation Commissioner. These are described in the "Internal Instruction" documents published by the Compensation Commissioner.

Biological monitoring

Distinction between biological monitoring, biological exposure monitoring and biological effect monitoring

127. As illustrated in Figure 1 above, biological exposure monitoring and biological effect monitoring are subdivisions of biological monitoring.
128. Biological exposure monitoring is the measurement and assessment of chemicals or their metabolites (substances the body converts the chemical into,) in exposed employees. These measurements are made on samples of exhaled air, urine, blood or other biological materials, or any combination of these. These measurements reflect the total uptake of a chemical by an individual by all routes (inhalation, ingestion, absorption through skin or by a combination of these routes). Biological exposure monitoring, therefore, does not represent an adverse effect or an occupational disease – it only reflects exposure.
129. Biological effect monitoring is the measurement and assessment of early non-adverse reversible subclinical physiological effects caused by the absorption of chemicals (i.e. prior to functional or structural impairment). It typically involves measuring biochemical responses. For example, measuring plasma and erythrocyte cholinesterase activity in employees exposed to organophosphate pesticides; or measuring increases in urinary protein following exposure to cadmium; or changes in functioning of enzymes.
130. Biological effect monitoring should be distinguished from medical testing for established clinical disease, which is sometimes also referred to as effect monitoring. For example, measuring changes in blood cell counts following exposure to bone marrow toxins does not constitute biological effect monitoring.
131. Biological effect monitoring responses may have potential health implications for the individual and may also arise from causes other than occupational exposure.

Objectives and uses of biological exposure monitoring

132. The main objective of biological exposure monitoring is to provide a complementary method to air monitoring when air sampling methods alone may not give a reliable indication of exposure. Biological exposure monitoring may be useful in the following situations:
    (a) to detect and determine absorption via the skin or gastrointestinal system, in addition to that by inhalation;
    (b) to test the efficacy of personal protective equipment and monitor work practices;
    (c) to compliment air monitoring in circumstances when work practices are not normal, such as abnormally long or variable working hours or very strenuous work (high breathing rates = increased chemical intake)
    (d) to detect non-occupational exposures;
    (e) to assess total body burden;
    (f) to reconstruct past exposure in the absence of other exposure measurements for chemicals with long half-lives; and
    (g) to assess the effectiveness of medical removal procedures.

Important considerations in biological exposure monitoring

133. In choosing a test to meet the objectives, it is important to understand the relationship between environmental exposure and the concentration of an HCA in biological samples. This includes an

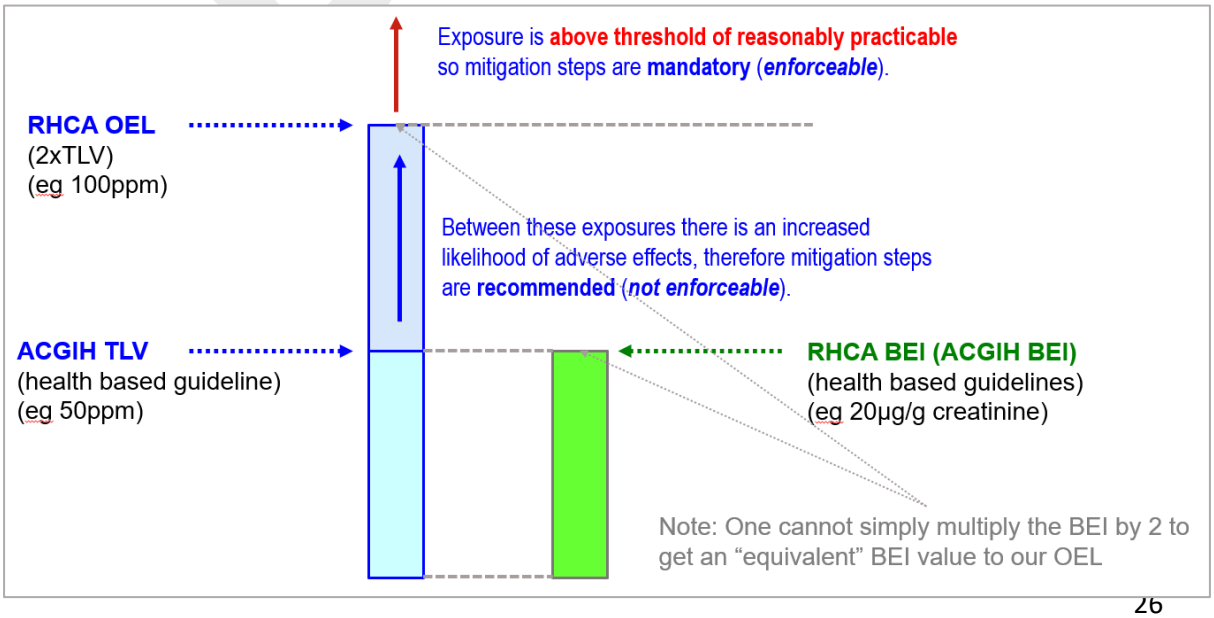
understanding of the principles of absorption, biotransformation, distribution and excretion of the HCA or its metabolites.

134. In addition, there should be (1) analytical methods available with sufficient sensitivity and specificity to detect concentrations of the agent in biological media in the range of exposure likely to be associated with the process in industry and (2) reference values against which to infer occupational exposure with reasonable reliability. The HCAs listed in Table 4 of Annexure2 are those for which extensive documented research has been done and where these criteria are deemed to have been met.

Biological exposure indices

135. Biological exposure indices (BEIs) are values against which to compare biological monitoring results, intended as a reference guideline for the likelihood of adverse health effects.
136. A BEI represents in theory the level of an HCA or metabolite most likely to be observed in a specimen collected from a healthy employee who has been exposed to an HCA to the same extent as an employee with inhalation exposure to half the OEL-TWA. They are health-based values, meaning that they represent the levels at which the earliest signs of adverse effect may occur.
137. BEIs do not represent a sharp distinction between hazardous and non-hazardous exposures. For example, owing to biological variability, it is possible that an individual's measurements can exceed the BEI without incurring an increased health risk. There are also some susceptible individuals who may be harmed at levels below the BEI.
138. BEIs are guidance reference values, not legal reference values. If measurements in specimens obtained from an employee on different occasions persistently exceed the BEI, or if measurements in specimens obtained from a group of similarly exposed employees, the employer must investigate the cause of the excessive values and take proper action to reduce the exposure.
139. BEIs apply to eight-hour exposures, five days a week.
140. BEIs should not be applied, either directly or through a conversion factor, in the determination of safe levels for *non-occupational* exposure to air and water pollutants, or food contaminants. BEIs are not intended for use as a measure of adverse effects or for diagnosis of occupational disease.
141. The level of a hazardous chemical or its metabolites in the body does not *necessarily* correlate with exposure to the hazardous chemicals (there may be other non-occupational sources of exposure), symptoms or damage to health.

Figure 2: The relationship between the RHCA OEL, ACGIH TLV and RHCA BEI.



Biological monitoring sampling strategy

142. Several approaches may be considered, depending on the circumstances.
    a) 100% Sampling-This means selection of all employees exposed to a HCA listed in Annexure 2, Table 4 and where the risk assessment indicates the need for biological monitoring. The rationale for this approach is not to miss anybody who may be individually at risk. This is best suited to circumstances where the target group(s) is small, and exposures are highly variable.
    b) Purposive sampling -This means the selection of the employees who will give the most useful information about exposure, and which accounts for various routes of exposure and use of PPE. This is best suited to circumstances where the target group(s) is small, and specific issues are being addressed, such as effectiveness of PPE.
    c) Statistical sampling (epidemiological approach) -This means the collection of a minimum number of samples to achieve statistical representativeness in a group of similarly exposed employees, in the same manner that statistical representativeness is achieved via occupational hygiene sampling strategy. The rationale for this approach is that biological monitoring is directly analogous to personal dosimetry in occupational hygiene monitoring. Data obtained from biological monitoring of groups of employees can be used in cross-sectional studies. These can be used to compare the situations existing in different departments of the factory, or in similarly exposed groups (SEGs), in order to set up risk maps for manufacturing processes. This is best suited to circumstances where the target group(s) is large, and it will be prohibitively expensive to biologically monitor all the exposed employees. Analysis of a group becomes especially important when the results of the biological indicators used can be markedly influenced by factors independent of exposure (diet, concentration or dilution of urine, etc.) and for which a wide range of "normal" values exists. In order to ensure that the group study will furnish useful results, the group must be sufficiently numerous and homogeneous as regards exposure and sex. The more the exposure levels are constant over time, the more reliable the data will be.

Consultation with health and safety committee/ representatives

143. The employer must consult with the relevant health and safety committee or representative as the case may be on the following matters:
    (a) conducting and the outcomes of the risk assessment,
    (b) control measures implemented in the workplace,
    (c) exposure monitoring (both occupational hygiene and biological) programs/sampling participation required by employees,
    (d) the programme of medical screening and medical surveillance to be implemented, and
    (e) training, instruction and information to be provided, including frequency of training.