Department of Disease Control
Division of Occupational and Environmental Diseases

ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace

The AMS Team,
ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace
ASEAN Health Cluster 1

Final Draft (Revised Contents of the Document as of May, 2024)

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ASEAN GUIDELINE ON OCCUPATIONAL HEALTH SURVEILLANCE CRITERIA AT THE WORKPLACE

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ISBN (Ebook): 978-616-11-5255-0

Published by: Division of Occupational and Environmental Diseases (DOED), Department of Disease Control, Ministry of Public Health, Thailand

1st Issue: May 2024

Press Name: Aksorn graphic and design publishing house limited partnership

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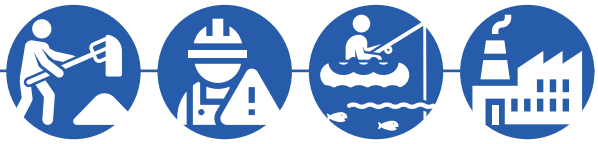

Foreword

According to the concern with the minimum requirement of occupational health surveillance criteria by health hazards identification at the workplace for equality in health surveillance for all labour in all worker sectors (formal sector, informal sector, and migrant worker) by cross-cutting gender and nationality, the cooperation among ASEAN Member States (AMS) to establish the "ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace" has been agreed to process in ASEAN Health Cluster 1: Promoting Healthy Lifestyle in Health Priority 4, Promotion of Occupational Health under the ASEAN Post-2015 Health Development Agenda (2016-2020). Thailand is the "Lead Country," and the "Co-Lead Countries" are Lao PDR and the Philippines.

The Division of Occupational and Environmental Diseases (DOED), Department of Disease Control (DDC), Ministry of Public Health of Thailand is the focal point of the cooperation process, accompanied by the support of the secretariat team of ASEAN Health Cluster 1 (the ASEAN Secretariat from the ASEAN Socio-Cultural Community (ASCC) and the Center for International Cooperation of the Department of Health (DOH), Ministry of Public Health of Thailand). The contents of the guideline have been written by the nominated officials of AMS. The exchange of knowledge and opinion among AMS has proceeded from the second meeting of ASEAN Health Cluster 1 to the seventh meeting of ASEAN Health Cluster 1. The meetings during 2016-2022 have been attended by national and international stakeholders in Thailand and the Philippines, as well as opinions from the WHO Headquarters, the WHO South-East Asia Region, the WHO Representative to Thailand, the International Labour Organization Decent Work Technical Support Team for East and South-East Asia and the Pacific (ILO DWT), the ASEAN-OSHNET Secretariat, the Guangdong Province Hospital for Occupational Disease Prevention and Treatment (GDHOD) in P.R. China, and the University of Occupational and Environmental Health (UOEH) in Japan. The contents of the guideline are focused on the health risk assessment by the walk-through survey and the minimum requirements for tools and procedures for health surveillance in workplaces. This final draft of the guideline is developed from the guideline as of January 2023 which has been distributed to the contributors of ASEAN Health Cluster 1: Promoting Healthy Lifestyle.

We hope that the e-book of the final draft of the guideline will be useful for piloting and using in workplaces for occupational health surveillance.

The AMS Team, ASEAN Health Cluster 1
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May 2024

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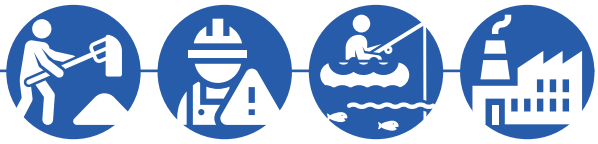

Acknowledgement

We would like to thank the WHO Headquarters, the WHO South-East Asia Region, the WHO Representative to Thailand, the International Labour Organization Decent Work Technical Support Team for East and South-East Asia and the Pacific (ILO DWT), the ASEAN-OSHNET Secretariat, the Department of Disease Control under the Ministry of Public Health of Thailand, the Department of Health under the Ministry of Public Health of Thailand, the Guangdong Province Hospital for Occupational Disease Prevention and Treatment (GDHOD), P.R. China, the University of Occupational and Environmental Health (UOEH), Japan, the ASEAN Secretariat from Health Division, the ASEAN Socio-Cultural Community (ASCC), and contributors from ASEAN Member States of ASEAN Health Cluster 1: Promoting Healthy Lifestyle. Additionally, we would like to give special thanks to Dr. Thomas H. Gassert, the advising expert on basic occupational and environmental health (OEH) and occupational diseases from WHO HQ, for reviewing “the ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace” and Dr. Nasir Hassan, Regional Advisor - Air Pollution, Environmental Health and Chemical Safety (AEC), WHO SEARO.

The AMS Team, ASEAN Health Cluster 1
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Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AMS	ASEAN Member States
ASEAN	Association of Southeast Asian Nations
ATSDR	Agency for Toxic Substances and Disease Registry
BEIs	Biological Exposure Indices (ACGIH)
CCOHS	Canadian Centre for Occupational Health and Safety (Canada)
HBS	Hazardous Biological Substance
HCS	Hazardous Chemical Substance
IAPA	International Au Pair Association
IARC	International Agency for Research on Cancer (WHO)
IDLH	Immediately Dangerous to Life or Health (NIOSH)
ILO	International Labour Organization
LD50	Lethal Dose for 50% of Population (Intake) or Median Lethal Dose (Intake)
MSDs	Musculoskeletal Disorders or Musculoskeletal Diseases
NIOSH	National Institute for Occupational Safety and Health
NRC	National Research Council
NTP	National Toxicology Program (United States Department of Health and Human Services)
OEL	Occupational Exposure Limit (NIOSH)
OHSA	Occupational Health and Safety Authority
OSHA	Occupational Safety and Health Administration
PAHs	Polycyclic Aromatic Hydrocarbons

Acronyms (Continued)

PEL	Permissible Exposure Limit (OSHA)
PPE	Personal Protective Equipment
Q Fever	Query Fever
REL	Recommended Exposure Limit (NIOSH)
SARS	Severe Acute Respiratory Syndrome
SDS	Safety Data Sheet or Material Safety Data Sheet (MSDS)
SHE	Safety, Health and Environment
STIs	Sexually Transmitted Infections
TB	Tuberculosis
TLV	Threshold Limit Value (ACGIH)
TLV-TWA	Threshold Limit Value – Time-weighted Average (ACGIH)
U.S. CDC	The United States Centers for Disease Control and Prevention (U.S. CDC) or Centers for Disease Control and Prevention (CDC)
U.S. EPA	The United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
VP	Vapour Pressure
WBGT	Wet Bulb Globe Temperature
WHO	World Health Organization
WHMIS	Workplace Hazardous Materials Information System (Canada)

Note: Sources of Acronyms: ACGIH, ASEAN, ATSDR, ILO, NIOSH, OSHA, U.S. CDC, U.S. EPA, WHMIS, WHO.

Glossary of Terms

Absorption	The process of taking in. For a person or animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs (ATSDR, 2009).
Accident	The occurrence in a sequence of events that produces unintended injury, death, or property damage. Accident refers to the event, not to the result of the event (NSC, 2023).
Accumulation	Successive additions of a substance to a target organism, or organ, or to part of the environment, resulting in an increasing quantity or concentration of the substance in the organism, organ, or environment (ILO, 2004).
Acute Toxicity	The adverse effects occurring within a short time of administration of a single dose or multiple doses given within 24 hours (Hagan, 1959; ILO, 2004).
Additive Effect	The overall consequence which is the result of two chemicals acting together and which is the simple sum of the effects of the chemicals acting independently (ILO, 2004).
Adverse Effect	This is abnormal, undesirable or harmful effect to an organism, indicated by some result such as mortality, altered food consumption, altered body and organ weights, altered enzyme levels or visible (pathological) change. An effect may be classed as adverse effect if it causes functional or anatomical damage, causes irreversible changes or increases the susceptibility of the organism to other chemical or biological stress. A non-adverse effect will usually be reversed when exposure to the chemical ceases (ILO, 2004).
Aerosol	This is a very broad term applied to any suspension of solid or liquid particles in a gas. They are fine enough in the particle size (0.001 to 100 micrometers) to remain dispersed for a period of the time (ILO, 2004).
Agricultural Worker	A worker who is engaged in cultivation, animal husbandry, forestry, horticulture, the primary processing of agricultural products, or any other form of agricultural activity (ILO, 1999).
Airborne Transmission	Situations where droplet nuclei (residue from evaporated droplets) or dust particles containing microorgnisms can remain suspended in air for long periods of time. These organisms must be capable of surviving for long periods of time outside the body and must be resistant to drying. Airborne transmission allows organism to enter the upper and lower respiratory tract (CDC, 2012).
Allergy	A broad term applied to disease symptoms following exposure to a previously encountered substance (allergen), often one which would otherwise be classified as harmless. Essentially, it is a malfunction of the immune system (ILO, 2004).
Asbestosis	The damage to the lungs caused specifically by exposure to, and inhalation of, asbestos fibres (ILO, 2004).
Biological Assessment of Exposure	Mainly used for hygienic evaluation of workplaces (deducing from the analytical results the level of exposure, sometimes even correlations with the concentration in the air, the possible absorption by other routes than inhalation, etc.) and for medical prevention or diagnostics (probability of health impairment at certain values of the exposure test). The definition of biological assessment of exposure should include only the chemical and haematological analyses already mentioned and should not be extended to include indicators of general health or sickness, or functional tests (WHO, 1979).

Glossary of Terms (Continued)

Biological Half - Life (Synonym: Biological Half-Time)	The time required for the amount of a particular substance in a biological system to be reduced to one-half of its value by biological processes when the rate of removal is approximately exponential (ISO, 1972). For a one-compartment system describing an exponential biological process, biological half-life = log 2/f where f = elimination or decay constant (ILO, 2004).
Biological Monitoring	The periodic examination of biological specimens (in accordance with the definition of monitoring). It is usually applied to exposure monitoring but can also apply to effect monitoring (WHO, 1979; ILO, 2004).
Biomarker	A defined characteristic that is measured as an indicator of normal biological processes, pathogenic processes, or biological responses to an exposure or intervention, including therapeutic interventions. Biomarkers may include molecular, histologic, radiographic, or physiologic characteristics. A biomarker is not a measure of how an individual feels, functions, or survives (NIH, 2016).
Biomarker of Exposure	An exogenous substance, the metabolite(s) or the product of interactions between a xenobiotic agent and some target molecule or cell that is measured in a compartment within an organism (NIH, 2000).
Cancer	A disease which results from the development of a malignant tumour and its spread into the surrounding tissues (ILO, 2004).
Carcinogen	An agent, chemical, physical or biological, that can act on living tissue in such a way as to cause a malignant neoplasm (WHO, 1980; ILO, 2004). A substance that causes cancer (ATSDR, 2009).
Carcinogenesis	The induction by chemical, physical, or biological agents, of neoplasms that are usually not observed, an earlier induction of neoplasms that are usually observed, and/or the induction of more neoplasms than are usually found although fundamental differences in the mechanisms may be involved (IARC, 1977; ILO, 2004).
Chronic Effects	Effects that develop slowly and have a long duration. They are often, but not always, irreversible. Some irreversible effects may appear a long time after the chemical substance was present in the sensitive tissue. For such delayed or late effects, the latent period (or the "time to occurrence'' of an observable effect) may be very long, particularly if the level of exposure is low (WHO, 1979; ILO, 2004).
Chronic Toxicity	Adverse effects occurring as a result of repeated dosing with a chemical on a daily basis, or exposure of the chemical, for large part of an organism's lifespan (usually more than 50%). With experimental animals, this usually means a period of exposure of more than 3 months. Chronic exposure studies over 2 years using rats or mice are used to assess the carcinogenic potential of chemicals (WHO, 1979; ILO, 2004).
Concentration	A general term referring to the quantity of a material or substance contained in unit quantity of a given medium. When the term concentration is used without further qualification, it now means amount of substance concentration (WHO, 1979; ILO, 2004).
Confounder (Confounding Factor)	A factor that is associated with both the exposure and outcome of interest and can distort the apparent magnitude of the effect of the study factor (NIH, 2000).
Criteria	Validated sets of data used as a basis for judgement (WHO, 1979; ILO, 2004).

Glossary of Terms (Continued)

Dose	The amount of a chemical administered to an organism (WHO, 1978; ILO, 2004).
Dose Exposure-Response Relationship	The relationship between administered dose or exposure and the biological change in organisms. It may be expressed as the severity of an effect in one organism (or part of an organism) or as the proportion of a population exposed to a chemical that shows a specific reaction (WHO, 1979; ILO, 2004).
Effect	A biological change in an organism, organ, or tissue (WHO, 1979; ILO, 2004)
Elimination (in Metabolism)	The expelling of a substance or other material from the body (or a defined part thereof), usually by a process of extrusion or exclusion but sometimes through metabolic transformation (WHO, 1979; ILO, 2004).
Emission	The giving off of environmental pollutants from various sources (WHO, 1979; ILO, 2004).
Employer	A person or organization employing workers under a written or verbal contract of employment which establishes the rights and duties of both parties. Governments, public authorities, and private enterprises as well as individuals may be employers (ILO, 1999).
Environment	The aggregate, at a given moment, of all external conditions and influences to which a system is subjected (ISO, 1975). The term "system" covers all living organisms, including human beings (ILO, 2004).
Ergonomic Principles	A concept whereby the work to be carried out is organized and specified – and tools and equipment designed and used – in such a way as to be matched with the physical and mental characteristics and capacity of the worker (ILO, 2008).
Exposed Group (in epidemiology)	A group whose members have been exposed to a supposed cause of a disease or health state of interest, or possess a characteristic that is a determinant of the health outcome of interest. The abbreviated term "the exposed" is sometimes used (ILO, 2004).
Exposure	The amount of an environmental agent that has reached the individual (external dose) or has been absorbed into the individual (internal dose, absorbed dose) (WHO, 1979; ILO, 2004). Contact with a substance by swallowing, breathing, or touching the skin or eyes (ATSDR, 2009).
Exposure Assessment	The quantification of the amount of exposure to a hazard for an individual or group (WHO, 1979; ILO, 2004).
Exposure Limit	A general term implying the level of exposure that should not be exceeded (WHO, 1979; ILO, 2004).
Formal Paid Employees (Formal Sector)	The employer makes contributions to pension/social security or the employee has access to paid leave (UNDA, 2010).
Hazard	A source of danger: a qualitative term expressing the potential that an environmental agent can harm health (WHO, 1988; ILO, 2004).
Hazard Assessment	An evaluation of the results of a hazard analysis including judgements as to their acceptability and, as a guide, comparison which relevant codes, standards, laws and policies (ILO, 2008).

Glossary of Terms (Continued)

Hazard Identification	The identification of the substance of concern, its adverse effects, target populations, and conditions of exposure (WHO, 1988; ILO, 2004).
Health	A state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity (WHO, 1978b; ILO, 2004).
Informal Sector	All remunerative work (i.e. both self-employment and wage employment) that is not registered, regulated or protected by existing legal or regulatory frameworks, as well as non-remunerative work undertaken in an income- producing enterprise. Informal workers do not have secure employment contracts, workers' benefits, social protection or workers' representation (ILO, 2003).
Industrial Hygiene	The recognition, measurement and control of workplace hazards (ILO, 2008).
Injury	Physical harm or damage to the body resulting from an exchange, usually acute, of mechanical, chemical, thermal or other environmental energy that exceeds the body's tolerance (NSC, 2023).
LD50	The dose of a toxic substance lethal to 50% of a test population (ILO, 2004).
Metabolism	In general, the sum total of all physical and chemical processes that take place within an organism; in a narrower sense, the physical and chemical changes that take place in a given chemical substance within an organism. It includes the uptake and distribution within the body of chemical compounds, the changes (biotransformations) undergone by such substances, and the elimination of the compounds and of their metabolites (WHO, 1979; ILO, 2004).
Metabolite	A substance resulting from chemical transformation in an organism (WHO, 1979; ILO, 2004).
Migrant Worker	A person who migrates or who has migrated from one country to another with a view to being employed otherwise than on his own account and includes any person regularly admitted as a migrant worker (ILO, 1975). A person who is to be engaged or employed, is engaged or employed, or has recently been engaged or employed in a remunerated activity in a State of which he or she is not a national. The applicability of the Consensus to different categories of migrant workers shall be subject to the laws, regulations, and policies of respective ASEAN Member States (ASEAN Consensus, 2018).
Monitoring (for health, environmental, and associated technical purposes)	The repetitive and continued observation, measurement, and evaluation of health and/or environmental or technical data for defined purposes, according to prearranged schedules in space and time, and using comparable methods for sensing and data collection (WHO, 1980; ILO, 2004).
Monitoring Biomarker	A biomarker measured repeatedly for assessing status of a disease or medical condition or for evidence of exposure to (or effect of) a medical product or an environmental agent (NIH, 2016).
Mutagen	An agent that induces mutation (WHO, 1979; ILO 2024).
No-Observed-Adverse-Effect Level (NOEL)[1]	The greatest concentration or amount of a chemical, found by experiment or observation, that causes no detectable adverse alteration of morphology, functional capacity, growth, development, or life span of the target (WHO, 1979; ILO, 2004).

[1]Some institutions/organizations use another abbreviation term, as such "NAOEL."

Glossary of Terms (Continued)

Occupational Disease	Any disease contracted as a result of an exposure to risk factors arising from work activity (ILO, 2002).
Occupational Health	Health in relation work. This does not only mean the absence or infirmity. Health at work also includes the physical and mental elements such as clean working environment, sufficient light directly related to safety, and hygiene at work that can affect health (ILO, 1999).
Occupational Health Professionals	Persons who have been accredited through appropriate procedures to practice a profession related to occupational health or who provide occupational health services according to the provisions of relevant regulations. Occupational health professionals include all those who by profession carry out occupational safety and health activities, provide occupational health services or who are involved in occupational health practice, even if only occasionally. They may be occupational health physicians, nurses, occupational safety and health inspectors, occupational hygienists, occupational psychologists and specialists involved in ergonomics, accident prevention and the improvement of the working environment, as well as in occupational health and safety research. Many others, in addition to occupational health and safety professionals, are involved in the protection and promotion of the health of workers, e.g., management and workers' representatives (ILO, 1998).
Occupational Health Surveillance	The ongoing systematic collection, analysis, interpretation and dissemination of data for the purpose of prevention. Surveillance is essential to the planning, implementation and evaluation of occupational health programmes and to the control of work-related ill health and injuries, as well as to the protection and promotion of workers' health. Occupational health surveillance includes workers' health surveillance and working environment surveillance (ILO, 1998).
Occupational Injury	Damage or harm to the body caused by, linked to, or occurring in the course of work (ILO, 1999).
Occupational Safety	The protection of workers' lives and physical well-being by eliminating or controlling risks in the working environment or the system of work within which workers operate (ILO, 1999).
Occupational Safety and Health	The discipline dealing with the prevention of work-related injuries and diseases as well as the protection and promotion of the health of workers. It aims at the improvement of working conditions and environment. Members of many different professions (e.g., engineers, physicians, hygienists, nurses) contribute to "occupational safety, occupational health, occupational hygiene and improvement of the working environment" (ILO, 1998).
Population at Risk	The number of people who can develop the adverse health effect under study and who are potentially exposed to the risk factor of interest. For example, all people in a population who have not developed immunity to an infectious disease are at risk of developing the disease, if they are exposed. Similarly, people already having chronic disease are excluded from the population at risk in studies of the incidence of the disease (WHO, 1979; ILO, 2004).
Risk	The probability that an event will occur, e.g., that an individual will become ill or die within a stated period of time or age. Also, a nontechnical term encompassing a variety of measures of the probability of a (generally) unfavourable outcome (Last, 1988; ILO, 2004).

Glossary of Terms (Continued)

Risk Assessment	A combination of hazard identification, quantification of risk resulting from a specific use or occurrence of a chemical, taking into account the possible harmful effects on individual people or society of using the chemical in the amount and manner proposed and all the possible routes of exposure. Quantification ideally requires the establishment of dose-effect and dose-response relationships in likely target individuals and populations (ILO, 2004).
Risk Characterization	The outcome of hazards identification and risk estimation applied to a specific use or occurrence of an environmental health hazard (e.g., a chemical compound). The assessment requires quantitative data on the human exposure in the specific situation. The end product is a quantitative statement about the proportion of affected people in a target population (WHO, 1988; ILO, 2004).
Risk Factor	An aspect of personal behavior or lifestyle, an environmental exposure, or an inborn or inherited characteristic that is associated with an increased occurrence of disease or other health-related event or condition (U.S. CDC, 2015).
Risk Management	The managerial, decision-making and control process to deal with those environmental agents for which risk evaluation has indicated that the risk is too high (WHO, 1988; ILO, 2004).
Sample	One or more items taken from a population and intended to provide information on the population, and possibly to serve as a basis for a decision on the population or on the process which had produced it (ISO, 1977; ILO, 2004).
Sampling	The procedure used to constitute a sample (ISO, 1977; ILO, 2004).
Screening	The presumptive identification of unrecognized disease or defect by the application of tests, examinations, or other procedures which can be applied rapidly. A screening test is not intended to be diagnostic. Persons with positive or suspicious findings must be referred to their physicians for diagnosis and necessary treatment (ILO, 2004).
Sensitivity (of a screening test)	Sensitivity is the proportion of truly diseased persons in the screened population who are identified as diseased by the screening test. Sensitivity is a measure of the probability of correctly diagnosing a case, or the probability that any given case will be identified by the test (synonym: true positive rate) (ILO, 2004).
Standardization	A set of techniques used to remove as far as possible the effects of differences in age or other confounding variables, when comparing two or more populations. The common method uses weighted averaging of rates specific for age, sex, or some other potential confounding variable(s) according to some specified distribution of these variables (ILO, 2004). There are two main methods, as follows: **1. Direct method:** The specific rates in a study population are averaged, using as weights the distribution of a specified standard population. The directly standardized rate represents what the crude rate would have been in the study population if that population had the same distribution as the standard population with respect to the variable(s) for which the adjustment or standardization was carried out (ILO, 2004).

Glossary of Terms (Continued)

	2. Indirect method: This is used to compare study populations for which the specific rates are either statistically unstable or unknown. The specific rates in the standard population are averaged, using as weights the distribution of the study population. The ratio of the crude rate for the study population to the weighted average so obtained is the standardized mortality (or morbidity) ratio, or SMR. The indirectly standardized rate itself is the product of the SMR and the crude rate for the standard population (Last, 1988).
Subacute Toxicity	Adverse effects occurring as a result of repeated daily dosing of a chemical, or exposure of the chemical, for part of an organism's lifespan (usually not exceeding 10%). With experimental animals, the period of exposure may range from a few days to 6 months. (WHO, 1979; ILO, 2004).
Subchronic Toxicity	Adverse effects occurring as a result of repeated dosing with a chemical on a daily basis, or exposure of the chemical, for large part of an organism's lifespan (usually more than 50%). With experimental animals, this usually means a period of exposure of more than 3 months. Chronic exposure studies over 2 years using rats or mice are used to assess the carcinogenic potential of chemicals (WHO, 1979; ILO, 2004).
Surveillance	Ongoing scrutiny, generally using methods distinguished by their practicability, uniformity, and frequently their rapidity, rather than by complete accuracy. Its main purpose is to detect changes in trend or distribution in order to initiate investigative or control measures (Last, 1988; ILO, 2004). There are two methods, as follows: **1. Active surveillance:** a system employing staff members to regularly contact heath care providers or the population to seek information about health conditions. Active surveillance provides the most accurate and timely information, but it is also expensive (Nsubuga P, et al., 2006). **2. Passive Surveillance:** a system by which a health jurisdiction receives reports submitted from hospitals, clinics, public health units, or other sources. Passive surveillance is a relatively inexpensive strategy to cover large areas, and it provides critical information for monitoring a community's health. However, because passive surveillance depends on people in different institutions to provide data, data quality and timeliness are difficult to control (Nsubuga P, et al., 2006).
Surveillance of the Working Environment	A generic term which includes the identification and evaluation of environmental factors which may affect workers' health. It covers assessments of sanitary and occupational hygiene conditions, factors in the organization of work which may pose risks to the health of workers, collective and personal protective equipment, exposure of workers to hazardous agents and control systems designed to eliminate and reduce them. From the standpoint of workers' health, the surveillance of the working environment may focus on, but not be limited to, ergonomics, accident and disease prevention, occupational hygiene in the workplace, work organization, and psychosocial factors in the workplace (ILO, 1998).
Target Organ (s)	Organ (s) in which the toxic injury manifests itself in terms of dysfunction or overt disease (WHO, 1979; ILO, 2004).

Glossary of Terms (Continued)

Target Population	The collection of individuals, items, measurements, etc., about which we want to make inferences. The term is sometimes used to indicate the population from which a sample is drawn and sometimes to denote any ``reference'' population about which inferences are required (ILO, 2004). The group of persons for whom an intervention is planned (Last, 1988; ILO, 2004)
Teratogen	The descriptor applied to any substance that can cause non-heritable birth defects (ILO, 2004).
Threshold Limit Value (TLV)	A guideline value defined by the American Conference of Government Industrial Hygienists to establish the airborne concentration of a potentially toxic substance to which it is believed that healthy working adults may be exposed safely through a 40 hour working week and a full working life. This concentration is measured as a time-weighted average concentration. They are developed only as guidelines to assist in the control of health hazards and are not developed for use as legal standards (ILO, 2004).
Time-weighted Average (TWA) Exposure	A regulatory value defining the concentration of a substance to which a person is exposed in ambient air divided by the total time of observation. For occupational exposure a working shift of eight hours is commonly used as the averaging time (ILO, 2004).
Toxicity	The toxicity of a substance is the capacity to cause injury to a living organism (WHO, 1978a; ILO, 2004). A highly toxic substance will cause damage to an organism if administered in very small amounts and a substance of low toxicity will not produce an effect unless the amount is very large. However, toxicity cannot be defined in quantitative terms without reference to the quantity of substance administered or absorbed, the way in which this quantity is administered (e.g., inhalation, ingestion, injection) and distributed in time (e.g., single or repeated doses), the type and severity of injury, and the time needed to produce the injury (WHO, 1979; ILO, 2004).
Toxic Substance	A poisonous substance that can destroy life or injure health (ILO, 2008).
Vector-Borne Transmission	Vectors are animals that are capable of transmitting diseases. Example of vectors are flies, mites, fleas, ticks, rats, and dogs (U.S. CDC 2012; U.S. CDC 2018).
Walk-Through Surveys	Voluntary inspection programmes and audits carried out by occupational health professionals may identify specific or suspected occupational hazards which would justify a specific workers' health survey (ILO, 1998).
Work-Related Disease	A disease with multiple causal agents which may include factors in the work environment (ILO, 2008).
Worker/Employee	Any person who performs work, either regularly or temporarily, for an employer (ILO, 2008).
Workers' Health Surveillance	A generic term which covers procedures and investigations to assess workers' health in order to detect and identify any abnormality. The results of surveillance should be used to protect and promote the health of the individual, collective health at the workplace, and the health of the exposed working population. Health assessment procedures may include, but are not limited to, medical examinations, biological monitoring, radiological examinations, questionnaires or a review of health records (ILO, 1998).

Glossary (Continued)

Working Conditions/ Working Life/ Conditions of Work	The factors determining the circumstances in which the worker works. These include hours of work, work organization, job content, welfare services, wages, and the measures taken to protect the occupational safety and health of the worker. (This term may mean different things in different countries) (ILO, 1999).
Working Environment	The circumstances in which work takes place including conditions at the workplace such as hygiene, the organization of work, personal protective equipment, and control systems to eliminate or reduce exposure to hazardous agents (ILO, 1999).
Workplace	All the places where workers need to be or to their work, and which are under the direct or indirect control of the employer (ILO, 1999).
Xenobiotic	A xenobiotic is a chemical which is not natural component of the organism exposed to it. Synonyms: drug, foreign substance or compound (ILO, 2004).
Zoonoses	Any disease or infection that is naturally transmissible from vertebrate animals to humans (WHO, 2020).

Note: Sources of Glossary of Terms: ACGIH, ASEAN, ATSDR, IARC, ILO, IOSH, ISO, NIH, NSC, OSHA, SRA, UNDA, U.S. CDC, WHO.

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CHAPTER 1
Introduction

CHAPTER 1
INTRODUCTION

1.1 Background

Based on ILO estimates, 2.3 million workers die every year globally from work-related injuries and diseases. An additional 160 million workers suffer from work-related diseases and 313 million from injuries per year. The economic costs to companies and economies is significant. The ILO estimates that more than 4 per cent of the world's annual gross domestic project (GDP) is lost as a consequence of work-related injuries and diseases.[2] In addressing these issues, the UN Agenda for Sustainable Development 2030 has included several targets to promote occupational health and to create safe and secure working environments of all workers.

Work-related deaths, injuries and diseases take a particularly heavy toll in developing nations, like most of the ASEAN Member States. Large numbers of people in the ASEAN region who work in industries such as agriculture, construction, logging, fishing, and mining are engaged in hazardous activities. Death and disability resulting hazardous work place is a major cause of poverty, affecting entire families.

The ASEAN Member States through cooperation under the ASEAN Socio-Cultural Community (ASCC), one of the pillars of ASEAN, made collective commitment to lift the quality of life of its peoples through cooperative activities that are people-oriented, people centered, and geared towards the promotion of sustainable development to face new and emerging challenges in ASEAN. One of strategic measures to realize the commitment, as enshrined in the ten-year roadmap of the ASCC through the ASCC Blueprint 2025 is through the promotion of non-discriminatory laws-policies and practices by developing effective responsive, accountable and transparent institutions at all levels including in the areas of occupational health.

Through the ASEAN Post-2015 Health Development Agenda (APHDA) 2016-2020, the mid-term strategy of the ASEAN health sector in realizing the health-related strategic measures in the ASCC Blueprint 2025, the ASEAN Health Cooperation has committed to the Promotion of Occupational Health as one of the 20 health priorities. This health priority is under the purview of ASEAN Health Cluster 1 on Promoting Healthy Lifestyle, and which key regional initiatives are related to capacity strengthening through knowledge sharing and tools/guidelines development. Through the Work Programme[3] (2016-2020) of ASEAN-Health Cluster 1, one of the regional initiatives under the Promotion of Occupation Health is the development of ASEAN Guidelines on Occupational Health Surveillance Criteria at the Workplace.

The ASEAN Member States (AMS) under the ASEAN Socio-Cultural Community (ASCC) cooperation, one of the pillars of ASEAN, made a collective commitment to improve the quality of ASEAN people's life through the

[2] ILO Global Wage Report 2016/2017.
[3] This guideline uses the spelling "Programme."

cooperative activities that are people-oriented, people-centered, and geared towards the promotion of sustainable development to face the new and emerging challenges in ASEAN. One of the strategic measures to realize this commitment, as enshrined in the ten-year roadmap of the ASCC through the ASCC Blueprint 2025, is through the promotion of non-discriminatory laws, policies, and practices by developing effective, responsive, accountable, and transparent institutions at all levels, including in the areas of occupational health.

1.2 ASEAN Health Cooperation

The Association of Southeast Asian Nations (ASEAN) was established on August 8, 1967 in Bangkok, Thailand with the signing of the ASEAN Declaration (Bangkok Declaration) by the founding fathers of ASEAN, namely Indonesia, Malaysia, the Philippines, Singapore, and Thailand, and then making up what are to day the ten Member States of ASEAN in the year 1999 (Brunei Darussalam, Cambodia, Lao PDR, Myanmar, Vietnam). Currently, ASEAN is a 10-nation regional organization made up of Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam (Figure 1. Mapping of ASEAN Member States). The motto of ASEAN is “One Vision, One Identity, One Community.” ASEAN aims to promote collaboration and cooperation among its member states as well as advance the interests of the region as a whole, including economic and trade growth. According to the purposes and principles of the “Association of Southeast Asian Nations Charter (ASEAN Charter),” ASEAN is an intergovernmental organization that is primarily aimed at promoting economic growth and regional stability among its member states. It forms a diverse and dynamic region experiencing rapid demographic, epidemiological, and socio-economic growth. These developments also pose many threats and challenges to the public health systems of ASEAN Member States because of the variability that continues to exist between and within countries in the region.

Note: Source of figure: https://www.freepik.com/vectors/asean-map.

Figure 1. Mapping of ASEAN Member States.

The population in ASEAN is larger than that in the European Union or North America. The world's third-largest population, or 8.4 per cent[4] of the world's population, are ASEAN citizens. The International Labour Organization (ILO) estimates that ASEAN will record the second-largest growth in labour force worldwide between now and 2030; another 59 million people are projected to enter its workforce by 2030. ASEAN would continue to represent the third-largest labour force worldwide, behind only China and India, accounting for a total of 10 per cent of the global labour force by 2030.[5] Therefore, ASEAN manpower is influential on the ASEAN economy.

The 10 ASEAN countries vary greatly by income, development level[6], and highly migrant workers among ASEAN Member States (AMS). Intra-ASEAN migration is on the rise, from 1.5 million in 1990 to 6.5 million in 2013. An estimated one in eight migrant workers is a young person between the ages of 15 and 24.[7] In some countries, poverty remains the most important determinant of health status, mainly for marginalized and vulnerable groups, including those living in remote, isolated, mountainous, or island communities. Therefore, the opportunity of a powerful and driven economic force is associated with the opportunity of reducing the burden of diseases in a country.

In the year 2015, the ASEAN Post-2015 Health Development Agenda (APHDA) was established following ASEAN Vision 2025, and the ASEAN Socio-Cultural Community Blueprint 2025 (ASCC 2025) was established, among others. APHDA encapsulates the shared goals, strategies, priorities, and programmes of the health sector. The core governance structure overseeing the ASEAN Post-2015 Health Development Agenda for 2016–2020 is composed of the two main governing bodies of ASEAN health development, the ASEAN Health Ministers' Meeting (AHMM) and the Senior Officials' Meeting on Health Development (SOMHD).

To operationalize APHDA, four ASEAN Health Clusters were established. Each health cluster provides strategic leadership in identifying and implementing regional programmes, projects, and initiatives on selected health priority issues. In order to succeed in the new health agenda, clustering, goal setting, and lists of health priorities were applied for ASEAN Health Cooperation. These ASEAN Health Clusters are: 1) Health Cluster 1: Promoting Healthy Lifestyle; 2) Health Cluster 2: Responding to All Hazards and Emerging Threats; 3) Health Cluster 3: Strengthening Health Systems and Access to Care; and 4) Health Cluster 4: Ensuring Food Safety.

ASEAN Health Cluster 1 (AHC 1): Promoting Healthy Lifestyle has 2 goals and 7 health priorities. Its goals are a) to achieve the maximal health potential of the ASEAN Community through promoting healthy lifestyle, and b) to ensure healthy lives and promote well-being for all people at all ages. The seven health priorities under ASEAN Health Cluster 1 include: i) prevention and control of NCDs; ii) reduction of tobacco consumption and harmful use of alcohol; iii) prevention of injuries; iv) promotion of occupational health; v) promotion of mental health; vi) promotion of healthy and active aging; and vii) promotion of good nutrition and a healthy diet.

[4] This guideline uses the spelling "per cent."
[5] PwC Growth Markets Centre. The future of ASEAN – Time to act. PwC, Time to act. London: PwC United Kingdom; 2018.
[6] Khuong, Vu. ASEAN economic prospects amid emerging turbulence: Development challenges and implications for reform. Brookings Institution; Washington, D.C.; 2020.
[7] ASEC. Mid-term review of the implementation of ASEAN Socio-Cultural Community Blue 2025: Executive summary. Jakarta: ASEAN Secretariat; 2020.

1.3 Principles and Rationale for Establishing the "ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace"

In ASEAN, the labour force is composed of formal workers and informal sectors. 78.0 per cent of the employed population is in informal employment, above the proportions found globally (61 per cent) and in the Asia Pacific (68.2 per cent).[8] Based on ILO estimates, 2.3 million workers die every year globally from work-related injuries and diseases. In addition, 160 million workers suffer from work-related diseases and 313 million from injuries per year. The companies' economic costs and economies are significant. The ILO estimates that more than 4 per cent of the world's annual gross domestic product (GDP) is lost as a consequence of work-related injuries and diseases. In addressing these issues, the UN Agenda for Sustainable Development 2030 has included several targets to promote occupational health and to create safe and secure working environments for all workers.[9] Work-related deaths, injuries and diseases take a particularly heavy toll on developing nations, like most of the ASEAN Member States. Large numbers of people in the ASEAN region who work in various industries such as agriculture, construction, logging, fishing and mining are engaged in hazardous activities. Death and disability resulting from hazardous workplace are major causes of poverty that affect entire families.

Over the period of 1980–2020, the ASEAN economy grew 4.6 per cent in 2019.[10] The ASEAN population increased from 355.1 million to 661.8 million, with an average annual growth of 1.3 per cent. The dominated population was the youth population aged 0–19 years old and the working-age population aged 15–64 years, which increased from 54.0 per cent in 2000 to 60.0 per cent in 2020.[11] In ASEAN, the AMS faces a double burden of disease: non-communicable diseases, including occupational diseases, are increasingly commonly seen in most countries; communicable diseases, remain a burden and are accompanied by the emerging COVID-19 pandemic. Moreover, the emerging risk of diseases arising from the use and exposure to chemicals, particularly in occupations and the environment, is rapidly growing. Thus, the conduct of the "ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace" has been carried out through the Work Programme (2016–2020) of ASEAN Health Cluster 1 (AHC 1) in agreement with the AMS of ASEAN Health Cluster 1, in which Thailand is the lead country and Lao PDR and the Philippines are the co-lead countries. Regarding the variety of technology among ASEAN countries, the recommended guideline is aimed at preventing and controlling occupational diseases and injuries among all workers, formal workers and informal workers, on a varied scale of workplace by concerning the minimum requirements for tools and procedures with the same standard of health risk assessment in the workplaces for suitable integration among ASEAN countries, which supporting the promotion of a healthy lifestyle. The conceptual framework of the project was to establish one ASEAN system for active health surveillance according to the ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace. The project was aimed at: 1) strengthening capacity and capability in promoting healthy lifestyles and reducing risk factors at the workplace; 2) promoting cost-effective intervention packages for conditions related to risk factors; 3) strengthening advocacy, networking, sharing of information, good practices, and experiences among ASEAN Member States (AMS); and 4) developing strong monitoring and evaluation mechanisms for the implementation of the regional strategies for promoting healthy lifestyles.

[8] International Labour Organization. Transition from the informal to the formal economy recommendation, 2015 (No. 204) Workers' Guide: Geneva: ILO; 2017.
[9] ILO Global Report 2016/2017.
[10] Eye on Asia Resource Centre. Eye on Asia. ASEAN- A regional profile. Singapore; 2023.
[11] ASEC. ASEAN Key Figures. Jakarta: ASEAN Secretariat; 2021.

The criteria are used as the minimum requirement for health and safety measures and follow the same standard of health hazard identification in manufacturing and industry that are related to "Sustainable Development Goals (SDGs)" as follows: SDG Goal #3: Ensure healthy lives and promote well-being for all at all ages; SDG Goal #8: Decent work and economic Growth; SDG Goal #11: Make cities and human settlements inclusive, safe, resilient, and sustainable and SDG Goal #17: Strengthen the means of implementation and revitalize, the Global Partnerships for Sustainable Development. Besides, equality in health surveillance for all worker sectors (formal sector, informal sector, and migrant worker) by cross-cutting of gender and nationality should be concerned. The "ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace" has been proposed to AHC 1 since the year 2016. The working process is planned to proceed in five steps, as mentioned in the following: 1) To rank the high health hazards in workplace; 2) To establish the technical guideline which is composed of the minimum requirement for exposure assessment, the appropriate health examinations, the recommendation on prevention and control of occupational health, and the monitoring of workers' sickness; 3) To draft the finalized "ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace"; 4) To distribute the draft of the finalized "ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace" to AMS for recommendation; and 5) To process for adoption by ASEAN Member States who find this guideline relevant to their setting.

1.4 Summary of the Occupational Health Profile of ASEAN Member States (AMS)

This guideline is one of the activities under ASEAN Health Cluster 1 that is related to health priority 4: Promotion of occupational health, which aims at providing a conceptual framework to address health issues arising from occupational health hazards in ASEAN. Information on occupational health profiles obtained from the ASEAN Member States (AMS), particularly on economic growth, statistics on worker populations and occupational diseases, national legislation, strategies, policies, organizational structures, and the roles of relevant authority institutions or organizations. The ASEAN occupational health profiles are summarized below:

1) The authority bodies for occupational health in the ASEAN Member States sit under various organizations, as the following:

(i) Organizations response for occupational safety and health relating to labour, e.g., Ministry of Labour, Ministry of Labour and Social Welfare, Ministry of Manpower, and Ministry of Labour and Vocational Training;

(ii) Organizations response for occupational health and occupational diseases, e.g., Ministry of Health, Ministry of Public Health, and Ministry of Health and Sports.

2) The organizational functions involve workers' compensation for occupational diseases, accidents and injuries, national statistics (worker population, occupational diseases, accidents, and injuries)

3) The occupational health services cover formal and informal sectors at all levels (primary care, secondary care, and tertiary care)

4) There are variable guidelines, best practices, and tools for risk assessment in working process for AMS.

5) The legislation for occupational health and safety and occupational diseases stands at almost the same point as health surveillance, investigation and regulation. The details of the legislation involve only an overview of active health surveillance.

1.5 The Ranking of High-Risk Workplace for Health Hazards

Scoping on the main health surveillance criteria for all workers, covering formal and informal workers. The methodology to rank high-risk workplace for health hazards in various workplace was issued in the process of developing the "ASEAN Guideline for Occupational Health Surveillance Criteria at the Workplace." Through a series of consultations among ASEAN Member States, it was agreed that high-risk workplace for health hazards are ranked based on input from ASEAN contact points of health priority 4 on occupational health under ASEAN Health Cluster 1. These inputs were based on national statistics of number of workplace, number of risk workers, number of patients caused by working, and relevant information gathered at contact points. The high-risk workplaces for health hazards were then selected and listed below in Table 1.

Table 1 **The top-ranking health-hazardous workplace in ASEAN defined by the industries and sectors following the International Labour Organization**

No.	The twelve ranked hazardous industries and sectors in ASEAN
1	Construction
2	Agriculture; plantations; other rural sectors (hunting)
3	Transport (including civil aviation; railways; road transport)
4	Health services
5	Hotels; tourism; catering
6	Chemical industries
7	Commerce
8	Food; drink; tobacco
9	Textiles; clothing; leather; footwear
10	Mining (coal; other mining)
11	Oil and gas production; oil refining
12	Shipping; ports; fisheries; inland waterways

Notes: 1) The hazardous ranking is adjusted by the number of target groups, health effects, and number of patients.
2) ASEAN Member States tabulated a list of the top ten ranking industries and sectors.
3) The tenth, eleventh, and twelfth orders are ranked on an equal score.

1.6 Objectives

a) General objective:

To establish one ASEAN system for active health surveillance to promote healthy lifestyles.

b) Specific objectives:

1) To assess and monitor the health of workers;
2) To provide recommendations on the minimum requirements for appropriate health examinations. and prevention and control measures.

1.7 Who will use the Guideline

The guideline users are appointed by public health officials and relevant responsible officials in occupational health surveillance. The user will be a member of a multidisciplinary team who takes on the role of investigator (assessor or examiner) for the formal and informal sectors. The line manager and safety officer are designated as responsible officers for the manufacturing process.

1.8 Instruction on How to Use the Guideline

The aim of this guideline is to provide workers' health surveillance for prevention purposes through a reference to the method of assessing and monitoring the health of workers specific to the industries highlighted in the guidelines. The recommendation is the basic required assessment that should be conducted in order to successfully know the health status of the worker and subsequently monitor their health status at suggested intervals. This is important to ensure that the possible health effects are detected early and are not allowed to advance to a level causing morbidity and mortality in the worker.

The guideline also provides recommendations on the prevention and control measures that may be taken to prevent exposure to hazards in those industries. The suggested measures are very basic steps that may be taken, and further action may be taken according to the needs and resources available.

This guideline is intended to be used as the first step in addressing exposure to workers. Thus, it is to provide a platform to further enhance the prevention and control of occupational diseases among population at risk or risk workers following the ILO[12] in assessment of workers' health for prevention in the workplace, medical examinations of individual workers, and surveillance of the working environment (working condition) should include – (a) identification and evaluation of the environmental factors which may affect the workers' health; (b) assessment of conditions of occupational hygiene and factors in the organization of work which may give rise to risks to the health of workers; (c) assessment of collective and personal protective equipment; (d) assessment where appropriate, of exposure of workers to hazardous agents by valid and generally accepted monitoring methods; (e) assessment of control systems designed to eliminate or reduce exposure.

[12] ILO. Technical and ethical guidelines for workers' health surveillance (OSH N0.72), 1998.

The details of “How to” for using the guideline for prevention and control of occupational diseases in the formal sector and the informal sector in the mentioned high-ranking workplace in ASEAN (12 workplace) and the other 10 workplace are composed of 9 main topics as described below:

1) The target area for using guideline is the workplace in both the formal and informal sectors.
2) The guideline is aimed only at investigating the minimum requirement of occupational health surveillance for recommendation, not for treatment.
3) The user must be an official who has ever studied or been trained in occupational health, which includes knowledge of walk-through survey, exposure assessment, and basic health examinations of risk factors by a reliable organization.
4) The user must have experience in occupational health for at least one year.
5) The user has been trained on how to use the guideline by the appointed organization.
6) The user has no conflict of interest.
7) The health surveillance team must be a multidisciplinary team, whose minimum requirement should consist of an occupational medical doctor, occupational health nurse, appointed public health technical officer, safety officer, or appointed officer of the workplace.
8) If there is no occupational medical doctor, a medical doctor who has ever studied or been trained in occupational health by a reliable organization is required.
9) If there is no occupational health nurse, a professional nurse who has ever studied or been trained in occupational health by a reliable organization is required.

CHAPTER 2
TECHNICAL GUIDELINE ON OCCUPATIONAL HEALTH SURVEILLANCE CRITERIA AT THE WORKPLACE

CHAPTER 2
TECHNICAL GUIDELINE ON OCCUPATIONAL HEALTH SURVEILLANCE CRITERIA AT THE WORKPLACE

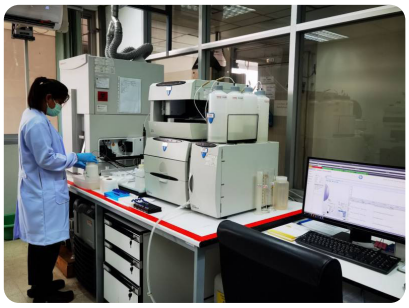
2.1 Exposure Assessment to Health Hazards

The process of exposure assessment to health hazards encompasses teams, tools, and procedures and is important for workers' health surveillance on population at risk (risk workers). Workers' health surveillance is on purpose for prevention as defined "Preventive Occupational Health" on 3 levels: 1) primary prevention which is safety and hygiene identification and control of hazards at work[13]; 2) medical surveillance, which means hazardous work, doing baseline, and periodic or annual medical examinations; and 3) medical care for high exposure, injuries, and illnesses at work with the intent to minimize the duration of suffering, care, and return to safe work. Workers' health surveillance, within an organized framework, should be based on sound ethical and technical practices. Specifically, any workers' health surveillance programme must ensure: (i) professional independence and impartiality of the relevant health professionals; (ii) workers' privacy and confidentiality of individual health information (ILO, 1998). Using a systematic approach to assess exposure to occupational hazards is the cornerstone of an industrial hygiene, health, and safety management system and aids employers in mitigating and taking steps to minimize and prevent the risk of harm or injury to employees (workers).[14] The details are described below:

- The team should ideally be multidisciplinary occupational health professionals, including industrial hygienists, public health officers, or, in the presence of such personnel, health personnel with at least some training in basic occupational health and safety, including risk assessment training;
- Tools mean questionnaire, sensation (e.g., seeing, smelling, and touching), simple/direct reading/mobile equipment (lux light meter, sound level meter, thermometer, hygrometer, barometer, wet bulb globe temperature (WBGT) meter, chemical contamination direct reading, gas direct reading, radiation detector, etc.);
- Procedures for evaluation of risk assessment (e.g., severity of harmfulness, toxicity, and number of risk persons).

Health hazards and control measures must be periodically reviewed to ensure their continued effectiveness, and employees (workers or labours) must be trained in procedures to minimize harm. Most ASEAN countries with existing laws and regulations on workplace health and safety require employers to identify and assess all occupational hazards, apply appropriate control measures, and communicate all health hazards to employees. It is also the obligation of management and employees to help identify workplace hazards. The following are steps to assess exposure to any workplace health hazards:

[13] Hazards at work as described in 1) Identification of health hazards in the workplace for occupational health surveillance (page 29).
[14] Synonym: Labours.



Analytical Laboratory

Area Air Sampling

Identification of Health Hazards

1) Identification of health hazards in the workplace for occupational health surveillance

Principally, the health hazards are divided into five types: 1) physical hazards; 2) biological hazards; 3) chemical hazards; 4) ergonomic hazards; and 5) psychological hazards (please see the details of each health hazard at **Step 3: Identifying potential health hazards**). The identification of health hazards in the workplace for setting up occupational health surveillance should start by taking three key approaches to identifying all potential sources of harm, as follows:

- By area and work activities carried out in each area (focus on activities);
- By occupation and task, they do (focus on people and tasks);
- By the total process used to convert raw materials into products (focus on process).

Identifying potential health hazards in each task is an alternative systematic approach. This concept is referred to as P.E.M.E.P. because all hazards will inherently fall into five categories, as the following:

- People (Worker)
- Equipment
- Material
- Environment
- Process

2) Risk assessment

Generally, the risk assessment process is composed of four steps, following the National Research Council (NRC) (1993): 1) hazard identification; 2) dose response assessment; 3) exposure assessment; and 4) risk characterization. A risk assessment takes into consideration factors such as frequency of exposure to the hazard, likelihood of harm, and the severity of the likely degree of harm (e.g., various xenobiotics, toxicity (acute toxicity, chronic toxicity, LD50, mutagen, teratogen, and carcinogen[15]), vapour pressure, volatile substances, and potential for explosion and fire) following the workplace hazardous materials information system, which classifies chemicals and communicates hazard information through labels and safety data sheet (SDS), or Material Safety Data Sheet (MSDS). A method of prioritizing must be established to ensure control measures are applied to the most serious risks first. Ideally, qualitative, quantitative, or both risk assessments should be carried out depending on available resources and the situation.

The risk assessment level is applied from ILO and is able to be ranked by the table for ranking risk assessments in the workplaces to find out the severity level (please see Table 2), and then risk levels can be calculated by multiplying opportunity and severity level (please see Table 3), respectively.

[15] IARC, ACGIH, and NTP are the organizations that clarify types of carcinogens.

Table 2 Matrix for Severity Level Calculation

No.	Manufacturing Process	Source of Hazards	Hazards (I)	Health Effects (II)	Prevention and Control Measures (III)	Number of Risk Persons (IV)	Severity Level (I+II+III+IV)

Notes: 1) Hazards: the ranking level of hazards depends on the number of types of hazards, such as the level of two types of hazards (i.e., chemical hazard and biological hazard) is "2."
In this table, the high level is caused by three main types of hazards: 1) physical hazards, 2) biological hazards, and 3) chemical hazards.

2) Health effects: 3 = carcinogen, explosion; 2 = effects on some important organs or systems; and 1 = irritation.
3) Prevention and control measures: "3" means "<80% of no measures and/or unsuitable PPE"; "2" means "80%-90% of suitable prevention and control measures and/or suitable PPE"; and 1 means ">90% of some prevention and control measures and control measures and/or suitable PPE."
4) Number of risk persons: "3" means ">50% of workers in the workplace"; "2" means "20%-50% of workers in the workplace"; and "1" means "<20% of workers in the workplace."
5) The severity level: 9-12 = high level; 5-8 = medium level; and 1-4 = low level.
6) If there are either ergonomic or psychological factors contributing to more than three main hazards in the manufacturing process, the high severity level is still pointed out.
7) If there is either a carcinogen or an explosion, the high severity level should be indicated.
8) The "Matrix for Severity Level Calculation" is agreed upon by AMS.

Table 3 Matrix for Risk Level Calculation

Opportunity	Risk Level (Opportunity Level X Severity Level)		
	Severity Level		
	High (3)	Medium (2)	Low (1)
High (3)	Not Acceptable (9)	High Risk (6)	Medium Risk (3)
Medium (2)	High Risk (6)	Medium Risk (4)	Acceptable Risk (2)
Low (1)	Medium Risk (3)	Acceptable Risk (2)	Low Risk (1)

Notes: 1) "Opportunity" means "frequency occurrence of harm."
2) Opportunity level: "Low opportunity (1)" = "not applicable" means "opportunity < 5% per year"; "Medium Opportunity (2)" = "Likelihood or Probable" means "opportunity 5%–50% per year"; "High Opportunity (3)" = "Almost Certain" means "opportunity > 50% per year." Therefore, the frequency of occurrence; and the percentage of occurrence depend on the agreement in each organization.
3) "Severity Level" means "Degree of Effects" (regarding table 2).
4) "Risk Level" means "Degree of Risk from Working": "Low Risk" means "the workplace achieves minimum requirement for good management of the manufacturing process and health surveillance, so there the are some risks that do not have many health effects, and it is easy to manage to improve prevention and control"; "Acceptable Risk" means "the workplace has a risk that can be able to quickly managed for prevention and control improvement"; "Medium Risk" means "management is required for prevention and control soon"; "High Risk" means "management is quickly required to improve prevention and control"; "Not Acceptable Risk" means "the immediate requirement to manage prevention and control."
5) The "Matrix for Risk Level Calculation" is applied to the risk assessment matrix of the AMS agreement.

3) Control measures

Determining what is needed to prevent the consequences of health hazards and most effectively control health hazards and applying the principle of "hierarchy of controls" (please see Figure 2 in 2.3 Recommendation for Prevention and Controls (Based on NIOSH)) to find the appropriate solution. The proper PPE should be based on the risk factors and meet or be equivalent to standards approved by the American National Standards Institute (ANSI) (OSHA 3151-02R 2023, 2023).

4) Monitor and review

Periodic monitoring and review should be carried out by the responsible personnel[16] within the prescribed intervals using developed monitoring mechanisms and tools. The periodic measurement exposure limit values (occupational exposure limits: OELs) of the working environment (working condition), i.e., Threshold Limit Values (TLVs), (ACGIH); Recommended Exposure Limits (RELs), (NIOSH); and Permissible Exposure Limits (PELs), (OSHA), by collecting the ambient air in the working area and personal aerosols. The TLV Time Weighted Average (TLV-TWA) concentration for a normal 8-hour workday or 40-hour week is generally used as the workers' health surveillance criteria.[17] The periodic health examinations are accompanied by general health examinations and health examinations concerning risk factors (including screening tests and/or laboratory analysis for type and concentration level of biomarker of exposure in biological sample) is also generally managed for occupational health surveillance. The higher level of physical hazards in the working condition and the higher concentration level of contaminated chemicals in the working conditions indicate the risk level. The higher concentration level of biomarkers of exposure in biological samples[18] indicates the risk of occupational diseases caused by the exposed chemical. Usually, working environment measurements (working condition measurements) twice a year and health examinations once a year are managed.

[16] If it is done by governments, it will be done by enforcing agencies (Ministry of Health, Ministry of Public Health, Ministry of Labour, Local Health Authorities, etc.). If it is done by industries, it will be done by reliable companies (e.g., OSH officers, OSH managers, OSH practitioners).

[17] TLV Time Weighted Average means concentration for a normal 8-hour workday or 40-hour week (ACGIH).

[18] Biomarker of exposure in a biological sample may be the residuals of exposed chemicals or metabolites of the exposed chemical or the enzyme deviation.

2.2 Determination of the Appropriate Health Examinations Identified by Health Hazards

According to the twelve ranks of highly hazardous workplace in AMS (please see Table 1), which has been clarified by the statistics on a number of risk groups, health effects, and number of patients resulted from the cooperation working to find out by AMS, kinds of workplace were named following the name of industries and sectors by the International Labour Organization (ILO). The health examination for workers should be recommended to process as the following:

1) The health examination should include three types of medical examinations, as described below:
   (i) Pre-employment medical examination
   (ii) Annual medical examination by risk factors
   (iii) Retirement medical examination

2) This guideline is suitable to be used for occupational health surveillance through annual medical examinations and retirement medical examinations.

3) The walk-through survey must be the first step for direction on measurement of working conditions and recommendation of health examinations by risk factors (risk exposure to the potential health hazards).

4) The determination of appropriate health examinations identified by health hazards is required as a minimum requirement, as illustrated in Table 4.

5) The control measures for hazards are required as a minimum requirement, as illustrated in Table 5.

The essential elements of the walk-through survey method are described in steps following:

Step 1: Collecting the information about workplace hazards, history of injuries and illnesses, and history of health examination

Accompanied by a walk-through survey, the information on the plant layout of the workplace, the main manufacturing process, types of hazards, history of injury and illness, and history of health examinations in the workplace must be collected and reviewed as guided below:

a. To review the equipment and machinery operating manual.
b. To review knowledge training of the equipment and machinery operating accompanied by giving clear instruction guidelines to workers.
c. To review providing safety information: Safety Data Sheet (SDS) or Material Safety Data Sheet (MSDS), operating system, PPE, etc.
d. To review records of the injuries and illnesses.
e. To arrange a job safety analysis.
f. To arrange the hazard identification process.

Step 2: Workplace safety hazard inspections

The regular inspection of hazards in the workplace must be done for risk identification, prevention, and control with the following purposes[19] :

a. To regularly inspect all operations, work areas, machines, vehicles, and facilities.
b. To use the check list to identify unsafe conditions and unsafe workers' actions.
c. To designate potential hazard areas, e.g., hot areas, slippery areas, and chemicals-emitting areas.
d. To set the risk level (degree of risk) of each potential area for management in order of significance.

Step 3: Identifying potential health hazards

The identification of potential health hazards must be followed by a recommendation for a health examination. The potential health hazards are such kinds of hazards or, overall, the hazards in the workplace. Generally, health hazards can be divided into 5 groups: a) physical hazards; b) biological hazards; c) chemical hazards; d) ergonomic hazards; and e) psychosocial hazards. Each hazard type is described in detail as the following:

a. Physical hazards include:
   - Radiation: ionizing, nonionizing (microwaves, radio waves, etc.)
   - Extreme temperature: hot or cold
   - Constant loud noise
   - High exposure to sunlight and ultraviolet rays
   - Vibration (whole body vibration or hand-arm vibration)
   - Air pressure

b. Biological hazards include:
   - Bacteria
   - Virus
   - Fungi (e.g., mushroom, mold, and yeast)
   - Parasite
   - Toxin

The biological hazards of exposure are associated with the field of work related to animals, hospitals and health care, laboratories, infectious living cells and materials, or any other field workers who easily get infected with specifically infectious diseases from microorganisms. The workers may get exposed through contact with blood and any other fluids, contaminated air ventilation, eating contaminated food, drinking contaminated beverages, insect bites, birds, and other animal droppings.

c. Chemical hazards include:
   - Heavy metal
   - Organic solvents
   - Pesticides
   - Dust (e.g., silica, PM_{10}, and $PM_{2.5}$)
   - Fibre[20] (e.g., asbestos, linin, and Jute)
   - Etc.

[19] Please see the details in the ASEAN Guidelines for Occupational Safety and Health, ASEAN 2013.
[20] This guideline uses the spelling "fibre."

d. Ergonomic hazards include:
   - Improperly adjusted workstations and chairs
   - Improperly adjusted lighting (poor lighting or high lighting)
   - Frequent lifting
   - Poor posture
   - Awkward movements
   - Repetitive movements
   - Having too much force, especially if you have to do it frequently

e. Psychosocial hazards include:
   - Job content: lack of variety, short work cycles, high uncertainty, etc.
   - Load and work pace: work over/under load, high level of time pressure, continually subject to deadlines, etc.
   - Work schedule: shift work, night shift, inflexible work schedules, etc.
   - Control: low participation in decision-making, pacing, etc.
   - Environment and equipment: inadequate equipment availability, poor environmental condition such as lack of space, etc.
   - Organizational culture function: poor communication, low support for problem solving, etc.
   - Interpersonal relationships at work: poor relationships with superiors, interpersonal conflicts, etc.
   - Role in organization: role ambiguity, role conflict, etc.
   - Career development: career stagnation, under promotion, over promotion, poor pay, job insecurity, etc.
   - Home-work interface: demands confliction, low support at home, etc.

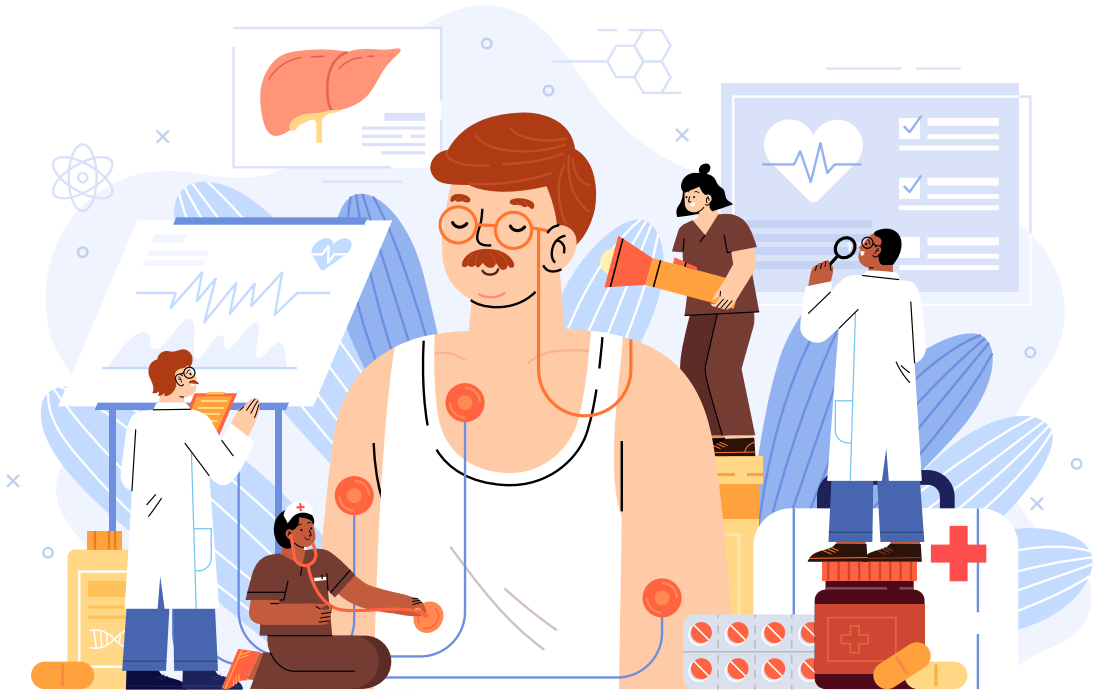


Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
1	Agriculture; Plantations; Other Rural Sectors (Hunting)[2]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Pesticides, heavy metal, organic solvents/ volatile organic compounds (VOCs), acid-base, PAHs, gas, particulate matter (total dust and respirable dust), chemicals explosion and fire, biotoxin (e.g., mushroom, snake, and marine animals) *Dust (including fibre) in agriculture; plantations; other rural sectors (hunting) manufacturing process: silica dust, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, etc.),* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) Psychosocial hazards: - Stress (long working hours, not enough rest periods, economy, relevant policies, line of command, conflict among workers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (zoonoses[21], vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (pesticides poisoning, heavy metal poisoning, silicosis, byssinosis, bagassosis, organic solvents poisoning, allergies, skin diseases, respiratory diseases, allergies, mutagen, teratogen, cancer, etc.) - Vitamin Deficiency - MSDs - Heat Stroke - Confined space illness and injury - Caisson's disease - Stress - Violence	- Lux Light Meter - UV Meter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed pesticides and other risk chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

[21] Zoonoses or Zoonosis

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
2	**Basic Metal Production**	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, radiation, humidity, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Chemicals in working process, gas, heavy metal fume, particulate matter (total dust and respirable dust) *Dust in the basic metal production manufacturing process: i.e., heavy metal dust* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) Psychosocial hazards: - Stress (long working hours, not enough rest periods, economy, relevant policies, line of command, conflict among workers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (heavy metal poisoning, metal fume fever, allergies, skin diseases, mutagen, teratogen, cancer, etc.) - MSDs - Heat Stroke - Stress - Violence	- Lux Light Meter - UV Meter - Radiation detector - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed heavy metal, and other risk chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
3	Chemical Industries[6]	Physical hazards: Injury, light, noise, vibration, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Chemicals in working process, gas, particulate matter (total dust and respirable dust), chemicals explosion and fire *Dust (including fibre) in chemical industries manufacturing process: chemicals usage dust, heavy metal dust, silica dust, asbestos fibre, etc.)* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) Psychosocial hazards: - Stress (long working hours, not enough rest periods,, economy, relevant policies, line of command, conflict among workers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, legionnaires' disease, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (chemical poisoning, allergies, skin diseases, respiratory diseases, mutagen, teratogen, cancer, etc.) - MSDs - Heat Stroke - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
4	Commerce [7]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Chemicals in working process, gas, particulate matter (total dust and respirable dust), biotoxin (e.g., mushroom, snake, marine animals, etc.) *Dust (including fibre) in the commerce manufacturing process: paper powder, carbon black powder, silica dust, asbestos fibre, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, etc.* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture Psychosocial hazards: - Stress (long working hours, not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector- borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases a variety of commercial chemical poisonings, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat Stroke - Stress - Violence	- Lux Light Meter - UV Meter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
5	Construction[1]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Chemicals in working process (e.g., heavy metal, organic solvents/volatile organic compounds (VOCs), acid-base, gas, particulate matter (total dust and respirable dust)), chemicals explosion and fire *Dust (including fibre) in construction manufacturing process: silica dust, asbestos fibre, wood dust, heavy metal dust, etc.* Ergonomic hazards: Working Posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) Psychosocial hazards: - Stress (long working hours, not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical Diseases (allergies, silicosis, asbestosis, other respiratory diseases, allergies, skin diseases, heavy metal poisoning, organic solvents poisoning (VOCs poisoning), mutagen, teratogen, cancer, etc.) - Vitamin Deficiency - MSDs - Heat Stroke - Confined Space illness and injury - Caisson's disease - Stress - Violence	- Lux Light Meter - UV Meter - Sound Level Meter - Vibration Meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Radiation concentration (if any) - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
6	Education[22]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Pesticides, heavy metal, organic solvents/ volatile organic compounds (VOCs), acid-base, gas, particulate matter (total dust and respirable dust), chemicals explosion and fire, biotoxin (e.g., mushroom, snake, marine animals) *Dust (including fibre) in education process: chalk powder, paper powder, silica dust, asbestos fibre, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, etc.* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (zoonoses, vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (heavy metal poisoning, pesticides poisoning, organic solvents poisoning, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat Stroke - Confined space illness and injury - Caisson's disease - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

[22] Health hazards depend on types of education.

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours, not enough rest periods, economy, relevant policies, line of command, conflict among workers, conflict with students, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)				
7	Financial Services; Professional Services	Physical hazards: Injury, light, UV, noise, heat, cold, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Heavy metal, organic solvents (VOCs), acid-base, gas, particulate matter (total dust and respirable dust) *Dust in financial services; professional services manufacturing process: paper powder, heavy metal dust, traffic dust, etc.* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command,	- Accident & Injury - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (heavy metal poisoning, pesticides poisoning, organic solvents poisoning, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat Stroke - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals)	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS ,risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)			Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling
8	Food; Drink; Tobacco [8]	Physical hazards: Injury, light, UV, noise, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Pesticides, heavy metal, organic solvents/ volatile organic compounds (VOCs), acid-base, PAHs, gas, particulate matter (total dust, and respirable dust), chemicals exposure and fire, biotoxin (mushroom, snake, marine animals, etc.) *Dust (including fibre)in food; drink; tobacco manufacturing process: silica dust, smoke, cellulose fibre, etc.* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (zoonoses, vector-borne diseases, legionnaires' disease, STIs, TB, influenza, SARS, COVID-19, etc.) - Radiation syndrome - Chemical diseases (pesticides poisoning, organic solvents poisoning, allergies, skin diseases, respiratory diseases, mutagen, teratogen, cancer, etc.) - MSDs - Heat Stroke - Confined space illness and injury - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)			Psychosocial examination: Psychological testing and assessment	
9	Forestry; Wood; Pulp and Paper	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Pesticides, heavy metal, organic solvents/ volatile organic compounds (VOCs), PAHs, gas, particulate matter (total dust and respirable dust), biotoxin (e.g., mushroom, snake, marine animal) *Dust (including fibre) in forestry; wood; pulp and paper manufacturing process: paper powder, pulp powder, wood dust, carbon powder, silica dust, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, smoke, etc.* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (zoonoses, vector-borne diseases, STIS, TB, influenza, SARs, COVID-19, etc.) - Chemical diseases (byssinosis, silicosis, pesticides poisoning, organic solvents poisoning, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat Stroke - Confined space illness and injury - Stress - Violence	- Lux Light Meter - UV Meter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)			Psychosocial examination: Psychological testing and assessment	
10	Health Services[4]	Physical hazards: Injury, light, UV, noise, heat, cold, humidity, radioactive/radiation, air pressure, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: heavy metal, organic solvents/volatile organic compounds (VOCs), acid-base, chemicals in each working process, gas, particulate matter (total dust and respirable dust), biotoxin (e.g., mushroom, snake, marine animal) *Dust (including fibre) in health services process: talc powder, paper powder, carbon powder, heavy metal dust, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, etc.* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Radiation syndrome - Chemical diseases (organic solvents poisoning, allergies, skin diseases, respiratory diseases, cancer, etc.) - cancer caused by other agents - MSDs - Heat Stroke - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Thermometer - Hygrometer - Wet Bulb Globe Temperature - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with service recipients/customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)			Psychosocial examination: Psychological testing and assessment	
11	**Hotel; Tourism; Catering**[5]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Pesticides, heavy metal, organic solvents/ volatile organic compounds (VOCs), acid-base, gas, particulate matter (total dust and respirable dust), biotoxin (e.g., mushroom, snake, marine animal) *Dust (including fibre) in hotel; tourism; catering manufacturing process: paper powder, silica dust, asbestos fibre, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, etc.*	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, legionnaires' diseases, leptospirosis, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (pesticides poisoning, organic solvents poisoning, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat Stroke - Confined space illness and injury	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical	• Administrative control (e.g., legislation, SOPs, policies enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biomonitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer Posture Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Stress - Violence	biomarker concentration of risk-exposed chemicals)	Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling
12	**Mining (Coal; Other Mining)**[10]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Pesticides, heavy metal, organic solvents/ volatile organic compounds (VOCs), acid-base, gas, particulate matter (total dust and respirable dust) *Dust (including fibre) in hotel; tourism; catering manufacturing process: paper powder, silica dust, asbestos fibre, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, etc.*	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Radiation syndrome - Chemical diseases (silicosis, asbestosis, coal lung disease, heavy metal poisoning, allergies, skin diseases, cancer, etc.) - MSDs	- Lux Light Meter - UV Meter - Radiation detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals	- Administrative control (e.g., legislation,SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) - Engineering control - Ergonomics in work station design - Ergonomics in machine and equipment design - Biological monitoring and health surveillance - Use of proper PPE

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer Posture Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Heat Stroke - Confined space illness and injury - Stress - Violence	- Suitable working measurement (working posture) - Types and quantities of microorganisms	(e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	- Specific policy (i.e., the new normal) - Baseline of workers' health examinations - Baseline of working condition measurement in workplaces - Counselling
13	Mechanical and Electrical Engineering	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, air pressure, electricity, radioactive/radiation Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Heavy metal, particulate matter (total dust and respirable dust) *Dust (including fibre) in mechanical and electrical engineering manufacturing process: heavy metal dust, silica dust, asbestos fibre, etc.* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector--borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Radiation syndrome - Chemical Diseases (silicosis, asbestosis, organic solvents poisoning, heavy metal poisoning, respiratory diseases, skin diseases, cancer, etc.)	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal)

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Vitamin Deficiency - MSDs - Heat Stroke - Confined space illness and injury - Caisson's Disease - Stress - Violence	- Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	(e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling
14	Media; Culture; Graphical	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Heavy metal, organic solvents/volatile organic compounds (VOCs), acid-base, gas, particulate matter (total dust and respirable dust) *Dust in Media; Culture; Graphical Manufacturing: e.g., heavy metal, paper powder.* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Radiation syndrome - Chemical diseases (heavy metal poisoning, organic solvents poisoning, respiratory diseases, skin diseases, cancer, etc.) - MSDs - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture)	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal)

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)		- Psychological assessment - Types and quantities of microorganisms	laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of workers' health examinations • Baseline of working condition measurement in workplaces • Counselling
15	Oil and Gas Production; Oil Refining[11]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Heavy metal, organic solvents/volatile organic compounds (VOCs),, acid-base, gas, particulate matter (total dust and respirable dust), chemicals explosion and fire *Dust (including fibre)in oil and gas production; oil refining manufacturing process: e.g., carbon powder, asbestos fibre.* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (e.g., vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Radiation syndrome - Chemical diseases (heavy metal poisoning, organic solvents poisoning, asbestosis, allergy, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat stroke - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)		- Types and quantities of microorganisms	biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling
16	Postal and Telecommunications Services	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, radioactive/radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemica hazards: heavy metal, organic solvents/volatile organic compounds (VOCs), acid-base, gas, particulate matter (total dust and respirable dust) *Dust in postal and telecommunications services process: e.g., paper powder, carbon powder.* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Radiation syndrome - Chemical diseases (heavy metal poisoning, organic solvents poisoning, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat stroke - Confined space illness and injury	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of biomarker concentration of exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical	- Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) - Engineering control - Ergonomics in work station design - Ergonomics in machine and equipment design - Biological monitoring and health surveillance - Use of proper PPE - Specific policy (i.e., the new normal) - Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Stress - Violence		biomarker concentration of exposed chemicals) Ergonomic examination: Posture examination Psychosocial examination: Psychological assessment	- Baseline of working condition measurement in workplaces - Counselling
17	Public Service	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Pesticides, heavy metal, organic solvents/ volatile organic compounds (VOCs), acid-base, gas, particulate matter (total dust and respirable dust) *Dust (including fibre) in Public Service Process: paper powder, carbon powder, heavy metal, silica, asbestos fibre, linin fibre, hemp fibre, jute fibre, cotton fibre, pollen, etc.)* Ergonomic hazard: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, leptospirosis, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (heavy metal poisoning, organic solvents poisoning, silicosis, asbestosis, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat Stroke - Confined space illness and injury	- Lux Light Meter - UV Meter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Stress - Violence		biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counseling
18	**Shipping; Ports; Fisheries; Inland Waterways**[12]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, air pressure, radioactive/ radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: all transported chemicals, fisheries chemicals, particulate matter (total dust and respirable dust), chemicals exposure and fire, biotoxin (e.g., snake, marine animals) *Dust (including fibre) in shipping; ports; fisheries; inland waterways process: silica dust, asbestos fibre, paper powder, carbon powder, etc.)* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (zoonoses, vector-borne diseases, leptospirosis, TB, influenza, SARS, - COVID-19, HIV, etc.) - Chemical diseases (chemicals poisoning, allergy, skin diseases, respiratory diseases, cancer, etc.) - Vitamin Deficiency - MSDs - Heat Stroke - Confined Space illness and injury - Caison's diseases	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - Wet Bulb Globe Temperature - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination - (General health examination) Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific Policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Stress - Violence		laboratory analytical biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling
19	**Textiles; clothing; Leather; Footwear**[9]	Physical hazards: injury, light, noise, vibration, heat, cold, humidity, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: heavy metal, organic solvents/volatile organic compounds (VOCs), pesticides, acid-base, gas, particulate matter (total dust and respirable dust) *Dust (including fibre) in textiles; clothing; leather; footwear manufacturing process: e.g. silica dust, linin fibre, hemp fibre, jute fibre, cotton fibre, etc.),* Ergonomic hazards: - Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.) - Computer posture	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (organic solvents poisoning, allergies, skin diseases, respiratory diseases, cancer, etc.) - MSDs - Heat Stroke - Confined Space illness and injury - Stress - Violence	- Lux Light Meter - UV Meter - Sound Level Meter - Vibration meter - Thermometer - Hygrometer - Wet Bulb Globe Temperature - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture)	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)		- Psychological assessment - Types and quantities of microorganisms	biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling
20	**Transport (including civil aviation; railway; road transport)**[3]	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, air pressure, radioactive/ radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: organic solvents/volatile organic compounds (VOCs), gas, particulate matter (total dust and respirable dust), chemicals explosion and fire, biotoxin (e.g., mushroom, snake, marine animals) *Dust (including fibre) in transport (including civil aviation; railway; road transport) process: silica dust, asbestos fibre, carbon powder, etc.)* Ergonomic hazards: Working posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious - Infectious diseases (vector-borne diseases, STIs, TB, influenza, SARS, Covid-19, etc.) - Chemical Diseases (silicosis, asbestosis, heavy metal poisoning, organic solvents poisoning, allergy, skin diseases, respiratory diseases, cancer, etc.) - Vitamin Deficiency - MSDs - Heat Stroke - Confined space illness and injury	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration Meter - Thermometer - Hygrometer - WBGT - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Types and quantities of microorganisms	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical biomarker concentration of risk-exposed chemicals)	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Caisson's disease - Stress - Violence		Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling
21	Transport Equipment Manufacturing	Physical hazards: Injury, light, UV, noise, vibration, heat, cold, humidity, air pressure, radioactive/ radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: silica, asbestos, Heavy metal, organic solvents/volatile organic compounds (VOCs), Particulate matter (total dust and respirable dust), chemicals explosion and fire, biotoxin (e.g., snake, marine animals) *Dust (including fibre) in transport equipment manufacturing process: heavy metal, silica dust, asbestos fibre, carbon powder, etc.* Ergonomic hazards: - Posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (vector-borne diseases, leptospirosis, STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical Diseases (silicosis, asbestosis, heavy metal poisoning, organic solvents poisoning, respiratory diseases, skin diseases, cancer, etc.) - Vitamin Deficiency - MSDs - Heat Stroke - Confined Space	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration Meter - Thermometer - Hygrometer - Wet Bulb Globe Temperature - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture) - Psychological assessment	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

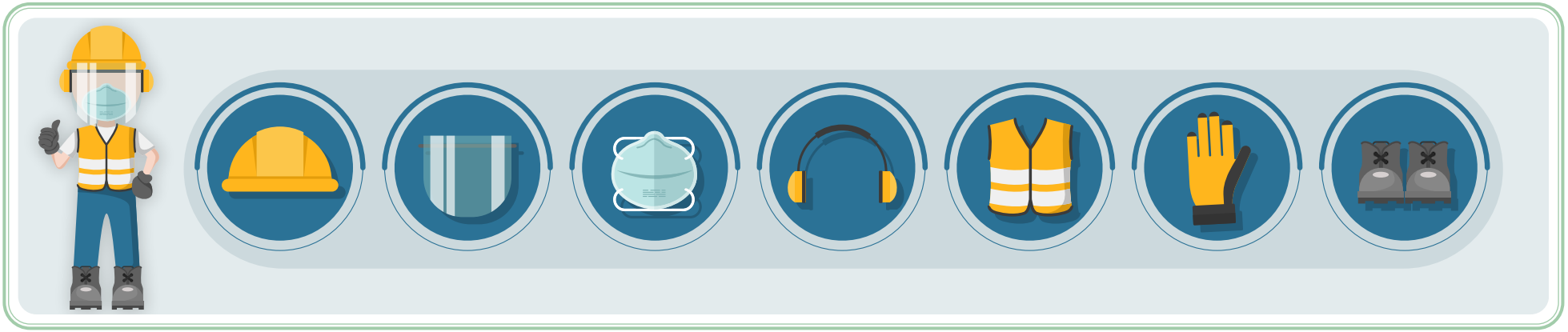
Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)	- Stress - Violence	- Types and quantities of microorganisms	biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling
22	**Utilities (Water; Gas; Electricity)**	Physical hazards: Injury, light, noise, vibration, UV, heat, cold, humidity, air pressure, radioactive/ radiation, electricity Biological hazards: Microorganisms (e.g., virus and bacteria) Chemical hazards: Silica, asbestos, gas, particulate matter (total dust and respirable dust), chemical explosion and fire, electric leak, electric shock *Dust (including fibre) in utilities (water; gas; electricity) process: silica dust asbestos fibre, heavy metal dust, etc.* Ergonomic hazards: Posture (static, awkward, repetitive movement, excessive load, forceful exertion, etc.)	- Accident & Injury - Hearing Loss - Degenerative eye - Infectious diseases (STIs, TB, influenza, SARS, COVID-19, etc.) - Chemical diseases (e.g., gas poisoning and chemical contaminants poisoning) - Burn, shock, cardiac arrest caused by an electric leak, and/or electric shock - MSDs - Heat Stroke - Confined space illness and injury - Stress - Violence	- Lux Light Meter - UV Meter - Radiation Detector - Dosimeter - Sound Level Meter - Vibration Meter - Thermometer - Hygrometer - Wet Bulb Globe Temperature - Chemicals properties - Measurement of chemical concentration and/or contaminant concentration 1) Area air sampling 2) Personal air sampling - Suitable working measurement (working posture)	Physical examination: - Audiometry - Vision test - Spirometry - Chest X – ray - Clinical examination Biological examination: - Biomedical testing - Respiratory system examination - Skin examination - Microorganism testing Chemical examination: - Screening test of the biomarker concentration of risk-exposed chemicals (e.g., reactive paper, test kit, and screening laboratory analytical	• Administrative control (e.g., legislation, SOPs, policies, enforcement, SDS, risk communication, warning sign, suggestion label, and training programme) • Engineering control • Ergonomics in work station design • Ergonomics in machine and equipment design • Biological monitoring and health surveillance • Use of proper PPE • Specific policy (i.e., the new normal) • Baseline of workers' health examinations

Table 4 The determination of the appropriate health examinations identified by the health hazards accompanied safety measures and control measures for health hazards (continued)

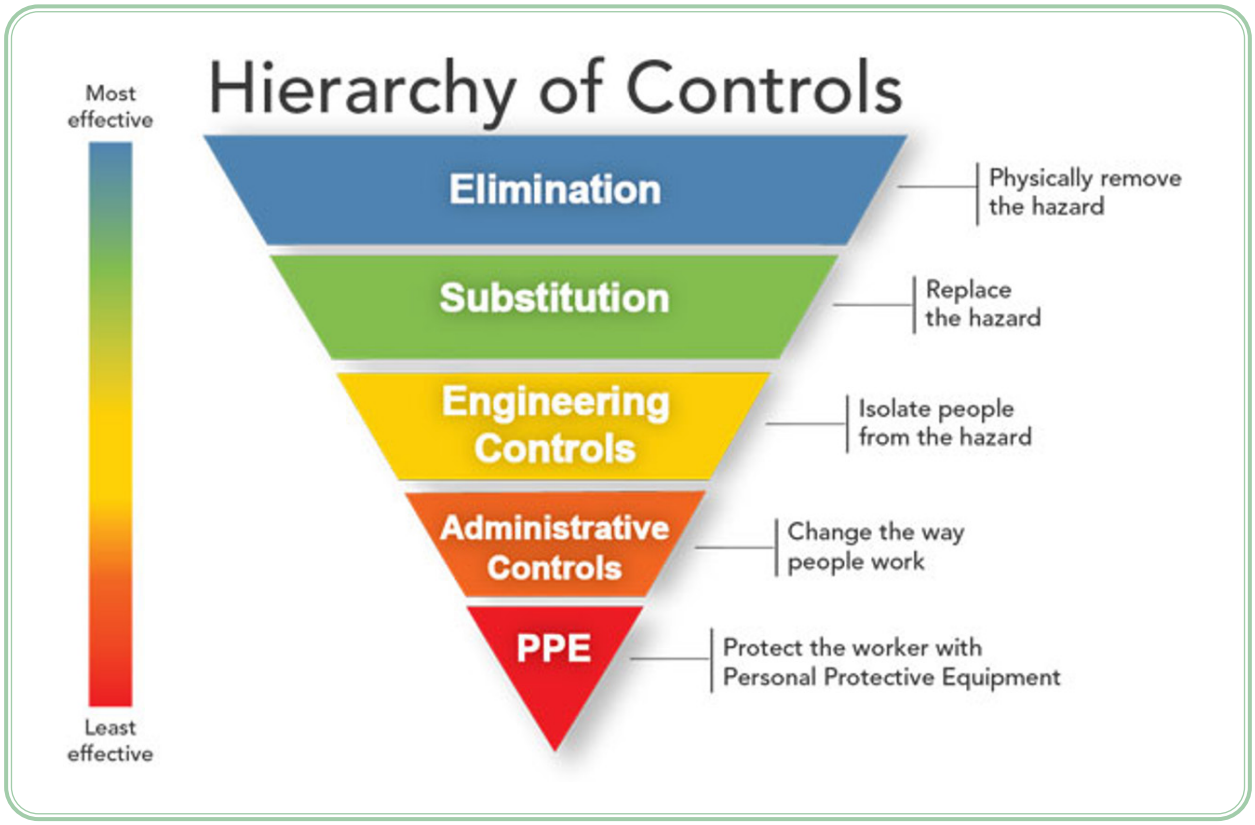
No.	Workplaces	Potential Hazards	Health Effect Outcome	Working conditions and Safety Measurements	Health Examinations (Screening)	Control Measures for Health Hazards
		Psychosocial hazards: - Stress (long working hours not enough rest periods, economy, business competitors, relevant policies, line of command, conflict among workers, conflict with customers, conflict with stakeholders, etc.) - Violence (e.g., use of force and sexual harassment)		- Psychological assessment - Types and quantities of microorganisms	biomarker concentration of risk-exposed chemicals) Ergonomics examination: Ergonomic assessment Psychosocial examination: Psychological testing and assessment	• Baseline of working condition measurement in workplaces • Counselling

Notes:
1) The superscription number (1) – (12) are illustrated on the industrial names and sectors. Their details are in the light orange label following "Table 1 The top-ranking health-hazardous workplaces defined by the industries and sectors following the International Labour Organization."
2) "Biomarker Concentration" means "concentration level of metabolite of chemical exposure and/or initial chemical exposure (depending upon laboratory potential on chemical analysis)."
3) "MSDs" means "Musculoskeletal Disorders or Musculoskeletal Diseases."
4) "Proper PPE" means "the selected PPE are based on the risk assessment and meet or are equivalent to standards approved by the American National Standards Institute (ANSI)."
5) "Reactive Paper" means "the testing paper containing the chemical reactive features will turn colour" (the definition of reactive paper for use in this guideline).
6) "Respirable dust" means "particulate matter in size ≤PM10."
7) "Safety Data Sheet (SDS)" or "Material Safety Data Sheet (MSDS)."
8) "SARS" means "Severe Acute Respiratory Syndrome."
9) "SOPs" means "Standard Operating Procedures."
10) "STIs" means "Sexually Transmitted Infections."
11) Zoonoses: anthrax, brucellosis, tularemia, Q fever, leptospirosis, etc.
12) The chemical concentration and contaminant measurement in working conditions (i.e., area air sampling and personal air sampling) should be proceeded with after pointing out the risk area and the risk worker.



2.3 Recommendation for Prevention and Control (Based on NIOSH)

As the importance of protecting workers' health increases, the concept of the National Institute for Occupational Safety and Health (NIOSH)[23] has becomes widely used in occupational health management. The concept illustrates the methodology that "controlling exposures to hazards in the workplace is vital to protecting workers. The hierarchy of controls is a way of determining which actions will best control exposures. The hierarchy of controls has five levels of actions to reduce or remove hazards. The preferred order of action based on general effectiveness is elimination, substitution, engineering control, and administrative controls. Using this hierarchy can lower worker exposures and reduce the risk of illness or injury." The hierarchy of controls is shown in Figure 2.



Note: Source of figure: from https://www.cdc.gov/niosh/topics/hierachy/default.htm.

Figure 2. Hierarchy of Controls.

The action based on general effectiveness are described below:

A. Elimination

Elimination is the method to remove the hazard at its source. This could include changing the work process to stop using a toxic chemical, a heavy object, or a sharp tool. It is the preferred solution to protect workers because no exposure can occur. If the process is still in the design or development stage, the elimination of hazards may be inexpensive and simple to implement. For an existing process, major changes in equipment and procedures should be required to eliminate the hazard.

[23] National Institute for Occupational Safety and Health (NIOSH), Center for Disease Control and Prevention (CDC), USA.

B. Substitution

Substitution is using a safer alternative to the source of the hazard. When considering a substitute, it's important to compare the potential new risks of the substitute to the original risks.

At the development stage, elimination and substitution may be the simplest and cheapest options. Another good opportunity to use elimination and substitution is when selecting new equipment or procedures. Prevention through Design is an approach to proactively including prevention when designing work equipment, tools, operations, and spaces.

C. Engineering Controls

Well-designed engineering controls can be highly effective in protecting workers, and they will typically be independent of worker interactions to provide this high level of protection. The initial cost of engineering controls can be higher than the cost of administrative controls, or PPE, but over the longer term, operating costs are frequently lower, and in some instances, it can provide cost savings in other areas of the process.

D. Administrative Controls

The administrative controls are aimed at reducing the duration, frequency, or intensity of exposure to hazards. The administrative controls may include work process training, job rotation, ensuring adequate rest breaks, limiting access to hazardous areas or machinery, and adjusting line speeds.

E. PPE

The personal protective equipment (PPE) is frequently used to minimize exposure to hazards where hazards are not particularly well controlled. The selection of proper PPE depends on the work process and is identified based on the risk assessment .The PPE programme should address workplace hazard assessment, employee training, and monitoring for continued effectiveness.

Administrative controls and PPE programmes may be relatively inexpensive to establish, but, over the long term, they can be very costly to sustain. These methods for protecting workers have also proven to be less effective than other measures, requiring significant effort by affected workers. The selected proper PPEs are based on the risk assessment and meet or are equivalent to standards approved by the American National Standards Institute (ANSI)" (OSHA 3151-02R, 2023).

Therefore, prevention and control based on occupational hazard exposure are illustrated in Table 5.

Table 5 Prevention and control based on occupational hazards exposure

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
1. Physical Hazard				
1.1	High exposure to light/ sunlight/ ultraviolet rays/ radiation.	- To design light and protection of ultraviolet rays and radiation at the work stations to adjust the suitable working conditions. - To provide the proper PPE for protection of workers' health while working in the manufacturing process.	- To adjust work stations. - To provide worker education regarding physical hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of physical concerns. - To provide regular maintenance of work stations. - To provide work instruction to workers.	- Eyes and face protection for exposure to the glare of light and ultraviolet rays (e.g., safety glasses and face shields) - Protective clothing from the sun and radiation - Safety gloves - Safety shoes
1.2	High exposure to lound noise.	- To design the working process to adjust to reduce the noise by fixing and tightening the equipment and machines. - To provide the proper PPE for protection of workers' health while working in loud noise conditions.	- To adjust work stations. - To provide worker education regarding physical hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of physical concerns. - To provide regular maintenance of work stations. - To provide work instruction to workers.	- Ears protection
1.3	Exposure to extream hot or cold temperatures (too hot or cold to work).	- To design working conditions to adjust to the suitable temperature. - To provide the proper PPE for protection of workers' health while working in extreme temperatures.	- To adjust work stations. - To provide worker education regarding physical hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of physical concerns. - To provide regular maintenance of work stations. - To provide work instruction to workers.	- Protective clothing - Safety gloves - Safety shoes

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
1. Physical Hazard (Continued)				
1.4	Exposure to unsuitable humidity.	- To design working conditions to adjust to the suitable humidity. - To provide the proper PPE for protection of workers' health while working in high or low humidity	- To adjust work stations. - To provide worker education regarding physical hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of physical concerns. - To provide regular maintenance of work stations.. - To provide work instruction to workers.	- Protective clothing - Safety gloves - Safety shoes
1.5	Exposure to unsuitable air pressure.	- To design working conditions to adjust to the suitable air pressure and protect workers' health from extreme air pressure. - To provide the proper PPE for protection of workers' health while working in high or low air pressure.	- To adjust work stations. - To provide worker education regarding physical hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of physical concerns. - To provide regular maintenance of work stations. - To provide work instruction to workers.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection and air respirator - Protective clothing - Safety gloves - Safety shoes
1.6	Exposure to vibration.	- To design a working process to reduce vibration. - To fix and tighten machines and equipment to reduce or stop vibration. - To manage the maintenance equipment. - To provide the proper PPE for protection of workers' health while working in conditions of vibration.	- To adjust work stations. - To provide worker education regarding physical hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working conditions measurements and periodic health examinations. - To manage early reporting of signs and symptoms of workers' health concerns. - To provide regular maintenance of work stations. - To provide work instruction to workers.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
2. Biological Hazards				
2.1	Bloodborne pathogens through contact with contaminated items and surfaces.	- To design and adjust the closed operating system. - To design and adjust the decontamination equipment - To separate infected workers from other workers. - To allow sick workers to stay for treatment (absence). - To provide vaccines for workers' health prevention. - To provide early detection of infection conditions for workers.	- To comply with all infection, prevention, and control (IPC) practices of WHO. - To provide immunization programmes for workers. - To provide worker education regarding biological hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working conditions measurements and periodic health examinations. - To manage early reporting of signs and symptoms of workers' health concerns.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes
2.2	Exposure to airborne biological agents through contact with secretions from infected clients (customers) (e.g., coughing and sneezing) or air contaminated with infectious biological agents.	- To design and adjust the closed operating system. - To design and adjust the decontamination equipment - To separate infected workers from other workers. - To allow sick workers to stay for treatment (absence). - To provide vaccines for workers' health prevention. - To provide early detection of infection conditions for workers.	- To comply with all infection, prevention, and control (IPC) practices of WHO. - To provide immunization programmes for workers. - To provide worker education regarding biological hazards, awareness, and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors - To manage safe work procedures, including periodic working conditions measurement and periodic health examinations. - To manage early reporting of signs and symptoms of workers' health concerns.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes
2.3	Exposure to biological contaminants from ventilation systems, water, or food in working conditions.	- To design and adjust the closed operating system. - To design and adjust the decontamination equipment - To manage the maintenance of ventilation systems.	- To manage infection prevention and control practices related to building maintenance and food preparation. - To provide worker education regarding biological hazards and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
2. Biological Hazards (Continued)				
		- To manage early spill clean-up. - To manage preventive maintenance of ventilation systems. - To manage water supply systems with regular testing to ensure proper functioning. - To manage early detection and remediation.	- To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of physical concerns. - To manage renovation projects to reduce contamination. - To provide work instruction to workers.	
3. Chemical Hazards				
3.1	Exposure to disinfectant and cleaning agents.	- To design and adjust the closed operating system. - To design and adjust the decontamination equipment. - To design and adjust the hoods for chemical mixing and exhaust hoods. - To design adequate general clean ventilation in the working areas. - To adjust the automatic contaminants diluting machines.	- To purchase the proper amount of disinfectant and cleaning agents in ready-to-use concentrations to minimize handling. - To manage housekeeping in the workplace and the working areas. - To provide worker education regarding chemical hazards and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of workers' health concerns. - To provide SDS sheets to workers. - To provide proper chemical storage concerning chemical compatibility. - To provide proper storage of products. - To provide work instruction to workers.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes
3.2	Exposure to laser printer emission, copier and links and other supplies.	- To maintain adequate clean general ventilation rate. - To locate printers and copiers away from room occupants.	- To purchase the proper amount of disinfectant and cleaning agents in ready-to-use concentrations to minimize handling. - To manage housekeeping in the workplace and the working areas. - To provide worker education regarding chemical hazards and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
3. Chemical Hazards (Continued)				
			- To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of workers' health concerns. - To provide SDS sheets to workers. - To provide proper storage of products. - To provide limit the number of printers and copiers in the room based on the general ventilation rate. - To provide work instruction to workers.	
3.3	Exposure to chemicals in the working process.	- To design the closed operating system. - To use chemical mixing and exhaust hoods. - To ventilate contaminated air and maintain adequate and proper air ventilation rate. - To adjust the automatic contaminants diluting machines. - To use less toxic chemical substitutes.	- To purchase the proper amount of chemicals in ready-to-use concentrations to minimize handling. - To manage housekeeping in the workplace and the working areas. - To provide worker education regarding chemical hazards and control strategies. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of workers' health concerns. - To provide SDS sheets to workers. - To provide proper storage of products with concerning chemical compatibility. - To provide work instruction to workers.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes
3.4	Exposure to scented products (may induce sensitizations).	- To use a closed operating system. - To ventilate contaminated air and maintain adequate and proper ventilation.	- To develop scent-free policies. - To post signage in working areas where affected workers work. - To manage housekeeping in the workplace and the working areas. - To provide worker education regarding chemical hazards and control strategies. - To provide self-assessment tools to assist workers in identifying and controlling risk factors.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
			- To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of workers' health concerns. - To provide proper chemical storage concerning chemical compatibility. - To provide proper storage of products concerning chemical compatibility. - To provide work instruction to workers.	- Eyes and face protection (e.g., safety glasses and safety goggles) - Respiratory protection - Protective clothing - Safety gloves - Safety shoes
4. Ergonomic hazards				
4.1	Ergonomic hazards associated with computer use.	To design ergonomic work stations, chairs, and equipment incorporate adjustable workstations to accommodate shared use by employees of various sizes.	- To adjust work stations and chairs to fit the user. - To provide worker education regarding ergonomic hazard and control strategies. - To manage housekeeping in the workplace and the working areas. - To provide work instruction to workers. - To provide worker education regarding ergonomic hazards and control strategies. - To manage ergonomic assessments in working areas. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of ergonomic concerns - To manage stretches and microbreaks (relaxation time, exercise time, and time for rest). - To adjust computer stations with an ergonomic design. - To manage the maintenance of work stations, chairs, and equipment.	- Eye protection for working with computer
4.2	Ergonomic hazards associated with material handling of equipment, furniture, and supplies including lifting, carrying , pushing, pulling, etc.	- To design storage areas with adequate space. - To use ergonomically designed equipment and furniture with appropriate casters and handles.	- To purchase standardized ergonomically designed equipment, furniture, and supplies. - To manage housekeeping in the workplace and the working areas. - To manage the maintenance housekeeping practices and minimize clutter and tripping hazards. - To manage the maintenance programme for equipment.	- Protective clothing - Safety gloves - Safety shoes

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
4. Ergonomic hazards (Continued)				
		- To use provision of appropriate materials handling equipment such as carts, trolleys, etc.	- To manage stretches and microbreaks (relaxation time, exercise time, and time for rest). - To provide work instruction to workers - To provide worker education regarding ergonomic hazards and control strategies. - To manage ergonomic assessments in working areas. - To manage self-assessment tools to assist workers in identifying and controlling risk factors - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of ergonomic concerns.	
4.3	Falling hazards associated with slips, trips, and falls	- To install anti-slip floor. - To design stairwells according to accepted safety standards. - To ensure adequate lighting.	- To design and adjust flooring, stairwells, hallways, handrails, etc. - To manage housekeeping in the workplace and the working areas. - To manage the maintenance housekeeping practices and minimize clutter and tripping hazards. - To inspect ladders prior to use. - To perform regular maintenance on flooring, stairwells, hallways, handrails, etc. - To manage stretches and microbreaks (relaxation time, exercise time, and time for rest). - To provide work instruction to workers. - To provide worker education regarding ergonomic hazards and control strategies. -- To manage ergonomic assessments in working areas. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of ergonomic concerns. - To implement a spill cleanup program that includes prompt spill cleanup, the use of warning signs, etc.	- Protective clothing - Safety gloves - Safety shoes

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
4. Ergonomic hazards (Continued)				
4.4	Cuts from sharp instruments, including scissors and box cutters.	- To avoid using sharps when required proper storage of sharps.	- To manage the purchasing standards for ergonomically designed equipment and suitable sizes of equipment for workers. - To manage housekeeping in the workplace and the working areas. - To manage stretches and microbreaks (relaxation time, exercise time, and time for rest). - To provide work instruction to workers. - To provide worker education regarding ergonomic hazards, awareness, and control strategies. - To manage ergonomic assessments in working areas. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage stretches and microbreaks (relaxation time, exercise time, and time for rest). - To manage early reporting of signs and symptoms of ergonomic concerns.	- Protective clothing - Safety gloves - Safety shoes
5. Psychological Hazards				
5.1	Depression, anxiety, sleep disorders, other mental illnesses as response to excessive workplace stressors	- Line of command - Persons at the workplace - Clients (customers) - Stakeholders	- To provide worker education regarding psychological hazards, awareness, and control strategies about the signs of depression, symptoms of depression, other mental illnesses, and elimination of the workplace risk factor. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage safe work procedures, including periodic working condition measurements and periodic health examinations. - To manage early reporting of signs and symptoms of ergonomic concerns. - To provide support services and programmes, benefit plans provision, and effective return to work programmes. - To support system communication with family physician. - To provide counseling.	* The proper PPE depends on the type of work and risk factors.

Table 5 Prevention and control based on occupational hazards exposure (continued)

No.	Potential hazards	Solution at the exposure pathway	Prevention measures	Personal protective equipment (PPE)
5. Psychological Hazards (Continued)				
5.2	Stress related to work-life conflict.	- Employer, head of group, co-workers, family, cousin and friends	- To manage policies and procedures that support rest time and life balance (e.g., voluntary reduced hours, job sharing, and paid and unpaid leaves). - To provide work designs to address workload and work demand issues for solution management. - To manage the reliance on paid and unpaid overtime reduces supportive management culture. - To manage the work-life balance policies and programme and communicate with workers. - To manage the social support systems in place. - To provide worker education regarding psychological hazards, awareness, and control strategies about the signs and symptoms of depression, other mental illnesses, elimination of the workplace risk factor. - To manage self-assessment tools to assist workers in identifying and controlling risk factors. - To manage suitable work procedures for workers. - To manage early reporting of signs and symptoms of ergonomic concerns. - To assist workers in identifying and controlling risk factors. - To provide counseling.	* The proper PPE depends on the type of work and risk factors.

Notes: 1) "PPE" means "Personal Protective Equipment"; "Working Conditions Measurement" means "Working Environment Measurement"; "Health Examination" means "Physical Examination"; "Safety Data Sheet (SDS)" means "Material Safety Data Sheet (MSDS)"; "Safety Glasses" means "Safety Spectacles."

2) Infection prevention and control (IPC) is a practical, evidence-based approach to preventing patients and health workers from being harmed by avoidable infections (defined by the WHO).

3) The proper use of PPE is based on the risk assessment and meets or is equivalent to standards approved by the American National Standards Institute (ANSI)" (OSHA 3151-02R 2023).

4) The standard PPE follows the Occupational Safety and Health Administration (OSHA) requirements for PPE as set forth in the Code of Federal Regulations (CFR).

5) The periodic working condition measurement should be provided for workers at least twice per year (semiannual).

6) The periodic health examinations (general medical examination and health examination by risk factors) should be provided for workers at least once per year.

7) The occupational hazards and controls for health care administrative workers should follow the handbook occupational hazards and controls for health care administrative workers, Government of Alberta, 2011.

8) The selection of the proper PPE should follow the NIOSH directory of personal protective equipment, National Institute for Occupational Safety and Health (NIOSH), 2021; Personal Protective Equipment, Occupational Safety and Health Administration (OSHA), 2023; Hazards, Canadian Centre for Occupational Health and Safety (CCOHS), 2023.

ASEAN Guideline on Occupational
Health Surveillance Criteria
at the Workplace

CHAPTER 3
MONITORING OF SICKNESS ABSENCE FROM WORK

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MONITORING OF SICKNESS ABSENCE FROM WORK

3.1 Introduction

Sickness and absences from work are often unavoidable. But when unduly prolonged, it is wasteful and damaging to individuals and their families, employers, and our wider society. Staff are a valuable resource, and their health and wellbeing are important. From the viewpoint of the organization, predictable patterns of attendance and low levels of absence are critical to managing workflow and ensuring the efficient and timely delivery of services. Staff sickness and absence are the primary contributors to non-attendance.

3.2 Objectives

- To assist managers and employees in maintaining an optimum level of attendance at work.
- To ensure that non-attendance due to sickness is managed effectively and that employees who are absent due to illness are treated fairly and sensitively.
- To identify the roles and responsibilities of both managers and employees.

3.3 Definition of Terms

- Sickness is defined as any morbid condition, whatever its cause (following R 134, Medical Care and Sickness Benefits Recommendation, No. 134, 1969).
- Sickness absence is defined as a day or a period of days when an employee is unable to attend work because they are ill or they have been advised to refrain from work for health reasons.
- Monitoring of sickness absence from work provides an occasion for sickness, and absence is an unbroken period of time off.
- Short-term sickness is defined as intermittent episodes of absence lasting a day or a period of sickness lasting less than four consecutive weeks.
- Long-term sickness absence is defined as a period of unbroken sickness absence lasting four weeks or more.

3.4 Scope

This guideline applies to all employees, and it should be in conjunction with other health and attendance-related policies, where relevant, except for the following groups: maternity leave, career leave, any periods of absence agreed upon under family-friendly policies, and any pre-agreed periods of absence to receive treatment.

3.5 Roles and Responsibilities among Employees, Line Managers, and Human Resources

3.5.1 Employees

- Employees should attend work and perform the duties of their post unless they have an authorized absence, for example, sickness absence, parental leave, or annual leave.
- Employees should not attend work if they are unwell or unfit, if, in so doing, they would affect their health and the health of others.
- Employees should be aware of and comply with this sickness absence procedure and any locally agreed sickness absence reporting arrangements within their department.
- Employees should make sure that they know whom to contact when reporting an absence. Their contact person may be, for example, their supervisor, line manager, or department manager.
- Employees are responsible for notifying their manager or nominated person of their sickness absence. Employees should keep in touch with them, attend meetings as appropriate, and following the manager's advice throughout their sickness absence.
- Employees should immediately inform their manager or nominated person if they think their sickness absence is work-related, for example, as a result of an incident or accident at work. They should also complete an incident form.
- If employees have come into contact with an infectious disease, they must notify their line manager immediately so that reasonable steps can be taken to protect their colleagues when necessary.
- Employees should submit a "Fit Note" to their manager or nominated person within the times frames detailed in their local reporting arrangements.
- Employees should attend an occupational health appointment if reasonably requested by their manager. This may be while they are off sick. However, managers can require that staff attend occupational health at any time if they are sufficiently concerned about their well-being.
- Employees should not unreasonably withhold their consent for Occupational Health to approach their consultant for further information where this will inform any decision-making.
- Employees should meet with their manager on their return in order to discuss the reason for their absence and to ensure that they are fit enough to resume their duties. This meeting is referred to as a return to work discussion.

3.5.2 Line Managers

The line managers will:

- Be sensitive to the needs of all employees, including underrepresented groups. This includes ensuring that messages and explanations are given using plain language and are easily understood.
- Ensure that they implement local arrangements for reporting sickness absences in their area.
- Arrange the receipt and retention of all medical certificates submitted by staff on the employee personnel file.
- Ensure that all sickness absences are properly and promptly recorded each month on the payroll sheets and returned to the Payroll Department/Unit for closure.
- Ensure that the sickness absence records of all staff members are reviewed regularly and appropriate action is taken as necessary.

- Maintain contact with those who are absent for short-term and long-term sickness in a sensitive manner and to an extent that is reasonable in the circumstances.
- Ensure that employees are contacted for a brief return to work discussion when they return to work following a period of sickness absence.
- Obtain medical advice about an employee's ability to carry out their job using the information provided in the "Fit Note" and referring to the "Occupational Health Service" where appropriate.
- Ensure employees are made fully aware of any reasons for referrals to the occupational health service and, wherever practicable, will act upon advice received from them.
- Review sickness information provided by human resources and management data, ensuring robust follow-up action in line with this policy.

3.5.3 Human Resources

The Human Resources Department will:

- Advise on the management of individual cases as appropriate.
- The support manager is in close liaison with the Occupational Health Service in adopting a range of options that can facilitate a healthy workplace and return to work programmes.
- Provide absence statistics to the Governance Committee.

3.6 Sickness Absence Management and Procedure

3.6.1 Absence Notification and Certification

- Where an employee is prevented from attending work due to ill health, they must notify their line manager (or other designated person) before their normal starting time or, where this is not reasonably practicable, within one hour in order that appropriate cover can be arranged.
- When reporting an absence from work, the reason for the absence and likely duration should be given.
- The line manager should also be made aware of any outstanding work commitments that will need to be attended to.
- It is generally expected that employees will contact the line managers to report their absences themselves in order to ensure that a dialogue can take place.
- Failure to report an absence within a reasonable period of time without due cause will be treated as an unauthorized absence.
- Where an employee has failed to contact their line managers within the specified timeframe, the line manager may attempt to contact him to ascertain the reason for his absence.
- Where an absence is likely to last more than one day and the employee is unsure as to when they expect to be well enough to return to work, they should agree with their line manager when they will next be in contact to provide an update. In this situation, where illness persists for several days, the employee must contact their line manager no later than the fourth day of that absence.
- On being notified that a member of their team is absent from work due to ill health, the line manager (or designated person) will input the relevant details into "Record Absence Details."

- Absences continuing beyond 7 calendar days (medical certification):
  - Where the absence continues or is likely to continue beyond 7 calendar days (inclusive of Saturdays and Sundays), the employee must forward a General Practitioner (GP) Statement of Fitness for Work (i.e., a 'medical fit note') or, where appropriate, a hospital certificate to their line manager (or designated person) as soon as possible to cover the period of absence beyond the seventh calendar day.
  - Medical fit notes must be submitted at regular intervals to fully cover the absence.
  - If an employee anticipates a delay in submitting the fit note, they must notify their line manager prior to the expiration of their most recent fit note.
  - Unjustifiable delays in returning medical fit notes or gaps in coverage may result in sickness payments being stopped or suspended.
  - Where a possible return to work date has been indicated and this is then subject to change, the employee should inform their line manager of this as soon as practicable, supported by a further medical fit note (see Appendix I: Flowchart of the Sickness Absence Process).

3.6.2 Maintaining Contact during Absence

- Employees must be contactable at reasonable times during periods of sickness absence, and they may be required to attend meetings, for example, an occupational health review, in order that support for the individual employee and advice to the line manager can be provided.
- Where, during a period of absence, an employee resides at a different location from the address specified in their employment record, they must notify their line manager in order that the contact can be available.
- The frequency and mode of contact during a period of absence will depend on the nature and likely duration of the absence, and it should be agreed upon between the line manager and employee.
- However, where an absence is of a long-term nature, contact should be at least monthly.

3.6.3 Return to Work

- On return to work following any period of sickness, the line manager will arrange to conduct a return to work discussion with the employee.
- Following a one-off short-term absence, this meeting will generally be informal and will give the line manager the opportunity to check that the employee has fully recovered and update them on any relevant work-related matters or developments.
- Following a prolonged absence, or where the level and/or frequency of absence are causing concern, this discussion may become more formal.

3.6.4 Work-Related Absence

1) Work-related accident:

- Where a member of staff has had an accident at work resulting in his absence, they must notify their line manager immediately concerning the incident or at the earliest possible opportunity thereafter.
- Having been informed of the incident, the line manager should notify the head of the department/unit and the local safety coordinator and must ensure that the matter is reported to the responsible department/unit via an incident reporting system.
- To comply with legally prescribed time limits for the reporting of certain incidents, the incident reporting form must be returned to SEPS within 5 working days (or immediately where the accident is of a more serious nature).

2) **Work-related ill health:**

- Where it is indicated that an absence may be the result of a work-related condition, for example, work-related stress or a musculoskeletal condition, the manager should be notified, and the management referral to Occupational Health Advisor ("OH" in Figure 4. Flowchart of sickness absence management (ANNEX 4).
- "Flowchart of Sickness Absence Management" should be arranged as soon as practicable in order that the situation can be assessed, and any appropriate action should be taken.

3.6.5 Frequent Short-Term Absences: The Bradford Score

- Many absences are caused by minor ailments, and employees are able to return to work quickly. However, where the pattern of short-term absence develops, it should be investigated by the manager to establish whether there is an underlying cause.
- To help maintain a fair and consistent approach, the manager assesses, quantifies, and measures attendance levels through the use of the "Bradford Score."
- When an employee's Bradford Score[24] reaches 108 points, or any other methods that meets the organizational agreement, in any twelve-month period (prorated salary for part-time staff), their line manager will review their absence record, consider any mitigating circumstances, and determine whether supportive measures need to be put in place.

3.6.6 Long-Term Absence

- A continuous absence lasting 4 weeks or more is defined as long-term.
- The department seeks to be supportive when assisting employees who are off work through long-term sickness absences and flexible in managing their return to work.

3.6.7 Sickness Payment

- Subject to the notification and certification procedures outlined above, employees will receive sickness payment for the period of one sixth of their full salary and one sixth of their half salary, up to a maximum period of six months at full salary followed by an equal period at half salary.
- The method of calculating sick leave is detailed in the employee's terms and conditions of employment.
- Further details are provided within the organizational agreement.
- Third-party liability:
  - Where an employee is absent from work as a result of an accident or injury sustained whilst away from work and this was caused by another person (e.g., a car accident), damages for loss of earnings may be recoverable from the person who caused the accident, i.e., the 'third party'.
  - In such cases, the organization will seek to reclaim any sickness pay, which may be recovered from the third party.
  - For procedural payroll details, the employee should contact the organizational human resources unit.

[24] Bradford score or the Bradford scale, is a human resource tool, usually used as a disciplinary tool for sickness absence specific type of absenteeism measurement. (https://www.unison.org.uk/content/uploads/2014/09/TowebFact- Sheet-on- the-Bradford-Factor2.pdf).

3.6.8 Sickness during Annual Leave

- Employees who fall sick during a period of annual leave will be permitted to reclaim those days lost through illness if their absence is in the organizational agreement of a responsible and medically certified.
- This period of absence will then be recorded as sickness absence or sick leave.
- The requirement to provide a medical fit note applies even where the absence is less than 7 days.

3.6.9 Abuse of Process

Unless there is a satisfactory reason, if an employee fails to notify their manager about their absences or fails to provide a medical certificate, they will not be paid for those days of that absence. It will also be recorded as 'unauthorized'. Unauthorized absence (without good reason) constitutes a breach of contract. Backdated certificates will not be accepted unless there are exceptional circumstances.

Unless there are exceptional circumstances, abuse of this policy or failure to follow these or any local guidelines will result in an investigation in accordance with the organization's disciplinary policy and procedure.[25]

3.6.10 Audit

It is the manager's responsibility to check the certification of both self-certified and fit notes. Human Resources will assist and advise on short-term and long-term cases, liaising with managers where appropriate to ensure compliance with this policy.

3.6.11 Review

This guideline and procedure should be reviewed after 4 years or earlier at the request of either staff or management.

[25] Organization, which is assigned to be responsible for managing.

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ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace

ANNEXES

ANNEXES

ANNEX 1 THE WALK-THROUGH SURVEY TEAM

The walk-through survey team for occupational health surveillance is the key team responsible for identifying health hazards, risk assessment, and evaluation of the ability of the owner of the workplace to prevent and control occupational health diseases. Therefore, the criteria of the minimum requirement standard of the walk-through survey team for occupational health surveillance are as below:

1. The multidisciplinary team is composed of an occupational medicine, an occupational nurse, an industrial hygienist, and a toxicologist who has ever been trained inn walk-through surveys, accompanied by a safety officer or the responsible person to process the manufacturing of the workplace;
2. If there are not enough staff on the team as required in "1," the team should be at least composed of an industrial hygienist, a safety officer, and a responsible person to process the manufacturing of the workplace;
3. The walk-through survey team is the inspector team, which takes on the role of assessors or examiners for health surveillance at the workplace.

ANNEX 2 THE TYPES OF EQUIPMENT FOR THE WALK-THROUGH SURVEY

The Types of Equipment for the Walk-Through Survey

The tools for the walk-through survey are comprised of: a) the walk-through survey team; b) the knowledge of each inspector in the walk-through survey team (i.e., structure of the workplace, processing manufacturing, structure, risk area, source of hazards, potential routes of exposure, work habits of the population); c) the use of sensory information (smell, hearing, vision, touching) during site visits; d) the standardized portable equipment, including PPE. Therefore, the equipment for the walk-through survey should be portable and easy to use for direct measurement. The types of portable equipment for walk-through surveys at the workplace are listed according to minimum requirements in Table 6 below.

Table 6 **The minimum requirement lists the types of portable equipment by following the measurements for the walk-through survey at the workplace**

Types of Measurement	Types of Equipment
Light intensity	Lux light meter (Lux meter or Light meter)
Noise level	Sound level meter
Cumulative noise-exposure	Noise dosimeter
Temperature level	Thermometer
Heat stress index	Wet bulb globe temperature (WBGT) meter
Humidity level	Hygrometer or Moisture meter or Humidity meter
Air pressure level	Barometer
Gas Concentration	Gas detector
Time rate of change of velocity	Vibration meter
pH level	pH detector or pH meter
Concentration of chemicals contaminated in the indoor air	Chemicals contamination detector in the ambient air
Concentration of chemicals contaminated on the surface area	Chemicals contamination detector on the surface area
Radiation measurement	Radiation detector
Radiation dose	Radiation dosimeter badge (indirect reading) Dose meter or Pocket dosimeter (direct reading)
Hazards identification	Walk-Through Survey Form

Notes: 1) The portable equipment (including PPE) should be standardized type.
2) The selected portable to use should depend on the type of workplace and working process.
3) The inspectors should use the proper PPE for protect themselves.

Figure 3. Pictures of Sample Portable Instruments (source of pictures: https://www.google.com/).

ANNEX 3 WALK-THROUGH SURVEY AT THE WORKPLACE FORM

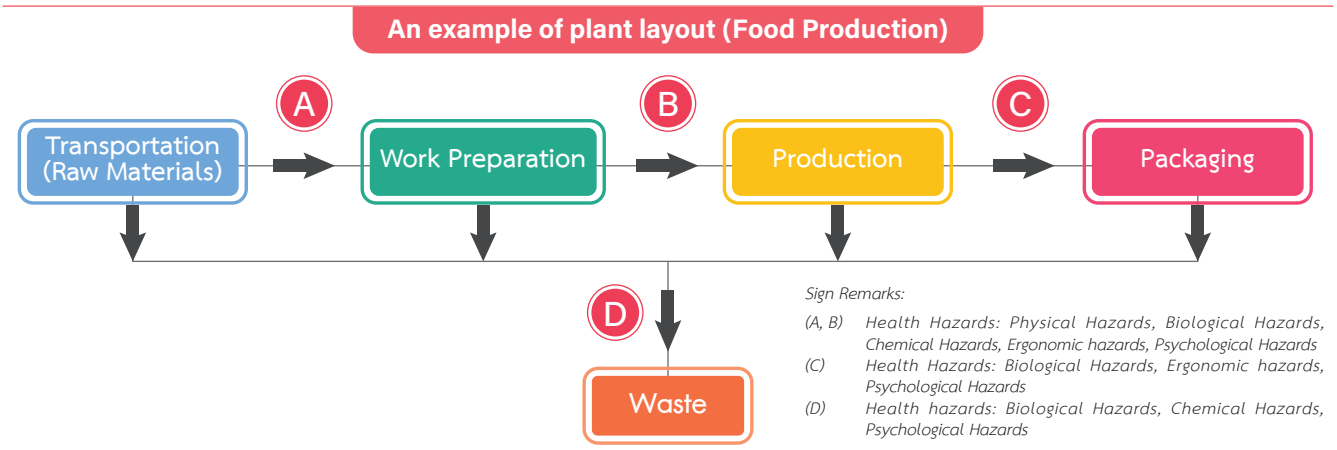
Elucidation:

1. The walk-through survey form[26] is aimed at being a simple tool for the identification of occupational health hazards in the manufacturing process in workplace in both the formal and informal sectors;
2. The recommended accompanying tools are a camera, mobile equipment, and direct reading tools to measure the environmental working conditions;
3. The walk-through survey team is strongly recommended to be "the multidisciplinary team," which should consist of a public health officer, a safety officer, and the assigned or designated responsible person of the process plant;
4. The leader of the walk-through survey team should be a public health technical officer who is an occupational health professional;
5. The summary and conclusion data that is filled out in the main walk-through survey form to present to the manager or owner is the final result of brainstorming among officials in the team.

Information for the Walk-Through Survey:

1. **General Information about the Workplace:**
   - 1.1 Name (workplace/company) .....
   - 1.2 The owner name or manager name .....
   - 1.3 The address of the workplace .....
   - 1.4 The type of sector, e.g., manufacturing, ...
   - 1.5 The type of sector (formal sector or informal sector) .....
   - 1.6 The material usage in the production process (described in details: type of chemical, type of equipment, etc.)
     .....
   - 1.7 The main output product.....
   - 1.8 The by-product output .....
   - 1.9 The number of workers [divided by gender (male/female)].....
   - 1.10 The number of shift work, number of workers in each shift work, and timeline of each shift work .....
     .....

2. **The plant layout of the workplace and product processing (drawing and/or taking photographs and strictly writing the sign or symbol for the risk exposure to health hazards)** (an example of plant layout as shown below).



[26] The walk-through survey at the workplace form is applied to the ILO concept, accompanied by some practical forms, and has been agreed upon by AMS.

3. Health information and health service in the workplace:

3.1 The overview evaluation

- ❑ Enough
- ❑ Not enough
- ❑ Standardized health service
- ❑ Not standardized health service

3.2 The place for health service in the workplace

- ❑ Having the medical room
- ❑ Having the patient transferring system to the nearby hospital
  (please indicate the name of the hospital .....)

3.3 The medical personnel

1) Medical doctor
   - ❑ Part time
   - ❑ Full time

2) Nurse
   - ❑ Part time
   - ❑ Full time

3) Others (please indicate .....)
   - ❑ Part time
   - ❑ Full time

3.4 The safety, occupational, and environmental working condition persons (e.g., safety officer, committee concerning with safety and occupational and environmental working condition)

- ❑ Having (please indicate .....)
- ❑ No

3.5 Workers' heath examination

1) Pre - employment medical examination
   - ❑ Having (please indicate .....)
   - ❑ No

2) Annual medical examination
   - ❑ Having (please indicate .....)
     If you select this answer please continuously answer 2.1 – 2.5
   - ❑ No

   2.1) General health examination
   - ❑ Having (please indicate .....)
   - ❑ No

   2.2) Health examination by risk factor
   - ❑ Having (please indicate .....)
   - ❑ No

   2.3) Medical counselling
   - ❑ Having (please indicate the responsible counselling persons)
     (medical doctor or nurse or both by case .....)
   - ❑ No

   2.4) Patient transferring system
   - ❑ Having (please indicate .....)
   - ❑ No

   2.5) Informing the health examination results to the workers
   - ❑ Having (Please indicate .....)
   - ❑ No

4. The environmental working measurement (the working condition measurement)

4.1 Personal sampling

- ❑ Having (please indicate the method of sampling, type of health hazards sampling, reference the usage of standard safety value, and the number and amount of over and under the usage safety value)
- ❑ No

4.2 Working condition sampling

- ❑ Having (Please indicate the method of sampling, type of health hazards sampling, reference the usage of standard safety value, and the number and amount of over and under the usage safety value)
- ❑ No

5. The information of sanitation and hygiene

5.1 The overview evaluation

- ❑ Enough
- ❑ Standardized sanitation and hygiene
  (please indicate the standard .....)
- ❑ Not standardized sanitation and hygiene
- ❑ Not enough

5.2 Drinking water

1) Place: Near the risk place
   - ❑ Yes
     (please indicate the standard .....)
   - ❑ No

2) The quality of drinking water
   - ❑ Standardized drinking water
     (please indicate the standard .....)
   - ❑ Not standardized drinking water

5.3 The toilet room (restroom), the washing room, and the changing clothes room

1) Providing the toilet room (restroom)
   - ❑ Yes
     If yes, please answer the following the answer

   1.1) Separating between male and female
   - ❑ Yes (please indicate the number of toilet rooms (restrooms) per male and female worker .....)
   - ❑ No

   1.2) The time schedule for cleaning the toilet
   - ❑ Yes (please indicate the method for cleaning .....)
   - ❑ No

2) Providing the washing room
   - ❑ Yes
     If yes, please answer the following question

2.1) Separating between male and female

❑ Yes (please indicate the number of washing rooms per amount of male workers and female workers .....)

❑ No

2.2) The time schedule for cleaning the washing room

❑ Yes (please indicate method for cleaning .....)

❑ No

3) Providing the changing clothes room

If yes, please answer the following question

3.1) Separating between male and female

❑ Yes (please indicate the number of the changing clothes room per male and female worker .....)

❑ No

3.2) Enough for using

❑ Enough ❑ Not enough

3.3) The time schedule for cleaning the changing clothes room

❑ Yes (please indicate method for cleaning .....)

❑ No

4) The hand washing

❑ Yes

If yes, please answer the following the question

4.1) Separating between male and female

❑ Yes (please indicate the number of the handwashing per male and female worker .....)

❑ No

4.2) Enough for using

❑ Enough ❑ Not enough

4.3) The time schedule for cleaning the the hand washing

❑ Yes (please indicate the method for cleaning .....)

❑ No

6. The PPE

❑ Yes

If yes, please answer the following the question

1.1 Enough

❑ Yes (please indicate the type of PPE.....)

❑ No

1.2 Standardized of PPE

❑ Yes (please indicate the standard for the usage PPE.....)

❑ No

7. The air ventilation

❑ Yes Indicate .....

(If yes, please indicate the type and/or method of ventilation)

❑ No

8. **The safety measures**

❑ Yes Indicate .....

(If yes, please indicate the type and/or method of safety measures, e.g., measure, laws/legislation, separating room, keeping distance of pathway between source and receiver, ventilation, covering, remote control, and low toxic substance replacement/substitution)

❑ No

9. **The administrative control**

❑ Maintenance

❑ Occupational health and safety training

❑ Human resource management (put the right man into the right job)

❑ Suitable working time arrangement

❑ Others (please described in detail.....)

10. **The relevant addition information (If any)**

.....

.....

.....

11. **Risk assessment**

11.1 The table for severity level calculation

Table of Matrix for Severity Level Calculation

No.	Manufacturing Process	Source of Hazards	Hazards (I)	Health Effects (II)	Prevention and Control Measures (III)	Number of Risk Persons (IV)	Severity Level (I+II+III+IV)

Notes: 1) Hazards: the ranking level of hazards depends on the number of types of hazards, such as the level of two types of hazards (i.e., chemical hazard and biological hazard) is "2."
In this table, the high level is caused by three main types of hazards: 1) physical hazards, 2) biological hazards, and 3) chemical hazards.

2) Health effects: 3 = carcinogen, explosion; 2 = effects on some important organs or systems; and 1 = irritation.

3) Prevention and control measures: "3" means "<80% of no measures and/or unsuitable PPE"; "2" means "80%-90% of suitable prevention and control measures and/or suitable PPE"; and 1 means ">90% of some prevention and control measures and control measures and/or suitable PPE."

4) Number of risk persons: "3" means ">50% of workers in the workplace"; "2" means "20%-50% of workers in the workplace"; and "1" means "<20% of workers in the workplace."

5) The severity level: 9-12 = high level; 5-8 = medium level; and 1-4 = low level.

6) If there are either ergonomic or psychological factors contributing to more than three main hazards in the manufacturing process, the high severity level is still pointed out.

7) If there is either a carcinogen or an explosion, the high severity level should be indicated.

8) The "Matrix for Severity Level Calculation" is agreed upon by AMS.

11.2 The table for risk level calculation

Opportunity	Risk Level (Opportunity Level X Severity Level)		
	Severity Level		
	High (3)	Medium (2)	Low (1)
High (3)	Not Acceptable (9)	High Risk (6)	Medium Risk (3)
Medium (2)	High Risk (6)	Medium Risk (4)	Acceptable Risk (2)
Low (1)	Medium Risk (3)	Acceptable Risk (2)	Low Risk (1)

Notes: 1) "Opportunity" means "frequency occurrence of harm."

2) Opportunity level: "Low opportunity (1)" = "not applicable" means "opportunity < 5% per year"; "Medium Opportunity (2)" = "Likelihood or Probable" means "opportunity 5%–50% per year"; "High Opportunity (3)" = "Almost Certain" means "opportunity > 50% per year." Therefore, the frequency of occurrence; and the percentage of occurrence depend on the agreement in each organization.

3) "Severity Level" means "Degree of Effects." (regarding to 11.1).

4) "Risk Level" means "Degree of Risk from Working": "Low Risk" means "the workplace achieves minimum requirement for good management of the manufacturing process and health surveillance, so there the are some risks that do not have many health effects, and it is easy to manage to improve prevention and control"; "Acceptable Risk" means "the workplace has a risk that can be able to quickly managed for prevention and control improvement"; "Medium Risk" means "management is required for prevention and control soon"; "High Risk" means "management is quickly required to improve prevention and control"; "Not Acceptable Risk" means "the immediate requirement to manage prevention and control."

5) The "Matrix for Risk Level Calculation" is applied to the risk assessment matrix of the AMS agreement.

12. Suggestion

.....

.....

The Surveyor Name (First Name and Family Name): .....

Position: .....

Institution: .....

Address: .....

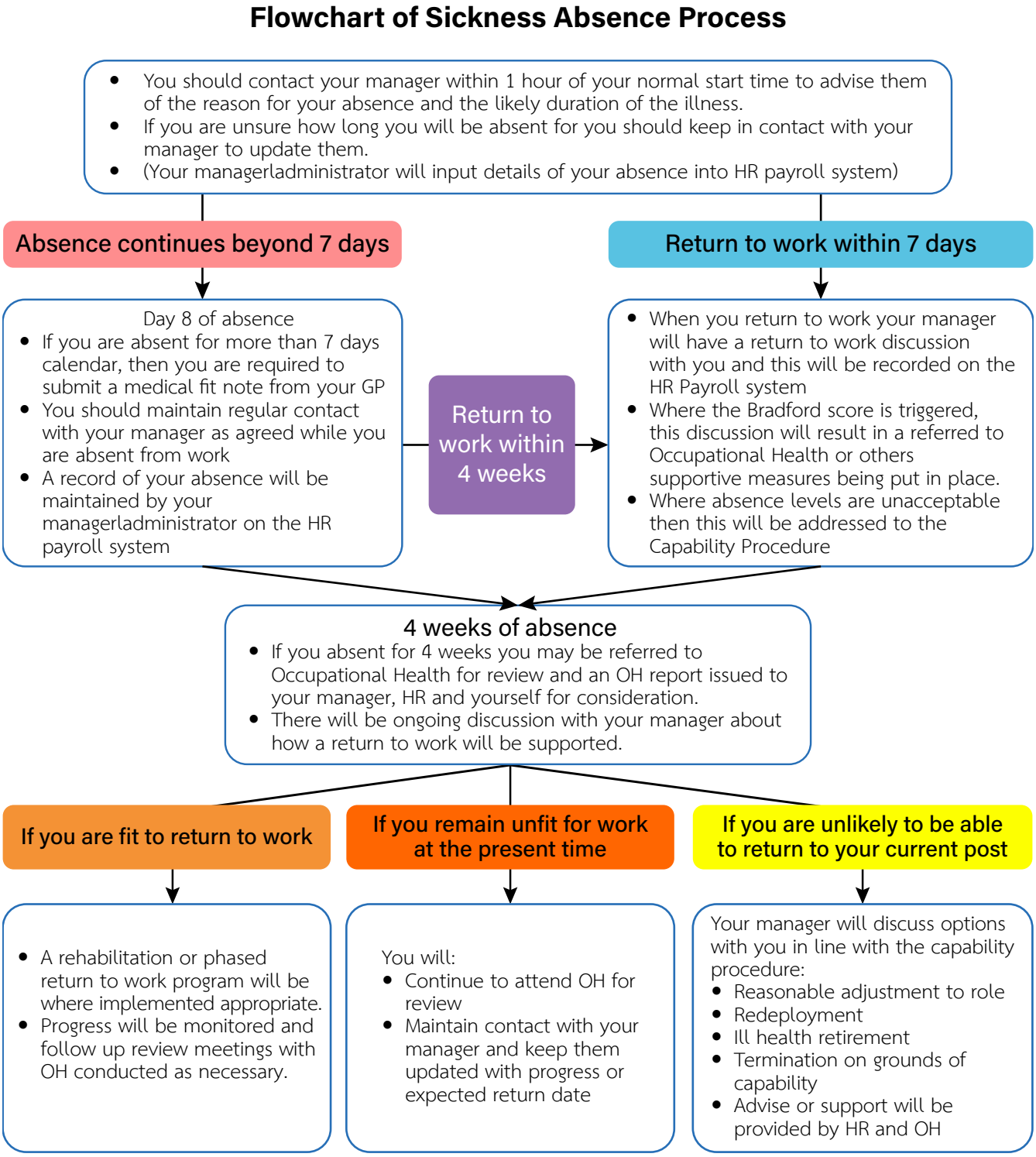
Tel: ..... ID Line: .....

E-mail Address: .....

.....

Day/Month/Year

ANNEX 4 FLOWCHART OF SICKNESS ABSENCE MANAGEMENT



Notes: 1) Figure from Fengthong T. ASEAN Guideline for sickness absence management and procedure (drafted on 19 July 2018). Vientiane: Ministry of Health of Lao PDR; 2018.
2) "HR" means "Human Resources"; "OH" means "Occupational Health Advisor."
3) This flow chart uses the word "program."

Figure 4. Flowchart of Sickness Absence Management.

ANNEX 5 CONTRIBUTORS

5.1 Working Group from ASEAN Member States (AMS) of the ASEAN Health Cluster 1 (AHC 1)

Table 7 List of contributors to the ASEAN Guideline on Occupational Health Surveillance Criteria at the Workplace (2017- 2020)

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3	Dr. Vong Sathiarany	Deputy Director	Department of Preventive Medicine	Ministry of Health	Cambodia
4	Dr. Astuti MKKK	Directorate of Occupational Health and Sports	Section of Occupational Health	Ministry of Health	Indonesia
5	Dr Tayphasavanh Fengthong	Director of Environmental and Occupation Health Management Division	Hygiene and Health Promotion Department	Ministry of Health	Lao PDR
6	Dr. Priya Ragunath	Public Health Physician (Occupational Health), Senior Principal Assistant Director, Head of the Occupational and Environmental Health Sector	Disease Control Division	Ministry of Health	Malaysia
7	Dr. Aung Min Myat	Assistant Director (Occupational and Environmental Health Division)	Department of Public Health	Ministry of Health and Sports	Myanmar
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9	MS. Hazel Koh	Manager	Public Health Group, International Cooperation	Ministry of Health	Singapore
10	Dr. Nalinee Sripaung	Deputy Director	Division of Occupational and Environmental Diseases, Department of Disease Control	Ministry of Public Health	Thailand
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14	Mr. Jim Catampongan	Senior Officer, Health Division, Human Development Directorate	ASEAN Socio Cultural Community Department	ASEAN Secretariat	ASEAN Secretariat
15	Ms. Alautiah M. Rahmunanda	Technical Officer, Health Division, Human Development Directorate	ASEAN Socio-Cultural Community Department	ASEAN Secretariat	ASEAN Secretariat

Notes: 1) Contributors in the working group are the nominated officials of their institutions. Thailand is the "Lead Country," and Lao PDR and the Philippines are the "Co-Lead Countries."
2) For this table, "Dr." refers to either "M.D." or "Ph.D."

5.2 Consultants

5.2.1 Reviewer:

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