

INTERNATIONAL LABOUR ORGANIZATION
Sectoral Activities Programme

**Draft code of practice on
safety and health in agriculture**

**Meeting of Experts to Adopt a Code of Practice
on Safety and Health in Agriculture**

Geneva, 2010



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Introduction

In accordance with decisions taken by the Governing Body of the ILO at its 298th Session in March 2007, and its 306th Session in November 2009, a Meeting of Experts on Safety and Health in Agriculture was convened in Geneva from 23 November to 1 December 2009 to consider a draft code of practice on safety and health in agriculture. The meeting was composed of seven experts appointed following consultations with Governments, eight experts appointed following consultations with the Employers' group and eight experts appointed following consultations with the Workers' group of the Governing Body.

[Text referring to subsequent steps is to be developed following adoption of the code.]

ILO codes of practice are technical standards which provide practical guidance for specific sectors or topic areas. They often complement existing ILO standards, notably Conventions and Recommendations, but, unlike Conventions, they are non-binding. Where they deal with occupational safety and health (OSH), they provide detailed technical advice about the hazards and risks associated with the particular sector or topic area, and how such hazards/risks can be effectively managed and controlled so as to prevent occupational accidents and diseases.

This code of practice is devoted to improving OSH in agriculture and complements the Safety and Health in Agriculture Convention 2001 (No. 184), and its supplementing Recommendation (No. 192), and provides further guidance for their application in practice. It provides guidance on appropriate strategies to address the range of OSH risks encountered in agriculture in order to prevent – as far as is reasonably possible – accidents and diseases for all those engaged in this sector. It also provides guidance on the roles of the competent authorities, employers, workers and their organizations in promoting OSH within this sector. Its provisions are based on principles contained in Convention No. 184 and many other ILO Conventions and Recommendations, all of which are listed in the bibliography at the end of the code.

The provisions of this code are not intended to replace relevant national legislation or good practice on OSH in agriculture, especially where these lay down higher standards of control. More stringent requirements should take precedence over those of this code, but in the absence of national legislation and guidance, this code together with other national and international standards should serve as helpful guidance in improving OSH in agriculture.

Importantly, OSH standards affecting women workers have been traditionally underestimated because these standards and exposure limits to hazardous substances are based on male populations and laboratory tests. Since the majority of agricultural workers are women, this code takes into consideration the gender dimensions of OSH in agriculture. This is a positive development which more closely reflects the reality of the sector.

1. Objectives and scope

1.1. Objectives

1.1.1. The overall objective of this code of practice is to help promote more of a preventive OSH culture in agriculture globally. In particular, it should help to:

- (a) raise awareness of the hazards and risks associated with agriculture and how they can be effectively managed and controlled and accidents and diseases prevented;
- (b) prevent occupational accidents and diseases and improve the working environment in practice in individual agricultural enterprises;
- (c) encourage governments, employers, workers and other stakeholders to cooperate in their efforts to prevent accidents and diseases to workers in agriculture;
- (d) raise awareness of OSH issues concerning particular groups of workers, such as women and young workers; and
- (e) promote more positive attitudes and behaviour towards OSH in agriculture throughout the sector.

1.2. Scope

1.2.1. For the purposes of Convention No. 184, agriculture is defined as “agricultural and forestry activities carried out in agricultural undertakings including crop production, forestry activities, animal husbandry and insect raising, the primary processing of agricultural and animal products by or on behalf of the operator of the undertaking as well as the use and maintenance of machinery, equipment, appliances, tools, and agricultural installations, including any process, storage, operation or transportation in an agricultural undertaking, which are directly related to agricultural production”. In the Convention, however, the term “agriculture” does not cover: (a) subsistence farming; (b) industrial processes that use agricultural products as raw material and the related services; and (c) the industrial exploitation of forests.

1.2.2. This code of practice is applicable to the same wide range of activities as described above, but with two exceptions. Firstly, the code does not apply to forestry, since there is a separate ILO code of practice dealing with OSH in that sector.¹

1.2.3. Secondly, while the Convention does not apply to subsistence farming, some of the provisions of this code may be helpful in preventing accidents and diseases even in very small enterprises, including subsistence farms. However, not all the provisions of this code will be relevant for subsistence farmers.

1.2.4. Likewise, it is intended that all workers should benefit from the provisions of this code, whether they are seasonal, casual or temporary workers that are employed for only short durations, contractors or permanent employees of the agricultural enterprise.

¹ *Safety and health in forestry work*, ILO, 1998.

1.2.5. The code is therefore intended to be widely applicable and to be relevant to all agricultural enterprises except for forestry, irrespective of size, and for the protection of all workers, irrespective of their employment status.

2. The characteristics of OSH in agriculture

2.1. Employment and OSH

2.1.1. With more than a third of the world's labour force employed in the sector, agriculture is the second greatest source of employment worldwide after services. It is also the most important sector for female employment in many countries, especially in Africa and Asia, and a major proportion of agricultural workers are women.

2.1.2. Agriculture also involves a wide range of different types of machinery, animals, plants and products, working in both indoor and outdoor environments under widely varying geographic and climatic conditions. While agricultural enterprises in many developed countries are highly mechanized and operate on a large scale, the opposite is true in many developing countries where subsistence farming is much more common.

2.1.3. Such wide-ranging profiles, both in terms of employment and of enterprise, have a significant bearing on levels of risk awareness and on attitudes towards preventing accidents and diseases within the sector. Agriculture is in fact one of the most hazardous of all sectors and many agricultural workers suffer occupational accidents and ill-health each year. The contributory causes of such accidents and ill-health are many, but often include:

- working with machines, vehicles, tools and animals;
- slips, trips and falls from heights;
- lifting heavy weights and other work giving rise to musculoskeletal disorders;
- exposure to dust and other organic substances, chemicals, and infectious agents; and
- other working conditions common to rural environments, such as working in extremes of temperature and attacks by wild animals.

2.1.4. Child labour is also more prevalent in agriculture than in any other economic sector, accounting for approximately 70 per cent of child labour worldwide. Moreover, since many children below the age of employment live on farms, the risk of accidents and diseases to them is significantly increased, including through exposure to pesticides and other chemicals frequently used in agriculture. International efforts to eliminate child labour in agriculture have continued for many years, but children below and above the legal age of employment continue to suffer accidents on farms, some of them fatal.

2.1.5. There is also a high involvement of migrant workers and many workers are employed on a casual, piecework or seasonal basis.

2.2. Addressing the challenges

2.2.1. The task of improving OSH in agriculture faces a number of difficulties. Firstly, many agricultural workers are only poorly protected by national labour law, and some countries specifically exclude the agricultural sector from their general labour legislation and/or from OSH legislation. Secondly, in other countries some relevant legislation does exist but it is poorly applied in practice and inadequately enforced by labour inspectors. In particular, labour inspectorates are often inadequately resourced and trained and inspectors rarely if ever visit rural enterprises such as farms unless transport is

provided. Thirdly, national systems for improving OSH in agriculture are also inadequate in many countries and competent OSH advice is often scarce.

2.2.2. As a result, many farmers and workers are unaware of their obligations, rights and responsibilities and fail to comply with such OSH legislation that does exist. This is made worse in that agriculture is one of the sectors where trade unions, for many reasons, face the greatest challenges to organize the workforce, including legal restrictions, geographical isolation and cultural attitudes. The prevalence of seasonal, migratory and casual labour along with the added constraints of illiteracy, ignorance of workers' rights, and isolation render the task of organizing among rural workers particularly difficult.

2.2.3. Thus the challenges for improving OSH in agriculture need to be addressed on several fronts. The competent authorities should establish national policy on the subject and develop OSH legislation taking account of ILO instruments such as Convention No. 184 and Recommendation No. 192. The Promotional Framework for Occupational Safety and Health Convention 2006 (No. 187), and its accompanying Recommendation (No. 197), are also relevant here, and consideration should be given to developing national OSH programmes for agriculture. The labour inspectorates, together with the competent authorities, need to address issues of resources for inspection and of information and training in the context of OSH inspection in agriculture.

2.2.4. Meanwhile, employers, workers and other parties should be more aware of their duties and rights in the area of OSH in agriculture and take specific action to manage and control OSH risks and prevent occupational accidents and diseases in the sector. Particular attention should be given to specific risks and risk groups, bearing in mind that a major proportion of agricultural workers are women. Seasonal and casual workers also need to be given specific attention.

2.2.5. All such matters are addressed in more detail in Chapters 3 and 4.

3. Developing a national framework for OSH in agriculture

3.1. National policy, systems and programmes for OSH

3.1.1. Convention No. 187 and its accompanying Recommendation No. 197 promote the development of national policies, national systems and national programmes for OSH covering all economic sectors, including agriculture. The overall aim of such measures should be to promote a preventive OSH culture and to promote the effective management of OSH nationally and at the enterprise level.

3.1.2. With specific regard to agriculture, governments should adopt comprehensive OSH legislation that affords protection for all workers in the sector, irrespective of their gender and employment status, in accordance with the Safety and Health in Agriculture Convention, 2001 (No. 184). Labour inspectors should also have sufficient legal status and powers, as well as resources and training, to be able to enforce the legislation adequately in the sector.

3.1.3. National systems for OSH in agriculture should thus comprise organizations and mechanisms aimed at promoting OSH in agriculture, including:

- (a) authorities or bodies responsible for OSH and for ensuring compliance with national laws and regulations, including systems of inspection;
- (b) information about hazards and risks in agriculture and how these may be addressed, and related advisory services;
- (c) occupational safety and health training for employers and workers;
- (d) occupational health services, available in rural areas as well as urban ones;
- (e) mechanisms for the collection and analysis of data on occupational injuries and diseases;
- (f) provisions for collaboration with relevant insurance or social security schemes covering occupational injuries and diseases; and
- (g) support mechanisms for a progressive improvement of OSH in very small agricultural enterprises, such as subsistence farms, and in the informal economy.

3.1.4. National OSH programmes for agriculture should be developed in accordance with Convention No. 187. These may be targeted specifically at the agricultural sector or may cover a wider range of sectors or topics. National programmes covering agriculture should, in particular:

- (a) promote the development of a national preventive OSH culture for the sector;
- (b) contribute to the protection of workers by eliminating or minimizing, so far as is reasonably practicable, work-related hazards and risks, in accordance with national law and practice, in order to prevent occupational injuries, diseases and deaths and promote OSH in the workplace;
- (c) include objectives, targets and indicators of progress; and

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- (d) be supported, where possible, by other complementary national programmes and plans which will assist in achieving progressively a safe and healthy working environment.

3.1.5. For national OSH systems and programmes to be effective, it is vital that competent authorities, employers, workers and their representatives and other partners work together and cooperate in a constructive manner. Such cooperation in the area of agriculture will also help to ensure that the objectives of this code of practice will be achieved in practice.

3.2. Competent authority

3.2.1. In the light of the foregoing paragraphs, the competent authority should:

- (a) formulate, implement and periodically review a national policy, national system and national programme for OSH in agriculture;
- (b) promote continuous improvement of OSH in agriculture to prevent occupational accidents, diseases and dangerous occurrences; and
- (c) consider making new, or updating existing, statutory provisions for eliminating or controlling hazards in agriculture.

3.2.2. The competent authority should ensure that relevant legislation protects agricultural workers as effectively as workers in other sectors.

3.2.3. The competent authority should ensure that all agricultural workers, irrespective of their employment status, benefit from the same level of OSH protection and are subject to the same requirements for prevention. The competent authority should provide guidance to employers' and workers' organizations on ensuring equal protection for vulnerable workers, such as temporary, casual and migrant workers, women workers, young workers, contractors and workers provided by labour supply agents – especially women workers and young workers in these groups.

3.2.4. Statutory provisions should include regulations, approved codes of practice, exposure limits and procedures for consultation and dissemination of information.

3.2.5. The competent authority should:

- (i) establish systems and criteria for classifying substances used and produced in agriculture that may be hazardous to health, in accordance with national and international standards;
- (ii) establish requirements for marking and labelling substances provided for use in agriculture, taking into account the need to harmonize such systems internationally;
- (iii) establish criteria for determining information provided in chemical safety data sheets;
- (iv) establish systems and criteria for identifying safety and health hazards and appropriate risk control measures relating to machinery, equipment, processes and operations used in agricultural production;
- (v) establish safety standards with regard to the design, manufacture and use of tractors and other machinery used in agriculture, based on sound scientific criteria and accepted international practice (see also 7.1.3.); and

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- (vi) adopt systems of market surveillance to ensure that substances, machinery and equipment that are supplied or imported for use in agriculture meet appropriate national requirements.

The competent authority should set out the necessary rules to determine these criteria and requirements, but is not necessarily expected to undertake technical tasks or laboratory tests itself.

3.2.6. Where there are serious hazards that may pose unacceptable OSH risks to workers, the competent authority should consider whether to:

- (i) prohibit or restrict the use of certain hazardous processes or substances in agriculture;
- (ii) require advance notification and authorization before such processes and substances are used; or
- (iii) ensure that the risks faced by certain categories of workers with regard to specified processes or substances are thoroughly assessed to determine whether or under what conditions such workers may be allowed to use such processes or substances.

3.2.7. When considering action envisaged in paragraph 3.2.6. above, the competent authority should consult fully with the representative organizations of employers and workers concerned and with other relevant parties.

3.2.8. The competent authority should ensure that guidance and assistance is provided to employers and workers to help them comply with their legal obligations.

3.2.9. The competent authority should promote a management systems approach to OSH, such as the approach set out in the *Guidelines on occupational safety and health management systems*, ILO–OSH 2001.

3.2.10. The competent authority should promote the establishment of OSH policies and OSH committees and the appointment of OSH representatives at the enterprise level.

3.2.11. The competent authority should promote a preventive OSH culture in agriculture through national programmes and in particular through innovative approaches to improving OSH in micro-enterprises, in small and medium-sized enterprises and in the informal economy.

3.2.12. The competent authority should secure the enforcement of national laws and regulations concerning the policy mentioned above through an adequate and appropriate system of inspection. The system of enforcement should provide for corrective measures and adequate penalties for violations of relevant national laws and regulations.

3.2.13. The competent authority should establish, review and apply systems for the reporting, recording, notification and investigation of occupational accidents, diseases and dangerous occurrences in agriculture.¹ These are essential for both reactive and proactive monitoring and should be undertaken to:

- (a) provide reliable information about occupational accidents and diseases at workplace and national level;
- (b) identify major safety and health problems arising from agricultural activities;

¹ See glossary for the assigned meanings.

-
- (c) define priorities of action;
 - (d) develop effective methods for dealing with occupational accidents and diseases; and
 - (e) monitor the effectiveness of measures taken to improve OSH performance.

3.2.14. The competent authority should establish, apply and periodically review a system for the reporting, recording and notification of occupational accidents, diseases and dangerous occurrences. In undertaking such tasks, the competent authority should take due account of the Employment Injury Benefits Convention, 1964 (No. 121), as amended, the Protocol of 2002 to the Occupational Safety and Health Convention, 1981 (No. 155), the List of Occupational Diseases Recommendation, 2002 (No. 194), as revised in 2010, and the ILO code of practice *Recording and notification of occupational accidents and diseases* (1995).

3.2.15. In accordance with the Occupational Health Services Convention, 1985 (No. 161), and its accompanying Recommendation (No. 171), the competent authority should make provision for the progressive development of occupational health services to cover all workers in agriculture:

- (a) by means of legislation;
- (b) by collective agreements or as otherwise agreed upon by the employers and workers concerned; or
- (c) in any other manner approved by the competent authority after consultation with the representative organizations of employers and workers concerned.

Appendix I provides further information on workers' health surveillance and Appendix II on surveillance of the working environment.

3.3. Labour inspectorates

3.3.1. Through the adoption of the Labour Inspection (Agriculture) Convention, 1969 (No. 129), the ILO constituents emphasized the importance of OSH inspection in this sector.² It is therefore vital that labour inspectorates have adequate resources so that inspectors can routinely visit agricultural enterprises and that they are adequately trained and instructed about OSH in agriculture.

3.3.2. Labour inspectors should secure the enforcement of relevant OSH legislation at agricultural workplaces in accordance with national legislation, in a gender-sensitive manner and in particular:

- (a) carry out routine preventive inspection visits to agricultural enterprises;
- (b) investigate selected accidents, diseases and complaints, to determine causation and to promote prevention, bearing in mind their obligation to respect confidentiality regarding the source of complaints;
- (c) supply technical information and advice to employers, workers and their representatives with respect to their OSH-related responsibilities, duties and rights;

² See the definition of "labour inspectorate" in the glossary.

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- (d) notify the employer, the workers concerned and their representatives and OSH committees of the findings of inspections, for the implementation of required remedial action;
 - (e) take enforcement measures, including imposing orders to take immediate action to remove danger or to remedy non-compliance, or to recommend such action to the competent authority;.

3.3.3. Labour inspectors should be adequately trained so that:

- (a) they are competent to deal with technical and legal issues associated with OSH in agriculture and can provide relevant support and advice to all parties involved;
- (b) they are able to secure the enforcement of relevant OSH and minimum age legislation.

3.3.4. In national, regional or provincial OSH programmes for agriculture, labour inspectorates should:

- (a) cooperate fully with the competent authority, employers, workers and other partner organizations in such programmes;
- (b) ensure that their inspection programmes and enforcement priorities reflect those of the national, regional or provincial programmes; and
- (c) provide the competent authority with relevant information, such as gaps in OSH legislation and sex-disaggregated data concerning accidents and their causation, which might be helpful in developing future gender-responsive legislation, policies and programmes.

3.3.5. While the principal task of labour inspectors is to secure the enforcement of relevant national legislation, inspectors also have a vital role in national OSH programmes as envisaged by Convention No. 187. Thus, labour inspectorates should:

- (a) collaborate with the competent authority in its approaches to reach out to and influence enterprises not usually subject to inspection in practice, such as small and micro-enterprises, family farms and enterprises in the informal economy;
- (b) propose innovative means of reaching out to such enterprises and also vulnerable workers, such as through agricultural fairs and exhibitions, the media, the trade press, training and educational activities and other means; and
- (c) work with a wide range of partner organizations, such as agricultural training providers, educational and research institutes, safety and health advisory services and manufacturers and suppliers of machinery and substances (see also Chapter 19 on outreach).

3.3.6 The authority, roles and responsibilities of labour inspectors should be communicated to all affected parties.

3.4. Employers

3.4.1. Employers have a duty to provide and maintain safe and healthy workplaces, plant, tools and other working equipment. They should also organize work so as to prevent, so far as is reasonably practicable, occupational accidents and diseases, and apply relevant

standards, codes and guidelines as prescribed, approved or recognized by the competent authority.

3.4.2. Employers should give high priority to the management of OSH in agriculture, which should also be integrated into other management systems (see also Chapter 4).

OSH policy

3.4.3. Employers should set out OSH policies, which should be specific to their enterprises and appropriate to their size and the nature of activities.

3.4.4. OSH policies should include, as a minimum, the following key principles and objectives to which employers are committed, namely:

- (a) promoting a preventive OSH culture within the enterprises, including positive attitudes and behaviour regarding OSH issues;
- (b) recognizing the biological differences between women and men and managing OSH in such a way that the OSH of all employees is protected and occupational accidents and diseases are prevented;
- (c) complying with relevant OSH national laws and regulations, voluntary programmes, collective agreements on OSH and other requirements to which the enterprise subscribes or may wish to subscribe;
- (d) identifying personnel, including senior managers and directors, to carry out specific responsibilities in the area of OSH in agriculture;
- (e) ensuring that workers and their representatives are consulted and encouraged to participate actively in all elements of the OSH management system;
- (f) regular monitoring and review of OSH arrangements;
- (g) continuous improvement of the performance of the OSH management system;
- (h) providing continuous information and appropriate training of all workers and their representatives and ensuring that workers receive and understand the relevant safety and health information provided; and
- (i) recognizing OSH to be an important function within enterprise management structures and integral to business performance and productivity.

3.4.5. Additional key components to incorporate into an OSH policy include:

- (a) the provision of the necessary resources to ensure a safe and healthy working environment in agriculture;
- (b) arrangements for communication with other relevant bodies, for example legislators, workers' organizations, public utilities such as water authorities, and organizations responsible for environmental conservation and health care;
- (c) the function and constitution of the OSH committee with the inclusion of women workers on such committees;
- (d) procedures for the enforcement of OSH requirements;

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- (e) procedures for the recording and notification to relevant national authorities of occupational accidents, diseases and dangerous occurrences;
 - (g) the means by which the policy will be communicated to all workers including the date on which the policy will be reviewed and, as necessary, revised;
 - (h) any emergency procedures.

OSH organization and arrangements

3.4.6. Employers should:

- (a) set out in writing their respective OSH policy, programmes and other arrangements needed to implement the OSH policy;
- (b) define the various OSH responsibilities, accountability and authority levels of directors, managers, supervisors and others and communicate these clearly to their workers, visitors or any other persons working in the workplace, as appropriate;
- (c) ensure consultation with and the full participation of workers and their representatives in the fulfilment of the OSH policy;
- (d) define the necessary OSH competence requirements for all employees and establish training arrangements to ensure that all managers, supervisors, workers and workers' safety representatives are competent to perform their safety and health duties;
- (e) ensure that workers have sufficient information, in a form and language that they understand, concerning OSH risks and arrangements for managing them, including emergency arrangements;
- (f) establish and maintain appropriate documentation and communication arrangements;
- (g) identify hazards and assess risks, reducing them in accordance with the principles described in Chapter 4;
- (h) act on information supplied to them by their employees or other workers regarding any unsafe, unhealthy or illegal working practice;
- (i) organize first aid and emergency prevention, preparedness and response arrangements;
- (j) establish procedures for the compliance with OSH requirements in purchasing and leasing equipment and supplies;
- (k) ensure compliance with OSH requirements by contractors and subcontractors working at the agricultural enterprise;
- (l) develop, establish and review procedures to monitor, measure and record OSH performance, taking into consideration the results of the investigations of occupational accidents, diseases and dangerous occurrences, OSH compliance audits and reviews of the OSH system by management; and
- (m) identify and implement preventive and corrective actions and opportunities for continual improvement.

3.4.7. Employers should make the necessary arrangements to provide for:

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- (i) regular surveillance of the working environment, and health surveillance as defined by legislation or good practice (see Appendices I and II); and
 - (ii) adequate and competent supervision of work and working practices.

3.4.8. Employers should have particular regard for the OSH of more vulnerable workers in agriculture, including casual and seasonal workers, migrant workers, lone workers and women and young workers, and take appropriate action to ensure their protection from occupational accidents and diseases.

3.4.9. OSH measures should not involve any expenditure for the workers.

3.4.10. Employers should provide OSH measures to all workers without discrimination.

OSH committees

3.4.11. Employers should provide for the establishment and efficient functioning of OSH committees, recognizing workers' elected OSH representatives. OSH committees should include workers or their representatives, employers' representatives and, as far as reasonably practicable, an OSH expert. Participation of women on these committees should be encouraged.

3.4.12. OSH committees should meet regularly or if a specific need arises and participate in the decision-making process related to OSH-related issues. Guidance on the composition, rights and responsibilities of OSH committees is provided in the Occupational Safety and Health Recommendation 1981 (No. 164), Paragraph 12.

Young workers

3.4.13. Employers should be fully informed of the increased risks to OSH faced by young workers in agriculture. They should ensure that young workers are trained in safe work procedures and demonstrate their ability to perform tasks safely before being assigned to do so. Young workers should be closely supervised and any unsafe work practices immediately corrected. Employers should ensure that children below the age of legal employment are not employed in agriculture, whether or not accompanied by a parent.

3.4.14. In no case should employers allow workers below the age of 18 to carry out hazardous work unless:

- (a) young workers are permitted to perform such work under national laws and regulations or by decision of the competent authority;
- (b) the workers are at least 16 years of age;
- (c) the workers have received specific instruction or vocational training that provides them with the competence to carry out such work safely or they are currently undertaking such training;
- (d) their capabilities for carrying out the tasks are properly assessed; and
- (e) they are adequately supervised throughout such work.

3.4.15. The Worst Forms of Child Labour Recommendation 1999 (No. 190), provides guidance on the term “hazardous work”. Reference should be made to this and other sources of information listed in the bibliography at the end of this code.

3.5. Workers

3.5.1. Workers in agriculture should have the right:

- (a) to be informed and consulted on OSH matters including risks from new technologies; and
- (b) to participate in the application and review of OSH measures and, in accordance with national law and practice, to select OSH representatives and representatives in OSH committees.

3.5.2. Workers should have the duty to cooperate with the employer to achieve compliance with the duties and responsibilities placed on the employer pursuant to this code.

3.5.3. Workers should report forthwith to their immediate supervisor or safety and health representative any unusual conditions at the workplace or affecting installations and equipment which they believe could present a hazard or risk to their safety or health or that of other people, and which they cannot deal with effectively themselves.

3.5.4. When workers or their representatives observe non-compliance with safety and health regulations or codes of practice by any person, they should take corrective action immediately. If such action is unsuccessful, the problem should be referred to a higher level of management immediately.

3.5.5. Workers should have the duty, in accordance with their training, and the instructions and means given by their employers, to:

- (i) comply with prescribed OSH measures;
- (ii) take all steps to eliminate or control hazards or risks to themselves and to others arising during agricultural production, including through the proper care and use of protective clothing, suitable for both women and men workers, facilities and equipment placed at their disposal for this purpose;
- (iii) cooperate with the employer and other workers to permit compliance with the duties and responsibilities placed on the employer and workers.

3.5.6. Workers should participate in instruction and training programmes provided by the employer or required by the competent authority, and should behave in a manner consistent with their training. Workers and their representatives should review the instruction and training programmes and make recommendations as necessary. Training schedules should accommodate workers with family responsibilities. Where they determine that these programmes are ineffective, they should make recommendations to the employer to improve their effectiveness.

3.5.7. Workers should participate and cooperate in exposure monitoring and health surveillance programmes required by the competent authority and/or provided by the employer for the protection of their health.

3.5.8. Workers' representatives should inform and familiarize other workers with the increased risks to health and safety faced by young workers in agricultural production.

3.5.9. Workers and their representatives should encourage and support young workers to develop safe work habits and to fully comply with safe working procedures.

3.5.10. Workers and their representatives should report to management the presence on the worksite of children below the age of legal employment.

3.5.11. Workers and their representatives should participate in the process of consultation and cooperate with employers concerning all aspects of safety and health in agriculture.

3.5.12. Workers and their representatives should have the right to:

- (i) be consulted regarding any hazards or risks to safety and health in agricultural production;
- (ii) inquire into and receive information from the employer regarding any hazards or risks to safety and health arising from agricultural production, including information from suppliers. This information should be provided in forms and languages easily understood by the workers;
- (iii) take adequate preventive measures, in cooperation with their employer, to protect themselves and other workers against hazards or risks to safety and health from agricultural production; and
- (iv) request, and be involved in, the identification of hazards and assessment of risks when undertaken by the employer and/or by the competent authority. They should also have the right to be involved in discussing relevant control measures and the investigation of accidents and diseases.

3.5.13. Workers and their representatives should be consulted about and involved in the introduction and development of workers' health surveillance, and should participate and cooperate with occupational health professionals and their employers in its implementation.

3.5.14. Workers should be informed in a timely, objective and comprehensible manner:

- (i) of the reasons for the examinations and investigations relating to the safety and health hazards involved in their work; and
- (ii) of the results of medical examinations, including pre-assignment medical examinations, and of the respective health assessments. The results of medical examinations should be communicated individually to the worker concerned, and kept confidential in accordance with national legislation and should not be used to discriminate against workers.

3.5.15. Workers should have the right:

- (i) to bring to the attention of their representatives, the employer or the competent authority hazards or risks to safety and health arising from agricultural production;
- (ii) to notify the competent authority if they consider that the measures taken and the means used by the employer are inadequate for the purpose of ensuring a safe and healthy working environment;

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- (iii) to remove themselves from danger when they have reasonable justification to believe that there is an imminent and serious risk to their safety and health and that of other people. Such workers should inform their supervisor and/or safety and health representative immediately;
 - (iv) in the case of a safety or health condition that places them at increased risk of harm, to request a transfer to alternative work not exposing them to that increased risk, if such work is available and if the workers concerned have the qualifications or can reasonably be trained for such alternative work. Every effort should be made to accede to such a request without a loss of earnings, in accordance with national law and practice; and
 - (v) to be provided with adequate medical treatment and compensation for occupational injuries and diseases resulting from agricultural production.

3.5.16. Workers who remove themselves from danger in accordance with the provisions of paragraph 3.5.15(iii) should be protected against undue consequences in accordance with national conditions and practice.

3.5.17. Workers who exercise their rights as specified in paragraph 3.5.15(i), (ii) and (vi) should be protected from discrimination, for which there should be recourse in national laws and practice.

3.5.18. Workers and their elected OSH representatives should receive appropriate education and training and, where necessary, retraining in the most effective methods available for minimizing risks to OSH, in particular in those areas referred to in Chapters 5–12 of this code.

3.5.19. Women workers should have the right, in the case of pregnancy or when breastfeeding, to alternative work not hazardous to the health of the unborn or nursing child, where such work is available, in order to prevent exposure to hazards, and to return to their previous jobs at the appropriate time without a loss of earnings in accordance with national law and practice.

3.6. Manufacturers and suppliers

3.6.1. Manufacturers of machinery, equipment, chemicals and other products intended for use in agriculture should:

- (a) as far as reasonably practicable, ensure that their products are designed and manufactured so that they present minimal OSH risks to those who use them correctly;
- (b) provide instructions in the language of the user for the safe installation, storage, use and maintenance of those products; and
- (c) provide information in the language of the user about any residual hazards, including appropriate warning labels and other markings. Chemicals should be accompanied by chemical safety data sheets and containers should be suitably labelled.

3.6.2. Such manufacturers should comply with any relevant OSH legislation that concerns the supply of new products for use in agriculture, referring also to any relevant national and international product standards. With regard to the design of new agricultural machinery and equipment, manufacturers should take account of recent advances in modern technology, and the adaptability of new machinery and equipment for usage of

both women and men workers, and with regard to new chemicals, they should take account of recent toxicological data.

3.6.3. Suppliers and importers of agricultural products should ensure, as far as they are able to do so, that such products meet the above requirements, in particular that they are accompanied by relevant information and instructions.

3.6.4. Employers who purchase agricultural products should ensure, as far as they are able to do so, that such products meet the above requirements, in particular that they are accompanied by appropriate instructions and information. Employers should also consult their workers and their representatives on such matters, as appropriate.

3.7. Contractors and labour supply agents

3.7.1. Contractors ³ and labour supply agents should:

- (a) be registered or hold licences where required by national laws or regulations or subscribe to recognized voluntary schemes where they exist;
- (b) make themselves aware of and operate according to the commissioning party's ⁴ policies and strategies for the promotion of OSH and should comply and cooperate with related measures and requirements.

3.7.2. When using contractors, the commissioning party should ensure that:

- (a) OSH criteria, such as a record of good OSH performance and an adequate OSH management system, are included in procedures for evaluating and selecting contractors;
- (b) where required, only such contractors are used that have been duly registered or hold licences;
- (c) contracts specify OSH requirements as well as sanctions and penalties in case of non-compliance. Contracts should include the right for supervisors mandated by the commissioning party to stop work whenever a risk of serious injury is apparent and to suspend operations until the necessary remedies have been put in place. Contracts should include the right of the commissioning party to terminate contractors who fail to meet OSH requirements;
- (d) the same safety and training requirements apply to the contractors and their workers as to the workers in the agricultural enterprise, and such training is provided to them prior to work commencing and as work progresses, as necessary;
- (e) effective ongoing communication and coordination is established between the employer, supervisors and the contractor prior to commencing work. This should include provisions for communicating hazards and the measures to prevent and control them. The respective OSH responsibilities of the commissioning party and the contractors should be clarified and recorded;

³ The term “contractor” refers here to both contractors and subcontractors.

⁴ In this section, “commissioning party” refers to an employer or enterprise that engages the services of a contractor or a labour supply agent.

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- (f) arrangements for reporting work-related injuries and diseases, ill health and incidents among the contractors' workers while performing work for the commissioning party are clearly specified;
 - (g) OSH performance of contractor activities on site is regularly monitored;
 - (h) on-site OSH procedures and arrangements are followed by the contractor(s); and
 - (i) contractors who violate their contractual obligations are excluded from future bidding.

3.7.3. Commissioning parties that use temporary or casual workers supplied by labour supply agents should:

- (a) clarify in writing who takes responsibility for OSH management, supervision and training;
- (b) ensure that new workers are informed of the workplace hazards, safe work practices and emergency procedures; and are supplied with necessary personal protective equipment (PPE) in the right sizes;
- (c) ensure that the workers have the skills and qualifications needed to perform the job safely;
- (d) make arrangements for the OSH of workers who have little or no knowledge of the local language; and
- (e) pay the labour supply agents a sufficient amount to enable them to meet legal requirements with regard to OSH.

Safety and health policies and procedures

Checklist	Date	Self-audit			Step 2	Step 3
		Step 1	Yes	No		
Safety and health policy statement		N/A			Priority for action	What action is required
1. Does the workplace have a written, posted and signed occupational safety and health (OSH) policy?						
2. Have all workers been made aware of their workplace's OSH policy?						
Safety and health responsibilities		N/A			Priority for action	What action is required
1. Does the workplace-specific OSH policy establish the responsibilities of the employer/manager?						
2. Does the workplace-specific OSH policy establish the responsibilities of the supervisor(s)?						
3. Does the workplace-specific OSH policy establish the responsibilities of the worker?						
4. Does the workplace-specific OSH policy establish the responsibilities of visitors?						
5. Does the workplace-specific OSH policy establish the responsibilities of contractors and others?						
Posted safety and health materials		N/A			Priority for action	What action is required
1. Are the forms for reporting injury at work conspicuously posted and/or available at the workplace?						
2. Is a copy of the Occupation Safety and Health Act conspicuously posted and/or available at the workplace?						
3. Are emergency service numbers conspicuously posted and/or available at the workplace?						
4. Are explanatory materials about safety and health legislation, such as a user's guide, posted at the workplace?						

Checklist	Date	Self-audit			
		Step 1		Step 2	Step 3
		N/A	Yes	No	Priority for action
Safety and health standards and procedures					
1. Does the workplace have communicated standards and procedures for reporting workplace injuries and illnesses?					What action is required
2. Does the workplace have communicated standards and procedures for reporting hazards?					
3. Does the workplace have a communicated emergency evacuation plan?					
4. Does the workplace have communicated personal protective equipment (PPE) standards and procedures adequate for women and men?					
5. Does the workplace have communicated procedures for processing "work refusals"?					
Safety and health representative/committee					
1. Does the workplace have safety representatives?					What action is required
2. Does the workplace have an OSH committee? If yes, are women workers on these committees?					
3. Does the workplace have communicated procedures with regard to the responsibilities and activities of the OSH representative/committee?					
4. Does the workplace have safety representatives' names and work locations posted in a conspicuous workplace location?					
5. Are the minutes of the OSH committee posted?					
Safety and health education/training					
1. Does the workplace have policies, standards and procedures for OSH training?					What action is required
2. Does the workplace have new employee orientation training and initial job instruction, which includes observation and supervision, to ensure workers are competent in the assigned activities?					

Checklist	Date _____	Self-audit				
		Step 1		Step 2		Step 3
		N/A	Yes	No	Priority for action	What action is required
Workplace safety and health and inspections						
1. Does the workplace have a communicated policy and procedures, ensuring regular workplace inspections?						
2. Does the workplace have a communicated policy and procedure for addressing issues highlighted by inspections?						
Workplace injury and incident investigations						
1. Does the workplace have policy and procedures for reviewing incidents resulting in lost time injuries?						
2. Does the workplace have policy and procedures for reviewing incidents resulting in fire or environmental release?						
3. Does the workplace have a communicated procedure for reporting critical injuries?						

4. Occupational safety and health management systems

4.1. OSH management systems

4.1.1. The positive impact of introducing OSH management systems at the enterprise level, both on the reduction of hazards and risks and on productivity, is now recognized internationally by governments, employers and workers. In particular, it helps to promote positive attitudes towards OSH and also a preventive OSH culture, both at the enterprise level and more widely.

4.1.2. While OSH management systems need to be specific to agriculture and appropriate to the size of the enterprise and nature of activities, many elements of the ILO *Guidelines on occupational safety and health management systems, ILO-OSH 2001*, are generic and can be used in the design and application of OSH management systems in an agricultural enterprise, whatever its size and nature of activities.

4.1.3. Typically, an OSH management system should contain the following main elements:

- (a) OSH policy (see paragraphs 3.4.3 to 3.4.5);
- (b) OSH organization and arrangements for establishing responsibility and accountability, competence requirements and training, documentation and record keeping, communication and information, etc. (see paragraphs 3.4.6 to 3.4.10);
- (c) hazard identification and risk assessment;
- (d) planning and implementation of controls; and
- (e) monitoring, evaluation and improvement of OSH performance.

4.2. Hazard identification and risk assessment

4.2.1. The employer should identify, evaluate systematically and record the sex-differentiated hazards and risks to workers' safety and health that may arise during the course of their work. Special attention should be given to risks during maintenance and repair, clearing blockages from machinery and other less frequent tasks.

4.2.2. The identification of hazards in the workplace should take into account:

- (a) the situation or events or combination of circumstances that have the potential to give rise to injury or illness;
- (b) the nature of potential injury or illness relevant to the activity, product or service;
- (c) those likely to be harmed (young workers, temporary workers, pregnant workers); and
- (d) past injuries, incidents and illness.

4.2.3. The identification process should also include consideration of:

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- (a) the way in which work is organized, managed, carried out and any changes that occur in this;
 - (b) the design of workplaces, work processes, materials, plant and equipment;
 - (c) the fabrication, installation, commissioning, handling and disposal of materials, workplaces, plant and equipment:
 - (i) the purchasing of goods and services;
 - (ii) the contracting of plant, equipment, services and labour including contract specification and responsibilities to and by contractors; and
 - (d) the inspection, maintenance, testing, repair and replacement of plant and equipment.

4.2.4. A risk assessment should be carried out to determine the likelihood and severity of accidents and diseases associated with each identified hazard, and controls measures listed. There are many established methods and techniques for the purpose of risk assessment; a simple example of a risk assessment form is shown below.

A sample risk assessment form

Health and safety risk assessment form			
Name of the employer and enterprise Address			
Work activity or workplace being assessed	Identify the main hazards and those at risk of injury or ill-health	Assess the likelihood of risk and severity of injury or ill-health	Risk reduction measures to be put into place
Tractor use	<p>1. Rollover of tractor especially when on slopes. At risk: the driver, unauthorized riders or those working close by.</p> <p>2. Being run over by tractors, especially when reversing. At risk: those working close by and bystanders such as children who live on farms.</p> <p>3. High noise levels from the tractor engine. At risk: the driver.</p> <p>4. High whole-body vibration levels from the tractor chassis. At risk: the driver.</p>	<p>1. Risk of death or serious injury can be high in certain places.</p> <p>2. Risk of being run over is high in areas of poor vision and close to domestic buildings.</p> <p>3. Risk of noise-induced hearing loss is high over prolonged periods of exposure.</p> <p>4. Risk of back pains and other musculoskeletal disorders is high over prolonged periods of exposure.</p>	<p>1. The tractors should be equipped with a rollover protection structure (ROPS) and seat belt. All tractor operators should be trained in the safe use of tractors and particularly rollover prevention and required to follow safe work practices. The "one seat—one rider" rule should be enforced without exception.</p> <p>2. All tractor operators should be alert to the presence of co-workers and bystanders and ensure that they are kept at a safe distance. Horns and flashing lights should be fitted, especially for larger tractors. If fitted, they should be used.</p> <p>3. Sound-proofed safety cabs should be fitted, which may also serve as a ROPS.</p> <p>4. Driver seating should be ergonomically designed.</p>

4.2.10. As part of the risk-assessment process, the employer, in consultation with workers and their representatives, should chart the flow of raw materials, intermediate and finished products, mobile equipment and workers in the course of operations, noting the hazards that pertain to each step.

4.2.11. The assessment should be reviewed whenever there has been a significant change in the work to which it relates or when there is reason to suspect that it is no longer valid. The review should be incorporated in a system of management accountability which ensures that control action shown to be necessary by the initial assessment is in fact taken.

4.3. Planning and implementation of controls

4.3.1. Based on the results of the risk assessment and other available data, e.g. the results of workers' health surveillance (see Appendix I), surveillance of the working environment (see Appendix II), and active and reactive monitoring, the employer should:

- (a) define OSH objectives for the reduction of such risks to as low a level as possible;
- (b) devise and implement corresponding preventive measures, based on an appropriate order of prevention; and
- (c) develop, approve and implement a "safe work plan" before any operation starts.

These activities should include the routine application of site inspection and planning as well as of the principles of work organization.

4.3.2. Preventive and protective measures should be implemented in the following order of priority:

- (a) eliminate or substitute the hazardous agent with a less hazardous one, such as a less hazardous chemical, or non-hazardous one, or using low voltage electrical hand tools;
- (b) reduce the hazard/risk at source through the use of engineering controls, such as providing sound-proofed safety cabs for tractors, or interlocking guards with machinery;
- (c) minimize the hazard/risk by using safe working procedures or other organizational measures, such as restricting entry into enclosures that have been sprayed with pesticides; and
- (d) where unacceptable risks remain, provide suitable personal protective equipment (PPE), such as protective clothing, respiratory protective equipment, hearing protectors, etc., ensuring that it is both properly used and maintained.

4.3.3. PPE often provides the least effective means of protection and it should be considered as a last resort. It should be provided only when other options, as listed above, have been considered and implemented as far as reasonably practicable, and unacceptable risks remain.

4.3.4. Control measures should be monitored and reviewed at regular intervals and if necessary revised, especially when circumstances change or if new information becomes available about the risks posed or the suitability of existing control measures. Control measures should also be reviewed and if necessary revised following an accident.

Hierarchy of control measures for reducing risks in the workplace

1. Eliminate or substitute the hazardous agent with a less hazardous one.
2. Reduce the hazard/risk at source through the use of engineering controls.
3. Minimize the hazard/risk by using safe working procedures or other organizational measures.
4. Where unacceptable risks remain, provide suitable personal protective equipment (PPE).

4.4. Monitoring, evaluation and improvement

4.4.1. The monitoring and evaluation of OSH performance should reinforce commitment to accident and disease prevention and promote a preventive OSH culture within the enterprise.

4.4.2. Further information about performance monitoring and measurement is available in the *ILO Guidelines on occupational safety and health management systems, ILO-OSH, 2001*, section 3.11.

5. Competence, education and training

5.1. General

5.1.1. The competent authorities should support the establishment and operation of an education and training system catering to the needs of the agricultural sector. Particular attention should be paid to raising knowledge and skill levels with regard to occupational safety and health in agriculture.

5.1.2. The competent authorities in consultation with employers' and workers' organizations, should support the development of a national qualifications framework including a credible system of certification of specialized skills, including OSH competencies, relevant to agriculture.

5.1.3. The necessary OSH competence requirements should be defined by the employer based on the provisions of the national laws or regulations, in consultation with workers and their representatives. Appropriate training arrangements leading to recognized vocational training qualifications should be established and maintained to ensure that all persons are competent to perform the OSH aspects of their present or planned duties and responsibilities.

5.1.4. Employers should have, or should have access to, sufficient OSH competence to identify and eliminate or control work-related hazards and risks, and to implement the OSH management system. Specific training needs can be identified from the initial and ongoing hazard identification, risk assessment and evaluation of control measures.

5.1.5. Training programmes should:

- (a) cover all workers at the workplace, including managers and supervisors, migrant and temporary workers and contractors, as appropriate;
- (b) be conducted by competent persons and provided during working hours. If this is not possible, provision for childcare should be taken into account to allow all workers to attend;
- (c) provide effective and timely initial and refresher training at appropriate intervals and, in an appropriate manner and language understood by the workers;
- (d) include participant evaluation for comprehension and retention of the training;
- (e) be reviewed periodically by the safety and health committee, where it exists, or by the employer in consultation with workers and their representatives, and modified as necessary; and
- (f) be adequately documented.

5.1.6. The form and the content of training, particularly for new workers, should be devised and implemented in consultation with workers or their representatives, and should be in accordance with the identified needs, and may include:

- (a) pertinent aspects of OSH legislation and any collective agreement, such as the rights, responsibilities and duties of competent authorities, employers, contractors and workers;

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- (b) assessments, reviews and exposure measurements, and the rights and duties of workers in this regard;
 - (c) the role of health surveillance, the rights and duties of workers in this regard, and access to information;
 - (d) instructions on PPE as may be necessary, its significance, correct use and limitations, in particular factors which may show inadequacy or malfunction of the equipment, and the measures which may be required for the workers to protect themselves;
 - (e) the nature and degree of hazards or risks to safety and health which may occur, including any factors which may influence that risk, such as appropriate hygiene practices;
 - (f) safe operating procedures, for example, as regards work in confined spaces, the isolation of hazardous energy, or the handling of animals;
 - (g) the correct and effective use of prevention, control and protection measures, especially engineering controls, and workers' own responsibility for using such measures properly;
 - (h) correct methods for the handling of substances, the operation of processes and equipment, and for storage, transport and waste disposal;
 - (i) procedures to be followed in an emergency, firefighting and fire prevention, and first aid;
 - (j) reporting procedures;
 - (k) hazard warning signs and symbols for hazardous ambient factors which may occur;
 - (l) appropriate hygiene practices to prevent, for example, the transmission of hazardous substances off site; and
 - (m) cleaning, maintenance, storage and waste disposal, to the extent that these may cause exposure for the workers concerned.

5.1.7. Training should be provided to all personnel at no cost to the worker and should take place during working hours. If this is not possible, the timing and other arrangements should be agreed upon between the employer and workers' representatives, taking into account family responsibilities.

5.1.8. Employers should ensure that training and information requirements and procedures are kept under review, as part of the assessment review and documentation.

5.1.9. The same standards of competence apply to agricultural contractors as apply to agricultural employers, managers, supervisors and workers (see also paragraph 3.7).

5.2. Competence of managers and supervisors

5.2.1. Successful management requires the integration of OSH into all activities, including contractors' activities.

5.2.2. Responsibility for managing OSH within any organization should be placed upon managers and supervisors at each level in the job hierarchy. Managers and supervisors should be in possession of an appropriate qualification and training, or have

gained sufficient knowledge, skills and experience to qualify on the basis of competence, to ensure that they are able to:

- (a) plan and organize safe operations, including identification of hazards, assessments of risks and the implementation of preventive and protective measures;
- (b) establish, implement and maintain an OSH management system;
- (c) monitor the status of OSH in those operations for which they are responsible;
- (d) take corrective action in the event of non-compliance with requirements; and
- (e) communicate effectively with all concerned.

5.2.3. Managers and supervisors should receive technical and other training including on their responsibility to consult workers and their representatives, to allow them to fulfil their responsibilities for OSH.

5.3. Competence of workers

5.3.1. Continuous worker education and training is essential for workers in agriculture, especially for young workers or those with little previous experience, particularly in agricultural enterprises with a high turnover of workers.

5.3.2. Each employer should ensure that all workers working at the workplace for whom they have a responsibility are:

- (a) appropriately educated and trained and possess relevant skills certificates or other appropriate qualifications;
- (b) suitably instructed in the tasks to which they are assigned, especially before they use any work equipment or processes with which they are unfamiliar, and trained to recognize any unusual risks and the precautions required;
- (c) suitably instructed and trained when any new hazardous substances are introduced or when processes are changed or when work equipment is replaced or modified;
- (d) made aware of the relevant laws, regulations, requirements, codes of practice, instructions and advice relating to prevention of accidents and diseases in agriculture;
- (e) informed of their individual and collective responsibility and that of the employer for OSH; and
- (f) sufficiently instructed and trained in the correct use and effects of PPE and its appropriate care.

5.3.2. Ergonomic posture and movements, the appropriate choice of tools and the handling of tools ergonomically should become routine to such an extent that the operator works correctly.

5.3.3 Chemical safety data sheets should be provided for each of the hazardous chemicals used to explain the chemical and physical hazards, in languages and at educational levels that ensure they will be understood by workers.

5.3.4. Competence testing and periodic retraining should be done in order to ensure that workers have retained the necessary up-to-date information.

5.3.5. An appropriate level of supervision should be provided to ensure that the proper procedures are being followed.

6. Contingency and emergency preparedness

6.1. General

6.1.1. Any comprehensive OSH programme should include plans for emergency response, such as in dealing with a large spillage of a hazardous chemical or as in providing first aid to lone workers who suffer serious injuries at work.

6.1.2. The emergency response plans should include, at a minimum, the following:

- (a) the roles and responsibilities of the workers assigned to respond;
- (b) emergency escape routes and procedures;
- (c) procedures to be followed by workers who remain to perform critical operations before they evacuate;
- (d) the evacuation of the worksite;
- (e) the means for internal communication and coordination;
- (f) the means of communication for lone workers or groups of workers working at distant locations;
- (g) procedures to account for all workers after the emergency evacuation is complete;
- (h) rescue, medical and other duties for workers who are assigned to perform them;
- (i) the means for reporting fire and other emergencies;
- (j) provisions for first aid (see section 18.4);
- (k) providing relevant information and training to all personnel, at all levels, including regular exercises in emergency prevention, preparedness and response procedures.

6.1.3. The necessary and most recent information should be provided to protect all persons in the event of an emergency at the worksite. Alarms should be capable of being seen and heard by everyone. Periodic emergency drills should be performed.

6.1.4. Emergency planning, prevention, preparedness and response arrangements should be designed to protect both workers and the public and should be established in cooperation with external emergency services.

6.2. Escape and rescue

6.2.1. An appropriate escape and rescue plan should be prepared in writing in every workplace.

6.2.2. Such plans should take into account relevant geographic, geological and other natural features that could impede rescue efforts.

6.2.3. Emergency plans and procedures should be communicated to the workforce.

6.2.4. In fixed installations, an adequate number of emergency exits should be arranged. Emergency exit signs should be visible in all work areas. The routes to the emergency exits should be free of any materials.

6.2.5. Provision should be made for the quick evacuation of a person in the event of an injury or illness which requires medical assistance.

6.2.6. Transport or a means of communication should be available at the worksite to contact rescue services in case of an emergency. The functioning of the communication arrangements should be checked regularly.

6.2.7. Vehicles for transportation to a point where an ambulance can be met should always be available. If practicable and appropriate, helicopter landing areas should be designated and made known to all personnel present at the worksite.

6.2.8. All workers should be informed about the telephone number or the most efficient means of contacting the nearest hospital, ambulance station, poison control centre or physician. Information should also be given on the location of the worksite and a meeting point for transportation.

6.2.9. At permanent worksites, a place should be provided where an ill or injured person might rest in comfort until the evacuation is under way.

6.2.10. In some emergency situations, specialized rescue equipment to remove or disentangle an accident victim may be necessary and should be provided.

6.2.11. Rescue equipment should include items such as:

- (a) protective clothing;
- (b) fire extinguishers;
- (c) self-contained breathing apparatus;
- (d) cutting devices and mechanical or hydraulic jacks;
- (e) ropes, harnesses and specialized stretchers to move the victim;
- (f) equipment required to protect first-aid personnel against becoming casualties themselves in the course of delivering first aid;
- (g) any other protective equipment normally required by workers in the area.

6.2.12. Although initial first aid should be given before moving the patient, simple means should also be accessible for immobilizing an injured or sick person if necessary, for transporting him or her from the scene of the accident.

6.2.13. Where medical assistance is not available within a reasonable distance, particularly in remote areas, consideration should be given to the creation of an on-site dispensary and health-care facilities with qualified medical personnel.

Emergency preparedness

Checklist	Date	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1				
		N/A	Yes	No		
Planning						
1. Does the workplace have an emergency response plan?						
2. Does the workplace have established emergency escape routes and procedures?						
3. Does the workplace have a trained first-aiders?						
4. Does the workplace have basic rescue equipment and are workers trained to use it?						

7. Machinery and work equipment safety

7.1. Introduction

7.1.1. Agriculture involves the use of a wide variety of hazardous machinery and processes. Among the most common are tractors, cultivators, harrows, seeding equipment, sprayers, harvesters, mowers, balers, grinders, trucks, wagons, trailers, all-terrain vehicles, augers, manure spreaders, and elevating equipment. In addition, a wide range of tools are used both in agricultural production and when carrying out repairs. The safety features of equipment and tools should be key considerations at the time of purchase as well as the adaptability of usage for both women and men workers.

7.1.2. The principal safety risks include traumatic injuries including, but not limited to, cuts, burns, electrocution, fractures and amputations caused by contact with cutters, gears, belts, shafts and other moving parts, burst hydraulic hoses and contact with live electrical equipment. Such injuries occur not only during the course of production but also during maintenance and repairs, cleaning, clearing blockages, etc. The effects of such injuries can be all the more serious because many farm workers work alone and first aid or medical help may be far away.

7.1.3. The competent authority should establish safety standards with regard to the design, manufacture, installation and use of agricultural machinery and equipment. Such standards should be based on sound scientific criteria and accepted international practice.

7.2. Tractors

7.2.1. *Hazard description*

7.2.1.1. Farm tractors are the most important piece of power equipment used in agriculture and are associated with a major proportion of injuries and deaths in agricultural production and maintenance. Older tractors warrant special attention as they are often not fitted with up-to-date safety equipment, such as rollover protective structures (ROPS) and seat belts.

7.2.1.2. Most tractors have rubber tyres, hydraulic systems and power-take-off (PTO) and utilize a combination of engine speeds and gear ratios. The most serious hazards associated with tractor operations include overturns, run-overs and PTO entanglement.

7.2.1.3. All terrain vehicles (ATVs) have emerged as a tractor of preference in many countries, in part because they provide the first step away from draught animals in some enterprises, and in part because they can perform many tractor operations within close quarters, inside agricultural structures, other enclosures, and in livestock operations.

7.2.1.4. Hazards associated with tractors and ATVs can be grouped into instability resulting in rollovers, run-overs, PTO stub and other miscellaneous risks including, but not limited to, slips and falls when climbing on or off tractors and ATVs, crushing injuries from unintended rolling, and driving under low-hanging tree limbs.

7.2.1.5. Tractors that do not have up-to-date health and safety features such as rollover protection structures (ROPS), seat belts and temperature-controlled cabs require specific risk assessment, and such safety features should be retrofitted where possible.

7.2.1.6. Noise associated with farm tractors and ATVs use can result in hearing impairment (see Chapter 11).

7.2.1.7. Vibration associated with tractors and ATVs use may result in musculoskeletal injuries (see Chapter 12).

7.2.1.8. Operator seats on tractors and ATVs and other control levers and consoles may, due to design and placement issues, result in ergonomic injuries (see Chapter 8).

7.2.2. Risk assessment

7.2.2.1. The employer should establish an inventory of tractors and ATVs used in the enterprise and determine whether they are fitted with up-to-date safety features, including ROPS, PTO shields, seat belts, etc. In assessing risks from such vehicles, the employer should take account of the protection afforded to the driver from existing safety features, the uses to which the vehicles are put, whether they work on slopes, and the skill levels of the drivers themselves. Risks from hydraulic hoses and other power sources should also be considered, as should risks from poor maintenance, such as from worn brakes.

7.2.2.2. The employer should also bear in mind any risks to co-workers, such as from being run over or from any malpractices like riding on vehicles without proper seating. Risks of injury to pedestrians close to farm buildings, particularly children who live there, should also be taken into account.

7.2.2.3. On the basis of the risk assessment, the employer should develop a plan to implement improvements. An example of a simple risk assessment for tractor use is given in Chapter 4.

7.2.3. Elimination of the hazard

7.2.3.1. The elimination of hazards relative to the maintenance and operation of tractors in agricultural environments presents a major challenge. Total elimination may prove impossible given the number and variety of tractors and ATVs, the wide range of tasks and the level of risk in the outdoor environment. Nonetheless, the employer should have as a goal the elimination of tractor and ATV hazards by the use of all safety modalities available, including engineering controls, safe work systems and procedures and the training, induction and supervision of workers. The employer should ensure that adequate competency-based training is provided to tractor and ATV operators and, where applicable, that competency-based certification of operators is carried out. The worker is expected to be fully cooperative and compliant with such training and certification.

7.2.4. Engineering controls

7.2.4.1. The employer should ensure that all tractors and ATVs that workers are asked to operate are equipped with ROPS, seat belts, PTO shields, mudguards to protect the worker from movement of the wheels and a muffler that successfully results in noise abatement.

7.2.4.2. The employer should ensure that the brakes, emergency brakes, lights, signal lights and other safety devices are regularly maintained and kept in safe working condition.

7.2.4.3. The employer should ensure that tractors equipped with cabs have a means of controlling the interior temperature to an acceptable standard (see section 16.2 on thermal exposures).

7.2.4.4. The employer should ensure that tractors equipped with cabs have a means of controlling noise in the cab. If noise exposure cannot be reduced to acceptable limits, the employer should provide PPE to the worker.

7.2.4.5. The employer should ensure that tractors are equipped with a ladder or steps and a handrail to enable the worker to mount and dismount the tractor safely.

7.2.4.6. The employer should ensure that ATVs procured for use within specific agricultural enterprises are fitted with appropriate rollover bars and operator restraints if these units are to be used on inclines, hills, or in other off-road or off-installation areas. Night-time use will require the fitting of headlamps and brake/turn signal devices.

7.2.4.7. The employer should ensure that all tractors and ATVs are equipped with seating that is designed to reduce musculoskeletal injuries to the worker.

7.2.4.8. The employer should ensure that tractors are fitted with appropriate emergency stop controls.

7.2.5. Safe working systems and procedures

7.2.5.1. The employer should establish strict maintenance and operating protocols and provide training and supervision to ensure their implementation.

7.2.5.2. The employer should read operator manuals to learn how to safely operate the tractors and ATVs and ensure that tractor and ATV operators are trained and familiar with the operating instructions. Manuals should be available to operators and, on tractors, kept in the cab.

7.2.5.3. The employer should ensure that operators are physically, psychologically and physiologically capable of operating the tractor or ATV.

7.2.5.4. The employer should ensure that workers implement safe working procedures related to operating tractors and ATVs.

7.2.5.5. The employer should ensure that tractor drivers have an understanding of tractor stability, and are aware of the risk of side rollovers, rear rollovers and run-overs and how to prevent them.

7.2.5.6. Employers and tractor operators should be aware that the tractor's centre of gravity is central to its stability; that adding weights (e.g. lifting fork, front-end loader, side-saddle chemical tank) alters the centre of gravity; that moving off a flat plane (level surface) alters the centre of gravity; that centrifugal force can contribute to overturn when tractors are turning; that rear-axle torque can cause the front end of a tractor to lift off the ground if the rear axle cannot rotate (e.g. when rear tractor tyres are stuck in mud or blocked from rotating by the operator); that drawbar leverage can occur (e.g. when a two-wheel drive tractor is pulling a load, the tractor's rear tyres push against the ground backward and downward and become a pivot point, causing the load to tip the tractor rearward); and that loads should only be attached to tractors in accordance with design specifications.

7.2.5.7. The employer should ensure that ATV operators possess an understanding of ATV stability, including centre of gravity integral to the specific machine in use; effect of add-on technologies such as wheel weights, post-hole augers, rear-end sprayers, front-end dozer blades and buckets, etc.; turning radii and the effect of operator centrifugal force; use in water and other muddy conditions; and safe vehicle velocity and speeds when engaged in livestock herding and control activity.

7.2.5.8. The employer should ensure that workers who operate tractors or ATVs are fully informed, trained and supervised in the safe operation of the tractor or ATV with regard to the operator, other workers, bystanders and others. In particular, the employer should ensure that tractor and ATV operators and other workers understand how to prevent run-overs.

7.2.5.9. Operators and those on the ground should exercise vigilance in keeping bystanders away from areas where tractors and ATVs are in use. The operator should ensure that others, including workers and bystanders, are at a safe distance when the tractor or ATV is about to be operated. In situations where children might be at risk the operator should make a specific search for children.

7.2.5.10. The operator should wear a seat belt when operating a tractor that is equipped with a rollover protection structure (ROPS) or a cab.

7.2.5.11. The employer should ensure that workers know the “one seat—one rider” rule and enforce it.

7.2.5.12. Tractor operators should not allow additional riders on tractors. On tractors equipped with trainee seats, a trainee should occupy the seat only when actual training activity is under way.

7.2.5.13. Workers should be aware that crushing injuries can occur between tractors or ATVs and other objects.

7.2.5.14. The employer should ensure that workers understand how to prevent PTO injuries. Wrap-point hazards can be reduced by the use, repair and replacement of master shields on PTOs. Proper work procedures should be followed to prevent entanglement in PTOs. Workers should ensure that their clothing and person are such as to reduce risk of entanglement injuries as a result of loose-fitting clothing, long or untied hair, jewellery and other personal objects being caught in PTO shafts.

7.2.5.15. Workers should be aware of the safe working procedures related to tractor operations and PTO master shields. Workers should never step over a PTO shaft in operation.

7.2.5.16. Workers should report broken or missing master shields to the employer.

7.3. Other agricultural machinery, equipment and tools

7.3.1. *Hazard description*

7.3.1.1. Agricultural workers use a wide variety of equipment and tools that are designed to undertake a range of tasks including but not limited to tilling the soil, sowing seeds, applying agricultural chemicals, harvesting and storing crops, cutting and baling hay, grinding feed, hauling manure and many other tasks.

7.3.1.2. Tillage equipment, such as ploughs and cultivators, seeders, chemical sprayers of both the hand-held and machine-mounted variety, swathers, combines, mowers, balers, feed grinders, manure spreaders and numerous other large and small machines including hydraulic devices, have all been implicated in accidents involving serious injury or death. Such machinery includes rotating components, sharp cutting edges, transmission belts and chain drives, feed rolls and gear drives that, unless properly

guarded, pose a grave risk of amputation, crushing or entanglement that may result in severe disability or death.

7.3.1.3. Accidents involving hand tools such as hoes, hammers, crowbars, picks and beaters, sickles, scythes, cutlasses and machetes and portable power tools may lead to scratches, lacerations, amputations of digits or limbs or other injuries, some of which may result in severe disability or death.

7.3.1.4. Falls from machines represent an important cause of severe injury.

7.3.1.5. Noise associated with farm machinery use can result in hearing impairment (see Chapter 11).

7.3.1.6. Vibration associated with farm machinery use may result in vibration injuries (see Chapter 12).

7.3.1.7. Tractor seats and other aspects of tractor use may result in musculoskeletal injuries.

7.3.2. Risk assessment

7.3.2.1. Employers should inform themselves of the relevant standards and carry out a risk assessment to determine the measures required to eliminate the hazard or the control strategies required to minimize workers' exposure. The employer should include an evaluation of the state of the machines in question in terms of maintenance and repair, adequacy of guards and operating procedures. The employer should ensure that potential crush points are identified. The employer should determine whether workers are aware of the hazards they face and consistently apply safe working procedures.

7.3.3. Elimination of the hazard

7.3.3.1. Total elimination of machine-related hazards and associated risk may prove impossible given the nature of the tasks and machines available to accomplish the tasks.

7.3.4. Engineering controls

7.3.4.1. Engineering controls can greatly reduce the level of risk and should be used whenever possible. The employer should ensure that to the extent possible, risks are mitigated by means of guarding those parts of machines and equipment that may cause injury. The objective is to make sure that machines are made safe by eliminating sources of harm, such as fitting brakes to mobile equipment like trailers.

7.3.4.2. The employer should ensure that fixed guards are used whenever necessary and properly fastened in place with appropriate fasteners such as screws or nuts and bolts which need tools to remove them.

7.3.4.3. The employer should ensure that in circumstances where workers require regular access to parts of the machine and a fixed guard is not possible, an interlocked guard should be used. This will ensure that the machine cannot start before the guard is closed and will stop if the guard is opened while the machine is operating. If access is required to parts that are guarded, the machinery should be shut down.

7.3.4.4. The employer should ensure that established systems for inspections exist to ensure that guards are properly maintained and defects are rectified.

7.3.4.5. The employer should ensure that workers understand why the safe use of equipment and proper use of guards and PPE are essential to reducing traumatic injuries.

7.3.4.6. Engineering controls should reduce exposure to noise, vibration and ergonomic hazards.

7.3.5. Safe working systems and procedures

7.3.5.1. The employer should not permit the use of any unsafe or faulty equipment.

7.3.5.2. The employer should ensure the provision of adequate information, instruction and training for those using equipment, and that their skill levels are periodically evaluated.

7.3.5.3. Unauthorized persons should not be allowed to operate machinery. In particular, children should be kept away from all agricultural equipment.

7.3.5.4. The employer should ensure that workers are trained to operate equipment before they are directed to do so. Adequate equipment for women workers should be provided in order to avoid accidents linked to equipment not ergonomically suited.

7.3.5.5. The employer should ensure that machinery and equipment, including their guards and other safety devices, are regularly maintained and kept in a safe condition. Records of such maintenance should also be kept.

7.3.5.6. The employer should ensure that tools are kept in good repair. Tools with broken or cracked handles, chisels and punches with mushroom heads, and bent or broken implements should be replaced.

7.3.5.7. The employer should ensure that machinery and equipment are selected so as to be suitable for their intended use, and that they are not misused, such as using tractor-mounted buckets for working at height or as pile drivers.

7.3.5.8. The employer should ensure that all clearing of blockages and other reasons for gaining access to dangerous machinery should be carried out with machinery stopped.

7.3.5.9. Workers should know how to operate the machine including the emergency stopping procedures, before commencing operation of any machine. No machine should be left running when the operator leaves it.

7.3.5.10. Workers should receive relevant training on potentially dangerous equipment and be instructed never to use a machine unless they are trained to do so.

7.3.5.11. Workers should receive relevant training on proper coupling/hitching of implements and on the proper mounting for driveline power transmission systems and implements.

7.3.5.12. Workers should not operate machinery unless the guards are in position and all protective devices are working.

7.3.5.13. Workers should be authorized to safely stop the machine if it or any implement is not working safely or if any guards or protective devices are faulty, and inform the supervisor as soon as possible.

7.3.5.14. Workers should use handholds when mounting and dismounting equipment.

7.3.5.15. Workers must never operate equipment while under the influence of alcohol or other substances which might affect their operating ability.

7.3.5.16. The employer should ensure that safe work protocols ensure adequate protection with regard to noise, vibration and ergonomics.

7.3.5.17. The employer should ensure that various hazards including shear points, pinch points and wrap points are identified and guarded and that workers are made aware of these hazards and trained and supervised to avoid them.

7.3.5.18. The employer should ensure that workers are adequately trained in the means to prevent equipment from falling or moving so as to avoid potential crushing or fatal injury, such as when changing the cutting platform and unblocking on a combine, or in any situation when a heavy component of a machine requires moving, attaching or repair.

7.3.6. *The use of PPE (see also Chapter 17)*

7.3.6.1. Where there are still some residual risks that cannot be reduced by other means, the employer should provide appropriate PPE, such as coveralls, gloves, goggles, safety boots and hearing protectors.

7.4. Control of hazards created by energy sources

7.4.1. *Hazard description*

7.4.1.1. Electrical, mechanical, hydraulic, pneumatic, fuel and other energy sources are used to improve productivity. Much agricultural equipment makes use of such energy sources, which pose special hazards to workers' OSH.

7.4.1.2. Stored energy is energy that is confined and may be released unexpectedly such as that which comes from machinery springs and suspension systems, hydraulic systems, compressed air systems, compressed gas systems, high pressure water systems, or other sources of stored power, e.g. batteries.

7.4.2. *Assessment of risk*

7.4.2.1. The employer and the operator should carry out a risk assessment to determine the hazards posed by energy sources and release of stored energy in order to develop control strategies required to minimize workers' exposure.

7.4.3. *Elimination of the hazard*

7.4.3.1. The elimination of power-related hazards in the agricultural workplace may prove impossible, but engineering controls and strict adherence to SWPs greatly reduce the level of risk.

7.4.4. *Engineering controls*

7.4.4.1. The employer should ensure risks are mitigated by means of guarding those parts of machines and equipment that may cause injury.

7.4.4.2. All sources of power that, if not properly guarded, can cause injury to the operator should be properly guarded.

7.4.4.3. Contact with electricity on farms can be predicted, such as when driving under a power line with an upright irrigation pipe, or a partially elevated materials elevator or auger. An example of an engineering control is the burying of high voltage power lines, thus virtually eliminating the possibility of electrical burns or death as a result of contact of equipment such as grain augers to high voltage overhead wires.

7.4.5. Safe working systems and procedures

7.4.5.1. The employer should ensure that the safe control of energy is addressed by procedure and carried out by trained workers in accordance with the nature of the energy source and the characteristics of the farm environment.

7.4.5.2. The employer should ensure that all agricultural equipment undergoing servicing, renovation, or maintenance is appropriately isolated, locked out and labelled and that all persons are protected.

7.4.5.3. Employers should identify and implement specific procedures for the control of hazardous energy sources that include such measures as preparation for shutdown; actual shutdown; equipment (or module component) isolation; lock-out or tag-out application; safe positioning of workers; locating appropriate tools and protective equipment; release of stored energy; verification of isolation; and awareness of location of AC/DC power lines, hydraulic and pneumatic piping in work areas.

7.4.5.4. Employers should ensure that energy sources for agricultural equipment are turned off or disconnected or de-energized and the activating switch locked or labelled with a warning tag before maintenance or repair work is begun.

7.4.5.5. Employers should identify and implement specific procedures for the control of hazardous energy once maintenance or repair work has begun including planning for re-energizing; accounting for exposed workers; removal of lock-out/tag-out device; and re-energizing of machine/device/component.

7.4.5.6. Employers should ensure that workers working around hazardous energy sources and equipment are equipped and trained in the hazard and protective measures in place.

7.4.5.7. Employers should ensure that electrical, hydraulic and compressed air/gas installations are installed and maintained by qualified personnel.

7.4.5.8. Employers should ensure that energy sources and facilities are appropriately labelled and that existing overhead power lines and underground cables are mapped.

7.4.5.9. Assigned workers should be trained to understand the equipment that they operate or repair, meticulously follow all operational and repair procedures; observe lock-out/tag-out procedures; know where safety zones are located, and know where other workers and standby persons are located.

7.4.5.10. Workers should know the proper procedures to adopt in the case of emergency (see Chapter 6).

7.4.5.11. Unauthorized workers should not enter areas with hazardous energy sources.

7.4.6. *The use of PPE*

7.4.6.1. Employers should ensure that workers are provided with protective equipment for the task to be undertaken such as face and eye shields, gloves appropriate for the task(s) at hand, aprons, leggings, etc.

Farm tractor safety (forklifts, skid steers, ATVs, track vehicles)

Checklist	Date	Self-audit		Step 2	Step 3	
		Step 1				
Physical conditions		N/A	Yes	No	Priority for action	What action is required
1. Is the tractor equipped with a rollover protective structure and seatbelts?						
2. Do workers always wear seatbelts with rollover protective structure when available?						
3. Is there a slow moving vehicle (SMV) sign on the rear of the tractor or on the rear of towed equipment for roadway travel?						
4. Are SMV signs clean, with good reflective qualities?						
5. When towing equipment, do you use safety hitch pins and chains for roadway travel?						
6. Is there a first-aid kit mounted on the tractor, or accessible nearby?						
7. Is there a fire extinguisher located on the tractor, or accessible nearby?						
8. Are regular efforts made to keep steps free of mud, tools or debris that could cause slips?						
9. Is the exhaust system on each tractor in good condition and leak-free?						
Work practices		N/A	Yes	No	Priority for action	What action is required
1. Do operators read the operator's manual or follow rules for safe operation? Is the operator's manual available?						
2. Before operating, do operators walk around the tractor making a visual preoperational check of the tractor and for bystanders or other objects?						
3. Is the rule "No riders" on the tractor consistently enforced?						

Checklist	Date _____	Self-audit		
		Step 1	Step 2	Step 3
4. Do you lock brake pedals together before roadway travel? Or when travelling at high speeds?				
5. Are brakes adjusted regularly?				
6. When operating a tractor in buildings, do you open doors and windows or start ventilation fans?				
7. Are buildings locked or keys removed from the ignition of the tractor when not in use to prevent unauthorized people from using the equipment?				
8. Do tractor operators always steer clear of tipping hazards such as ditches, steep hills?				
9. When using front-end loaders, do workers travel with the bucket lowered to reduce chances of a side rollover due to instability?				
10. Have all tractor operators received training on the specific equipment that they will be using? Have they reviewed the manual for safe operating practices?				
11. Is mounted equipment always lowered to the ground before the operator leaves the tractor?				
12. Are towed loads always hitched to the drawbar and never higher?				
13. When towing high or wide loads, are clearances from overhead power lines always checked? As well as distances from poles?				
14. If the tractor does not have a sound proof cab, does the operator always wear hearing protection when noise levels exceed 90 decibels?				

Power take-off (PTO) driven equipment

Checklist	Date _____	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1	Yes	No		
Physical conditions		N/A				
1. Do all PTOs have working shields and guards in place?						
2. Is there a master shield in place where the PTO meets the tractor?						
3. Are shields on PTOs checked periodically to ensure that they rotate freely? (Check only with power off.)						
Work practices		N/A				
1. Before leaving the tractor seat, is the PTO always disengaged, engine shut off and where possible keys removed from the ignition? (Exceptions can be: silage blower, grinder-mixers, irrigation and manure pumps.)						
2. When working with PTO-driven equipment, is clothing close fitting, long hair covered, and laces, etc., tucked away?						
3. Do workers always avoid stepping over PTO shaft?						
4. Are worn or defective parts replaced as soon as possible?						

Self-propelled equipment (harvesters, sprayers, combines, swathers, generators, irrigation pumps, etc.)

Checklist	Date	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1				
Physical conditions		N/A	Yes	No		
1. Are guards in place and key warning decals readable?						
2. Are steps and walkways free of mud, tools or debris?						
3. Is the SMV sign reflective and clean?						
4. Are all safety systems fully operational?						
Work practices		N/A	Yes	No	Priority for action	What action is required
1. Before operating, are operators aware of hazards or bystanders?						
2. Is the rule "one seat, one rider" enforced?						
3. Have all operators received training on their equipment and reviewed the operator's manual or safety rules? Is there documentation to support this training?						
4. Is the power turned off and locked out where required before adjusting or servicing the equipment? (Documentation of a written lock-out procedure should be developed where required.)						
5. Are chains, belts, wires and hoses regularly serviced and inspected?						

General machinery

Checklist	Date	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1				
		N/A	Yes	No		
Physical conditions						
1. Are key warning decals on machinery readable? (Replacement decals are available from most dealers.)						
2. Are all shields and guards in place? (PTO and other.)						
3. Are all machines free of jagged metal or protrusions?						
4. Have you developed a policy and ensured compliance of when PPE should be worn or used?						
5. Is any equipment that is likely to be towed on roadways equipped with safety chains and safety hitch pins? Are they attached properly according to regulations?						
6. Are SMV signs clean and reflective? Are they mounted on the rearmost piece of equipment before roadway travel?						
Work practices						
1. Are defective and worn parts replaced as soon as possible (including tyres)?		N/A	Yes	No	Priority for action	What action is required
2. Are children and bystanders kept away from operating equipment?						
3. Is the power turned off before adjusting or servicing machinery or lockouts used if required?						
4. Are moveable components properly blocked before repair or adjustment? Are they locked out?						
5. Do workers always observe the "No riders" rule on machines or drawbars?						
6. When implements are parked, are they out of the transport position, blocked or left in down position?						

8. Ergonomics and the handling of materials

8.1. Introduction

8.1.1. Five ergonomic factors affect the health outcomes of agricultural workers. These include:

- the nature of the physical work environment (noise, heat, lighting, thermal comfort), the agricultural tasks to be performed;
- the technology applied to the prescribed tasks (including workplace design, facility design, and agricultural material handling);
- the manner in which tasks are organized (including use of shift work); and
- worker characteristics (including demographics, physiology, human error, and identification and treatment of injured workers).

8.1.2. Agricultural work can span a wide continuum from arduous to sedentary, from stooping, reaching, bending, and carrying out repetitive movements in awkward body positions to sitting in air-conditioned or heated comfort while operating sophisticated agricultural equipment. Economic, topographical, technical, gender-based and even socio-cultural factors may limit mechanization or usage, and where implemented, may introduce new ergonomic risk resulting from equipment design and vibration. Huge technological challenges to design and introduction of technology to replace manual labour remain within many agricultural worksites. There is still extensive reliance on manual labour.

8.2. Hazard description

8.2.1. *Routes of exposure*

8.2.1.1. Many agricultural work environments are characterized by labour-intensive practices such as manual seeding (transplanting rice, fresh vegetables, or horticultural products), crop maintenance (weeding, pruning, grafting, or hand tillage), harvest (hand picking of fresh fruits and vegetables, copra, or kapok), or post-harvest activities (inspection, packing, or loading/shipping).

8.2.1.2. Agricultural work may be conducted in hot and/or humid, or cold environments; both indoors and outdoors (see Chapter 16).

8.2.1.3. Work may be performed on agricultural terrain or within building structures which, in the absence of appropriate footwear, handrails, and non-slip flooring, may predispose workers to slips, falls, and off-balance whole-body recovery, thereby causing or exacerbating the potential for musculoskeletal injury.

8.2.1.4. Visual and acoustic cues and information for workers may be degraded due to physical characteristics of the work environment, including vibration of visual displays and machine controls, thereby subjecting workers to deficient task decisions.

8.2.1.5. Workers may be required to carry out repetitive lifting and carrying of heavy (greater than 23 kg) loads (pre-plant handling of seed containers and sacks, manual

harvesting of crops or post-harvest packing and handling of containers). Task rate payment systems exacerbate the potential for fatigue and musculoskeletal injury.

8.2.1.6. Workers may engage in prolonged exposures to stooped work (transplanting seedlings, pre-harvest weeding, or crop harvest by hand) that involves sustained or repeated reaching and twisting to full body bending.

8.2.1.7. Workers may perform very highly repetitive hand work (clipping, cutting, or manual plant shank pulling) which requires simultaneous non-neutral posturing of the hand or wrist with both applied upper-bound hand force (either to the tool or to the crop) and speed of hand/wrist movement.

8.2.1.8. Moving agricultural equipment and vehicles, motorized platforms used during planting or harvesting, mechanical harvesters employing vibrating technology, and work surfaces employing embedded weighing scales may induce whole body vibration (see Chapter 12). Workers who are positioned near or next to power generators and stationary milling or threshing machines may also sense transmitted vibratory motion.

8.2.1.9. Hand tools and other work appliances may generate mechanical vibration. These tools are ubiquitous within agricultural environments, and include, for example, impact wrenches used in equipment maintenance and repair, chainsaws, brush and weed saws, portable fruit, nut or kapok harvesters, and vibro-compactors.

8.2.1.10. Unreasonable expectations of the time and effort required to perform agricultural tasks may contribute to task loading and rate of task performance, resulting in increased risk of musculoskeletal injury.

8.2.1.11. Agricultural tasking rates (frequency, duration, and non-neutral posture) may predispose workers to musculoskeletal injury.

8.2.1.12. Workers who use tobacco, consume alcoholic beverages, or use various substances such as cyroheptadine (taken to increase testosterone production), ginseng, wheat germ oil, alcohol, Guarani (prepared from the seeds of the *Paulliania cupana* tree) and other folk medicines used for increasing energy, will experience constriction of blood circulatory vessels (ischemia), principally the capillaries that permeate striated (skeletal) muscle, thereby enhancing the risk of musculoskeletal disease resulting from cell tissue death and resorption.

8.2.1.13. Workers who experience job or task dissatisfaction may be predisposed to musculoskeletal injury.

8.2.1.14. Workers who are dehydrated are at increased risk of musculoskeletal injury.

8.2.2. *Principal health effects*

8.2.2.1. Workers who handle (lift, carry, and position) heavy objects (weighing in excess of 23 kg) at rates exceeding three times per minute for more than two hours are at risk of experiencing lower back injury, generalized fatigue, and possibly heat stress due to the combination of the weight of the object, the manner, frequency and duration of the task, and other environmental influences such as working in direct sunlight, near heat sources such as electric generators, air compressors, internal combustion engines, etc.

8.2.2.2. The manual planting of seedlings, crop maintenance (weeding, pruning, and grafting), the manual harvest of fresh fruits, nuts, vegetables, and palm oil, and post-

harvest handling of these products may cause cumulative trauma disorders, neck and upper extremity impairment, and lower back impairment.

8.2.2.3. Stooped work is a common risk factor for muscle cramps and/or musculoskeletal injury. The lower back is particularly affected by such activity.

8.2.2.4. Highly repetitive hand work during the manual maintenance and harvest of crops, and the coupling of non-neutral postures, the force applied, and the speed of hand action contribute to the risk of developing upper limb musculoskeletal injuries.

8.2.2.5. Excessive exposure to hand-transmitted vibration can cause disorders in the blood vessels, nerves, muscles, and bones and joints of the upper limbs of the human body.

8.2.2.6. Whole body vibration, depending on magnitude and duration, can lead to diseases of the peripheral nerves, prostatitis, and both acute and chronic back injury (see Chapter 12).

8.2.3. *Special risks to consider*

8.2.3.1. Musculoskeletal injuries and cumulative disorders may cause, for women in particular, osteoarthritis.

8.2.3.2. Within labour-intensive agriculture, young workers are particularly vulnerable to musculoskeletal injury due to soft bone density and developing musculature.

8.2.3.3. Females who are pregnant, and those who are caring for infants face increased musculoskeletal injury from exposure to arduous manual handling tasks, tasks requiring special equilibrium/non-neutral postures (tree fruit and nut picking), prolonged periods of lying prone, sitting, or standing (riding on mechanized picking or weeding platforms), and machine vibration.

8.2.3.4. Workers compensated on a piece-rate basis may experience an increased risk of musculoskeletal injury resulting from attempts to maximize their performance by increasing their work pace (thereby increasing total compensation).

8.3. Ergonomic control strategies

8.3.1. *General principles*

8.3.1.1. The competent authority should establish safety standards for the manual handling and transport of agricultural products, and tool and equipment design. Such standards should be based on sound scientific criteria and accepted international practice, taking into account the conditions in which agricultural work is performed.

8.3.1.2. The competent authority should develop guidelines for the implementation of safety standards within agricultural worksites differentiated by sex, including design and organization of work processes and workstations, safe work postures and movements, the conduct of ergonomic analyses of work tasks, the selection of tools and equipment, and analyses of worksite environmental effects.

8.3.1.3. Employers should carry out assessments of the risk to workers' health due to manual handling of agricultural materials or tools. The main factors to be assessed include:

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- (a) characteristics of the agricultural worksite environment and its impact on workers;
 - (b) equipment/workstation overall design and flow-through;
 - (c) the weight of the agricultural product(s) or tool(s) being handled;
 - (d) the frequency (usually in terms of actions per minute) of handling agricultural products or tools and applying force;
 - (e) the duration in which products or tools are handled or force is applied;
 - (f) the postures adopted by workers while handling the products or applying the force;
 - (g) the physical characteristics of the workers engaged in the activities (height, build, gender, age); and
 - (h) worksite environmental factors.

8.3.1.4. Employers should, based on the risk assessments, develop a plan for the elimination of identified hazards, and implementation of prevention and control measures which reduce the risk of musculoskeletal injury and disease. First priority should be given to elimination, then minimization by substitution using non-hazardous or less hazardous handling methods, work processes, or tools. Where this cannot be achieved, resort to administrative measures such as defined working systems and practices, the provision of information and training, and worker PPE may have to be relied upon.

8.3.1.5. Employers should involve workers in the assessment activity, as well as drafting of hazard elimination, prevention, and control measures. The use of available local expertise has many benefits, including inclusivity and group development of workable solutions to ergonomic exposures.

8.3.1.6. Employers should, based on available guidelines and risk assessments, inform themselves of relevant elimination, prevention, and control measures and seek guidance on their implementation from the relevant authority, regional or local clinical expertise, or other exemplary agricultural employers.

8.3.2. *Elimination of ergonomic hazard through engineering controls or substitution*

8.3.2.1. Engineering control that eliminates the agricultural worksite hazard at its source is the preferred approach for ergonomic interventions.

8.3.2.2. The competent authority(ies) should be prepared to provide regulatory information, ergonomic reference manuals, and other ergonomically useful technical information.

8.3.2.3. Manufacturers of agricultural equipment, tools and workstations should design and manufacture transport systems and technical devices usable by both men and women in agricultural worksites that eliminate the need for workers to manually lift, lower, carry, pull, or push heavy agricultural products or other materials. Further, manufacturers should:

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- (a) develop packaging mechanisms that facilitate handling, taking into account size, shape, and gripping surfaces;
 - (b) improve the location and function of hand controls and visual displays on mechanized agricultural equipment and stationary worksite devices such as agricultural product dryers, power generators, compressors, etc.;
 - (c) provide culturally and linguistically sensitive information about force requirements, hand/wrist posture, and other technical use detail for agricultural equipment and tools;
 - (d) design and produce hand tools that incorporate vibration damping and/or isolation; and
 - (e) design and produce agricultural workstations adjustable for both women and men that support the worker's body in a neutral trunk position.

8.3.2.4. Employers should select agricultural tools, machine technology, and worksite workstations that eliminate exposure to ergonomic hazards such as the carrying of heavy (greater than 23 kg) loads, stoop work or trunk bending, excessive fatigue levels resulting from task frequency, duration, and environmental exposure, vibration, excessive amount of hand/arm force, non-neutral postures, or highly repetitive hand work which requires applied hand force and excessive speed of hand/wrist movement. In particular, employers should:

- (a) select vehicles and powered agricultural equipment (including rider workstations) that minimize transmission of vibration to operators and other riders (see Chapter 12), permits ergonomically acceptable working positions, and moves forward at an ergonomically safe speed;
- (b) take all necessary measures to install and/or alter workstations so that exposure to musculoskeletal injury is eliminated;
- (c) consider partial or full mechanization of agricultural tasks, especially in the harvest of small grains, kapok, palm and other oils, coconuts, and fruits, vegetables, and nuts;
- (d) provide alternative tools and machine technology that eliminates exposure to noise, tool emissions (including heat), vibration, dust, particulate matter, and non-neutral postures that may affect workers' ability to see, hear, and touch properly;
- (e) maintain agricultural machinery, tools, and working surfaces according to manufacturer's recommendations;
- (f) remove from worksites worn out technology and tools because worn components increase the potential for ergonomic exposure;
- (g) consider the use of load transfer devices that reduce the risk of lower back injury and chronic pain by transferring a portion of upper body weight to the workers' hips and legs; and
- (h) routinely analyse agricultural jobs and embedded work tasks, as well as resulting demands placed on agricultural workers, and record findings for future use.

8.3.2.5. Employers should ensure that all forms of alcoholic beverages and other known allegedly performance-enhancing products are not permitted on the worksite, and that rehydration liquids, including water, are freely available, so that agricultural workers do not work while under the influence of alcohol or other products, while dehydrated.

8.3.2.6. Employers should ensure that at-hire screening or recruitment protocols do not allow for placement in worksites of workers at special risk of musculoskeletal injury or disease resulting from exposure to agricultural tasks.

8.3.3. *Control of ergonomic hazards through engineering and administrative minimization of impact*

8.3.3.1. The competent authority should offer guidance with regard to the assessment strategies used by employers when evaluating ergonomic control measures.

8.3.3.2. Employers should adopt engineering control measures designed to reduce ergonomic risks for workers, including the following:

- (a) engineered processes or organized work systems which eliminate or minimize stooped work, non-neutral work postures, lifting, carrying, or placing heavy (greater than 23 kg) loads, or highly repetitive hand work which requires simultaneous non-neutral posturing of the hand or wrist with both applied upper-bound hand force and movement speed of hand or wrist;
- (b) substitution of agricultural technology and/or tools for manual tasks;
- (c) substitution of higher level agricultural technology and/or tools for other tasks already employing some lower level of technology;
- (d) selection of tools that are suitable for the workers involved, such as selecting hand tools with longer or shorter shafts so as to be better adapted to the user;
- (e) strategic placement of exhaust mechanisms, fans, or heat shields at hot sites/workstations;
- (f) regular maintenance and repair of worksite equipment; and
- (g) documentation of jobs, all tasks, and progress toward ergonomic solutions.

8.3.3.3. Employers should assess ergonomic control measures to ensure they are performing as originally intended. The intervals and content of the assessment should be in accordance with national law, or alternatively, abide by criteria specified in national or international ergonomic standards that have been approved or recognized by the competent authority.

8.3.3.4. Employers should involve workers in the assessment activity, as well as design of follow-up remediation measures.

8.3.3.5. A suitable record of ergonomic assessments should be kept in accordance with national law and practice.

8.3.3.6. Administrative control measures designed to control ergonomic hazards for workers could be any combination of the following:

- (a) programmed use of rest periods for workers;
- (b) an initial period of activity that allows workers to gradually adapt to the pace and intensity of the job prior to actual placement in work settings;
- (c) routine use of job/task rotation among workers;

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- (d) written job descriptions depicting responsibilities, tasks, outcomes, and consequences;
 - (e) reduction in the number of workers exposed to musculoskeletal injury through segregation of hazardous tasks (piece-rate pay structures, production bonuses, etc.); and
 - (f) specific training designed to improve job-related or task-related worker skills, and provide protection from musculoskeletal injury and disease.

8.3.4. *Minimization of ergonomic hazard through information and training of workers*

8.3.4.1. Employers should ensure that workers who are exposed to worksite risk of musculoskeletal injury or disease receive adequate training or instruction in safe work techniques which take into account differences between women and men before being assigned to job tasks. Workers should be:

- (a) informed about the need to routinely adopt “neutral” body positions;
- (b) encouraged to properly adjust seating and working positions;
- (c) informed about the risk associated with repetitive lifting and lowering of tools, agricultural products, crating material, etc.;
- (d) informed of the risk associated with pushing or pulling heavy (greater than 23 kg) heavy loads/objects;
- (e) informed of the hazard associated with repetitive and forceful use of non-neutral posturing of the hand or wrist with both applied upper-bound hand force either to the tool or to the crop) and speed of hand/wrist movement;
- (f) instructed in SWPs associated with each task;
- (g) instructed in the correct handling and use of hand tools with a light, but safe grip;
- (h) encouraged to report any pain, discomfort, numbness or tingling to the employer without fear of discrimination; and
- (i) encouraged not to use tobacco, alcohol, and/or other stimulants, since most act as a vasoconstrictor, reducing blood supply to muscle mass, fingers, wrists and hands.

8.3.5. *Minimization of ergonomic hazard through use of PPE*

8.3.5.1. General principles

8.3.5.1.1. The use of PPE should be the last resort, after all other means for elimination, reduction, or control of musculoskeletal injury have been exhausted.

8.3.5.1.2. Employers should first identify the particular hazards for which PPE protection is desired, then match the PPE to each type of hazard encountered within agricultural worksites.

8.3.5.1.3. Employers should consult manufacturers of PPE to ensure that the right kind of PPE for men as well as for women are under consideration for protection against the relevant type of worksite hazard.

8.3.5.1.4. Employers should provide adequate training to all supervisory personnel in PPE acquisition, fitting, use, and return-to-use after cleaning or repair.

8.3.5.1.5. Employers should identify and clearly mark worksite areas requiring the use of PPE.

8.3.5.1.6. Employers should provide a sufficient number and the right kind of PPE for each of the workers requiring it, should provide spare parts and maintenance facilities at the agricultural setting for quick replacement of worn-out parts of PPE, and should provide clean, safe storage on site for all PPE.

8.3.5.1.7. Employers should check regularly for the proper use of the right kind of PPE and its condition while in routine use.

8.3.5.2. Minimization of the hazard

8.3.5.2.1. Employers should fit-test, preferably through actual worksite demonstration, all PPE on employees expected to perform agricultural worksite tasks.

8.3.5.2.2. Employers should give high priority to employee comfort, worksite mobility, and maintenance when selecting appropriate PPE and keeping it in working condition.

8.3.5.2.3. Employers should select PPE that is tested through agricultural worksite adaptation trials. Safety teams involving workers are particularly useful when identifying unsafe conditions, where PPE might be useful, and the types of PPE likely to be used by agricultural workers.

8.3.5.2.4. Employers requiring PPE use, should inform every worker, by spoken word, on-site demonstration, and in written form about:

- (a) why it is necessary to use the PPE;
- (b) when and where the PPE should be used;
- (c) how PPE should be used; and
- (d) how to care for the PPE while at the worksite.

8.3.5.2.5. Employers should ensure that every worker at risk uses PPE, including, as required, worksite heat/exhaust shields, gloves, boots, load transfer devices, wrist/ankle wraps, and/or sweat bands.

8.3.5.2.6. Employers should provide facilities for adequate hand hygiene so that unnecessary hand/wrist slip or grip risk resulting from dermal contamination due to lubricating, cleaning, or cooling/heating fluids is eliminated.

9. Chemicals

The widespread use of agrochemicals in agriculture worldwide poses serious health risks to employers, workers and the general public. Sound management of chemicals and the deployment of the full hierarchy of controls are needed to minimize occupational exposures, as follows:

- elimination or substitution, for example substituting a more hazardous chemical with a less hazardous one
- engineering control measures, for example a well designed system for storage and dispensing of pesticides;
- administrative controls such as restricting entry into enclosed areas that have been sprayed with pesticides;
- as a last resort, provision of personal protective equipment (PPE) that is suitable for the worker and appropriate for the task and affords adequate protection,.

9.1. Introduction

9.1.1. Pesticides are the chemicals of greatest concern in regard to health and safety in agriculture. Pesticides are categorized according to their use, and include fungicides, herbicides, insecticides, larvicides, miticides, molluscicides, nematicides, ovicides, piscicides and rodenticides. Other chemicals classed as pesticides include attractants, chemosterilants, defoliants, desiccants, disinfectants, growth regulators, pheromones, feed attractants and repellents. Other chemical exposures can occur in agriculture, as indicated below, but are not discussed in this section.

9.1.2. While some fertilizers are not considered to be a toxic hazard for workers, some can cause skin irritation and potentially serious respiratory effects, for example, through the inhalation of gaseous forms of anhydrous ammonia. Care should be taken when handling fertilizers to minimize exposures.

9.1.3. Some veterinary products including veterinary medicines have toxic properties and workers who handle these products may be exposed to them. Care should be taken when handling veterinary products to minimize skin exposures (see also Chapter 10 and respiratory risks).

9.1.4. Animal emissions, such as ammonia and methane, are eye and respiratory irritants, so care should be taken when workers enter closed spaces (see also Chapter 13).

9.1.5. Exhaust from fuel-powered equipment, including diesel, is a significant respiratory hazard and worker exposure should be minimized (see also Chapter 13).

9.1.6. Gases formed during crop storage can be toxic and may pose a risk to workers in closed spaces. Care should be taken to ventilate such spaces prior to entry, or to wear proper respiratory protection (see also Chapter 13).

9.1.7. Integrated pest management in which several modalities are used to control pest infestations such as chemical crop protection agents, cultivation techniques, biological controls, crop or pasture rotations, and/or other practices, may be useful in reducing exposures.

9.2. Hazard description

9.2.1. *Routes of exposure*

9.2.1.1. Absorption through the skin is the primary route of exposure for most widely used insecticides, fungicides and herbicides. At normal exposure levels, skin damage or other symptoms may not be noticed, so absorption occurs without the worker's knowledge. The distribution of skin exposure will be determined by the particular work tasks. Exposure can occur to the whole body during spraying. Exposure to the hands occurs in nearly all cases. Forearm, torso and facial exposure are common during mixing, loading and hand spraying. Exposure to the torso is likely when workers carry chemicals on their backs, as with backpack sprayers. Exposure to the legs can occur through contact with recently treated foliage, as is common in greenhouses or in fields with minimal spacing between crop rows. Intensity of skin exposure will be determined by the frequency of contact or activity, and by the pesticide-active ingredient concentration in the applied material and whether equipment, including PPE, is being used correctly. Certain groups are particularly vulnerable to absorption through the skin. These include women, particularly pregnant women, young persons, children and those with more body fat.

9.2.1.2. Inhalation is an important route of exposure when working with volatile compounds or in enclosed spaces such as greenhouses. Gases and vapours are readily inhaled and absorbed in the respiratory tract. Small particles (10 microns or less), including water droplets can also be inhaled. Pesticides can volatilize from treated leaves and soil, posing a hazard to re-entry workers.

9.2.1.3. Ingestion is another route of exposure for pesticides, and can be a significant contributor to dose if food or cigarettes are handled after contact with pesticides and prior to washing.

9.2.2. *Principal health effects*

9.2.2.1. Acute health effects

9.2.2.1.1. Pesticides produce acute health effects when signs and symptoms of poisoning occur shortly after exposure, normally within 24 hours. These effects may be either local or systemic. Local effects are those that occur at the point of contact, as is the case with skin and eye irritation. Systemic effects require absorption and distribution from the entry point to other parts of the body.

9.2.2.1.2. Based on the risk of single and multiple exposures over a short period of time, acutely toxic pesticides normally fall in the top three categories within the World Health Organization's classification of pesticides by hazard: extremely hazardous (Ia), highly hazardous (Ib), and moderately hazardous (II). Most insecticides fall into these categories, whereas most fungicides and herbicides fall into the less hazardous categories: slightly hazardous (III) and other (IV). There are, however, several commonly used fungicides and herbicides that pose a high risk to users. Rodenticides are generally very toxic to all mammals. It is important to note that the classification is based on the acute risk to health that might be encountered accidentally by any person handling the product in accordance with the directions for handling by the manufacturer or in accordance with the rules laid down for storage and transportation by competent international bodies.

Table 9.1. WHO classification of pesticides by hazard level

Class	Degree of hazard	Examples
Ia	EXTREMELY HAZARDOUS active ingredients (technical grade) of pesticides	ethoprophos, hexachlorobenzene, mevinphos, parathion-methyl, sulfotep, terbufos (virtually all of these are insecticides; the organophosphorus insecticides make up most of this class)
Ib	HIGHLY HAZARDOUS active ingredients (technical grade) of pesticides	azinphos-methyl, coumaphos, dichlorvos, lead arsanate, methamidophos, methiocarb, methomyl, nicotine, oxamyl, pentachlorophenol, warfarin (most of these are also insecticides, including some organophosphorus insecticides and a number of carbamates, although pentachlorophenol is a fungicide/wood preservative)
II	MODERATELY HAZARDOUS active ingredients (technical grade) of pesticides	bendiocarb, carbaryl, carbosulfan, chlordane, chlorpyrifos, cyfluthrin, cypermethrin, 2,4-D, diazinon, diquat, metam-sodium, paraquat, permethrin (includes carbamates, some OP insecticides, pyrethroid insecticides, and some herbicides, such as 2,4-D, diquat and paraquat)
III	SLIGHTLY HAZARDOUS active ingredients (technical grade) of pesticides	alachlor, dicamba, dicofol, dinocap, malathion, propargite, thiram, ziram (mostly herbicides and fungicides, but also at least one low toxicity OP pesticide, malathion)
IV	Other active ingredients unlikely to present acute hazard in normal use	amitrole, atrazine, benomyl, borax, captan, mancozeb, maneb, methoxychlor, picloram, spinosad, sulphur, temephos, vinclozolin

Source: World Health Organization. The WHO recommended classification of pesticides by hazard and guidelines to classification: 2004. World Health Organization, 2005.

9.2.2.1.3. Organophosphorus and carbamate insecticides are responsible for the majority of acute occupational pesticide poisonings. These chemicals inhibit acetylcholinesterase, an enzyme critical to the proper functioning of the nervous system as well as other esterases and carboxylases. Effects can range from flu-like symptoms such as headaches, excess salivation and nausea to respiratory distress and ultimately death. Sensitivity to exposure to organophosphorus insecticides can suddenly increase. Most occupational pesticide poisonings from these compounds are due to absorption through the skin. Several antidotes are commonly used in the clinical management of poisonings from these insecticides. See section 9.7.4. for information on cholinesterase monitoring.

9.2.2.1.4. Pyrethroid insecticides can produce an acute effect known as paresthesia following skin contact. Symptoms include continuous tingling or pricking, or when more severe, burning. These symptoms usually resolve within 24 hours.

9.2.2.1.5. Most organochlorine insecticides can produce an acute toxicity syndrome characterized by sensory and motor disturbances, headaches, dizziness, mental confusion and ultimately coma and respiratory depression. These compounds are easily absorbed through the lungs, gastrointestinal tract and skin.

9.2.2.1.6. Persistent organic pollutants such as paraquat and diquat are herbicides that can produce acute local effects due to skin contact such as blistering, ulcerations and discoloured fingernails. Ingestion can cause irreversible damage to the lungs and be fatal.

9.2.2.1.7. Paraquat may have particularly disastrous and lethal effects when inhaled by a worker. Paraquat should never be used by any worker for any agricultural procedure world-wide for any reason under any circumstances. Workers should be informed of their

right to refuse to apply paraquat or any other chemical which they have reason to believe might be harmful.

9.2.2.1.8. Fumigants such as methyl bromide, aluminium phosphide and magnesium phosphide, and chloropicrin and phosphine have been associated with occupational pesticide poisonings and fatalities. Elemental sulphur use in agriculture has been associated with dermatitis.

9.2.2.2. Chronic (long-term) health effects

9.2.2.2.1. Cancer testing for pesticides is required in most North American and European countries and should be extended to other parts of the world. As a result, many chemicals with clear evidence of carcinogenicity are no longer registered in these countries, and are being withdrawn elsewhere. Cancers such as leukaemia, non-Hodgkin's lymphoma and multiple myeloma have been associated with occupational exposures to pesticides, particularly herbicides. There is also epidemiologic evidence that suggests an association between lung cancer and pesticide exposure. Fumigants such as methyl bromide are known to be genotoxic and have produced cancers in laboratory animals.

9.2.2.2.2. Reproductive effects may occur due to either paternal or maternal pesticide exposure. Exposure may affect the sexual function and fertility of both men and women. Exposure to either parent before conception or maternal exposure during pregnancy or breastfeeding may adversely affect the development of the offspring.

9.2.2.2.3. Endocrine disruption refers to a mode of action whereby pesticide molecules or their breakdown products impact on the hormone system, for instance because the body responds to their presence as if they were hormones. As such they may trigger actions, normally triggered by hormones, that affect organ development at particular stages (pregnancy, foetus, young children). Endocrine disruption is increasingly being recognized as a serious chronic health effect.

9.2.2.2.4. Other chronic health effects are reportedly associated with pesticides include neurotoxicity, liver and thyroid disease and allergic dermatitis. Such effects tend to be specific to certain pesticides, so the information provided in chemical safety data sheets, pesticide labels and other health and safety materials should be consulted for each particular chemical.

9.2.3. *Risks to special populations*

9.2.3.1. Risk assessment should take account of vulnerable populations including children, young workers and women of child-bearing age.

9.2.3.2. Children are considered to be at particularly high risk from pesticides. Their small size, rapid development, under-developed metabolism, diet and behaviour mean that smaller doses of toxins have a greater impact than in adults. Developmental effects can include disturbance of the nervous system, endocrine disruption and carcinogenicity. Children can be exposed if they are present in the agricultural workplace, if their family members return home with pesticides on their clothing and skin, or if the family vehicle becomes contaminated. Special care should be taken to keep children away from pesticides, whether in concentrated or dilute form, and their containers, and to ensure that such chemicals are not brought into the home.

9.2.3.3. Young workers are considered to be at relatively high risk because they often have minimal health and safety training. They may also engage in risk-taking behaviours not normally seen amongst adult workers because of differences in their perceptions of risk and vulnerability.

9.2.3.4. Women during pregnancy can expose the foetus to pesticides when handling pesticides or when working in areas that have been treated recently with pesticides. Skin contact and absorption will result in pesticides entering the blood circulation, including the blood supply to the foetus. Doses to the foetus can be higher than doses to the mother under these circumstances. The foetus is considered particularly vulnerable to exposures during certain stages of development, and the window of vulnerability may vary according to the particular pesticide. Care should be taken by women during pregnancy or when breastfeeding to avoid or greatly minimize pesticide exposures.

9.2.3.5. Children who are breastfed may absorb pesticides that are in breast milk due to maternal exposures. Care should be taken by women who are breastfeeding to avoid or greatly minimize pesticide exposures.

9.2.3.6. Male workers in their reproductive years should avoid scrotal exposure due to the heightened risk of infertility.

9.3. Control strategies

9.3.1. General principles

9.3.1.1. The competent authority should adopt and enforce legislation in line with international standards or otherwise ensure that criteria are established for safety in the use of hazardous chemicals in agriculture, including pesticides.

9.3.1.2. The *Globally Harmonized System of Classification and Labelling of Chemicals* (GHS), Annex 4 (United Nations, 2009) provides guidance on the preparation of chemical safety data sheets and the provision of information to the workplace audience, including workers, employers, health and safety professionals, emergency personnel, and relevant government agencies as well as members of the community. Chemical safety data sheets should be written in simple, clear, precise language. They should contain information under the following 16 headings: identification; hazard identification; composition/information on ingredients; first-aid measures; firefighting measures; accidental release measures; handling and storage; exposure controls/personal protection; physical and chemical properties; stability and reactivity; toxicological information; ecological information; disposal considerations; transport information; regulatory information; and other information. In addition, each chemical safety data sheets should contain a brief summary or conclusion of the data given, so that non-experts can identify all the hazards for the hazardous substance or mixture.

9.3.1.3. Chemical safety data sheets that include advice on safe handling of chemicals to ensure adequate prevention and protection should be readily available. All those concerned with storage and handling of chemicals, and with general housekeeping, should be trained and should adopt safe systems of work at all times.

9.3.1.4. Pesticide labels provide critical information on the proper mixing, loading and application procedures and their instructions should be followed at all times. Pesticide labels also carry specific information on potential health effects and mitigation measures. Pesticide label information should be readily available to workers in a form and language that is appropriate and that they can understand. Labels should use large, easily readable printing, and include pictograms to assist readers who are unable to read the language in use on the label.

9.3.1.5. Pesticide labels should be durable and non-detachable from chemical containers so that the information remains available to managers and workers as the product passes along the supply chain and throughout the product's lifetime.

9.3.1.6. After reviewing the pesticides and other chemicals being used at work, obtaining information about their hazards and making an assessment of the potential risks involved, employers should take steps to limit exposure of workers to hazardous chemicals taking account of integrated pest management (IPM). The measures taken should eliminate or minimize the risks, preferably by substitution using non-hazardous or less hazardous products, or by the choice of technology. Where this cannot be achieved, the risks should be eliminated or minimized using good engineering controls. Administrative measures such as safe working systems and practices, the provision of information and training, and PPE will further minimize risks and may have to be relied upon for some activities entailing the use of chemicals.

9.3.1.7. For new work activities involving the use of chemicals, the hazards should be identified and the risks assessed at the earliest stage when the new work activity is being considered. The risks should be analysed for the full life-cycle of the chemical concerned, including, for example, transport, storage, mixing and applying, cleaning of equipment, disposal, the fate of empty containers. The hazards and risks should be reviewed at each subsequent stage in the development of a new process.

9.3.1.8. The purpose of the assessment is to enable an informed decision to be made by employers about the validity of measures to eliminate or minimize risks from chemicals. Employers should show that all aspects of the use of chemicals have been considered in the assessment. Where an employer identifies risks which can or should be eliminated or minimized, he or she should eliminate or minimize these risks as soon as possible and by the best possible means following the order of preference in the measures outlined in paragraph 9.3.1.6.

9.3.1.9. A programme should be prepared to specify the action necessary to eliminate or minimize the risks and indicate the time needed for its completion.

9.3.1.10. Pesticides and other hazardous chemicals might be used in ways that have the potential to be a risk not only to workers, but also to the population in the vicinity of the use of the chemicals and to the general environment. The use of such chemicals should additionally be controlled in accordance with national law and practice or international standards.

9.3.2. *Elimination/substitution*

9.3.2.1. Employers should include in their assessment consideration as to whether the risks from pesticides and other hazardous chemicals used can be eliminated by ceasing to use the chemicals; or reduced by replacing them by less hazardous chemicals or by the same substances in a less hazardous form or by using them less frequently. Care should be taken to consider all the known risks of the proposed substitutes, and action should be taken on precautionary measures before substitution, using an alternative process.

9.3.2.2. Where the use of pesticides and other hazardous chemicals cannot be prevented, the control measures outlined in the paragraphs below should be followed.

9.3.3. *Engineering and administrative controls*

9.3.3.1. Engineering controls may be defined as the control or elimination of risk by means of devices, structures or switches. Employers should provide suitable engineering

control measures to provide protection for workers, which could include any of the following:

- (a) totally enclosed process and handling systems;
- (b) segregation of the hazardous process from the operators or from other processes;
- (c) plants, processes or work systems which minimize generation of, or suppress or contain, hazardous dust, fumes, etc., and which limit the area of contamination in the event of spills and leaks;
- (d) partial enclosure, with local exhaust ventilation.

9.3.3.2. Employers should thoroughly examine and test engineering control measures at suitable or specified intervals to ensure that they are continuing to perform as originally intended. The intervals and content of the thorough examination should be in accordance with national laws or criteria specified in national or international standards approved or recognized by the competent authority, taking into account the extent of the risk in the event of failure of the control measure.

9.3.3.3. Any defects disclosed as a result of the examination or test should be remedied by the employer as soon as possible or within such time as the examiner directs.

9.3.3.4. A suitable record of each thorough examination should be kept in accordance with national law and practice.

9.3.3.5. Administrative control measures are work systems and practices to provide protection for workers and could be any combination of the following:

- (a) reduction of the numbers of workers exposed and exclusion of non-essential access;
- (b) reduction in the period of exposure of workers;
- (c) regular cleaning of contaminated equipment;
- (d) proper maintenance of engineering control measures;
- (e) immediate clean-up of any accidental contamination due to spills or leaks; and
- (f) provision of means for safe storage and disposal of pesticides and management and disposal of empty containers.

9.3.3.6. Employers should not allow pregnant or breastfeeding workers to be exposed to pesticides.

9.3.4. Information and training

9.3.4.1. General principles

9.3.4.1.1. Employers should inform workers of the hazards associated with pesticides and other chemicals used at their workplace.

9.3.4.1.2. Employers should instruct workers about how to obtain and use the information provided on pesticide labels and chemical safety data sheets.

9.3.4.1.3. Employers should train workers in the correct and effective use of the control measures, in particular the engineering control measures and measures for personal protection provided, and should be made aware of their significance.

9.3.4.1.4. Employers should use chemical safety data sheets, along with label-specific information, as a basis for the preparation of instructions to workers, which should be in writing, if appropriate.

9.3.4.1.5. Employers should train workers on a continuing basis in preventive working practices regarding the safe use of pesticides and in how to deal with emergencies.

9.3.4.2. Review

9.3.4.2.1. The extent of the training and instruction received and required should be reviewed and updated simultaneously with the review of the working systems and practice.

9.3.4.2.2. The review should include the examination of:

- (a) whether workers understand the most effective use of the engineering control measures provided;
- (b) whether workers understand when protective equipment is required, and its limitations; and
- (c) whether workers are familiar with preventive working practices regarding the safe use of pesticides and in how to deal with emergencies.

9.3.5. *Personal protection*

9.3.5.1. PPE ¹

9.3.5.1.1. The use of PPE should not be regarded as an alternative to engineering controls, safe handling practices or other suitable control measures. PPE should be considered the least preferred option, but should be provided and maintained where collective control measures cannot ensure protection. Effective action should continue to be taken by the employer to ensure that control measures are developed and applied in order to eliminate or minimize the risk to a level at which personal protection may not be required. PPE includes RPE, chemical protective clothing including gloves and footwear, and equipment to protect the eyes and face.

9.3.5.1.2. PPE should afford adequate protection against the risk from those pesticides to which the wearer is exposed, throughout the period during which such equipment is necessary, having regard to the type of work.

9.3.5.1.3. Items of PPE provided should comply with national law or be in accordance with criteria approved or recognized by the competent authority and based on national or international standards.

9.3.5.1.4. The equipment provided should be suitable for its purpose and there should be a sufficient supply readily available in the workplace in appropriate sizes for women and men workers who require it.

¹ See also Chapter 4, section 4.7 on PPE.

9.3.5.1.5. Workers required to wear protective equipment should be fully instructed in its use and should use the equipment provided throughout the time they are exposed to the risk that requires its use for protection.

9.3.5.1.6. Employers should provide supervision to ensure that the equipment is properly used.

9.3.5.1.7. All PPE that is necessary for safety in the use of chemicals should be provided and maintained by the employer without cost to the worker.

9.3.5.1.8. PPE should be cleaned and stored at the workplace.

9.3.5.2. Chemical protective clothing

9.3.5.2.1. Employers should seek competent professional advice with regard to the selection of chemical protective clothing.

9.3.5.2.2. Chemical protective clothing should properly fit the individual who wears it. Workers and their representatives should be consulted with regard to comfort and fit of PPE.

9.3.5.2.3. The selection of protective clothing should take into account: (a) the ability of the material from which it is made to resist penetration by the pesticides concerned; (b) the adequacy of the design and the fit of the clothing, and whether it is suitable for the intended use; (c) the environment in which it will be worn; (d) any potential for heat or allergic stress during the period of use.

9.3.5.2.4. Chemical protective clothing should not be used as an alternative to engineering or administrative controls.

9.3.5.3. Respiratory protective equipment (RPE)

9.3.5.3.1. RPE should be selected in compliance with national laws or national or international standards, and consistent with requirements on the pesticide product label.

9.3.5.3.2. RPE should also be selected taking into account the work involved and should be matched to the wearer.

9.3.5.3.3. RPE should be fit-tested before initial use and periodically for each worker.

9.3.5.3.4. RPE should be used only as a supplementary, temporary, emergency or exceptional measure and not as an alternative to engineering and administrative controls.

9.3.5.4. Cleaning, maintenance, storage and replacement of PPE

9.3.5.4.1. All protective equipment necessarily provided should be maintained in good condition, stored appropriately in a clean place, and replaced, at no cost to the worker, when no longer suitable for its purpose.

9.3.5.4.2. Employers should provide adequate stocks of PPE to allow for its replacement in accordance with the schedule recommended by the PPE manufacturer.

9.3.5.4.3. The protective equipment should not be used longer than the time or other factor indicated by the manufacturer or as indicated by exposure and use.

9.3.5.4.4. Workers should make proper use of the equipment provided, and maintain it in good condition, as far as this is within their control.

9.3.5.4.5. RPE, other than one-shift disposable respirators, should be cleaned, disinfected and thoroughly examined: (a) each time it is reissued; or (b) after a period specified by national laws or by national or international standards approved or recognized by the competent authority, or specified as part of the employer's control measures, whichever is first.

9.3.5.4.6. Employers should provide for the laundering, cleaning, disinfection and examination of chemical protective clothing or equipment which has been used and may be contaminated by chemicals hazardous to health. Appropriate protocols should be followed when laundering potentially contaminated clothing to ensure that other clothing used at the worksite is not contaminated. In addition, effluent from water used to wash contaminated clothing should be managed to avoid contamination of water sources.

9.3.5.4.7. It should be prohibited for PPE which may be contaminated by chemicals hazardous to health to be laundered, cleaned or kept at workers' homes.

9.3.5.4.8. When a contract laundry is employed, care should be taken by the employers to ensure that the contractor fully understands the precautions necessary for handling contaminated clothing.

9.3.6. *Workplace and worker hygiene*

9.3.6.1. Adequate washing facilities should be provided to enable workers to meet a standard of personal hygiene consistent with the adequate control of exposure and the need to avoid the spread of chemicals hazardous to health.

9.3.6.2. The washing facilities should be conveniently accessible but situated so that they do not themselves become contaminated by the workplace.

9.3.6.3. The type of washing facilities should be related to the nature and degree of exposure and the toxicity of the chemicals being used.

9.3.6.4. Face and eye washing facilities and safety showers with clean potable water should be available for workers contaminated by chemical splash.

9.3.6.5. Separate changing facilities for both women and men should be so situated and designed as to prevent the spread of contamination from protective clothing to personal clothing.

9.3.6.6. The employer should introduce protocols aimed at providing safe opportunities for eating and drinking for employees who are working in contaminated facilities. Specifically, where it is necessary to prohibit eating or drinking, suitable facilities should be set aside by the employer in consultation with workers and their representatives for these activities to be carried out in an uncontaminated area, which should be conveniently accessible to the work area.

9.3.6.7. After handling pesticides, workers should ensure that they wash their hands and face before eating and drinking. They should also not eat, drink, or smoke in a work area that is contaminated by pesticides.

9.3.7. Emergency procedures and first aid ²

9.3.7.1. Emergency procedures

9.3.7.1.1. Arrangements should be made to deal at all times, and in accordance with any requirements laid down by the competent authority or as advised by the assessment of risks, with emergencies and accidents which might arise from the use of pesticides and other hazardous chemicals at work. Health services should receive chemical safety data sheets on chemicals being used in the locality. Arrangements should be made to ensure that appropriate antidotes are available.

9.3.7.1.2. These arrangements, including the procedures to be followed, should be kept up to date in accordance with national law and practice in the light of new information such as that provided on product labels, chemical safety data sheets, experience with the chemicals and any changes in the work activity.

9.3.7.1.3. Employers should train workers in the relevant procedures. These should describe: (a) arrangements for raising an alarm; (b) arrangements for calling for appropriate emergency medical assistance; (c) use of appropriate personal protection and its limitations; (d) decontamination of workers and their equipment; (e) evacuation of the contaminated work area; (f) action to minimize the incident, e.g. controlling leaks and spills; and (g) evacuation of residents and bystanders near the worksite.

9.3.7.1.4. Where an incident may affect people or property outside the worksite, appropriate procedures should be developed in consultation with the authorities or services that may have relevant responsibilities, e.g. external emergency services and local authorities. Guidelines on preparing an emergency response plan in the event of such an incident can be found in the ILO code of practice, *Prevention of major industrial accidents* (Geneva, 1991), and in the UNEP handbook, *Awareness and preparedness for emergencies at local level (APELL): A process for responding to technological accidents* (Paris, 1988).

9.3.7.2. First aid ³

9.3.7.2.1. Adequate first-aid arrangements should be provided at the worksite. These arrangements should take account of the acutely toxic pesticides and other hazardous chemicals used at work, ease of communications, and the emergency services and facilities available. They should be in accordance with any requirements laid down by relevant authorities.

9.3.7.2.2. As far as is practicable, appropriate means and trained personnel for rendering first aid should be readily available at all times during the use of acutely toxic pesticides and other hazardous chemicals at work. The term “trained personnel” includes persons trained in first aid, registered nurses or medical practitioners, for example.

9.3.7.2.3. Where acutely toxic pesticides and other hazardous chemicals are used, first-aiders should be trained as regards: (a) the hazards associated with the chemicals and how to protect themselves from these hazards; (b) how to take effective action immediately; (c) any relevant procedures associated with sending a casualty to hospital.

² See also Chapter 6: Contingency and emergency preparedness.

³ See also section 16.4: First aid and medical care.

9.3.7.2.4. An assessment of first-aid needs should be made by the employer in consultation with workers and their representatives. The reasonable practicability of having trained personnel readily available will depend on: (a) the number of employees; (b) the nature of the work activity; (c) the size of the establishment and distribution of workers at the worksite; (d) the situation of the work activity in relation to the nearest hospital or other emergency medical services that may be required.

9.3.7.2.5. The first-aid equipment and facilities should be appropriate for dealing with the hazards to be encountered in the use of pesticides and other chemicals at work. Suitable facilities should be available for workers to use themselves, e.g. emergency showers or eyewash stations. These should be strategically placed to allow for immediate decontamination in the event of an emergency.

9.3.7.2.6. There should be ready access at all times to first-aid equipment and supplies.

9.4. Transport, storage and disposal of pesticides

9.4.1. Pesticides should be treated as hazardous materials during transport and should always be transported in their original containers. Transfer of pesticides into unlabelled containers for distribution or transport creates a serious potential health hazard for workers, their families and their communities.

9.4.2. Pesticides should be stored in secure, sheltered, well-ventilated spaces to which only authorized access is permitted. Containers should preferably be placed on skids or a platform. Pesticide storage facilities should be purpose-built, fire-resistant, and designed to prevent leakage in the event of spills, and the storage area should be embanked. Pesticide storage areas should not be accessible to pregnant workers, children or animals. Smoking should be prohibited in or near chemical storage areas and warning signs should be posted to that effect.

9.4.3. Disposal of pesticides should be conducted according to label instructions or according to safety practices applicable to hazardous materials, and in compliance with national law and practice.

9.4.4. Used pesticide containers should be washed, triple or pressure rinsed, and punctured or crushed so they cannot be used again and disposed of properly, preferably through a collection scheme, or if that is not available, by some authorized method of waste disposal. In no event should containers be reused for storing other items, particularly food and drink.

9.5. Exposure during pesticide handling

9.5.1. *Mixing and loading*

9.5.1.1. Hazard description

9.5.1.1.1. Agricultural pesticide formulations contain varying concentrations of the pesticide active ingredient. Formulations with 40–50 per cent active ingredients are common, and the concentration can be higher.

9.5.1.1.2. Workers who mix and load pesticides are likely to have direct contact with the pesticide active ingredient in this concentrated form.

9.5.1.1.3. A dust can be produced in front of the worker when dry formulations such as wettable powders or granular material are removed from packaging and transferred to application equipment. In addition to posing an inhalation hazard, the dust can be distributed on the worker's skin and clothing, and can contaminate the application equipment and the surrounding work area.

9.5.1.1.4. There is a risk of inhalation of vapours when concentrated liquid formulations are handled or mixed.

9.5.1.1.5. Spills and splashes can occur when liquid formulations such as emulsifiable concentrates are handled. Spills can result in exposure to skin and clothing, often on the lower portion of the body and on the feet and hands. Splashes can result in exposure to the face, neck and upper torso.

9.5.1.1.6. Splashing can also occur during the mixing of the pesticide formulation with water, particularly when the mixing vessel or application equipment is close to full.

9.5.1.1.7. Overfilling of the mixing vessel or application equipment can allow pesticides to contaminate outer surfaces, creating a contact hazard for workers beyond the mixing and loading time period.

9.5.1.1.8. Pesticide formulation containers remain a potential source of exposure until they are properly triple or pressure rinsed, washed or decontaminated.

9.5.1.1.9. Clothing items that have been contaminated during mixing and loading remain a source of skin exposure until they are removed and washed properly.

9.5.1.2. Control strategies

9.5.1.2.1. IPM strategies should be employed in all agricultural workplaces to reduce reliance on pesticides and to eliminate any unnecessary use and thereby reduce potential exposure to pesticides.

9.5.1.2.2. Substitution of high hazard pesticides with low hazard pesticides should be considered on a continuous basis.

9.5.1.2.3. Closed mixing and loading systems represent the highest level of protection for workers handling pesticides, and should be used whenever possible. Closed systems transfer the pesticide formulation from its original container to the mixing vessel or application equipment, and permit preparation of the final spray mix without direct contact on the part of the worker. Care should be taken when cleaning or repairing closed systems to minimize exposure.

9.5.1.2.4. Where open mixing and loading is necessary, all label instructions should be followed, and care should be taken to avoid direct contact with the pesticide formulation or the final spray mix.

9.5.1.2.5. Employers should ensure that, prior to the beginning of work, all equipment is in proper working order and that all workers who mix and load chemicals receive appropriate training to enable them to (a) understand the pesticide product label; (b) understand the workings of the equipment; (c) use proper protective measures; and (d) understand emergency procedures in case of an overexposure.

9.5.1.2.6. Employers should provide periodic training to mixers and loaders in the proper handling of pesticides to reduce the risk of exposure in accordance with national laws or criteria specified in national or international standards.

9.5.1.2.7. Respiratory protection should be used during mixing and loading when required by the product label. Respirators with pesticide cartridges should be used in most cases, which must provide the level of protection required against contact with the pesticide (see also section 9.3.5.). Surgical masks or cloth covering the nose and mouth are not protective against inhalation of pesticide vapours.

9.5.1.2.8. Goggles should be worn during mixing and loading to protect the eyes from splashes.

9.5.1.2.9. Chemical protective gloves should be worn during mixing and loading. Gloves should be decontaminated before being removed whenever possible. During breaks workers should remove gloves so as to avoid skin contact with the gloves' outer surfaces. Gloves should be discarded when signs of wear or damage suggest that the barrier properties are no longer intact.

9.5.1.2.10. Skin exposures during mixing and loading often occur at the interface of gloves and clothing. Gauntlet-style gloves can provide additional protection to the forearms. Taping clothing to gloves can provide a continuous protective barrier.

9.5.1.2.11. Chemical protective footwear should be worn during mixing and loading. Footwear should be decontaminated before being removed. Footwear should be discarded when signs of wear or damage suggest that the barrier properties are no longer intact. Normal types of footwear, including leather work boots, are not recommended, as they will absorb pesticides and become a source of exposure long after the mixing and loading has ended.

9.5.1.2.12. Label requirements should be followed in regard to protection of the arms, legs and torso. If chemical protective clothing is required, then care should be taken to avoid conditions where its use may contribute to heat stress. If the label requires only minimal protection, such as long-sleeve shirt and long pants, then this clothing should not be the worker's normal work clothing, and should be removed and washed at the end of the work period.

9.5.1.2.13. Mixing vessels and application equipment should be cleaned thoroughly at the end of the work period. Pesticide containers should be triple or pressure rinsed, washed and disposed of safely. Residues should be properly managed.

9.5.2. Application

9.5.2.1. Hazard description

9.5.2.1.1. Pesticide applications usually involve potential contact with more dilute materials than those handled during mixing and loading, but the duration of contact is normally much longer, so applicators are considered to be at substantial risk of exposure through both inhalation and dermal contact.

9.5.2.1.2. Risks from using applicators such as power sprayers, backpack sprayers or handguns can rapidly increase when wind direction changes and directs the spray back at the operator, or when the operator drives or walks through an area that has been recently sprayed. Protracted contact with pesticide spray raises the likelihood of skin exposure due to clothing penetration.

9.5.2.1.3. Applicators with closed cabs are protected from pesticide drift, but may inadvertently contaminate the inside of the cab during the normal course of work activities.

9.5.2.1.4. All-terrain vehicles (ATVs) can have front and rear mounted spray units and these present different risk profiles for the operator.

9.5.2.1.5. Applicators inside greenhouses can be exposed to spray due to air movement caused by ventilation systems. They can also use ventilation to their advantage to minimize exposure.

9.5.2.1.6. Leaks at connection points in hand-held application equipment such as hose-to-tank connections can result in the pesticide mixture dripping on to skin or clothing. Such leaks at connection points in tractor-powered application equipment can require maintenance or repair that commonly results in skin exposure.

9.5.2.1.7. Walking through plants recently treated with pesticides often means skin or clothing contact with overhanging foliage, and can result in substantial exposures.

9.5.2.1.8. Components of the application equipment remain a potential source of exposure until they are properly washed or decontaminated.

9.5.2.1.9. Clothing items that have been contaminated during application remain a source of skin exposure until they are removed and washed properly.

9.5.2.2. Control strategies

9.5.2.2.1. IPM strategies should be employed in all agricultural workplaces to reduce reliance on pesticides and to eliminate any unnecessary use and thereby reduce potential exposure to pesticides.

9.5.2.2.2. Substitution of high hazard pesticides with low hazard pesticides should be considered on a continuous basis.

9.5.2.2.3. Closed cabs or other types of enclosures should be used where feasible to minimize applicator exposure.

9.5.2.2.4. Spraying equipment to be mounted on vehicles should be positioned in a manner that does not adversely affect the vehicle's stability (see section 7.2.5.6). However, the equipment should also be mounted so that the operator is not driving through the drift while spraying.

9.5.2.2.5. Outdoor applications should be conducted under minimal wind conditions or when wind direction can be used to minimize applicator and bystander exposures.

9.5.2.2.6. Applications in greenhouses or similar enclosed environments should be conducted such that wind movement can be used to minimize applicator and bystander exposure.

9.5.2.2.7. All label instructions should be followed during applications, and care should be taken to avoid direct contact with the pesticide spray.

9.5.2.2.8. Employers should ensure that pesticide application equipment does not leak and that spare parts are available for its maintenance.

9.5.2.2.9. Employers should ensure that, prior to the beginning of work, all equipment is in proper working order and that all workers who apply chemicals receive appropriate training to enable them to (a) understand the pesticide product label; (b) understand the workings of the equipment; (c) use proper protective measures; and (d) understand emergency procedures in case of an overexposure.

9.5.2.2.10. Employers should provide periodic training to applicators in the proper handling of pesticides to reduce the risk of exposure in accordance with national laws or criteria specified in national or international standards.

9.5.2.2.11. Employers should train pesticide applicators to calibrate pesticide application equipment before every use. This not only reduces human exposure, but also environmental exposure, the risk of pest resistance and ultimately pesticide use, with resulting economic benefits.

9.5.2.2.12. Respiratory protection should be used during application when required by the product label. Respirators with pesticide cartridges should be used in most cases, which must provide the level of protection required against contact with the pesticide (see also section 9.3.5.). Surgical masks or cloth covering the nose and mouth are not protective against inhalation of pesticide vapours.

9.5.2.2.13. Goggles should be worn to reduce the risk of eye contamination with mist.

9.5.2.2.14. Chemical protective gloves should be worn during application of chemicals using power sprayers, backpacks or handguns. Gloves should be decontaminated before being removed whenever possible. During breaks workers should remove gloves so as to avoid skin contact with the gloves' outer surfaces. Gloves should be discarded when signs of wear or damage suggest that the barrier properties are no longer intact.

9.5.2.2.15. Skin exposures during application often occur at the interface of gloves and clothing. Gauntlet-style gloves can provide additional protection to the forearms. Taping clothing to gloves can provide a continuous protective barrier.

9.5.2.2.16. Chemical protective footwear should be worn during application. Footwear should be decontaminated before being removed. Footwear should be discarded when signs of wear or damage suggest that the barrier properties are no longer intact. Normal types of footwear, including leather work boots, are not recommended, as they will absorb pesticides and become a source of exposure long after application has ended.

9.5.2.2.17. Label requirements should be followed in regard to protection of the arms, legs and torso. If chemical protective clothing is required, then care should be taken to avoid conditions where its use may contribute to heat stress. If the label requires only minimal protection, such as long-sleeve shirt and long pants, then this clothing should not be the worker's normal work clothing, and should be removed and washed at the end of the work period.

9.5.2.2.18. Application equipment should be cleaned thoroughly at the end of the work period.

9.5.2.2.19. Used pesticide containers should be washed, triple or pressure rinsed, and punctured or crushed so they cannot be used again and disposed of properly, preferably through a collection scheme, or if that is not available, by some authorized method of waste disposal. In no event should containers be reused for storing other items, particularly food and drink.

9.5.2.2.20. Washing liquid from spray equipment should be disposed of without causing contamination to water sources.

9.5.2.2.21. Equipment repair should be conducted with the knowledge that equipment used for pesticide applications and equipment that is used in areas where

pesticide applications occur may be contaminated. Workers who clean the equipment prior to repair should use appropriate PPE. If equipment has not been thoroughly cleaned prior to repair, workers who repair equipment should use appropriate PPE during repair activities.

9.6. Exposure during re-entry

9.6.1. *Normal re-entry into sprayed areas*

9.6.1.1. Hazard description

9.6.1.1.1. Pesticide residues may remain on plant surfaces and in surface soil for extended periods of time following application. Skin contact with these residues or inhalation of volatilized residues can result in exposures to workers who enter treated areas after application.

9.6.1.1.2. Repeated contact with acutely toxic pesticides such as organophosphorus or carbamate insecticides on plants and soil during normal work activities can result in serious intoxications requiring first aid or hospitalization.

9.6.1.1.3. A unique hazard can occur when the organophosphorus insecticides are transformed to their more toxic oxon forms on plant and soil surfaces (e.g. parathion transformed to paraoxon), posing an acute health risk for workers.

9.6.1.2. Control strategies

9.6.1.2.1. IPM strategies should be employed in all agricultural workplaces to reduce reliance on pesticides and to eliminate any unnecessary use and thereby to reduce potential exposure to pesticides.

9.6.1.2.2. Substitution of high hazard pesticides with low hazard pesticides should be considered on a continuous basis.

9.6.1.2.3. Appropriate restricted entry intervals (i.e. time after application when workers are prohibited from entering treated areas) should be established for all pesticide/crop combinations based on risk assessments conducted by national authorities or based on criteria specified in national or international standards.

9.6.1.2.4. Pesticide-treated areas should be identified for the duration of the restricted entry interval with hazard signs or symbols that can be easily understood by all persons, including workers and bystanders.

9.6.1.2.5. Information regarding applications, pesticide toxicity and restricted entry intervals should be posted in the workplace or otherwise made available to workers.

9.6.1.2.6. Workers should be trained at the time of first employment and then periodically in the hazards of pesticides and in safe practices that will minimize exposures.

9.6.2. *Early re-entry into sprayed areas*

9.6.2.1. Hazard description

9.6.2.1.1. Certain agricultural tasks require that workers enter treated areas before the restricted entry interval has expired.

9.6.2.1.2. Early re-entry workers are likely to have contact with plants, soil and equipment surfaces with relatively high pesticide residues.

9.6.2.2. Control strategies

9.6.2.2.1. Early re-entry workers should wear protective equipment consistent with label requirements for pesticide handlers when entering treated areas.

9.6.2.2.2. Early re-entry workers should receive the same training as other workers, and special training related to the hazards of contacting pesticide residues and the particular tasks they will be conducting in treated areas.

9.7. Medical and health surveillance of workers ⁴

9.7.1. General principles

9.7.1.1. Medical surveillance includes, where appropriate, pre-assignment and periodical medical examinations. It also includes, where appropriate, medical examinations following an incident, when workers report symptoms of poisoning, upon resumption of work after a prolonged absence for health reasons, and upon and after termination of work involving exposure to chemicals.

9.7.1.2. Medical surveillance, conducted by an approved medical practitioner, should be used as part of overall health surveillance, in accordance with the objectives and principles of the Occupational Health Services Recommendation, 1985 (No. 171). Health surveillance should also include, where appropriate, simple techniques for the early detection of effects on health. These could include examination and questioning about health complaints.

9.7.1.3. Where necessary, the employer, or the institution competent under national law and practice, should arrange, through a method which accords with national law and practice, medical surveillance of workers: (a) for the sex-differentiated assessment of the health of workers in relation to risks caused by exposure to chemicals; (b) for the early diagnosis of work-related diseases and injuries caused by exposure to hazardous chemicals; and (c) for the assessment of the workers' ability to wear or use required respiratory or other PPE.

9.7.1.4. In the case of exposure of workers to specific hazards, medical and health surveillance should include, where appropriate, any examination and investigations which may be necessary to detect exposure levels and early effects and responses which also bear in mind the biological difference between women and men.

9.7.1.5. When a valid and generally accepted method of biological monitoring of workers' health exists for the early detection of the effects on health of exposure to specific occupational risks, it may be used to identify workers who need a detailed medical examination, subject to the individual worker's consent.

9.7.1.6. Medical surveillance is necessary where: (a) it is required by national law whenever workers are liable to be exposed to chemicals hazardous to health; or (b) employers are advised by an occupational health service that it is necessary as part of the protection of workers exposed to chemicals hazardous to health, giving special

⁴ See also Appendix I: Workers' health surveillance.

attention to pregnant and breastfeeding women and other susceptible workers; or (c) personal exposure or biological monitoring shows that there could be effects on the health of a worker because of exposure to chemicals at work and medical surveillance will assist early detection of ill effects.

9.7.2. Use of results

9.7.2.1. Where the results of medical tests or investigations reveal clinical or preclinical adverse effects, appropriate medical treatment should be provided and measures should be taken to improve the working conditions and environment with a view to preventing or reducing exposure of the workers concerned. In order to prevent further deterioration of their health, these measures should include a reassessment of the risks and corresponding control measures of relevant hazardous chemicals, and appropriate clinical re-evaluation of the health status of the workers should be carried out periodically.

9.7.2.2. Results of medical examinations should be used to determine health status with respect to exposure to chemicals, and should not be used to discriminate against the worker.

9.7.2.3. Results of medical examinations and exposure monitoring should be clearly explained by professional health personnel to the workers concerned or to persons of their choice.

9.7.3. Keeping of medical records

9.7.3.1. The conditions under which, and the time during which, records resulting from medical surveillance of workers should be kept, the conditions under which they may be communicated or transferred and the measures necessary to keep them confidential should be in accordance with national laws or practice, governed by recognized ethical guidelines.⁵

9.7.3.2. Workers should have access to their own medical records and exposure monitoring results, either personally or through their own physicians.

9.7.3.3. Workers and their representatives should have access to the results of studies prepared from medical records and exposure monitoring results, where individual workers cannot be identified. Strictest confidentiality with regard to individual medical and health surveillance information should be maintained in the development of such studies in accordance with recognized ethical guidelines.

9.7.3.4. Results of medical records and exposure monitoring should be made available to prepare appropriate health statistics and epidemiological studies, provided anonymity is maintained, where this may aid in the recognition and control of occupational diseases.

⁵ See ILO code of practice *Protection of workers' personal data* (Geneva, 1998) and *Technical and ethical guidelines for workers' health surveillance*, Occupational Safety and Health Series, No. 72 (Geneva, 1998).

9.7.4. Cholinesterase monitoring

9.7.4.1. Decision to conduct cholinesterase monitoring

9.7.4.1.1. Employers who intend to use organophosphorus or n-methyl carbamate pesticides should develop a plan for cholinesterase monitoring for pesticide handlers.

9.7.4.1.2. Pesticide handlers expected to mix, load, and/or apply substantial amounts of these pesticides should be enrolled in the monitoring programme.

9.7.4.1.3. The competent authority should ensure that systems are in place to carry out cholinesterase monitoring, that tests are carried out under high standards of hygiene and that the risk of blood contamination is eliminated. The competent authority should provide clear guidance in this regard in accordance with international practice.

9.7.4.2. Monitoring procedures

9.7.4.2.1. Pre-employment screening should ensure that those with inherently low-level cholinesterase do not undertake work with organophosphate or carbamate pesticides.

9.7.4.2.2. Baseline (i.e. prior to exposure) blood samples should be collected from pesticide handlers to establish each individual's normal cholinesterase levels.

9.7.4.2.3. Both plasma cholinesterase (buteryl or cholinesterase) and red blood cell cholinesterase (acetyl cholinesterase) should be measured in each blood sample.

9.7.4.2.4. Blood samples should be drawn periodically to determine if cholinesterase levels have been depressed significantly and repeated when workers show symptoms.

9.7.4.2.5. A depression greater than 20 per cent of either plasma or red blood cell cholinesterase normally triggers a workplace inspection in an effort to mitigate handler exposures.

9.7.4.2.6. A depression of plasma cholinesterase greater than 40 per cent or a depression of red blood cell cholinesterase greater than 30 per cent normally triggers removal of the handler from pesticide exposure and reassignment to other work until cholinesterase levels return to baseline.

9.7.4.2.7. The costs associated with cholinesterase monitoring are the responsibility of the employer.

9.8. Atmospheric and environmental control

9.8.1. *Aerial spraying and the off-target movement of pesticides*

9.8.1.1. Hazard description

9.8.1.1.1. Pesticides can move beyond targeted areas during and soon after applications. This movement of spray droplets off-target is normally referred to as pesticide drift, and can pose a hazard to workers in nearby areas or to nearby residents and bystanders.

9.8.1.1.2. Pesticides deposited in the target area can later move off-site through volatilization or on small particles. The residues can travel substantial distances before being deposited on surfaces. Persons contacting these surfaces are unaware of these residue deposits.

9.8.1.1.3. Pesticide use for certain crops in greenhouses can be almost continuous and therefore represent a hazard to workers in adjacent work areas. Off-target movement of pesticides is common, exposing workers to residues.

9.8.1.2. Control strategies ⁶

9.8.1.2.1. The employer should ensure that aerial spraying, whether conducted by employees or by contractors is conducted according to local/national regulations and practice, and at all times should be conducted in such a manner as to protect the health of workers, community residents, livestock and wildlife.

9.8.1.2.2. Employers, workers or contractors conducting aerial spraying should have appropriate training and certification. Equipment and protocols should have the approval of the competent authority.

9.8.1.2.3. Workers on the ground should be informed of the timing and nature of the spraying as well as appropriate re-entry times.

9.8.1.2.4. Under no circumstances should workers on the ground be used as spotters while aerial spraying is being conducted.

9.8.1.2.5. It is the responsibility of the employer to ensure that wind conditions are appropriate to prevent aerial drift, that neighbourhood residents are informed as to the time and nature of the spraying, and that every means is used to prevent contamination of neighbouring fields, pastures, gardens, wetlands and woods. Aerial spraying should not take place when wind conditions will result in substantial pesticide drift.

9.8.1.2.6. It is the responsibility of the employer to ensure that adequate records are kept.

9.8.1.2.7. Innovations in equipment or pesticide formulations that reduce drift should be promoted by national authorities or other relevant agencies.

9.8.1.2.8. Greenhouse managers should take special care with pesticide applications to minimize off-target movement of pesticides and to ensure that workers in adjacent areas are not exposed to significant amounts of pesticides.

9.8.2. ***Protection of water sources and the general environment***

9.8.2.1. Care should be taken to protect nearby water sources from pesticide drift and run-off.

9.8.2.2. Application equipment should not be rinsed in open water.

9.8.2.3. Contaminated clothing should not be washed in open water.

⁶ More detailed guidance can be found in FAO (2001): *Guidelines on good practice for aerial application of pesticides*.

9.8.2.4. Pesticides that are highly toxic to fish should not be used near open water.

9.8.2.5. Buffer zones established to protect sensitive environmental areas should be respected.

9.8.2.6. Used pesticide containers should be washed, triple or pressure rinsed; punctured or crushed so they cannot be used again; and disposed of properly, preferably through a collection scheme, or if that is not available, by some authorized method of waste disposal. In no event should containers be reused for storing other items, particularly food and drink. Effluent from water used to wash pesticide containers should be managed to avoid contamination of water sources and soil.

Hazardous materials

Checklist	Date _____	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1 N/A	Yes	No		
Physical conditions						
1. Are fuel and chemical tanks protected from vehicle impact?						
2. Are signs and decals used to indicate special storage areas?						
3. Is a binder with chemical safety data (MSD) sheets available in areas where hazardous chemicals are used?						
Working conditions						
1. Are all new workers trained and informed about hazardous materials present in the workplace?						
2. Are warning symbols pointed out to people in the workplace and MSD sheets made available to them to read?						
3. Are hazardous materials properly stored to control risk to unauthorized people and locked if necessary?						
4. When storing full or partially full containers, does everyone make sure that labels are in good condition for future users?						
5. Are special storage areas properly ventilated?						
6. When purchasing a controlled product, does the purchaser check for hazard symbols and marks and ensure that MSD sheets are provided?						
Work practices						
1. Are workers aware of the recommended emergency response for the hazardous material being used?						
2. Are hazardous materials stored so spills can be controlled?						
3. Is a first-aid station located nearby?						

Checklist	Date	Self-audit		
		Step 1	Step 2	Step 3
4. Is everyone aware that removal of or defacing labels could be subject to discipline?				
5. Is unidentified material properly disposed of?				
6. Are all workers trained on hazardous materials so that they may read and understand supplier/workplace labels, and MSD sheets?				
7. Has an inventory been made of all dangerous products used?				
8. Are all portable container, storage tanks, bulk vessels, conveyors and piping for hazardous materials properly identified and labelled?				
9. Is a label interpretation card posted in the handling area?				
10. Is everyone who picks up or purchases supplies, aware that they should obtain MSD sheets for all controlled materials?				
11. Are all MSD sheets available to workers?				
12. If a procedure creates a risk that is not described on the MSD sheet, is it brought to the owner's/operator's attention for discussion before action is taken?				
13. Is appropriate PPE available to male and female workers in the area where materials are handled?				
14. Are workers using PPE advised and aware that not using PPE could be cause for dismissal?				

Pesticide storage and handling

Checklist	Date	Self-audit			Step 2	Step 3
		Step 1	Yes	No		
Requirements		N/A				
1. Is the pesticide storage area used exclusively for the storage of pesticides?						
2. Is the storage area kept locked and a chemical warning sign posted?						
3. Is the storage area free of any foods/drinks for animals or humans?						
4. Are empty or partially full pesticide containers stored in a secured area that is not accessible to children or animals?						
5. Is the storage area vented to the outside?						
6. Are chemical warning signs posted on all entrances to the storage area?						
7. Is there an adequate source of clean water for decontamination of chemicals on skin, as eyewash, or spillage purposes near the storage area?						
8. Is the floor of the storage area capable of holding any spilled pesticides?						
9. Is the floor of the storage area absent of floor drains?						
10. Is the storage area clean and orderly?						
11. Are pesticides stored in their original container with a legible label?						
12. Is there absorbent material near the storage area to soak up any spilled pesticides?						
13. Has the local fire department been notified of the location of stored pesticides?						

Checklist	Date _____	Self-audit				
		Step 1		Step 2		Step 3
		N/A	Yes	No	Priority for action	What action is required
Pesticide disposal						
1. Are empty pesticide containers triple rinsed?						
2. Are empty containers punctured or crushed, recycled and disposed of in accordance with manufacturer's instructions and local regulations?						
Pesticide handling						
1. Have you attended a "grower pesticide safety" course within the past five years and have others taken the "short" course?		N/A	Yes	No	Priority for action	
2. Do you handle pesticides (herbicides, insecticides, fungicides, etc.) at least once per week in the growing season?						
3. Are any health problems that are, or may be, related to using pesticides recorded and investigated?						
4. Do workers read and follow directions on pesticide labels before use?						
5. Do workers inspect the container for leaks before handling pesticides?						
6. Do workers know what to do if a pesticide container should leak or spill?						
7. Are emergency numbers posted by the telephones (spill action centre, poison control centre, fire department, ambulance, etc.)?						
8. Are MSD sheets available for all pesticides used?						
9. Do spray tanks have a check valve on the hose to prevent back flow and contamination?						
10. Are pesticides secured and separated from other commodities when they are transported?						
11. Are vehicles inspected for contamination after unloading?						

Checklist	Date	Self-audit		
		Step 1	Step 2	Step 3
12. Are pesticides in your vehicle locked and inaccessible when the vehicle is unattended?				
13. Do workers ALWAYS wash their hands thoroughly before eating, drinking, smoking or using the toilet when working with pesticides?				
14. Do workers wear clean rubber gloves, eye protection and protective clothing when handling pesticides?				
15. Do workers wear an approved respirator when it is recommended on the label?				
16. Are the cartridges on respirators changed in accordance with the manufacturer's recommendation?				
17. Do workers inspect protective clothing and replace faulty equipment prior to handling pesticides?				
18. Do workers shower and change all clothing immediately after applying pesticides?				
19. Is contaminated clothing washed separately from normal clothing, and do laundry people understand why?				

10. Dusts and other particulate matter and other biological exposures

10.1. Summary

10.1.1. Agricultural production involves the generation of a variety of dusts and biological exposures that present potential hazards to the health of workers. These include dusts and other particulate matter, animal waste, zoonoses, needle-stick injuries, bites and stings as well as vector-borne diseases in the agricultural environment. Each of these categories of hazard is discussed below under the headings:

1. Hazard description;
2. Risk assessment;
3. Elimination of the hazard;
4. Control of the hazard at source through engineering controls or organizational measures;
5. Minimization of hazards by the design of safe work systems and procedures; and
6. The use of PPE.

10.2. Dusts

10.2.1. *Hazard description*

10.2.1.1. Dusts are generated in the production of various grains, legumes and other field crops. Dusts are most frequently generated during such processes as preparing seed for planting, harvesting, cleaning, primary processing, bagging and transporting crops to market. Dusts may include components such as straw, bagasse, husks of grain, mould fungal and bacterial residues, bioaerosols, endotoxin, pesticide residues, fumigants, and particles of silica. The above listing is illustrative and non-exhaustive.

10.2.1.2. Other forms of dusts are associated with the production of birds, swine and other livestock, which may take place in outdoor and/or indoor production facilities. Such dust may include particles of straw and grain, faecal matter, bacteria, microtoxins, endotoxin, moulds, fungi, animal hair, feathers, pollen and other substances.

10.2.1.3. The size of inhaled particles may be very small – less than 100 microns – and therefore may be capable of penetrating to the deepest levels of the lungs and causing a variety of breathing problems. The lungs of workers can be affected by exposure to harmful agents through acute (short-term) injury to the lung, or the development of long-term injury such as chronic obstructive pulmonary disease, asthma, organic dust toxic syndrome, and acute allergic alveolitis, also known as “farmer’s lung”.

10.2.1.4. High levels of organic dusts in agricultural workplaces may represent severe explosion hazards and resultant injury or death from fire.

10.2.2. Risk assessment

10.2.2.1. The competent authority should establish safety standards with regard to occupational exposure to dust in the agricultural environment. Such standards should be based on sound scientific criteria and accepted international practice.

10.2.2.2. The competent authority should establish safety standards with regard to the concentration of organic dust in enclosed installations with a view to the prevention of fire and explosive occurrences.

10.2.2.3. Employers should inform themselves of the relevant standards and carry out a risk assessment to determine the measures required to eliminate the hazard or the control strategies required to minimize workers' exposure. As a part of this assessment, the employer should conduct measurements of dusts in the work environment to determine the concentration of dusts in enclosed installations, the level of exposure in the various work areas and the risks to workers. The risk assessment should take into account the impact of varying weather and climatic conditions on the health effects of particulate exposures.

10.2.3. Elimination of the hazard

10.2.3.1. The elimination of dust from agricultural environments presents a formidable challenge. Total elimination may prove impossible, particularly in outdoor environments. Engineering controls can greatly reduce the level of dust and other suspended particulate matter, particularly in enclosed environments.

10.2.3.2. Employers should ensure that livestock waste storage and holding facilities are physically separate from animal and bird confinement houses. Such facilities should be designed and constructed in such a manner as to prevent aerosolization of aqueous matter, dust, or other particulate.

10.2.3.3. Employers should ensure that aerating, drying and storage facilities for grains, other feeds and tubers (potatoes, carrots, taro, beets) are designed and constructed in such a manner as to eliminate formation and exposure to mould or mouldy grain or tubers.

10.2.3.4. Employers should ensure that transport facilities and technology are designed and constructed so as to eliminate exposures to suspended dust, endotoxin and moulds.

10.2.4. Engineering controls

10.2.4.1. Employers should ensure that dust levels in grain storage and transport facilities are kept at or below the standard set by the competent authority, both to protect the health of the worker and to prevent severe explosion hazards and resultant injury or death from fire.

10.2.4.2. Employers should ensure that gas and particulate levels in livestock and poultry confinement houses and similar facilities are as low as practicable and are consistent with national standards and practice. As can be seen by the following table, maximum allowable exposure levels for ammonia and hydrogen sulphide gases are quite well defined and are fairly consistent within and between jurisdictions. It can also be seen that maximum allowable exposure levels for grain dust which had been set at 10 mgm³ time-weighted average in Canada and OSHA USA, are now recommended at 3 or 4 mgm³ time-weighted average by the State of California and the Conference of Governmental Industrial Hygienists. It should also be noted that in the Netherlands a maximum level for endotoxin is being considered. In addition, maximum exposure levels for grain dust may

not be appropriate for animal housing facilities because the dust in those houses contains in addition to grain dust, significant concentrations of other substances such as endotoxin and bacterial products, the effects of which may be magnified by coexisting ammonia and hydrogen sulphide. Significant effects on the respiratory system in humans have been shown at total dust levels as low as 2 mgm³.

Table 10.1. Recommended gas and dust levels by national/independent agencies

	NH ₃	H ₂ S	Grain dust	Endotoxin
Labour Canada	25 ppm TLV/8*	10 ppm	10 mgm/m ³ TLV/8**	
US Occupational Safety and Health Administration (OSHA)	50 ppm	20 ppm	10 mgm/m ³ TWA/8**†	
American Conference of Industrial Hygienists (ACGIH)	25 ppm TLV/8*	10 ppm	4 mgm/m ³ TLV/8**	
European Union	20 ppm TLV/8*	10 ppm		
Denmark	20 ppm TLV/8*	10 ppm	3 mgm/m ³ TLV/8**§	
Sweden	25 ppm TLV/8*	10 ppm	5 mgm/m ³ TLV/8** §	
State of California			4 mgm/m ³ TWA/8**†	
Dutch Health Research Council				135 EU/m ³ (under consideration)

* Threshold limit value (TLV) 8 hour time weighted average. † Time weighted average (TWA) 8 hour. ** Total particulate. § Organic dust.

10.2.4.2. Employers should ensure that all bio-filtration and other active and passive ventilation technologies function to specification.

10.2.4.3. Employers should ensure the provision of adequate space per animal and ceiling heights according to national standards and practice in order to minimize the concentration of dust/suspended particulate matter in animal and bird confinement houses (see Chapter 13 on agricultural installations).

10.2.4.4. Tractors and other equipment used in operations that generate dust should be equipped with cabins with filtration systems that protect the operator from the dust generated.

10.2.5. Safe working systems and procedures

10.2.5.1. Employers should ensure that work systems and procedures are in place to minimize the hazards to workers from dusts and biological exposures.

10.2.5.2. Employers should conduct measurements of dusts in the work environment at appropriate intervals to verify that hazards have been minimized. Employers should take corrective action, if this is not the case.

10.2.5.3. The employer should ensure adequate cleaning of the workplace.

10.2.5.4. The employer should ensure that equipment aimed at reducing exposures is adequately cleaned and maintained.

10.2.5.5. The employer should consider the need to reduce exposure time, for example by rotating workers in conjunction with other remedies.

10.2.5.6. The employer should provide information and training to workers that will enable them to understand the risks to their health of exposure to dusts and the need to observe SWPs.

10.2.6. The use of PPE

10.2.6.1. In circumstances where it is impossible or impracticable to eliminate or minimize hazards through the abovementioned control strategies, PPE should be used. PPE is not a substitute for control strategies to eliminate or minimize the potential hazard to the worker from dusts.

10.2.6.2. The employer should provide appropriate PPE for the use of workers. PPE for dust exposure is comprised of respiratory protection and appropriate clothing, such as coveralls, gloves, goggles and safety boots (see, in particular, Chapter 4, section 4.7.5, on RPE).

10.2.6.3. The employer should ensure that workers understand the risks to their health of exposure to dusts, are adequately trained in the use of appropriate PPE and are supervised to ensure compliance.

10.2.6.4. Workers should make proper use of the PPE provided and maintain it in good condition as far as this is within their control.

10.2.6.5. The employer should ensure that RPE (masks, filters, respirators) is available for use by the worker, that the RPE provided is appropriate to the exposure, and that workers are properly trained in its use. The following table summarizes the use of several types of commonly available RPE.

Table 10.2. Respiratory protective equipment (RPE)

Respirator types			
Air-purifying respirators	Advantages	Disadvantages	Approximate cost
Disposable mask or filter	Filters out particles such as grain dust and some mists and fumes. Optional exhalation valve reduces glasses fogging. Maintenance free. Good for short-term projects.		Inexpensive
Half-face respirator with dual cartridges and filters	Filters out particles, mists and fumes; absorbs and blocks chemical vapours and gases. Fairly easy to wear.	User should be clean shaven. May be hot to wear in warm weather.	Moderately expensive
Full-face respirator with dual cartridges and filters	Filters out particles, mists and fumes; absorbs and blocks chemical vapours and gases. Gives a better seal than a half-face respirator and protects eyes as well as nose and lungs.	User should be clean shaven. Hot to wear in warm weather. Glasses wearers need special eyewear mounted on interior of respirator face piece.	Moderately expensive
Battery-powered air-hood respirator with cartridges and filters	Filters out particles, mists and fumes; absorbs and blocks chemical vapours and gases. Requires less effort than user-powered respirators; may enable a worker with a heart or lung problem to continue working.	Cumbersome, may impede movement. Blowing air feels cold in winter.	Expensive

Air-supplying respirators	Advantages	Disadvantages	Approximate cost
Full-face respirator attached to air line	Provides clean air from a central source.	Requires special training and fit-testing. User should be clean shaven. Glasses wearers need special eyewear mounted on interior of respirator face piece. Attached air line may limit movement.	Expensive
Full-face respirator attached to air or O ₂ canister	Provides clean air from an independent source.	Requires special training and fit-testing. User should be clean shaven. Glasses wearers need special eyewear mounted on interior of respirator face piece. Canister heavy and bulky.	Expensive

10.3. Animal wastes

10.3.1. Hazard description

10.3.1.1. Animal and bird production may involve exposures to animal wastes such as manure and waste slurry, with risks of exposures to ammonia, hydrogen sulphide (H₂S), methane, bacteria and zoonoses.

10.3.1.2. Ammonia (NH₃) is often found in high levels in indoor livestock and poultry operations as a result of urine and faeces. Symptoms that result from exposure may include watering of the eyes and or breathing irritation as a result of elevated NH₃.

10.3.1.3. Elevated levels of carbon dioxide (CO₂) are usually an index of the inadequacy of ventilation. Elevated levels of CO₂ usually do not result in symptoms, although at high levels, asphyxiation may occur.

10.3.1.4. Hydrogen sulphide (H₂S) occurs as a result of the anaerobic digestion of organic material and in sewer tanks and holding facilities. H₂S exposures are extremely hazardous and may result in sudden death. H₂S is classed as a chemical asphyxiant similar to carbon monoxide and cyanide gases. H₂S inhibits uptake of oxygen in the body and causes death by suffocation. At levels of 2 to 10 ppm there is irritation of the eyes and throat. At levels of 10 to 50 ppm there is dizziness, headache, nausea and vomiting, coughing and breathing difficulty. At levels above 50 ppm, severe breathing problems, shock, convulsions and death may occur. The potentially disastrous effects of inhaling H₂S are made worse because at high levels of exposure the typical “rotten egg” smell of H₂S is not perceived by the worker because the olfactory nerves in the nose become paralysed by H₂S and the worker fails to perceive danger.

10.3.1.5. Methane gas is produced in manure systems. Exposure to methane gas from manure pits can result in death from asphyxiation.

Table 10.3. Common gases related to manure storage and management

Gas	Lighter than air	Odour	Class	Health effects
Ammonia	Yes	Sharp	Irritant	Irritation of eyes and throat
Carbon dioxide	No	None	Asphyxiant	< 20,000 ppm = safe level; increased levels result in headaches, drowsiness
Hydrogen sulphide	No	Rotten eggs	Poison	Headaches, dizziness, nausea, deadly at > 1,000 ppm
Methane	Yes	None	Asphyxiant, Flammable	Headaches

10.3.1.6. Infections in workers, particularly young workers and children, may occur as a result of secondary contamination of ground water with *E. coli* and other cholilforms. The contamination of drinking water in wells and other water sources with bacteria such as *E. coli* and other cholilforms can result in severe gastrointestinal diseases such as diarrhoea and severe kidney and other problems.

10.3.1.7. A number of diseases can be transmitted between animals and humans as noted in the zoonoses section (see table 10.4 under zoonoses).

10.3.2. Risk assessment

10.3.2.1. The competent authority should ensure that safety standards are established with regard to occupational exposure to products of manure in the agricultural environment. Such standards should be based on sound scientific criteria and accepted international practice.

10.3.2.2. Employers should inform themselves of the relevant standards and carry out a risk assessment to determine the measures required to eliminate the hazard or the control strategies required to minimize workers' exposure. As a part of this assessment, the employer should conduct measurements of gases in the work environment to determine the level of exposure in the various work areas and the risks to workers.

10.3.2.3. When children and other vulnerable groups live on the farm, the assessment should determine their risk of exposure.

10.3.3. Elimination of the hazard

10.3.3.1. The elimination of toxic gases from manure wastes in agricultural environments is an essential goal. Total elimination of H_2S from the breathing environment should be undertaken as a priority. Total elimination of other gases, such as NH_3 , may prove difficult in indoor environments. Engineering controls can greatly reduce the level of gases in enclosed environments.

10.3.3.2. Employers should ensure that livestock waste storage and holding facilities are physically separate from sewage systems used for humans.

10.3.3.3. Employers should ensure that the engineering of manure systems is such as to eliminate the risk to workers of exposure to H_2S above acceptable limits.

10.3.3.4. Employers should ensure that the engineering of containers for manure slurry, such as manure pits, tanks and other holding devices, is such that agitation of slurry, pulling of drain plugs, and other activities involved in moving the slurry do not result in exposures to workers that are above acceptable limits.

10.3.4. Engineering controls

10.3.4.1. Buildings, lagoons or tanks where manure is stored should be constructed so as to keep levels of exposures that workers experience to acceptable levels.

10.3.4.2. In animal confinement facilities, ventilation should be adequate to protect the worker from unsafe levels of gases such as NH_3 and H_2S .

10.3.4.3. Construction of animal rearing facilities should be carried out in such a manner as to control exposures to H_2S in situations where manure is handled as slurry below a slatted floor and when manure is collected in a manure pit.

10.3.4.4. Sewer connections between domestic waste systems and animal waste systems should not be permitted.

10.3.4.5. Construction of facilities involving manure slurry should be carried out according to national or local standards, or in cases where these do not exist, or are unclear, in accordance with good international practice.

10.3.5. Safe working systems and procedures

10.3.5.1. The employer should ensure that at no time does the level of H₂S in the workplace exceed the standard of 10 ppm.

10.3.5.2. As the olfactory nerves in the nose are paralysed by H₂S, the only reliable way to detect the gas is to measure the amount in the air. Employers should ensure that such measurements are carried out continuously in exposed situations and that alarm systems signal H₂S concentrations that approach a hazardous level.

10.3.5.3. The employer should ensure that workers are selected and trained to safely enter and work in a confined space before being assigned to do so. Such selection and training should include the proper use of PPE in confined spaces.

10.3.5.4. The employer should provide direct-reading gas detection instrumentation for evaluation of H₂S levels before a worker enters a confined space, such as a manhole, tank or pit where manure is stored.

10.3.5.5. The employer should ensure that no worker enters a manure pit or similar facility without the use of an externally driven air mask as well as having a safety harness, and two co-workers at the surface able to extract the exposed worker, if required, at a moment's notice.

10.3.5.6. The employer should ensure that a full rescue plan is in place in the event that a worker is overcome by H₂S in a manure pit or similar facility.

10.3.5.7. Workers should be instructed that, should a co-worker be overcome by H₂S, rescue workers should not enter the confined space in question without adequate protection and the presence on the surface of a minimum of two co-workers capable of extracting the affected worker from the pit.

10.3.5.8. The employer should ensure that employees are adequately trained in rescue operations and the use of PPE.

10.3.5.9. The employer should inform workers of their right to refuse to enter a potentially dangerous situation, such as entering into a manure pit or manure-holding facility, and this without prejudice.

10.3.6. The use of PPE

10.3.6.1. In circumstances where it is impossible or impracticable to eliminate hazards through the abovementioned control strategies, PPE should be used. PPE is not a substitute for control strategies to eliminate or minimize the potential hazard to the worker from toxic gases.

10.3.6.2. The employer should provide appropriate PPE for the use of workers. PPE for highly toxic gas exposures such as H₂S should consist of an externally driven air mask. Coveralls, gloves, goggles and safety boots may be required in certain circumstances.

10.3.6.3. The employer should ensure that workers understand the risks to their health of exposure to toxic gases, are adequately trained in the use of appropriate PPE and are supervised to ensure compliance.

10.3.6.4. Workers should make proper use of the PPE provided and maintain it in good condition consistent with their training and be provided with the proper means for doing so.

10.4. Zoonoses

10.4.1. Hazard description

10.4.1.1. Workers can develop symptoms of a zoonotic disease after handling an infected animal or animal by-products (hides), ingesting animal products (milk, undercooked meat) and disposing of infected tissues or faecal material.

10.4.1.2. Zoonotic diseases may mimic other diseases such as infectious diarrhoea and influenza, and humans are typically the ultimate hosts.

10.4.1.3. Examples of zoonotic diseases include anthrax which is contracted from handling tissues of infected animals and results in skin lesions in workers; brucellosis, which is contracted from handling tissues of infected livestock such as placental tissue and results in fevers in workers; campylobacter and cryptosporidium infections contracted primarily from livestock through contaminated food or water resulting in gastrointestinal symptoms such as diarrhoea in workers; leptospirosis contracted from rodents and livestock through contaminated water on the skin and resulting in fever in workers; psittacosis contracted from poultry and birds through inhaled faecal material resulting in pneumonia in workers; and rabies contracted from infected bites by dogs, wild animals bats, etc., and resulting in severe neurological problems leading to death. Table 10.4 contains details of these and other causes of zoonoses.

Table 10.4. Common causes, principal sources of infection, means of exposure and common human health effects

Common name	Principal source	Exposure	Common human symptoms
Anthrax	Mammals	Handling hair, bone or other tissues	Cutaneous lesions primarily, (intestinal or systemic illness on rare occasions)
Avian flu	Poultry, birds in the wild	Handling of infected birds, feathers or faecal matter	High fever, cough, may be fatal particularly for children
Brucellosis	Goats, sheep, cattle, swine	Contact with placenta and other contaminated tissues	Waxing and waning fever
Campylobacter	Poultry, cattle	Ingestion of contaminated food, water, milk	Gastrointestinal upset
Cryptosporidiosis	Poultry, cattle, sheep, small mammals	Ingestion of animal faeces	Gastrointestinal upset
Hanta	Mice	Dusts	Respiratory infection, haemorrhage or oedema of the lungs, meningitis
Hydatidosis	Dogs, ruminants, swine, wild carnivores	Ingestion of raw or undercooked contaminated animal products	Often non-symptomatic for years, depends on organs infected

Common name	Principal source	Exposure	Common human symptoms
Leptospirosis	Rodents, cattle, swine, wild carnivores, horses	Contaminated water on open skin	Flu-like symptoms followed by systemic illness, often leading to kidney or liver dysfunction
Orf	Sheep, goats	Contact with infected animals	Skin lesions and ulcerations
Psittacosis	Parakeets, poultry, pigeons	Inhaled desiccated droppings	Pneumonia
Q fever	Cattle, goats, sheep	Inhaled dust from contaminated tissues	Pneumonia
Rabies	Dogs, cats, wild carnivores, bats	Exposure of virus-laden saliva to breaks in skin	Neurological, ultimately death
Trichinosis	Swine, wild carnivores, arctic land and sea mammals	Eating poorly cooked flesh	Muscle swelling and pain
Tuberculosis	Cattle, dogs, goats	Ingestion of unpasteurized milk; inhalation of airborne droplets	Cough, fever, night sweats, fatigue, weight loss

10.4.2. Risk assessment

10.4.2.1. The competent authority should establish safety standards with regard to occupational exposure to products of dead or diseased animals in the agricultural environment. Such standards should be based on sound scientific criteria and accepted international practice.

10.4.2.2. Employers should inform themselves of the relevant standards and carry out a risk assessment to determine the measures required to eliminate the hazard or the control strategies required to minimize workers' exposure. As a part of this assessment, the employer should be aware of risks of zoonotic infections to workers in the various exposed situations, to women of childbearing age and particularly to pregnant workers.

10.4.3. Elimination of the hazard

10.4.3.1. The competent authority should make available information on the prevention of zoonoses and provide appropriate support services with regard to public health, veterinary health and occupational health measures.

10.4.3.2. The employer should undertake to eliminate the occurrence of zoonotic diseases through a combination of disease eradication measures, animal vaccination, human vaccination, maintenance of safe water supplies for people and for animals, the proper disposal of human and animal waste, work environment sanitation, labour camp sanitation, the cleaning and protecting of open wounds, appropriate food handling and preparation techniques (such as the pasteurization of milk and thorough cooking of meat), the use of PPE (such as boots in rice fields) and the prudent use of antibiotics to reduce the growth of resistant strains. Control technologies and preventive behaviours should be conceptualized in terms of pathways, agents and hosts and specifically targeted to the four routes of transmission (inhalation, ingestion, absorption, injection).

10.4.4. Engineering controls

10.4.4.1. Wherever possible, the employer should use engineering controls to reduce or eliminate the likelihood of a worker developing a zoonotic infection. Examples of engineering controls would be the automated machine washing of dairy equipment or the control of campylobacter and cryptosporidium infections by ensuring a safe water supply.

10.4.5. Safe working systems and procedures

10.4.5.1. The employer should undertake to minimize workers' exposure to zoonotic diseases by measures such as basic hygiene and sanitation practices. These include vaccination of animals, prompt treatment or proper disposal of infected animals, adequate disposal of infected tissues, proper cleaning and disinfection of contaminated sites and proper use of PPE.

10.4.5.2. The employer may wish to offer the opportunity for workers to be vaccinated.

10.4.5.3. The employer should train workers in the appropriate measures to prevent the outbreak or transmission of zoonoses tailored to the agent involved, for example, the vaccination of cattle against brucellosis.

10.4.5.4. The employer should institute and enforce regular hand washing as an effective measure against many of the pathogens involved in zoonotic disease transmission. Water, soap, disinfectants and single-use towels should be provided at places where animals that are, or are suspected of being, infected are kept.

10.4.5.5. The employer should undertake, where applicable, specific training of workers in:

- (a) the handling of live animals;
- (b) the necropsy of infected animals;
- (c) the handling of all animal by-products;
- (d) appropriate sanitary methods of carcass disposal, as essential in the control of zoonotic infections in the workplace; and
- (e) the proper use of PPE where this is needed.

10.4.5.6. Carcasses of diseased animals should be handled and disposed of in conformity with official regulations.

10.4.5.7. The employer should report outbreaks of communicable infectious diseases in accordance with any requirements of regional and national health authorities and relevant international regulations, such as the World Health Organization's International Health Regulations 2005.

10.4.6. The use of PPE

10.4.6.1. The employer should be aware of applicable safety standards with regard to the pathogens encountered in the workplace and the necessary PPE. Such PPE may include gloves, masks, eye protection, as well as appropriate gowns, aprons and boots.

10.4.6.2. The employer should provide appropriate PPE and train workers in its use. Specific training is required for workers who are in contact with the body fluids of animals or birds, who are exposed to procedures involving the skin of an animal being broken, who carry out necropsy, or who dispose of dead infected animals.

10.5. Needle-stick injuries and sharps exposures

10.5.1. *Hazard description*

10.5.1.1. Agricultural work carries with it the risk of injury from percutaneous needle stick or other sharps exposures during tasks requiring the use of needles or related sharps devices.

10.5.1.2. Examples of tasks associated with risk of needle-stick injuries are administration of parenteral medications or therapies (intravenous, intramuscular, subcutaneous), performing veterinary procedures such as surgery, biopsies or suturing and taking tissue or blood samples.

10.5.1.3. Injury from needle or sharps punctures carries with it a risk of trauma to underlying tissues, tendons and ligaments, as well as a risk of infection from inoculation of blood-borne pathogens.

10.5.1.4. Injury with needles containing medications, chemotherapeutic agents, vaccines, anaesthetics or antimicrobials carry with it the risk of exposure to potentially harmful doses of the agent in question.

10.5.2. *Risk assessment*

10.5.2.1. The competent authority should establish safety standards with regard to needles and sharps. Such standards should be based on sound scientific criteria and accepted international practice.

10.5.2.2. Employers should inform themselves of the relevant standards and carry out risk assessments to determine the measures required to eliminate the hazard or the control strategies required to minimize workers' exposure.

10.5.3. *Elimination of the hazard*

10.5.3.1. The employer shall at all times seek to eliminate the possibility of needle-stick injuries to employees by choosing a method of treatment for animals that does not involve sharps or needles.

10.5.4. *Engineering controls*

10.5.4.1. Engineering controls refer to sharps safety devices, needle safety devices and sharps disposal containers.

10.5.4.2. The employer should make available to the worker for use in appropriate circumstances sharps and needle safety devices that can eliminate or reduce the risk of percutaneous injury before, during or immediately after the use of the device. Such safety devices include needleless intravenous systems and needles with engineered injury protection, such as needles that self-retract after use or needles with attached hinged sheaths that cover the needle after use. Built-in needle disinfection devices can reduce the risk of infection.

10.5.4.3. The employer should undertake to be knowledgeable in the evolving technical design of such devices, and to share this knowledge with workers.

10.5.4.4. The employer should ensure that sharps disposal containers are provided and that workers are fully conversant with and compliant in their use.

10.5.4.5. The employer should ensure that sharps disposal containers are puncture proof, are not filled past their fill line, are labelled as hazardous waste, and are disposed of in a safe manner in accordance with prescribed procedures.

10.5.4.6. Employers should ensure that, where workers are required to give injections to animals, appropriate engineering controls have been instituted to adequately restrain the animal in question.

10.5.5. Safe working systems and procedures

10.5.5.1. The employer should train workers in the appropriate procedures for carrying out tasks that involve the risk of needle-stick injuries before requiring them to carry out such tasks.

10.5.5.2. The employer should put in place prevention and control measures to prevent exposure to needle stick and sharps injuries. These should include: (a) the prohibition of manually recapping, bending, breaking or clipping of contaminated needles or sharps; (b) the proper restraint of animals during procedures to reduce the risk of sudden movement and subsequent needle stick or sharps injury to the worker; and (c) procedures for the safe handling and disposal of full sharps containers.

10.5.5.3. Employers should keep a record of needle stick and sharps injuries and should regularly re-evaluate the effectiveness of the prevention and control measures.

10.5.6. The use of PPE

10.5.6.1. PPE, such as gloves or masks, should be used where the risk of exposure to harmful biological or chemical agents exists, but are not normally considered sufficient protection for sharps or needle-stick injuries. The use of PPE for protection from infectious materials, organisms or harmful chemicals is covered elsewhere.

10.6. Injuries due to wild animals

10.6.1. This section deals with a wide range of injuries that includes but does not exhaustively deal with a range of bites such as snake bites and insect, spider and scorpion stings.

10.6.1. Hazard description

10.6.1.1. Snake bites are most common among agricultural workers who spend time in fields, forested areas, tropical jungles and caves. Signs and symptoms associated with snake bites vary and depend on the type of snake. In general, symptoms can be categorized into local reactions and systemic reactions. Local reactions typically include redness and swelling around a pair of puncture marks at the site of the wound. Systemic effects are associated with venomous snakes. These include panic, nausea and vomiting, increased salivation and sweating, and laboured breathing which can eventually lead to respiratory failure due to paralysis of the respiratory muscles. The effect of venom on blood coagulation can cause external bleeding from body orifices and internal bleeding into organs. Death can ensue due to massive blood loss.

10.6.1.2. Insect, spider and scorpion bites and stings are common experiences of agricultural workers who are involved in crop husbandry, the harvesting of fruit, tubers, or grain, or the storage and handling of such agricultural products. Such injury may be inflicted by invertebrates, such as arachnida (spiders, scorpions and sun spiders), acarina (ticks and mites), chilopoda (centipedes), and hexapoda (bees, wasps, butterflies and

midges). Clearly, toxic effects (envenomation) are occupational hazards for exposed populations, and may include evidence of an embedded stinger, redness and swelling around the sting site, pain, blistering and localized itching. Other systemic effects may include panic (due to known allergic sensitivity or an overwhelming number of insect bite sites), increased salivation and sweating, and for workers with allergic sensitivity, tetany, tremors, paralysis of the extremities, and possibly fatal shock or eventual respiratory failure due to oesophageal swelling and paralysis of respiratory muscles.

10.6.2. Risk assessment

10.6.2.1. Employers should assess the risks from such hazards, bearing in mind the local environment and probability of workers being injured by wild animals during the course of their work.

10.6.3. Engineering controls

10.6.3.1. Employers should, to the extent possible, use engineering approaches for control of worker exposure. Such controls should be in compliance with local and national safety standards and in accordance with accepted international practice.

10.6.3.2. Employers should ensure that buildings which house workers and/or agricultural products and livestock are designed with adequate lighting, door and other airway mechanisms which block entry by insects, spiders, snakes and other such animals, appropriate feed, grain and other storage technology which discourages such entry and nest-building, and bridging or bracing mechanisms which impede the housing or development of their nesting, resting and feeding areas.

10.6.3.3. Employers should provide secure storage for workers' boots, gloves and clothing such that terrestrial venomous animals cannot enter and take refuge in such items.

10.6.3.4. Employers should ensure that caves, whether natural or man-made, are fitted with adequate lighting and maintained in accordance with good housekeeping and husbandry practices.

10.6.3.5. The employer should provide an indoor environment that eliminates or minimizes the risk of bites by providing appropriate enclosed building structures. The risk of insect bites can be reduced by adequate screening on doors and windows of working, resting and sleeping areas.

10.6.3.6. When outdoor work is required in areas infested with venomous animals, employers should:

- (a) to the extent possible, clear the outdoor work area of rubble and debris;
- (b) consider the elimination of shift work during periods of darkness;
- (c) provide lighting for night-time work in animal habitat areas;
- (d) recognize the hazards associated with introduction of workers into nocturnal environments, and prepare workers for such entry; and
- (e) where all other methods of control or mitigation fail, consider the use of pesticide treatment of worksites, animal habitat areas, or other nocturnal resting areas, taking all due precautions to minimize the potential exposure of workers to such chemical substances.

10.6.4. Safe working systems and procedures

10.6.4.1. Employers should develop written emergency management protocols for use in the event of injury to workers by venomous animals. First-aid personnel and other workers should be trained on the protocol of initial management of snake bites. First-aid boxes should contain antivenom, diluted ammonia, permanganate and hypochlorite lotions, as appropriate, for administration to affected workers.

10.6.4.2. Written records should be kept of workers with a history of severe allergic reaction to insect bites and stings and recommended treatment options. Workers who are allergic to bites and stings should be encouraged to carry an epinephrine auto injector.

10.6.4.3. Workers should be trained on the risk of exposure to bites and the recognition of signs and symptoms of snake bites as well as the bites of venomous spiders.

10.6.4.4. Workers should be trained to recognize the possible habitat for snakes, to identify venomous and non-venomous snakes, and to respond properly in the event of sighting a snake.

10.6.4.5. Employers should strive to ensure that workers' tetanus immunizations are kept up to date.

10.6.5. The use of PPE

10.6.5.1. Employers should provide appropriately fitted PPE for each worker, including footwear, working clothes, face and neck nets, appropriate gloves, etc. to cover all exposed areas of the body. Workers should use the PPE as requested by the employer.

10.6.5.2. PPE which requires a tight seal between the apparatus and the human body should be fit-tested.

10.6.5.3. Employers should provide for the storage of apparel and outdoor equipment in tightly closed plastic bags.

10.6.5.4. Employers should provide insect repellent.

10.7. Vector-borne diseases and parasitic infections in the agricultural environment

10.7.1. Hazard description

10.7.1.1. Vector-borne diseases and parasitic infections constitute a major hazard to the health, well-being and productivity of agricultural workers.

10.7.1.2. Mosquitoes, flies, fleas and ticks are insect vectors capable of transmitting micro-organisms, such as bacteria, viruses and parasitic agents to vertebrate hosts, including humans. Vectors can be dispersed long distances on wind currents or through transport systems, thus allowing the diseases they carry to establish in new areas under favourable conditions.

10.7.1.3. The most frequently encountered insect vectors and the diseases that they carry include mosquitoes (Dengue fever, West Nile virus, Rift Valley fever, malaria), ticks (encephalitis, Rocky Mountain spotted fever, tularaemia, Q fever, Lyme disease), fleas (plague), flies (trypanosoma, Leishmaniasis) and other insects (Chagas disease).

10.7.1.4. Freshwater snails are the vector of the parasite that causes schistosomiasis, also known as bilharzias. Among parasitic diseases, it is second only to malaria in its socio-economic impact. Occupational exposure occurs through contact with infested water, for example, in the course of irrigation or while working in rice paddies. The construction of dams, irrigation systems and canals has helped to spread schistosomiasis to new areas and to increase its incidence. Unsanitary water supplies and inadequate sewage disposal are contributing factors (see Chapter 17).

10.7.1.5. Parasitic worms, or helminths, are the source of such infections as ascariasis, dracunculiasis, elephantiasis, hookworm, lymphatic filariasis, onchocerciasis, schistosomiasis and trichuriasis. These are extremely debilitating diseases common in poor rural areas. Human hookworm infection, for example, is a soil-transmitted helminth infection that is a leading cause of anaemia and protein malnutrition in rural areas of sub-Saharan Africa, Latin America, South-East Asia and China.

10.7.2. Risk assessment

10.7.2.1. The competent authorities should review the principal vector-borne diseases and parasitic infections afflicting agricultural workers, develop public health measures to eliminate or mitigate them and provide information to employers and workers on measures that can be taken by them to prevent infection and promote health.

10.7.2.2. Employers should be aware of the impact on workers' health and productivity of vector-borne diseases and parasitic infections that affect the workforce.

10.7.2.3. Employers should seek guidance from the competent authorities regarding appropriate preventive and protective measures, and the reporting of communicable infectious diseases among workers to competent authorities in accordance with any regional, national or international requirements (see also section 10.4.5.7). The employer should also develop a plan to implement such guidance.

10.7.3. Elimination of the hazard

10.7.3.1. In areas where schistosomiasis is present, the competent authorities should establish standards with regard to the design of dams, irrigation systems and canals to eliminate or discourage the propagation of snails.

10.7.3.2. Employers should consider implementing measures to eliminate or control the vector. Such measures include, for example, eliminating on-site habitat (discarded automobile or truck tyres, standing ponds or pools of water, roadway depressions, accumulations of feed or product sacks, piles of fruit or nut tree trimmings, branches, etc.); improving the drainage of building areas, driveways, roads, ditches and berms; covering the top of rainwater catchment basins and other water container types with insect screening or netting; and ensuring that the irrigation systems they use are designed and operated so as to discourage the propagation of snails, for example, by allowing the rapid flow of water and proper drainage, and employing screening media at water intakes to block transmission of adult snails.

10.7.4. Engineering controls

10.7.4.1. Employers should provide adequate screening of windows and doors where mosquitoes and other vectors represent potential health risks to workers and encourage the use of treated bed nets.

10.7.4.2. Employers should select structural door components for workers' living quarters and indoor working areas which prevent the entry of vectors.

10.7.5. Safe working systems and procedures

10.7.5.1. Employers should consult with the competent authority when devising disease prevention and mitigation protocols.

10.7.5.2. To interrupt the life cycle of vectors of malaria and other bacterial or parasitic agents, chemoprophylaxis can be used to prevent disease, treat the disease, or both.

10.7.5.3. Vaccines to be used either for humans or for animals involved in the vector transmission cycle should be adequately stored and appropriately administered. Appropriate therapeutic caution should be used when employing chemoprophylaxis, as resistant strains have begun to emerge for many of these pathogens to the drugs commonly used for treatment.

10.7.5.4. The competent authority and employers should be aware that schistosomiasis can be treated using a single oral dose of the drug Praziquantel annually. Where the risk of contraction of schistosomiasis is high, a routine monitoring programme could identify infected individuals in order to enable treatment and break the transmission cycle of the disease. Employers should consult the competent authority for assistance in the design of a disease monitoring programme.

10.7.5.5. Employers should consider assigning shift work in a manner that would avoid high-intensity exposures when vectors are most active or during the peak season for infectious transmission.

10.7.5.6. For tick-borne diseases, regular checks for ticks and prompt removal are effective means of decreasing disease transmission. Employers should instruct workers on how to conduct regular checks for ticks and how to remove them.

10.7.5.7. Employers should conduct regular checks for vector nesting or breeding areas on work sites and workers should conduct such checks within their living quarters. Employers and workers should remain vigilant with regard to vector movement and deploy appropriate behaviour when confronting vectors.

10.7.5.8. Employers should provide toilets accessible to all worksites and discourage workers from defecating or urinating in open water.

10.8. The use of PPE

10.8.1. Employers should provide PPE for workers at worksites, including protective clothing (long pants, long sleeves and tight-fitting clothing wristlets and anklets), as well as mosquito netting for living quarters.

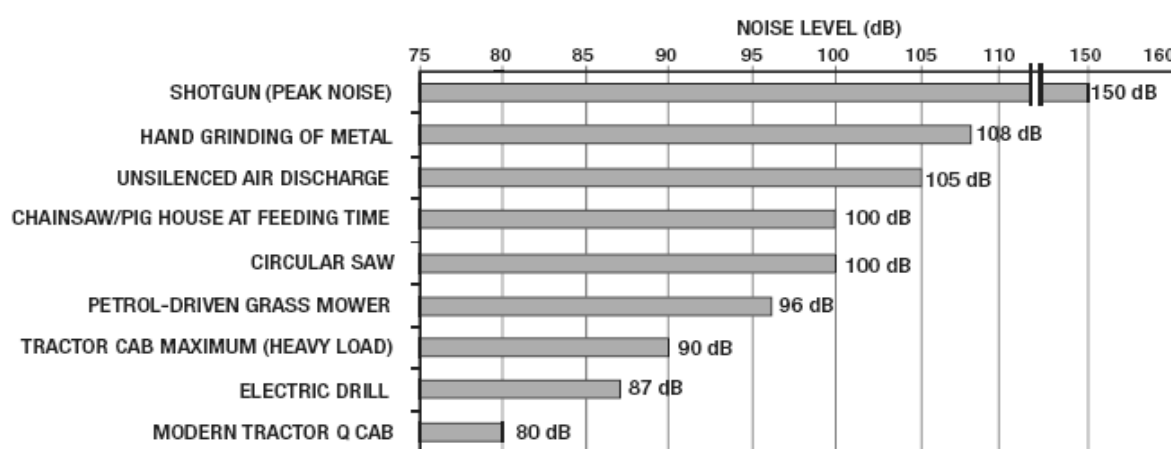
10.8.2. Where workers are exposed to contaminated or infested water, employers should provide rubber boots and rubberized hand gloves that prevent skin contact with water. Where workers are at risk of splashing, more complete PPE coverage, including face shields and rubberized leggings and aprons may be indicated.

11. Noise

11.1. Introduction

11.1.1. Noise is a serious occupational hazard to those who work in agriculture. The less exposure to noise the better. Hearing loss may result from a single intense exposure or cumulative exposure to noise. There are many potential sources of noise on farms, including tractors, chainsaws, grain dryers and guns, and contact with animals such as pigs. Exposure to farm equipment or animal production is the principal source of noise-induced hearing loss in agriculture. Some typical noise levels are shown in table 11.1 below. By comparison, the noise level of a normal conversation is 50–60 dB.

Table 11.1. Noise levels in selected agricultural activities



11.1.2. For machinery, the best option for reducing noise is to do so at source through good design. For example, many new tractors and other farm equipment have been designed so as to emit low levels of noise. The second option is to reduce noise by installing sound-proofed enclosures, acoustic materials or other engineering measures. If such means are insufficient, hearing protectors should be provided and the amount of time spent in noisy environments limited. Hearing protectors may also be needed for other agricultural processes, such as working with livestock.

11.2. Hazard description

11.2.1. Hearing damage usually occurs over longer periods of time because of prolonged exposure to high noise levels. Hearing loss may be only temporary after short periods of exposure to noise, but if workers continue to be exposed to high noise levels they will suffer permanent damage to their hearing. Permanent damage can also be caused immediately by sudden, extremely loud noises, e.g. from guns.

11.2.2. High noise levels can also be a safety hazard at work, interfering with communication and making warnings harder to hear, and they can also increase worker fatigue and cause irritability, reducing performance.

11.3. Risk assessment

11.3.1. Employers should assess the risks to their workers of noise-induced hearing loss, and in particular:

- (a) identify the particular agricultural machinery and processes that give rise to such exposure;
- (b) assess the risk of hearing impairment from such equipment and tasks;
- (c) assess the degree of interference to communications essential for safety purposes; and
- (d) assess the risk of fatigue, with due consideration to the mental and physical workload and other non-auditory hazards or effects.

11.3.2. In carrying out the risk assessments, employers should, in consultation with workers and their representatives:

- (a) seek the advice of the competent authorities and/or the occupational health services about exposure limits and other standards to be applied;
- (b) seek the advice of suppliers of processes and equipment about expected noise emissions;
- (c) if this advice is incomplete or otherwise of doubtful value, arrange for measurements by people who are competent to undertake these in accordance with current national laws and practice; and
- (d) give due consideration to the composition of the workforce (pregnant workers, women and young workers, etc.).

11.3.3. Noise measurements should be used to:

- (a) quantify the level and duration of exposure of workers and compare it with exposure limits, as established by the competent authority or internationally recognized standards to be applied (see also Appendix III, section 6);
- (b) identify and characterize the sources of noise and the exposed workers;
- (c) create a noise map for the determination of risk areas and activities;
- (d) assess the need both for engineering noise prevention and control, and for other appropriate measures and their effective implementation; and
- (e) evaluate the effectiveness of existing noise prevention and control measures.

11.4. Engineering controls

11.4.1. Based on assessments of workers' exposure to noise, employers should establish programmes to reduce such exposure to the lowest levels practicable. Such exposure should not exceed the limits established by national and/or international laws and standards.

11.4.2. In the case of new machinery and equipment, employers should:

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- (a) specify low noise emissions as a condition of purchase from their suppliers, so that machinery and equipment conform to relevant national or international laws and standards, such as ISO standards (see Appendix III); and
 - (b) arrange the workplace layout and job assignments so as to minimize workers' noise exposure.

11.4.3. If workers' noise exposures are still higher than those determined by national laws and standards, employers should reduce such exposures through other engineering means as far as practicable, such as by fitting sound-proofed enclosures or using other acoustic materials.

11.4.4. Employers should maintain machinery and equipment regularly, since worn components may increase noise levels. Worn out equipment and tools should be removed from use and replaced with new technology.

11.5. Safe working systems and procedures and the use of PPE

11.5.1. Where workers' noise exposures remain unacceptably high, as determined by national laws and standards, employers should:

- (a) minimize the exposures through appropriate organizational measures that reduce the time workers spend in the noisy environment; and
- (b) provide suitable hearing protectors, such as earplugs or muffs, selecting them in consultation with workers and their representatives.

11.5.2. Where hearing protectors are provided, employers should ensure that they are properly maintained and replaced as often as necessary.

11.5.3. Where hearing protectors need to be worn, hearing protection zones should be designated where the use of hearing protectors is mandatory and the need to wear hearing protectors should be indicated with appropriate signs. Hearing protectors should be available at the entries to the protection zones.

11.6. Workers' health surveillance, training and information

11.6.1. Where workers' noise exposures are likely to exceed those permitted by national laws and standards, they should receive regular audiometric testing.

11.6.2. Employers should ensure that such workers are trained in:

- (a) the effective use of hearing protectors;
- (b) identifying and reporting new or unusual sources of noise that come to their attention; and
- (c) the role of regular audiometric testing.

11.6.3. If regular audiometric testing produces significantly abnormal results, the causes should be determined and appropriate action taken.

11.6.4. Employers should ensure that workers are informed of:

- (a) the results of their audiometric tests;
- (b) the factors leading to noise-induced hearing loss and the consequences for the worker, including non-auditory effects and social consequences, especially for young workers;
- (c) the precautions necessary, especially those requiring workers' intervention or the use of hearing protectors;
- (d) the effects that a noisy environment may have on their general safety and health; and
- (e) the symptoms of adverse effects of exposure to high levels of noise.

11.6.5. Workers should have access to occupational health services (see Appendix I), where available, so that they can discuss possible symptoms of noise exposure with qualified practitioners.

12. Vibration

12.1. Introduction

12.1.1. Vibration in the workplace is generally classified as:

- (a) whole body vibration, which is transmitted by sitting or standing on vibrating surfaces, such as when driving tractors and other farm machinery. Prolonged exposure can lead to severe back pain and other musculoskeletal disorders; and
- (b) hand–arm vibration, which is transmitted through the use of hand-held powered equipment like chainsaws, brush cutters and hedge trimmers. Prolonged exposure can lead to damage to the hand and arm muscles (hand–arm vibration syndrome), joints and nerves.

12.1.2. Short duration exposure to whole body vibration or to hand–arm vibration may result in temporary disability, but prolonged or repeated exposure leads to permanent damage. The main concerns are therefore the magnitude of vibration transmitted and the duration of exposure. Exposure to whole body vibration is unlikely on its own to cause injuries, but it can aggravate existing back injuries which may cause pain.

12.1.3. As with noise, vibration is best reduced or eliminated at source through good design of equipment. For example, tractors with in-built suspended cabs or chainsaws with anti-vibration mountings can reduce vibration emission levels significantly. Engineering controls to reduce vibration subsequently may be possible but these are usually less effective. PPE, such as anti-vibration gloves, is not a substitute for engineering controls and should only be considered as a last resort. However, exposure levels will be reduced by spending less time working with vibrating equipment.

12.2. Hazard description

12.2.1. Common sources of whole body vibration include driving or standing on a tractor, all-terrain vehicles or other machinery to perform tasks like baling, drilling, foraging, spraying, ploughing and harrowing. The effects of whole body vibration are made worse by driving over rough ground or over bumps or potholes. It is also experienced when standing on vibrating platforms, such as mechanical harvesters and motorized tree fruit picking platforms, or working near large machinery, such as milling or threshing machines.

12.2.2. Common sources of hand–arm vibration in agriculture are the use of hand-held vibratory tools and equipment, such as chainsaws, brush cutters or grinders. Other sources include impact wrenches used in equipment maintenance and repair, chainsaws, brush saws and weed saws, portable fruit, nut or kapok harvesters and vibro-compactors.

12.3. Risk assessment

12.3.1. Employers should assess the risks to their workers from both whole body vibration and hand–arm vibration, and in particular:

- (a) identify the sources of vibration and the tasks that give rise to exposure, considering the types of equipment being used, the conditions under which they are used and the duration of exposure;

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- (b) assess the risks of musculoskeletal and other injuries from such tasks and processes; and
 - (c) assess the risk of fatigue, with due consideration to the mental and physical workload and other non-auditory hazards or effects.

12.3.2. In carrying out the risk assessments, employers should, in consultation with workers and their representatives:

- (a) seek the advice of the competent authorities and/or the occupational health services about exposure limits and other standards to be applied;
- (b) seek the advice of suppliers of processes and equipment about expected vibration emissions;
- (c) if this advice is incomplete or otherwise of doubtful value, arrange for measurements by people who are competent to undertake these in accordance with current national laws and practice; and
- (d) give due consideration to the composition of the workforce, including pregnant workers, women and young workers.

12.3.3. Vibration measurements should be used to:

- (a) quantify the level and duration of exposure of workers and compare these with exposure limits, as established by national and/or international law and standards (see also Appendix III, section 7);
- (b) identify and characterize the sources of vibration and the exposed workers;
- (c) assess the need both for engineering prevention and control and for other appropriate measures and their effective implementation; and
- (d) evaluate the effectiveness of existing prevention and control measures.

12.4. Engineering controls

12.4.1. Based on assessments of workers' exposure to vibration, employers should establish programmes to reduce such exposure to the lowest levels practicable. Such exposure should not exceed the limits established by national and/or international laws and standards.

12.4.2. In the case of new machinery and equipment, employers should specify low vibration emissions as a condition of purchase from their suppliers, so that the machinery and equipment conform to relevant national or international laws and standards, such as ISO standards (see Appendix III, section 7).

12.4.3. If workers' exposures to vibration are still higher than those determined by national laws and standards, employers should reduce such exposures through vibration damping as far as practicable, such as by fitting anti-vibration mounts or replacing unsuspended tractor cabs with suspended ones.

12.4.4. Employers should maintain machinery and equipment regularly, since worn components may increase vibration levels. Worn out equipment and tools should be removed from use and replaced with new technology.

12.5. Safe working systems and procedures and PPE

12.5.1. Where workers' exposures remain unacceptably high, as determined by national laws and standards, employers should:

- (a) minimize exposures through appropriate organizational measures that reduce the time that workers spend with vibrating machinery and equipment; and
- (b) if appropriate, provide suitable PPE, such as anti-vibration gloves, selecting them in consultation with workers and their representatives.

12.5.2. Where PPE is worn, such as anti-vibration gloves, employers should ensure that it is properly maintained and replaced as often as necessary.

12.6. Workers' health surveillance, training and information

12.6.1. Where workers are exposed to vibration levels likely to exceed those permitted by national law and standards, they should receive appropriate information and training about the risks involved. In particular, they should know how to:

- (a) use machinery and equipment so as to minimize exposure to vibration;
- (b) recognize symptoms from over-exposure to sources of vibration; and
- (c) identify and report new or unusual sources of vibration that come to their attention.

12.6.2. Workers should have access to occupational health services (see Appendix I), where available, so that they can discuss possible symptoms of exposure to whole body vibration or to hand-arm vibration with qualified practitioners.

13. Agricultural installations

13.1. Summary

13.1.1. Agricultural installations include farm workshops, animal housing, storage facilities, wells and pumps, crop and machinery maintenance structures, pens, stockyards and other structures of various types and sizes.

13.1.2. Many hazards can be prevented or minimized through design, construction and maintenance. Deficiencies in any of these aspects may result in hazardous exposures to workers.

13.1.3. Safe design, construction and maintenance should be considered for the life cycle of each facility. Facilities should meet building regulations. Major considerations include siting, structural soundness, layout and housekeeping, ventilation, fire, storages and electrical installations.

13.1.4. Good housekeeping greatly reduces the risk of “lost time injury” in enterprises and thereby increases productivity. Good housekeeping measures include, but are not confined to, such items as:

- the cleaning of workshops and removal of refuse at the end of each day;
- proper storage of goods, materials and gear on tidy shelving or pallet stack shelves. Stored materials should not obstruct passageways or traffic lanes or interfere with lighting;
- adequate lighting in work areas, ergonomic friendly work areas;
- separate and clearly painted travel routes for persons and mobile equipment on workshop floors; and
- regular “housekeeping” meetings with workers, their representatives, and management seeking feedback and input to improve housekeeping practice.

13.1.5. Design, construction and maintenance practices for agricultural installations, along with important safety behavioural practices for employers and workers, are described below. Hazards are discussed below under the headings: (1) Hazard description; (2) Risk assessment; (3) Engineering controls; and (4) Safe work systems and procedures.

13.2. Risk assessment

13.2.1. The competent authority should ensure that safety standards are established with regard to construction and maintenance of agricultural facilities. Such standards should be based on sound scientific criteria and accepted international practice.

13.2.2. Employers should inform themselves of the relevant standards and carry out a risk assessment to determine the measures required to eliminate the hazard or the control strategies required to minimize workers’ exposure.

13.3. Design, construction and maintenance

13.3.1. Hazard description

13.3.1.1. Major design components common to many agricultural installations include building materials and layout, illumination, ventilation, storage of hazardous materials and electrical installations.

13.3.1.2. Deficiencies or inadequacies in these areas create hazards and risks involving the movement of workers, fire hazards, electrocution hazards as well as vision and breathing problems.

13.3.2. Engineering controls

13.3.2.1. Building clients, architects, developers and engineers should ensure that all requirements of the competent authority are included in specification and tender documents. They should maintain records of the location and type of building materials used so as to provide the necessary information to those who may have potential for exposure in the future.

13.3.2.2. Building clients and main contractors should always give preference to contracting firms which conform to the requirements of the competent authority.

13.3.2.3. Chemical safety data sheets and labels, as well as other product information on safety and health should be prepared in conformity with the requirements of the competent authority, by the manufacturers of building products (e.g. protective coatings, soldering lead and insulation wools) and made available to suppliers and users. The production of chemical safety data sheets in electronic format should be encouraged.

13.3.2.4. Suppliers and importers, as the link between manufacturers and users, should ensure that the information and instructions of the manufacturers are transmitted to their customers. Any repackaging by the supplier should meet the requirements set out for manufacturers on packaging, storage, transport, labelling, chemical safety data sheets and product information.

13.3.2.5. Buildings and structures made of steel, iron or metal present less risk of fire loss. Insulation materials should be non-combustible and non-toxic. The potential generation of hazardous fibre and dust should be considered. Long open structures should have fire barriers in the roof and ceiling areas at distances of no more than 76 metres for low or moderate heat release structures, and 30 metres for high heat release structures.

13.3.2.6. Separate pathways for workers and mobile equipment should be provided. Blocking devices should be used to protect workers required to perform work in vehicle travel areas. Exits for workers should be clearly marked and lit. Pathways for mobile equipment should include sufficient width, height and turning space for the intended work. Walking and working areas should be sufficiently high for workers to move without stooping or bending. If there are low-hanging beams, structural supports or ceilings, they should be marked with hazard tape and workers provided with bump caps.

13.3.2.7. Illumination requirements vary considerably and depend both on work tasks and human factors. Work requiring attention to fine detail, such as reading a product label or machine operating instructions, will require a higher level of lighting. National building codes should be used to guide selection of lighting levels.

13.3.2.8. Ventilation controls should be designed to handle the most hazardous exposure expected. Exposures that should be considered include toxic and flammable

gases, liquids, and organic and inorganic dusts. Safe ventilation strategies and recommendations for hazardous exposures are specified in many industrial hygiene references and occupational safety and health standards.

13.3.2.9. Electrical installations should be designed to: protect wiring from deterioration due to a corrosive or hot environment; protect wiring from rodents; incorporate ground fault circuit-breakers in wet or high humidity areas; isolate high voltage equipment; ensure that spark-free lighting, motors and equipment are used in areas exposed to flammable liquids; provide for lockout of all electrical systems; enable the safe inspection and maintenance of system components; and allow for the future expansion of voltage and amperage levels.

13.4. Slips, trips and falls

13.4.1. Hazard description

13.4.1.1. Slips, trips and falls account for a significant percentage of injury incidents occurring in farm buildings, structures and facilities. Falling from any height is hazardous and can be fatal.

13.4.1.2. Injuries (sprains, strains, bruises to joints and muscles, ligaments, tendons and bones) often occur because of poor initial design and maintenance. This includes missing walkways, leaving materials in walking aisles, deteriorated steps and stairs, unprotected openings, poorly maintained ladders and walking surfaces made slippery from rain, mud, manure, chaff or other substances. Falls from height can also be caused by working on fragile roofs, on silos or on the top of high vehicles without adequate protection.

13.4.1.3. Inadequate lighting or poor visibility can also be a significant factor. For example, the risks of slips, trips and falls can increase when entering poorly lit areas from well lit ones or vice versa. Workers carrying objects that block their view or are too heavy or awkward increase the risk of accident.

13.4.2. Risk assessment

13.4.2.1. Employers should assess risks from slips, trips and falls, especially during maintenance when risks can be higher.

13.4.3. Engineering controls

13.4.3.1. Floors should be of robust construction, and use non-combustible materials.

13.4.3.2. Pits and other floor openings should be covered or cordoned off with clear warning signs when not in use. Such areas should always be well lit.

13.4.3.3. Platforms and walkways should be accessible via permanent, fire-resistant elevators, stairways or ladders.

13.4.3.4. Platforms, walkways and stairways with open sides should be provided with railings with panelling up to the height of the railings. Alternatively, they should have kick boards or toe-boards extending part-way up the railings.

13.4.3.5. Open-mesh walkways or platforms should be constructed so that any apertures in the mesh are small enough to prevent objects from falling through and causing injury to people below and they should be fastened securely.

13.4.3.6. Temporary workplaces such as mobile elevated work platforms should be equipped with suitable guard rails or other edge protection. Where such measures do not eliminate the risk of falling, workers should be provided with and trained in the use of appropriate fall arrest equipment, such as safety harnesses and lifelines (see section 17.7).

13.4.3.7. Where anchorage points are provided on buildings for use with lifelines or other fall arrest equipment, these should be regularly inspected, tested and maintained.

13.4.4. Safe work systems and procedures

13.4.4.1. Good housekeeping practices can contribute to worker safety by preventing slips, trips and falls.

13.4.4.2. The employer shall ensure that: walking surfaces and stairs inside facilities are equipped with adequate lighting; walkways that are exposed to wet or slippery substances are roughened; stairs and ladders are maintained in good condition with handrails in place; damaged floor boards and concrete defects are repaired, as needed; and ladder openings, hay chutes and animal house clean-out openings are protected with railings and toe-boards.

13.4.4.3. The employer should ensure that workers are clearly instructed and supervised in good housekeeping measures that can prevent slips, trips and falls. These include having walking aisles or pathways clearly identified; keeping stairs and passageways clear of tools, buckets, slippery substances, etc.; and keeping buildings free of accumulations of trash and other objects not needed in the workspace.

13.4.4.4. With regard to the use and maintenance of ladders, the employer should ensure that appropriate, well-maintained equipment is available and is appropriate to the task at hand. Workers should be properly instructed in the use of ladders and supervised when using them. Safe work practices include the presence of a second person at the base of the ladder; the avoidance of work on ladders in windy or stormy conditions; the use of mechanical means to lift or lower heavy objects; and other practices appropriate to the task at hand.

13.4.4.5. The employer should ensure that portable ladders are provided with non-slip shoes, spikes, hooks, stand-off devices or other devices to prevent slipping.

13.4.4.6. The employer should ensure that workers climbing structural ladders, such as on upright silos, grain bins, feed mills, etc. in which the ladders are at or above specific heights as provided by national or local regulations, are provided with a fall arrest system and instructed in its use.

13.4.4.7. The employer should ensure that ladders have a protective cage and that ladders over 9 metres (30 feet) have landing platforms. Employers could use the ASAE S412.1 *Ladders, cages, walkways and stairs* engineering standard as a guide.

13.4.4.8. All ladders should be inspected at suitable intervals and any defects immediately repaired. If irreparable, the ladder should be replaced.

13.5. Respiratory hazards

13.5.1. Hazard description

13.5.1.1. The daily activities of farming may generate breathing hazards from a range of sources, including organic and toxic dusts, fumes, gases and vapours, including welding fumes.

13.5.1.2. Working inside agricultural installations such as barns, workshops, livestock pens, and feed and crop storage structures often exacerbates the hazards because of enclosed work spaces, poor ventilation in a specific area and a lack of wearing respiratory protective devices.

13.5.1.3. Continual exposure to breathing hazards may create long-term health problems such as asthma, bronchitis, “farmer’s lung” and organic dust toxicity syndrome.

13.5.1.4. In some facilities, such as controlled atmospheric rooms for fruit and vegetables, and some crop silos and manure storages, a lack of sufficient oxygen for breathing may represent a life-threatening hazard.

13.5.2. Risk assessment

13.5.2.1. Employers should assess risks from all respiratory hazards, bearing in mind the particular circumstances of likely exposure.

13.5.3. Engineering controls and the use of PPE

13.5.3.1. The employer should ensure that building construction and ventilation procedures are such as to minimize dust exposures to workers.

13.5.3.2. Because the elimination of dust is difficult to achieve in many instances, employers should assess the respiratory hazards that workers may encounter in the agricultural installations to which they are exposed and take specific actions to eliminate or control these hazards through adequate ventilation.

13.5.3.3. The employer should ensure that respiratory protection such as dust masks, chemical cartridge respirators and self-contained breathing apparatus are available for use by workers (see Chapter 10).

13.6. Farm workshop safety

13.6.1. Hazard description

13.6.1.1. The farm workshop is a primary location where repair operations are completed and these activities can lead to serious injury.

13.6.1.2. Hazards include trips, slips and falls; fires from flammable liquids and oils; power-tool hazards (lacerations, abrasions, etc. to hands and eyes); noise; electrical shocks; and fumes, vapours and gases from painting, welding and cleaning products.

13.6.2. Risk assessment

13.6.2.1 Employers should assess risks from maintenance and other tasks undertaken in workshops. Many of the risks common to garages and other engineering workshops are to be found in agricultural workshops too.

13.6.3. *Elimination of the hazard and engineering controls*

13.6.3.1. The employer should ensure that farm shops are safely designed and maintained with orderly arrangement of tools and equipment and that walkways are kept clean and clear of objects to reduce trips and falls.

13.6.3.2. The employer should ensure that workers are properly trained and supervised in the repair of agricultural equipment. Prior to the repair of agricultural equipment, the power to equipment should be turned off, the movement of all rotating parts stopped and safety locks engaged.

13.6.3.3. The employer should ensure that workers are properly trained and supervised in the use of power tools, that all guards and shields are kept in place on power equipment and that hand tools are used only for their intended purpose.

13.6.3.4. The employer should ensure that shops are equipped with ground fault circuit interrupters to help prevent electrical shock.

13.6.3.5. The employer should ensure that shops are well lit and, if heated, that the shop is properly vented.

13.6.3.6. The employer should ensure that specific hazards are eliminated or reduced as far as possible, such providing non-slip coatings for potentially slippery surfaces. Where risks remain, employers should provide proper signage as well as appropriate PPE. Standard PPE for a farm shop should include leather gloves, chemical-resistant gloves, safety glasses, face shields, earplugs or muffs, steel-toed boots, respirators, hard hats, protective aprons and welding shields.

13.6.3.7. The employer should ensure that ventilation is adequate to exhaust fumes from engines, welding and paint.

13.6.3.8. The employer should ensure that a first-aid kit and an appropriate, up-to-date fire extinguisher are readily available within the shop and that workers are trained to use them.

13.6.3.9. The employer should ensure that all exits are clear.

13.7. *Asbestos and insulation wools*

13.7.1. *Hazard description*

13.7.1.1. Exposure to asbestos fibres in agricultural installations represents an extremely important risk for workers. Many agricultural installations, particularly older facilities may have asbestos used as insulation of ceilings and walls as well as around heating equipment and structures. Any uncovered asbestos wool represents a serious hazard to the workers in such an area.

13.7.1.2. Exposure to asbestos may cause diseases of the respiratory and digestive tracts, through inhalation or ingestion, and may cause secondary disease in a number of vital organs that may not become apparent for two to three decades. Diseases caused by exposure to asbestos may include asbestosis and mesothelioma that once diagnosed, are irreversible, disabling and frequently fatal.

13.7.1.3. Insulation wools have mechanical irritant properties and may pose a threat of disease to the eyes, skin and upper respiratory tract that may not become evident for two or more decades.

13.7.2. Risk assessment

13.7.2.1. The presence of asbestos in buildings, etc. poses very serious risks to workers if the asbestos is disturbed and the dust inhaled. Employers should ensure that thorough risk assessments are undertaken before any work that might involve asbestos is undertaken.

13.7.3. Elimination of the hazard and engineering controls

13.7.3.1. Employers using insulation wools should, as far as practicable, select appropriate products or handling methods so as to minimize the generation of fibres and dust, and should keep themselves informed regarding the development of changing insulation technology.

13.7.3.2. The employer should ensure that an inventory of all known asbestos-containing material at the workplace is prepared and kept current, and that these materials are identified by signs, labels or, when this is not practicable, other effective means. Where the presence of asbestos is not known, the material should be tested before it is touched. If in doubt, materials should be treated as if they were asbestos.

13.7.3.3. The employer should ensure that a risk assessment on asbestos-containing material identified in the inventory is conducted by a competent person. Regard should be given to the condition of the material, its friability, accessibility, and likelihood of damage, and the potential for fibre release and exposure of workers. Workers should be informed regarding the presence of asbestos and the potential risk of exposure.

13.7.3.4. The employer should ensure that asbestos-containing material is controlled by removal, disposal, enclosure or encapsulation, to prevent the release of asbestos fibre. Such work should be carried out by licensed operators in accordance with national law and practice.

13.7.3.5. The employer should not allow any work that would disturb asbestos-containing material, unless necessary precautions have been taken to protect workers.

13.7.3.6. Asbestos must not be used where it is banned by law or regulation. In countries where asbestos is allowed, the employer should nonetheless substitute less hazardous materials.

13.7.4. Safe systems of work and procedures

13.7.4.1. All work with asbestos must only be undertaken by competent and authorized contractors. Legislation covering such work, including the licensing of asbestos removal contractors, varies from one country to another, and employers should be aware of what such legislation requires. Agricultural workers must not attempt any work that might involve the release of asbestos fibres into the general working environment.

13.8. Fire safety

13.8.1. Hazard description

13.8.1.1. The heat and smoke of fire, along with the toxic gases and rapid loss of oxygen, can kill workers quickly.

13.8.1.2. Three major classes of fire that strike agricultural facilities are: Class A (combustibles, e.g. wood, straw, hay, paper products, plastics); Class B (flammable liquids, e.g. gasoline, diesel, fuel oil, methanol); and Class C (electrical, e.g. wiring, cords, welding, electrical motors).

13.8.1.3. Major sources and contributors to fire include smoking, lightning, excessive storage of combustible waste material (discarded timber, brush and jungle thrash, tyres, nut hulls, etc., urea and ammonium nitrate), poorly maintained electrical systems, improper storage of flammable liquids, heavy use of combustible building materials and a lack of fire barriers in large, open buildings.

13.8.1.4. Facilities that are constructed solely of wood are much more susceptible to fire than those constructed of non-flammable materials.

13.8.2. Risk assessment

13.8.2.1. Employers should assess fire safety risks from all relevant sources, including flammable materials held in storage areas.

13.8.3. Engineering controls and safe working procedures

13.8.3.1. The employer should, wherever possible, use non-combustible building materials.

13.8.3.2. The employer should ensure that regular housekeeping and good maintenance of installations take place as these are the most important actions that can be taken to reduce the chance of fire.

13.8.3.3. The employer should prohibit smoking in agricultural installations and enforce that policy.

13.8.3.4. The employer should ensure that loose waste materials that allow and promote fires are not present in agricultural buildings.

13.8.3.5. The employer should ensure that an efficient fire alarm system is installed in farm buildings with fire risks. Bells or sirens should be distinctive in sound and pitch from any other acoustic devices, and should not be used for any other purpose than sounding fire alarms or calling fire drills.

13.8.3.6. The employer should ensure that ABC-type extinguishers are accessible on each floor of a building or within 15 metres of a structure. Extinguishers should be mounted, fully charged and inspected at least annually. A 5 kilogram ABC extinguisher is recommended for most agricultural applications but larger or BC only extinguishers may be needed in some instances, e.g. near large chemical or fuel storages. Workers should be trained in their proper use.

13.8.3.7. The employer should ensure that electrical installations and equipment comply with applicable standards and are installed, adjusted, repaired or removed by a

qualified electrician. Unqualified personnel should not have access to electrical switchboards or any unprotected electrical installations.

13.8.3.8. The employer should ensure that lightning protection systems are installed by a certified installer.

13.8.3.9. The employer should ensure that flammable liquids are stored in metal, self-closing, locked cabinets and that compressed flammable liquids and gases are stored in compounds in the open air and away from workshop areas. Precautions should be taken to avoid unwanted sources of ignition, e.g. flashback arrestors should be provided with hoses for compressed flammable gases such as for welding.

13.9. Spontaneous combustion

13.9.1. *Hazard description*

13.9.1.1. Spontaneous combustion occurs when organic material in contact with air heats up sufficiently (without an outside heat source) to burn.

13.9.1.2. When the heat level in a self-heating material is high enough, a fire may start.

13.9.1.3. With hay, grain, oil seeds, split wood and pellets, the source of heat comes from the action of micro-organisms (e.g. bacteria, fungi) on materials having the right moisture and temperature conditions.

13.9.2. *Risk assessment*

13.9.2.1. Employers should assess risks of spontaneous combustion from various sources.

13.9.3. *Elimination of the hazard and engineering controls*

13.9.3.1. The employer should ensure that waste disposal cans are made of metal and possess both self-closing lids and no overfill capability so that cloth, paper and other solid materials that are soaked with flammable and combustible liquids (e.g. oils, oil-based paints and solvents) can be correctly disposed of.

13.9.3.2. The employer should ensure that the design of storage facilities is appropriate to the materials to be stored. Temperature, humidity and oxygen levels should be maintained at a level appropriate to the materials being stored.

13.9.3.3. The employer should ensure the proper design for storage and aeration of crops in granaries, bins, silos and barns.

13.9.3.4. The employer should ensure that oxygen-limiting silos are designed so that they can be kept sealed (closed), except for loading or unloading. Failure to do so allows the oxygen necessary for spontaneous combustion.

13.10. Animal handling

13.10.1. Hazard description

13.10.1.1. The hazards of handling different kinds of animals vary widely and according to circumstances.

13.10.2. Risk assessment

13.10.2.1. Employers should assess risks of spontaneous combustion from animal handling. In general the risks of injury are greater in livestock facilities that are poorly designed, constructed or maintained.

13.10.2.2. Severe crushing injuries to legs, arms, head and body are possible and the risk of injury is high when tasks are performed on large animals in a tight workspace such as in a small pen or chute.

13.10.2.3. Exposure to airborne contaminants and damaging levels of noise is higher in enclosed facilities.

13.10.3. Engineering controls

13.10.3.1. Employers should ensure that the equipment and handling facilities provided are appropriate for the type of operation and for the number of animals (or animal units) in that operation.

13.10.3.2. The employer should ensure that equipment and handling facilities are assessed and maintained regularly and that facilities undergoing servicing, renovation or maintenance should be appropriately isolated, locked out and labelled.

13.10.3.3. The employer should ensure that:

- (a) fencing and gates are strong and durable to contain animals;
- (b) alleys and chutes are wide enough to permit animals to pass, but not wide enough for the animal to turn around in;
- (c) alleys and chutes are constructed with solid walls rather than fencing materials; and
- (d) containment facilities, such as squeeze chutes, are used when performing activities that require close contact with individual large animals (e.g. trimming hooves, immunization).

13.10.3.4. The employer should ensure that:

- (a) floors, ramps and steps are roughened to prevent slips under wet conditions;
- (b) walking or working surfaces should be free of tripping and slipping hazards;
- (c) floors, working places and passageways are kept free from protruding nails, splinters, holes, sharp corners and loose boards;
- (d) low beams, steps or uneven floors are marked with reflective caution tape;
- (e) stairs, high walk areas, ladders and ladder openings have handrails and guard rails; and
- (f) lighting is even and diffused to eliminate glare.

13.10.3.5. The employer should ensure that animal handling facilities that involve indoor animal rearing are constructed to specifications that include sufficient ceiling height to account for the relationship between stocking density and the expected particulate load from dusts and other substances in the environment, according to local building standards.

13.10.3.6. The employer should ensure that areas around vents and fans are kept clear and that fans are properly maintained and frequently cleaned.

13.10.3.7. The employer should ensure that bodies of water such as dug-outs and sewer lagoons that represent a risk to children or the public are fenced appropriately, and that bodies of water that are in danger of being contaminated by livestock or manure, such as streams, rivers or ponds, are also fenced.

13.11. Confined spaces

13.11.1. *Hazard description*

13.11.1.1. Entry into confined spaces can pose very serious risks for workers, including suffocation and drowning. The employer should fully assess the risks of entering any confined spaces and put in place appropriate preventive measures and enforce them. The employer should also ensure that workers fully understand the risks and the preventive measures, recognizing that workers have a right to refuse to enter a confined space if appropriate safety measures are not in place.

13.11.1.2. A confined space is one that is large enough for the worker to enter, has limited or restricted means of entrance or exit, and is not designed for continuous worker occupancy. Risks of suffocation, etc. can arise from oxygen depletion or the presence of a toxic substance, and although risks may be greatest with whole body entry, the risk of suffocation can be as severe with just head and shoulders entry.

13.11.1.3. Confined spaces require additional safety and health precautions because their configurations hinder the activities of any workers who need to enter, work in and exit from them. In addition, many fatalities occur to rescue personnel who respond to emergencies involving workers trapped within a confined space without adequate planning and protection.

13.11.1.4. Examples of agricultural confined spaces are manure storage pits, silos, anaerobic digesters, plunge stock dips, and controlled atmospheric storages for nuts, seeds, grain, copra, fruits and vegetables.

13.11.1.5. Examples of temporary occupancy might entail a person performing repairs on or servicing a boiler, sump well, refrigeration compressor, milk tank or silo.

13.11.2. *Risk assessment*

13.11.2.1. Employers should assess risks from confined spaces.

13.11.3. *Engineering controls and safe working procedures*

13.11.3.1. The employer should ensure that potentially hazardous confined spaces are clearly marked with warning notices prohibiting unauthorized entry.

13.11.3.2. An appropriate system, including tags and locks, should be used to ensure that no personnel enter a confined space without authorization, and that no

personnel or equipment remain in the confined space before any openings are resealed or power and piping reconnected. Permits to work are important in this context.

13.11.3.3. Emergency communications should be in place.

13.11.3.4. Confined spaces that are totally enclosed, such as controlled storages for fruit and vegetables, should have all entrance points equipped with automatic warning alarms if an entrance is opened but the space is not yet safe to enter.

13.11.3.5. The employer should ensure that confined spaces that are not totally enclosed, such as manure pits and upright silos, are adequately ventilated before entry. The ventilation should continue while the worker is inside.

13.11.3.6. The employer should ensure that no worker enters a manure pit or similar facility without an externally driven air mask, a safety harness and two co-workers at the surface able to extract the exposed worker at a moment's notice.

13.11.3.7. The employer should ensure that workers are selected and trained to safely enter and work in a confined space before being assigned to do so. Such training should include the proper use of PPE in confined spaces.

13.11.3.8. Before a worker enters a confined space, the employer should ensure that the space has been purged, flushed or ventilated, as necessary, to eliminate or control the hazards, and adequate measures taken to ensure that no hazardous substances and no potential sources of ignition can enter the confined space while people are working there. Gas and oxygen detection equipment should be used.

13.11.3.9. The employer should provide and workers should use appropriate PPE, including appropriate rescue devices, to ensure adequate protection of the worker.

13.11.3.10. Workers in the hazardous confined space should be closely monitored by personnel outside the space to ensure that safe entry conditions are maintained. Such personnel should have the training and equipment to safely rescue or to initiate a prompt and safe rescue by others.

13.11.3.11. There should always be one person and in certain circumstances a second person on standby in case of emergency. A self-enclosed air driven mask may be necessary for the worker's protection, and an extraction harness and two co-workers at the surface may be necessary to extract the worker if necessary.

13.11.3.12. Further guidance can be found in Chapter 10.

13.12. Machinery and equipment

13.12.1. Hazard description

13.12.1.1. Mobile machines such as tractors, front-end loaders, skid-steers, material handlers and forklifts are often used inside and outside agricultural installations for production, daily chores or intermittent maintenance activities.

13.12.1.2. Most of these machines are driven by internal combustion engines which produce carbon monoxide (CO) exhaust and damaging levels of noise when used inside buildings. As CO is colourless and odourless, the employer should ensure that whenever an internal combustion engine is operated indoors, that appropriate venting of exhaust takes

place, and that CO monitors are in place to detect any enhanced levels of CO in the building.

13.12.1.3. Machines used in agricultural installations may also use buckets, forks or blades for handling manure, feed or other materials.

13.12.1.4. Hazards for these activities may include being crushed by falling objects or materials from buckets and lifts, run-overs of co-workers or bystanders, machines slipping off the edges of ramps or building drop-offs.

13.12.1.5. When used outdoors, larger machines with buckets or other attached equipment may come into contact with overhead power lines, creating an electrocution hazard.

13.12.2. *Elimination of the hazard and control strategies*

13.12.2.1. To reduce hazards and risks associated with machinery and equipment used in and around farm buildings and structures, employers should ensure that all self-propelled machines with buckets for lifting materials are equipped with a ROPS cab to protect against falling objects.

13.12.2.2. The employer should ensure that ventilation inside all structures is adequate to combat CO concentrations or the time the machine is operated inside the structure is limited to prevent CO build-up.

13.12.2.3. Cabs should be designed to mitigate noise exposure. Where that is not the case the employer should ensure that hearing protection is worn to protect against engine noise. If co-workers are necessary to help complete work tasks, they should wear hearing protection. Both the machine operator and the co-worker should use hand signals for communications.

13.12.2.4. The employer should organize vehicles' routes to avoid high noise areas and to mitigate workers' exposure to noise.

13.12.2.5. The employer should ensure that workers are trained in the use of hand signals in noise situations.

13.12.2.6. The employer should ensure that no bystanders are allowed inside the facility while machines are operating.

13.12.2.7. The employer should ensure that warehousing facilities are constructed and operated in such manner as to protect the worker from traumatic and ergonomic injury.

13.12.2.8. Further guidance can be found in Chapter 5.

Farm buildings (barns, sheds, greenhouses, packing barns, warehouses, controlled atmosphere storage, etc.)

Checklist	Date	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1		Step 2		
		N/A	Yes			
Physical conditions						
1. Is there sufficient ventilation or dust and fume control?						
2. Are walkways, aisles, steps, landings and traffic areas clear of any obstructions, litter and debris?						
3. Is there adequate lighting in work and travel areas?						
4. Are stairs in good condition and equipped with handrails?						
5. Are permanent ladders in good condition and checked before use?						
6. Have danger spots in floors been repaired or corrected?						
7. Are low ceilings, beams, etc., marked clearly with signs or fluorescent materials to prevent bumping into them?						
8. Are stored materials properly stacked to prevent them from falling?						
9. Are protrusions such as nails removed from walls, railings, etc., to prevent contact?						
10. Is there ample walking space between parked machines?						
11. Are keys removed from ignition or is machinery in locked sheds?						
12. Do large doors open smoothly?						
13. If a building has no windows, are there emergency lights with exit signs?						
14. Are carbon monoxide detectors installed where necessary? Are they regularly checked?						
15. Are floor openings protected with barriers, lids, or safety bars to prevent individuals from falling through them?						

Checklist	Date	Self-audit		
		Step 1	Step 2	Step 3
16. Are gasoline tractors and other fuel-burning equipment stored away from flammables or kept in a separate building?				
17. Are flammable liquids stored outside of structures?				
18. Are there at least two exits from barns and workshops?				
19. Are elevated docks and mezzanines protected by safety rails?				
20. Are roofs made of fragile materials, such as asbestos cement sheets, and if so are there adequate warnings about access to such areas?				
Physical conditions (workshop)		N/A	Yes	No
1. Are electrical outlets in the workshop properly grounded?				
2. Is personal PPE available, i.e. goggles, face shields, hard hats?				
3. Are a stocked first-aid kit and fire extinguisher accessible?				
4. Are suitable receptacles available for oil rags, used oil, etc.?				
5. Is adequate, well-organized storage available for tools and equipment?				
Work practices		N/A	Yes	No
1. Are extension cords used only for temporary work?				
2. Are portable lights properly shielded to prevent breakage?				
3. Are portable tools unplugged when not in use?				
4. Do workers take care to adjust work practices on wet floors and wipe up spills immediately?				

Farmyard, fields, lanes and drives

Checklist	Date	Self-audit			Step 2	Step 3	What action is required
		Step 1	Yes	No			
Physical conditions		N/A					
1. If children are present on the farm, do they have an assigned play area? Is it fenced to isolate them from the work area?							
2. Is there protection from uncovered water tanks, wells, cisterns, ponds, etc., and are DANGER signs clearly posted?							
3. Are all gates (yard and field) wide enough for machinery and trucks?							
4. Are all obstacles that can be snow covered removed from the yard and work areas before winter?							
5. Are sidewalks and walkways in good repair and kept clear of snow and ice?							
6. Is the yard clear of rubbish, dead vegetation, waste, mislaid tools, etc.?							
7. Are hazardous plants killed or removed from the farmyard?							
8. Is equipment kept off steep slopes where stability can be uncertain?							
9. Is there sufficient turning area for trucks and machinery along ditches and embankments?							
10. Are washouts repaired and filled so vehicles will not get stuck?							
11. Are low tree branches that could hit equipment trimmed?							
12. Are underground and overhead utilities (gas lines, power lines, etc.) well marked?							

Checklist	Date _____	Self-audit		
		Step 1	Step 2	Step 3
13. Are fences and barriers in good repair to prevent animals from getting out?				
14. Is the drive/lane in good condition?				
15. Are lane ways marked before winter snows to indicate ditches, etc., for snow removal?				
Working conditions		N/A	Yes	No
1. Are unauthorized personnel (including children) prevented from entering areas where farm machinery or tractors are working or stored?				
2. Are workers made aware of overhead power lines when moving tall equipment, ladders etc.?				
3. Is the yard free from nests of stinging insects?				

Electrical safety

Checklist	Date _____	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1	Yes	No		
Physical conditions		N/A				
1. Are powerlines, poles and electrical hardware coming into the farm in a good state of repair?						
2. Have trees been trimmed well away from conductors?						
3. Are overhead lines relocated underground or raised to avoid contact with high vehicles in the farmyard?						
4. Do all outlets have three-pronged receptacles of polarity plugs to provide proper grounding of electrical tools and appliances?						
5. Are there enough outlets to eliminate the use of extension cords?						
6. Are bare light bulbs protected where dangers of moving objects, excessive splashing, or flammables exist?						
7. Are outside outlets weatherproof? Do they have ground fault circuit interrupters?						
8. Are there warning systems to indicate that vital equipment has failed?						
9. Are fuses and switches all labelled properly to prevent confusion in an emergency?						
10. Are all electrical tools equipped with ground plugs or double insulated?						

Checklist	Date _____	Self-audit				
		Step 1		Step 2		Step 3
		N/A	Yes	No	Priority for action	
Work practices						
1. Are checks always made for underground utilities before digging?						What action is required
2. Is the correct size fuse always used in circuits?						
3. When moving high equipment, do operators always visually check for overhead power lines to ensure proper clearance?						
4. Are buildings, bale stacks, etc., located away from power lines and underground utilities.						
5. Do workers unplug portable and hand held tools and equipment that are not being used?						
6. Is there a clear and open aisle to your electrical panels and switches?						
7. Do workers use "lock-out" procedures when working on any powered equipment?						

Confined spaces (special structures: silos, grain bins, manure pits, mixing/holding tanks, cisterns, valve pits, dryers, pumphouses, etc.)

Checklist	Date	Self-audit			Step 2	Step 3
		Step 1	Yes	No		
Physical conditions		N/A				
1. Are ground level entrances secured against entry by unauthorized personnel and/or children?						
2. Are side ladders solid, secure and mounted sufficiently high to limit access by children?						
3. Are portable ladders removed after use to limit access?						
4. Are warning signs posted to warn of gases or low levels of oxygen?						
5. Are all shields and guards in place on unloading mechanisms?						
6. Are original structures free of structural problems?						
7. Are original structures equipped with ladder safety cages in cases of excessive height?						
8. Are fall arrest and harness systems used to reduce the risk of drowning and to aid retrieval efforts if required?						
Work practices		N/A				
1. Do workers ever enter a silo or manure pit where gas may be present, or where there may be an oxygen deficiency? If so, are they properly trained and equipped to do so and is a partner stationed outside capable of assisting in case of emergency?						
2. Are workers made aware of hazards of flowing grain entrapment, oxygen deficiency and gases?						
3. In case of emergency, is a partner stationed outside when entering a danger area?						

Checklist	Date	Self-audit		
		Step 1	Step 2	Step 3
4. Can power be locked out so that unloading mechanisms cannot start by accident?				
5. Are respirators used when handling mouldy hay/grains when grain dust or dangerous gases are present?				
6. Are confined space entry procedures consistently followed?				

Fire prevention

Checklist	Date	Self-audit			Step 2 Priority for action	Step 3 What action is required
		Step 1 N/A	Yes	No		
Physical conditions						
1. Are there designated smoking areas? Elsewhere, are NO SMOKING signs placed in prominent locations?						
2. Are light bulbs and heat lamps protected with wire guards (or other acceptable covers) where necessary?						
3. Are roofs checked for leaks where hay or straw are stored? (Excessive wetting of hay or straw could lead to spontaneous combustion.)						
4. Do livestock buildings have at least two exits for animals?						
5. Are doors and gate hatches usable?						
6. Are faulty wiring and electrical equipment repaired or replaced immediately?						
7. Are flammable liquids properly stored away from anything that may ignite them?						
8. Are matches and lighters stored safely?						
9. Are chimneys, heater pipes and stoves in good condition (and inspected regularly)?						
10. Are fire department numbers clearly displayed by all phones?						
11. If a pond or pool is part of your emergency response plan, can it be accessed in all kinds of weather?						
12. Are appropriate fire extinguishers located for easy access?						
13. Are fire extinguishers inspected regularly (once a year or more), and/or refilled after every partial or complete use?						

Checklist	Date _____	Self-audit			
		Step 1		Step 2	
		N/A	Yes	No	
Work practices				Priority for action	What action is required
1. Are rubbish and other combustibles regularly and properly disposed of?					
2. Do workers take extreme care when refuelling equipment to prevent ignition of fumes by hot machinery parts, cigarettes or other possible sources of ignition?					
3. When welding, do workers take extreme care to eliminate all possibility of igniting combustible materials?					
4. Do workers take care not to damage concealed electrical wiring when drilling holes or driving nails into walls?					
5. Do workers periodically review how to operate fire extinguishers?					

Checklist for ladder safety and materials handling

Checklist	Date	Self-audit			What action is required
		Step 1	Step 2	Step 3	
Physical conditions		N/A	Yes	No	Priority for action
1. Are ladders inspected regularly for necessary repairs or replacement?					
2. Are ladders stored where they cannot be damaged?					
Work practices		N/A	Yes	No	Priority for action
1. Do workers face the ladder when climbing up or down, or when working?					
2. Are areas around the top and bottom of the ladder clear of debris?					
3. Are portable straight ladders placed at a four to one angle? (The base set one foot out of every four feet up.)					
4. When using a ladder, does it extend at least a metre above the landing level?					
5. Are two people involved when moving or erecting long ladders?					
6. Do workers always put a ladder on firm footing or compact soil?					
7. Is work with ladders avoided in windy or stormy conditions?					
8. When working from a ladder, do workers always keep the trunk of the body centred with the ladder rails?					
9. Has everyone on the farm received instruction on safe lifting techniques including the "bend your knees" rule?					
10. When appropriate, is protective equipment worn when lifting and handling materials (steel-toed boots, gloves)?					
11. Are two people or mechanical means used to move heavy loads?					
12. Do workers check for a clear pathway before lifting and moving objects?					

14. Transport of persons, equipment and materials

14.1. General

14.1.1. Transport of equipment, materials and persons is a key function in agricultural production. It involves the loading, securing, relocating and unloading of equipment, materials and people both on and off the employer's premises. Conveyances of all types may be used, but the focus of this section is on motor vehicles, including trucks, buses and vans, agricultural equipment and trailers used to transport people, equipment, supplies, commodities, livestock, poultry and wastes.

14.1.2. The guidance offered here addresses hazards in transport with the potential to cause injury to workers and others and to cause material damage due to interactions between transport vehicles, equipment, loads, other objects, animals, people, infrastructure and the surrounding environment. Hazards not directly related to vehicular transport, such as those involving entanglement in moving parts or the manual handling of loads, are dealt with elsewhere in the code of practice.

14.2. Hazard identification

14.2.1. Operators of vehicles for the transport of equipment and those assisting them can be struck by moving, falling or shifting equipment while loading, unloading, or transporting it. They can be crushed while hitching or attaching equipment to a prime mover. They can fall while securing the equipment or be injured while installing the means to secure it. They can be injured when the vehicle or the equipment collides with objects during transport, which can also result in harm to other persons as well as property damage.

14.2.2. Operators of vehicles for the transport of materials as well as those assisting them can fall or be struck, engulfed or overcome while loading or unloading animals, wastes, supplies or commodities. Materials used in farming such as pesticides, soil amendments and fuels are hazardous. Loads can leak, spill, or otherwise escape during transport, especially in an upset or collision, causing harm not only to the operator but also to other persons and to the environment.

14.2.3. Agricultural workers use a variety of vehicles for transportation, including buses, trucks, trailers, automobiles, all-terrain vehicles, bicycles and agricultural equipment. Operators and passengers can fall while mounting or dismounting. They can fall within or from vehicles during transport. They can be injured by contact with interior panelling or fixtures, other persons, or objects during unexpected stops and starts or in a turnover or collision. They can be exposed to hazardous materials.

14.3. Control strategies

14.3.1. *Training and information*

14.3.1.1. Employers should ensure that operators, contractors and others have the requisite qualifications, training, skills and judgement with regard to the safe operating conditions of vehicles, the cargo to be carried, loading and unloading procedures, load

securement, applicable restrictions, and all associated hazards and risks to be able to safely manage the transport of equipment, materials and people.

14.3.1.2. Drivers should receive training about hazards, safety features and safe operating practices for the transport equipment to be used.

14.3.1.3. Drivers should receive and maintain adequate training relative to requirements and restrictions applicable to specific modes of transport and loads.

14.3.1.4. Drivers should receive training in hand signals. Drivers should receive training in allowable vehicular speed, width, weight and height requirements

14.3.1.5. Drivers should comply with all applicable training, certification and licensing requirements.

14.3.2. Design considerations

14.3.2.1. Roads and infrastructure to be used to transport people, equipment or materials should be designed and constructed to safely accommodate vehicles likely to be used for this purpose.

14.3.2.2. Transport vehicles and the facilities and means for loading and unloading them should be designed and constructed to maximize safe loading, transport, and unloading of the intended cargo, whether equipment, materials, or people.

14.3.2.3. All equipment on which safety depends, including overturn protection, lighting, marking, brakes, tyres, steering, horn, warning devices, such as “reversing beepers”, mirrors, windscreens, windscreen wipers, the fuel system, the exhaust system, ventilation and hitching, should conform to applicable requirements for components and systems.

14.3.2.4. Load hitching, coupling and securement components and systems should be designed to meet performance criteria for their intended application and to be safely employed and released.

14.3.2.5. The access to and egress from vehicles, workstations and cargo areas should be designed and constructed to reduce slips, trips and falls.

14.3.2.6. A seat belt for each driver and passenger should be provided and worn, except on vehicles with built-in restraint systems.

14.3.2.7. Vehicles should be designed to prevent people from riding on them except in seating areas designed to accommodate them.

14.3.2.8. Vehicle cargo areas should be designed and constructed to prevent loads from shifting, moving, falling, blowing, leaking, sifting or otherwise escaping control during transport.

14.3.2.9. Vehicles should be designed to protect operators and passengers from exposure to shifting loads, toxic emissions and other hazards associated with the loads in the event of a collision or overturn.

14.3.2.10. Controls on forklifts and other equipment should be designed to stop if manually released.

14.3.2.11. Stable, secure facilities should be designed and constructed to accommodate safe load transfer and storage at loading and unloading sites and, as applicable, to support the safe loading and unloading of livestock.

14.3.2.12. Employers should consult with workers and their representatives concerning modifications to be carried out on facilities, vehicles, equipment or workstations.

14.3.3. *Prevention and control*

14.3.3.1. Transport routes inside agricultural installations should be designed and constructed to allow for aisles and turns, or other types of control areas.

14.3.3.2. Transport routes should be clear of obstructions and, where possible, without irregular surfaces.

14.3.3.3. Transport routes and work areas containing transport vehicles should be visibly marked and segregated from walkways to the extent possible.

14.3.3.4. The safe operating speed for vehicles should be posted and enforced.

14.3.3.5. Vehicles should be used and maintained in accordance with applicable laws and manufacturers' recommendations and, as appropriate, be equipped with safety devices such as firefighting equipment and warning devices for reversing operations.

14.3.3.6. Employers should ensure that vehicles are serviced on schedule, maintained in good working order and periodically checked for performance. All safety-related systems and components should be properly installed and maintained and regularly inspected.

14.3.3.7. Employers should consider the importance of fail-safe mechanisms, when purchasing equipment such as forklifts or skid steers.

14.3.3.8. Critical deficiencies in equipment, components, or systems on which safety depends should be reported by workers, and recorded and addressed by employers prior to resumption of use.

14.3.3.9. Employers should ensure that equipment is kept tidy, free of grease, mud, excess gear and debris.

14.3.3.10. Employers should ensure that safety signs and instructions on equipment and machines are in place and legible.

14.3.3.11. Employers should ensure that the means used to transport cargo are designed and intended for that purpose, and for the cargo to be transported, and are appropriate to the transportation infrastructure.

14.3.3.12. Trailers used for the transport of persons should be designed or modified for that purpose, and be equipped with a braking system, secured seating, side panels and canopies.

14.3.3.13. Employers should ensure that lighting, marking, signalling, speed, weight, braking, steering, and other components and systems meet requirements and are employed to maximize the probability of safe transport.

14.3.3.14. Employers should ensure that hazardous materials in transit are properly labelled, are not left unattended and are transported in a manner that prevents spillage and exposures to unprotected persons and the environment.

14.3.3.15. Where particular hazards exist, employers should ensure that communication capabilities are in operable condition while moving cargo in remote areas, carrying hazardous materials or transporting people.

14.3.3.16. The driver of a vehicle should perform a check on the vehicle at the start of each shift and a record should be kept. Faults should be reported to the manager or supervisor, as appropriate.

14.3.3.17. Operators should ensure that cargo is staged for loading and, when unloaded, is placed and maintained in stable, secure storage. Loads should be inspected by workers before loading, in transit and after unloading.

14.3.3.18. Workers assigned to the loading or unloading of vehicles should know how to select and use the right equipment for the job, follow prescribed procedures for loading and unloading the specific cargo, and use all PPE recommended for the task. Wherever possible, manual loading and unloading should be avoided.

14.3.3.19. Loads should be secured to prevent them from moving during transport and to prevent accidents when unloading.

14.3.3.20. Operators should ensure that loading, unloading, connecting and hitching commences only when the vehicle is properly secured (e.g. locked, braked, chocked, etc.), the power is disengaged, other personnel are clear from the area or protected, and it is safe to proceed. No person, unless adequately protected, should be near the loading platform while loading is in progress.

14.3.3.21. Vehicles and equipment should be secured with engine off, elements lowered, transmission secured, and blocking and chocks in place.

14.3.3.22. Operators should ensure that loads are moved slowly and that they are smoothly positioned, properly distributed, and controlled in a manner suited to the vehicle and the route to be followed.

14.3.3.23. Drivers should be protected from cargo, fumes and other hazards.

14.3.3.24. Drivers should ensure that no persons, food, livestock, or feedstuffs are transported with hazardous materials.

14.3.3.25. Transport vehicles should move only when the operator has a clear field of view in the direction of travel, above and to either side, or is in communication with another person who does.

14.3.3.26. Transport vehicles should move slowly and smoothly during transport. Escort vehicles may be needed to ensure safe transport, minimal risk to others and minimum damage to infrastructure, particularly for long and awkward loads.

14.3.3.27. Materials below freeboard should not be exposed to high velocity air currents during transport.

14.3.3.28. Drivers should not permit extra persons as riders on loads or elsewhere except as authorized and in designated locations designed and intended for such use.

14.3.3.29. Drivers should ensure that passengers are seated and wearing a seat belt, when applicable. Aisles and exits should be unobstructed.

14.3.3.30. Drivers should remove keys from vehicles before leaving a vehicle unattended, in order to prevent unauthorized use.

14.3.4. Work organization

14.3.4.1. Employers who undertake the transport of persons, equipment and materials should pre-plan routes, choosing only those capable of accommodating the transport vehicle and its cargo. Such pre-planning should minimize transport route interferences such as overhead power lines, wires and structures, traffic, bridges, etc. Maps should be available and provided upon request.

14.3.4.2. Employers should pre-plan procedures for the loading and unloading of equipment, materials and people.

14.3.4.3. Transport operations should be undertaken with due regard for the timing of working shifts, traffic patterns and weather conditions.

14.4. Safe transport on public roads

14.4.1. The competent authorities responsible for public roads, infrastructure and transportation should collaborate and cooperate on safety issues with regard to:

- (a) roads and infrastructure, such as bridges and viaducts, are designed and constructed to safely accommodate agricultural equipment and transport vehicles;
- (b) roadways are constructed with a durable base, regular surface, adequate shoulders and effective drainage;
- (c) barriers or other measures are in place to prevent the fall of a vehicle or equipment into ditches or water;
- (d) to the extent possible, road gradients do not exceed 10 per cent;
- (e) lighting and marking of all forms of transport are required and mandated for use under appropriate conditions;
- (f) vehicular speed, weight, width and height requirements are formulated in writing and enforced;
- (g) operator requirements, in terms of training, licensing, and the registration of the operator and the vehicle are formulated in writing and enforced;
- (h) safe operating speeds are correctly posted and appropriately enforced;
- (i) infrastructure signage relative to obstructions, curves, slopes, intersections and the presence of livestock, people or wildlife, and other safety features is posted within the line-of-sight of vehicle operators;
- (j) infrastructure signage with regard to any height, weight or width restrictions is in place and is clearly visible;
- (k) infrastructure, curves and intersections are lighted and marked as appropriate for low-light or inclement weather conditions; and
- (l) systems of surveillance of vehicular accidents and pedestrian injury surveillance are established and maintained over time so that empirical evidence exists pertaining to where infrastructure improvements need to be made, greater enforcement of roadway safety needs to occur, or health promotion messaging needs to be accelerated.

Transport vehicles (trucks, buses, original or modified, etc.)

Checklist	Date _____	Self-audit				Step 2 Priority for action	Step 3 What action is required
		Step 1					
		N/A	Yes	No			
Physical conditions							
1. Do drivers carry out a thorough check before going on public highways (i.e. tyres, lighting, security of load)? Is there a record of these inspections?							
Work practices							
1. Are keys removed from motorized equipment or lock-outs used to prevent starting by children or unauthorized personnel?							
2. Is there a clear visual path in both directions, when merging onto public roadways from the farm driveway?							
3. Do drivers always wear seatbelts when provided?							
4. Are the mechanical conditions of the vehicle inspected at least yearly by a competent person?							
5. Are safety blocks and support truck hoists inspected at least yearly by a competent person?							
6. Will all vehicles that travel public roads pass a motor vehicle inspection?							

15. Animal production

15.1. Animal handling

15.1.1. Animal handling may involve a large number of activities from birthing through feeding, castrating, administering medicines, herding, training, insemination and slaughtering, and may involve a large number of species including horses, draft animals, oxen, cows, pigs, fowl, sheep, and goats, exotic breeds such as ostriches and llamas, as well as wild animals.

15.1.2. Animal production involves a number of hazards for workers. These include crushing, blunt or goring injuries as a result of moving, caring for, or conducting treatments on animals. These hazards are discussed below under the headings: (1) Hazard description; (2) Risk assessment; (3) Elimination of the hazard; (4) Control of the hazard through engineering controls; (5) Minimization of hazards by means of systems and protocols; and (6) The use of PPE.

15.2. Hazard description

15.2.1. Knowledge of the behaviour of animals present in the agricultural undertaking is vital for the development of safe handling procedures. Behaviour is based on, but not limited to the type of animal: its breed, temperament, natural instincts and sensory characteristics. Certain breeds are more aggressive or become agitated more easily than others.

15.2.2. Highly agitated animals are dangerous. If an animal becomes highly agitated, it may take 20 to 30 minutes for its heart rate to return to normal. Allowing an agitated animal sufficient time to calm down before handling can help prevent injuries.

15.2.3. Hazards to workers result from animals' agitation, fear, panic, or aggression when their instinctual behaviour is challenged. Common injuries to workers include being stepped on, knocked down, kicked, or pinned between the animal and a hard surface. Injuries can also occur from scratches, bites, pecks, butting and goring.

15.2.4. Most animals have a strong territorial instinct and develop an attachment to areas they have frequented, such as pens and pastures, water troughs and worn paths. Forcible removal from these areas can cause animals to react in an unexpected manner.

15.2.5. Male animals may show more aggression and require extra caution in handling, compared with females. Aggression is increased when males are challenged by other animals or during the mating season.

15.2.6. Many female animals exhibit a maternal instinct causing them to be more defensive and difficult to handle when their young are newborn. The tendency of a mother animal to become aggressive is reduced as the offspring matures.

15.2.7. Animals have a definite social order with dominant animals having first choice of feed, location and direction of travel. Crowding a subordinate animal against a dominant one during handling may disrupt the social structure and cause an unpredictable and dangerous response.

15.2.8. As a result of environmental or genetic factors, animals may develop individual behaviour patterns, such as kicking or biting, that pose a safety hazard to workers.

15.2.9. Other trauma may occur as a result of storage of wastes, temperature, electricity, machinery, chemical hazards, noise and airborne contaminants and illness due to zoonoses. Those issues are dealt with in other sections of this code of practice.

15.2.10. Sources of noise include machinery and tools related to the animal handling operation as well as the animals themselves. Noise levels vary according to the task being performed and the type of animal being handled. For example noise levels in swine production are high, with levels of 120 dB and higher being recorded during feeding time (see Chapter 11).

15.3. Risk assessment

15.3.1. The competent authority should ensure that safety standards are established with regard to occupational exposure to animal and animal rearing. Such standards should be based on sound scientific criteria and accepted international practice.

15.3.2. Employers should inform themselves of the relevant standards and carry out a risk assessment to determine the measures required to eliminate the hazard or the control strategies required to minimize workers' exposure.

15.3.3. Particular care should be taken with regard to assessing the hazards posed by the production of animals in non-traditional locales.

15.4. Elimination of the hazard

15.4.1. The elimination of risk of injury to workers from large and small animal and bird production presents a significant challenge. Total elimination may prove impossible, particularly in outdoor environments. Engineering controls can reduce the contact between workers and animals, thus reducing the likelihood of injury.

15.4.2. Employers should ensure that livestock containment facilities are constructed and operated with the goal of eliminating hazards to the worker.

15.4.3. Employers should consider castration of young male animals as a means of reducing aggression in the animals' behaviours. Other control strategies should be explored in animal breeding facilities.

15.5. Control of the hazard through engineering controls

15.5.1. The employer should ensure that barns, collection chutes, corrals, fences and other containment facilities are constructed with a view to maximum separation of the workers from the animals.

15.5.2. The employer should ensure that, where there is contact between the worker and the animal, adequate restraining devices are in place to protect the worker from traumatic injury.

15.5.3. The employer should ensure that all stanchions, gates and other containment devices are structured in such a manner as to prevent crushing, kicking and biting injuries to workers.

15.5.4. The employer should ensure that fencing and gates are sufficiently strong and durable to contain animals. Alleys and chutes should be wide enough to permit animals to pass, but not wide enough for the animal to turn around in. They should be constructed with wooden or steel rails or portable stock panels, rather than wire or fencing materials.

15.5.5. The employer should ensure that, where repetitive tasks, such as the milking of dairy cows, takes place, the physical facility is such as to prevent musculoskeletal injury to workers.

15.5.6. With regard to dairy facilities, elevated milking stalls, as opposed to ground-level stalls, lower the incidence of kicking. Parallel placement of stalls, so that milking can take place from between the hind legs, also reduces the incidence of kicking. The more traditional herringbone milking parlour layout, with milking from the side, is more likely to result in kicking.

15.5.7. The employer should ensure that containment facilities, such as squeeze chutes, are used when performing activities that require close contact with individual, large animals (e.g. trimming hooves, immunizations).

15.5.8. The employer should ensure that:

- (a) floors, ramps and steps are roughened to prevent slips under wet conditions;
- (b) walking or working surfaces are kept free of tripping and slipping hazards;
- (c) floors, working places and passageways are kept free from protruding nails, splinters, holes, sharp corners and loose boards;
- (d) low beams, steps or uneven floors are marked;
- (e) stairs, high walk areas, ladders and ladder openings have handrails;
- (f) lighting is even and diffused to eliminate glare; and
- (g) pits and other floor openings are cordoned off.

15.6. Minimization of hazards by means of systems and protocols

15.6.1. The employer should ensure that workers are trained to avoid injury from the animals they handle. Workers should be trained to recognize the behavioural characteristics of the animals they handle, to understand the need for calm management, notably the avoidance of sudden movements or distractions to animals from flags or other implements, and the need for habituation in handling animals to reduce animals' instinctive fear.

15.6.2. The employer should ensure that workers treat animals in a humane manner as this is a means of ensuring worker safety. Animals that are chased, slapped, kicked or hit are likely to become agitated more easily, increasing the risk of injury to workers.

15.6.3. Workers should be trained to recognize the physical characteristics of an animal about to charge or attack. These characteristics include raised or pinned ears, raised tail, raised back hair, showing teeth, flapping wings and pawing the ground.

15.6.4. The employer should set up control systems to minimize the risk to workers. This may involve culling animals that have developed dangerous behaviour patterns to create a more manageable animal herd, or otherwise managing animals through suitable controls.

15.6.5. The employer should ensure that safety protocols are developed that cover all aspects of animal handling in which workers will be involved. Such protocols should include the planning of an escape route, whenever a worker is required to work in close quarters with large animals.

15.6.6. The employer should ensure that safety protocols concerning the handling of large animals includes an understanding of the flight zone of the animal. The flight zone, sometimes referred to as the “startle zone”, is an area around an animal that, when penetrated, will cause the animal to move to create distance between the handler and the animal. The flight zone varies depending on the species and breed of animal, as well as the amount and type of handling the animal has had in the past. Animals can be moved by calmly penetrating the edge of the flight zone. Workers should be trained not to enter an animal’s blind spot suddenly, as this may startle the animal and cause it to kick.

15.6.7. The employer should train workers, when handling herd animals individually, to use the point of balance at the animal’s shoulder to encourage more manageable movement. To move an animal forward, the handler should be positioned behind the animal’s shoulder. To move it backward, the handler should be in front of the animal’s shoulders.

15.6.8. The employer should ensure that swine are managed in small, manageable groups and that the workers make use of a lightweight sorting board or panel, which also serves as a barrier between the hogs and the handler.

15.6.9. The employer should ensure that the use of dogs is limited to pastures and large pens where animals can easily move away. Animals are more likely to kick or bite if they are chased by dogs in confined spaces.

15.6.10. The employer should ensure that ergonomic hazards and potential musculoskeletal injury problems are identified and that adequate training of workers is conducted to prevent issues such as back strain, repetitive strain injury etc. (see Chapter 8 on Ergonomics).

15.6.11. The employer should ensure that workers are aware that handling dairy cattle puts them at enhanced risk of injury as compared to handling beef cattle, because of the increased handling time and the close contact with the animals. Risk is compounded by the fact that dairy cattle can be easily startled. Cattle have the ability to kick to the rear and sideways.

15.6.12. The employer should ensure that workers are aware that dairy cows with teat or other injuries should be handled carefully as they are more likely to kick the handler, and that workers have adequate training in injury avoidance.

15.6.13. The employer should ensure that workers are aware that dairy bulls can be much more aggressive than beef cattle. Special facilities should be made available so that a bull can be fed, exercised, watered and used for breeding without workers ever coming

into direct contact with the animal. Workers should be trained in the safe use of such facilities.

15.6.14. The employer should ensure that the worker is adequately trained in handling boars, and that when handling boars, the dominant male should be handled first. If a subordinate is handled first, the dominant boar may smell the subordinate on the worker and may direct its aggression towards the worker.

15.6.15. The employer should ensure that the worker is aware that while domesticated fowl are relatively harmless, geese, turkeys and roosters can show aggression, and that greater care should be taken when handling larger fowl such as ostriches.

15.6.16. The employer should ensure that workers are aware that the greatest risk for workers from poultry production is related to respiratory exposures (ammonia and dusts) in confined facilities, and that these risks may be compounded if the worker is a smoker. Management of dusts and other particulate exposures is discussed in Chapter 10.

15.7. The use of PPE

15.7.1. The employer should ensure that workers are equipped with appropriate PPE including safety boots, masks, chaps, gloves and coveralls, suitable for both men and women as the task indicates (see Chapter 4 for general guidance on PPE).

15.7.2. The employer should ensure that workers exposed to infected animals are provided with appropriate PPE, including water-impervious coveralls, gloves, safety glasses and respirator masks for the task to be performed (see the section on zoonoses in Chapter 10).

15.7.3. The employer should ensure that noise levels are monitored in situations of high noise such as indoor swine confinement facilities and that workers have appropriate hearing protection available and are trained in the use of hearing protection and monitored to ensure compliance (see Chapter 11).

Animal handling facilities

Checklist	Date	Self-audit			Step 2	Step 3
		Step 1	Yes	No		
Physical conditions		N/A			Priority for action	What action is required
1. Are outside ramps, steps and entrance ways protected from rain or properly maintained to deal with snow?						
2. Are pens, gates and fences in good condition?						
3. Are restraining devices used? Are they kept in good condition and securely anchored to prevent tipping or slipping?						
4. Are ventilation fans and vents in good operating condition and lighting adequate?						
5. Are animal drugs and chemicals kept in a secure area in labelled or original containers?						
Work practices		N/A			Priority for action	What action is required
1. Are cattle dehorned, and swine detusked?						
2. Are children forbidden to excite, tease or abuse animals?						
3. Are workers aware of the need to plan an emergency escape route when working in close quarters with animals?						
4. Are animals immunized as required?						
5. Do workers take special care in handling animals with new-born young?						
6. Do workers make animals aware of their approach so as not to frighten them?						

16. Weather and the environment

16.1. Weather and environmental factors

16.1.1. Agriculture exposes workers to weather and environmental factors as they carry out their work. Ambient air temperature, humidity, wind, dust storms, precipitation and solar radiation are important potential hazards. While some agricultural enterprises control such factors by using greenhouses, tunnels and conditioned caves, most agricultural activity occurs out of doors and is subject to ambient thermal, environmental and lighting conditions. Climate change is thought already to be affecting agriculture, creating increasingly unstable weather conditions.

16.2. Thermal exposure

16.2.1. *Hazard description*

16.2.1.1. Knowledge of the thermal exposures experienced by agricultural workers is vital for their overall safety and health. The principal hazards to workers result from prolonged exposure to hot or cold working environments, including welfare facilities and rest areas. When associated with inclement weather, inappropriate protective clothing, little or no opportunity for acclimatization, intense work, or insufficient rest and recovery periods, the risks of heat stress or cold stress, hypothermia etc. can be severe. It should be noted that fine motor control of the lower arm, hand and fingers is also affected by excessive temperatures. Exposure to extreme temperatures can be particularly hazardous for pregnant workers and the unborn child.

16.2.1.2. Dehydration is a major problem for agricultural workers and can be fatal. In its initial stages, it can lead to symptoms such as below normal sweating, fainting, confusion, dizziness, headaches, heat rashes, irritability, loss of coordination, muscle cramps and exhaustion. However, severe dehydration can be fatal and when other symptoms appear, such as a loss of thirst, immediate remedial action is vital.

16.2.2. *Assessment of risk*

16.2.2.1. If agricultural workers carry out all or some of their tasks under any conditions listed in section 16.2.1 and the thermal hazard cannot be eliminated, employers should carry out a risk assessment and determine the necessary controls.

16.2.2.2. In assessing the hazards and risks, employers should:

- (a) take into account typical weather patterns, seasonal variations and recorded extremes with regard to temperature, humidity, precipitation and wind;
- (b) if these are not known, arrange for measurements to be performed on site by a technically capable person, using appropriate and properly calibrated equipment;
- (c) take into account work activities conducted both outdoors and indoors;
- (d) seek the advice of the occupational health service, a local or regional public health service agency, or other competent body about exposure standards to be applied to extreme thermal conditions (see also section 5 of Appendix III on occupational exposure limits); and

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- (e) establish a plan for administering first aid and transportation to medical assistance for thermally stressed workers, including assigning specific responsibilities to supervisors.

16.2.2.3. The assessment of the thermal environment should take into account the risks arising from work requiring the use of PPE. A hot or cold work environment can render respiratory protectors, protective garments and other types of PPE uncomfortable and less likely to be used.

16.2.3. Control strategies

16.2.3.1. Training and information

16.2.3.1.1. Employers should train supervisors and workers exposed to excessively hot or cold working environments or inclement weather:

- (a) to recognize symptoms which may lead to heat stress or hypothermia, in themselves or others, and the steps to be taken to prevent onset and/or emergencies;
- (b) in the importance of sufficient rest periods and task rotation;
- (c) in the use of rescue and first-aid measures;
- (d) in action to be taken in the event of increased risk of injury and ill health because of high or low temperatures; and
- (e) in the importance of appropriate fit for all PPE so as to lessen dermal and respiratory exposure to either high or low temperatures.

16.2.3.1.2. Supervisors should be given the authorization to withdraw workers, if necessary.

16.2.3.1.3. Employers should consider the training and information needs of front-line supervisors with regard to:

- (a) identifying thermal stress;
- (b) the importance of employee physical fitness for agricultural work in hot or cold agricultural environments, including the need for acclimatization;
- (c) the importance of providing sufficient quantities of suitable liquids, salt, potassium and other trace elements depleted due to sweating;
- (d) the importance of access to shade;
- (e) the importance of sufficient calorie intake for physical exertion in low temperature environments; and
- (f) ensuring the proper care and use of PPE in hot or cold environments.

16.2.3.2. Work organization

16.2.3.2.1. Thermal comfort – the feeling of being neither too hot nor too cold – results from a combination of environmental factors, such as air temperature, radiant temperature, airspeed and humidity, and personal factors, such as clothing insulation and metabolic heat, i.e. the heat produced by the body as it carries out work. An individual's size, weight, age, sex and fitness level all affect thermal comfort.

16.2.3.2.2. When the assessment reveals that workers may be at risk of heat stress or hypothermia, the employer should endeavour to organize work such that:

- (a) exposure to extreme temperatures is reduced;
- (b) the pace of work is adapted to the thermal environment;
- (c) tasks are rotated among several workers;
- (d) adequate rest periods are provided. Rest periods should be as prescribed by the competent authority, if applicable, and in any case sufficient to allow the worker to recover; and
- (e) potable water is provided near to the worksite.

16.2.3.2.3. If PPE is required, employers should provide PPE specially designed for use in hot or cold thermal environments.

16.2.4. Thermal comfort: Heat stress

16.2.4.1. Hazard description

16.2.4.1.1. Exposure to a hot working environment, or a combination of a hot working environment and high ambient humidity (80 per cent or higher), while engaged in physical labour can result in a dramatic rise in body temperature, that may overwhelm the body's thermoregulatory mechanisms. This can lead to heat stress or heat stroke and may be life-threatening. Environmental factors are exacerbated when workers:

- (a) wear impervious, non-venting and non-sweat-wicking clothing;
- (b) work intensively;
- (c) are unable to access shade or other conditioned environments;
- (d) do not have access to potable drinking water;
- (e) do not have rest periods of suitable duration;
- (f) use PPE which does not provide for ventilation and exhaust of CO₂ and wicking away of sweat;
- (g) are exposed to high radiant heat sources and use inappropriate PPE for the thermal condition(s) experienced;
- (h) carry out piecework; or
- (i) use tobacco products or alcohol during work and breaks.

16.2.4.2. Control strategies

16.2.4.2.1. Where the assessment indicates that unhealthy or uncomfortable conditions arise from heat, the employer should implement means to reduce air temperature, including ventilation or air cooling.

16.2.4.2.2. Where part of the risk arises from the metabolic heat produced during work and other methods of eliminating the risk are impracticable, employers should provide adequate rest breaks, preferably under shade or in a cool rest area.

16.2.4.2.3. Employers should ensure that appropriate mechanical aids are available to reduce workloads and that tasks performed in hot agricultural environments are well designed ergonomically to minimize physical stress.

16.2.4.2.4. Where other methods of controlling thermal risk, including a work-rest cycle at the worksite, are not practicable, employers should provide protective clothing. In the selection of protective clothing, consideration may be given to the following:

- (a) tropical reflective clothing and head gear where heat gain is mostly by radiation;
- (b) insulated clothing with reflective surfaces during simultaneous exposure to high radiant heat and hot air such as that surrounding running agricultural engines, compressors, etc. Such clothing should allow freedom of movement to perform tasks; or
- (c) air-, water- or ice-cooled clothing as a possible complement to (a) and (b) above. Where failure of the protective clothing could expose the worker to extreme temperatures, a system should be installed to ensure that such failure is immediately detected and the worker removed from the worksite.

16.2.4.2.5. Where residual risk of heat stress remains even after all control measures have been taken, workers should be adequately supervised so that they can be withdrawn from hot conditions if symptoms occur.

16.2.4.2.6. Shaded rest areas should be provided.

16.2.4.2.7. Employers should make available sufficient quantities of clean drinking water, with the addition of proper electrolytes, where appropriate. There should be water points at regular intervals. Workers should have individual canteens. See Appendix VI: Fluid intake table.

16.2.4.2.8. Employers should prohibit alcohol consumption during work and breaks, since alcohol consumption inhibits cognitive judgement and muscle coordination, dehydrating the body and making it more susceptible to heat stress.

16.2.5. Thermal comfort: Cold stress

16.2.5.1. Hazard description

16.2.5.1.1. Exposure to a cold working environment, or a working environment characterized by low temperatures in combination with high wind (>5m/s), or moisture (rain, sleet or snow) may result in hypothermia. See Appendix VI: Wind chill indices.

16.2.5.1.2. These factors are exacerbated when workers:

- (a) perform tasks with skin exposed for extended periods of time;
- (b) wear unsuitable external garments or footwear;
- (c) are unprotected by appropriate waterproof rain gear and footwear;
- (d) use PPE which does not protect skin from exposure. Under extreme conditions, periods of exposure as short as 90 seconds can be dangerous; or
- (e) use alcohol or other drugs that impair judgement.

16.2.5.2. Control strategies

16.2.5.2.1. Training and information

16.2.5.2.1.1. Workers exposed to cold, as well as their supervisors, should be trained in the importance of caloric dietary requirements for physical exertion in low temperature environments.

16.2.5.2.2. Isolation, substitution, and engineering controls

16.2.5.2.2.1. Where agricultural workers are at risk of cold stress, hypothermia and cold injury to dermatological areas:

- (a) the employer should ensure that workers are protected through the use of adequate layered clothing, head gear, insulated boots and gloves;
- (b) PPE designed for use by workers in cold thermal extremes should be provided;
- (c) shields and barricades to stall wind velocity or redirect its flow could be provided;
- (d) employers should take extra care when workers are required to move from a warm working or rest area to a much colder environment, especially when exposed to strong wind, as the “wind chill” factor ¹ can result in dermal injury to exposed body parts; and
- (e) employers should provide heated rooms with toilet facilities and rest and meal areas with drinking water and other clean water for washing and hygiene purposes.

16.2.5.2.2.2. The clothing referred to in 16.2.5.2.2.1(a) above should have adjustable wrist cuffs, adjustable neck closure, bi-swing (deeply pleated) back and be constructed of fabric offering good insulation. Footwear should fit well (both socks and boots) and have an insulated boot body and slip-resistant grip soles. Reinforced boots should not be steel-toed.

16.2.5.2.2.3. Waterproof rain gear should have the following features: two-piece rain suit construction with electronically welded seams, inside and outside storm flaps, vented cape back and underarm vents, attached hood with fabric-lined collar, adjustable sleeve cuffs, leg cuffs and waist cuff. Footwear should be waterproof.

16.2.5.2.2.4. Risks may partly arise from the inability to produce enough metabolic heat to ensure bodily health and safety while performing work in cold environments (outside in winter, in chilling sheds, refrigerated coolers, unheated granaries, etc.). In such cases, employers should provide for worker acclimatization as well as warm liquids for hydration, PPE suitable for such environments and rest periods for exposed workers in a heated area. The rest periods should be as prescribed by the competent authority, if applicable, and in any case sufficient to allow the worker to recover. Warm drinks should be provided for rehydration.

16.2.5.2.2.5. Employers should ensure that appropriate mechanical aids are available to competently perform work tasks and that tasks performed in cold

¹ There is no universally agreed standard to calculate “wind chill” commonly understood to mean the apparent temperature felt on exposed skin due to wind. “Wind chill” depends on both temperature and wind speed.

environments are well designed ergonomically to minimize physical stress and potential injury.

16.2.5.2.2.6. When the assessment reveals that the workers may be at risk of hypothermia while using PPE, employers should:

- (a) organize the tasks so that work activity conducted in cold conditions includes the ability to move body extremities or accommodates whole body movement while using PPE; and
- (b) provide PPE that includes powered heating.

16.3. Other environmental exposure

16.3.1. *Ultraviolet light (UV) radiation*

16.3.1.1. Most agricultural tasks are routinely performed under full or partial sunlight, exposing workers to ultraviolet light radiation.

16.3.1.2. Hazard description

16.3.1.2.1. Exposure to ultraviolet light (UV) radiation produced by the sun's rays causes damage to the skin and eyes. Skin damage is irreversible. Both cumulative exposure to the sun and intense, intermittent exposure have been associated with an increased risk of skin cancer, cataracts, premature skin wrinkling and lesions. Exposure is most intense on sunny summer days and reflected snow covered surfaces between the hours of 10 a.m. and 2 p.m. Skin damage is generally irreversible, with potential clinical rehabilitation only of dermal wrinkling, skin colour and lesion removal.

16.3.1.3. Assessment of risk

16.3.1.3.1. The level and duration of exposure should not exceed the limits established by the competent authority or by other recognized standards. The assessment should, as appropriate, consider:

- (a) the risk of skin and eye injury;
- (b) the risk of discomfort resulting from such injury when performing work tasks; and
- (c) the exposure standards applicable to UV conditions.

16.3.1.3.2. In order to prevent adverse effects of UV on workers, employers should:

- (a) identify the tasks that give rise to UV exposure;
- (b) seek the advice of the occupational health service, a local or regional public health service agency, or other competent body about exposure standards to be applied to UV exposures;
- (c) quantify the level and duration of UV exposure of workers and compare that with exposure limits, as established by the competent authority or internationally recognized standards to be applied;
- (d) assess the need for engineering approaches (use of protective head gear or restructuring agricultural tasks);

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- (e) assess other appropriate measures and their effective implementation, such as through improved work organization whereby task exposure is reduced or task rotation among several employees is employed; and
 - (f) evaluate the effectiveness of existing UV prevention and control measures.

16.3.1.4. Control strategies

16.3.1.4.1. *Training and information*

16.3.1.4.1.1. Workers exposed to UV, as well as their supervisors, should be trained:

- (a) to recognize UV burn injury, to take the steps needed to prevent onset and to know when to withdraw;
- (b) to use effective sunscreen products;
- (c) to use sunglasses that effectively screen out both UVA and UVB rays and glare;
- (d) to wear sun-safe head gear with sufficient brim width to protect the neck, forehead, nose and ear tops from direct exposure to the sun's rays. Visors do not provide sufficient protection; and
- (e) to carry out skin checks.

16.3.1.4.1.2. Employers should provide sunscreen products such as lotion, for routine use; appropriate well-fitting PPE, including sunglasses; and suitable work garments such as sun-safe head gear free of charge to the worker.

16.3.1.4.2. *Isolation, substitution, and engineering controls*

16.3.1.4.2.1. When the assessment reveals that workers may be at risk of UV exposure, employers should, if practicable, organize work so as to eliminate or reduce midday exposure or, if this is not feasible, take measures to limit exposure through task rotation and employee use of PPE.

16.3.1.4.2.2. Where residual risk of UV exposure persists, workers should be adequately supervised so they can be withdrawn from exposure prior to onset of burn injury.

17. Personal protective equipment (PPE)

17.1. General provisions

17.1.1. PPE is the last line of defence and the least effective. It should be used whenever hazards and risks cannot be controlled by collective measures, but should never be considered as an adequate substitute for higher level control measures.

17.1.2. PPE provides supplementary protection against exposure to hazardous conditions in agricultural production where the safety of workers cannot be ensured by other means, such as eliminating the hazard, controlling the risk at source or minimizing the risk. Suitable and sufficient PPE, having regard to the type of work and risks, and in consultation with workers and their representatives, should be used by the worker and provided and maintained by the employer, without cost to the workers. The same level of protection should also be provided for casual or seasonal workers.

17.1.3. Items of PPE provided should comply with the relevant national standards and criteria approved or recognized by the competent authority.

17.1.4. Those responsible for the management and operation of the personal protection programme should be trained:

- in the nature of the hazards against which the PPE is intended to provide protection;
- in the selection, storage, testing and replacement of suitable PPE;
- in assuring that it is correctly fitted to the people who use it, and that a range of equipment is available in order to provide adequate comfort;
- in the consequences of poor performance or equipment failure; and
- to have an understanding of the appropriate action to take.

17.1.5. PPE should be selected considering the characteristics of the wearer and additional physiological load or other harmful effects caused by the PPE. It should be used, maintained, stored and replaced in accordance with the standards or guidance for each hazard identified at the workplace and according to the information given by the manufacturer. PPE stocks should be managed to ensure that appropriate PPE is always available.

17.1.6. PPE should be examined periodically in accordance with the manufacturer's recommendations, taking into account the amount of use to ensure that it is in good condition.

17.1.7. Different PPE and their components should be compatible with each other when they are worn together.

17.1.8. PPE should be personal to the wearer, unless it is properly cleaned after each use.

17.1.9. PPE should be assessed for ergonomic design and, to the extent practicable, should not restrict the user's mobility or field of vision, hearing or other sensory functions.

17.1.10. Employers should ensure that the workers who are required to wear PPE are fully informed of the requirements and of the reasons for them, and are given adequate training in the selection, wearing, maintenance and storage of this equipment.

17.1.11. Workers should use the equipment provided throughout the time they may be exposed to the risk that requires the use of PPE for protection.

17.1.12. The PPE should not be used for longer than the time indicated by the manufacturer.

17.1.13. PPE must not contain hazardous substances, such as asbestos.

17.1.14. Workers should make proper use of the PPE provided, and maintain it in good condition, consistent with their training and be provided with the proper means for doing so.

17.1.15. Where required on the basis of a risk assessment, workers should wear the appropriate protective clothing provided by the employer.

17.1.16. The selection of protective clothing should take into account:

- (a) the adequacy of the design and the fit of the clothing, allowing freedom of movement to perform tasks, and whether it is suitable for the intended use; and
- (b) the environment in which it will be worn, including the ability of the material from which it is made to resist penetration by chemicals, minimize heat stress, release dust, resist catching fire and not discharge static electricity.

17.1.17. Inspection of protective clothing and equipment should be performed by the user before each use. This should include checks for insects, rodents, snakes, etc., particularly in footwear.

17.1.18. The employer should ensure that a worker removes PPE and protective clothing before leaving the workplace.

17.1.19. PPE should be stored in accordance with manufacturers' recommendations. Contaminated work clothes should be washed (if reusable) or disposed of in a workplace facility. Under no circumstances should workers be allowed to take contaminated work clothes home.

17.1.20. Employers should provide for the laundering, cleaning, disinfecting and examination of protective clothing or equipment which has been used and may be contaminated by materials that are hazardous to health before reissuing the clothing or equipment. This should be provided at no cost to the worker.

17.2. Helmets and other head protection

17.2.1. Helmets should be worn by workers exposed to the risk of head injury. Helmets should be selected with regard to the task to be performed.

17.2.2. Any helmet that has been submitted to a heavy blow, even if there are no evident signs of damage, should be discarded.

17.2.3. In addition to safety, consideration should also be given to the physiological aspects of comfort for the wearer. The helmet should be as light as possible, the harness

should be flexible and should not irritate or injure the wearer and a sweatband should be incorporated.

17.2.4. If splits or cracks appear, or if the harness of the helmet shows signs of ageing or deterioration, the helmet should be discarded.

17.2.5. Helmets should be periodically checked for deterioration due to UV exposure and replaced as appropriate.

17.2.6. Where there is a hazard of contact with exposed conductive parts, only helmets made of non-conducting material should be used.

17.2.7. Helmets for persons working overhead should be provided with chin straps.

17.2.8. All protective headgear should be cleaned and checked regularly.

17.3. Face and eye protection

17.3.1. Face shields or eye protectors should be used to protect against flying particles, fumes, dust and chemical hazards.

17.3.2. Goggles, helmets or shields that give maximum eye protection for welding and cutting processes should be worn by operators, welders, their assistants and others who may be exposed to the hazards.

17.3.3. With the use of face and eye protectors, due attention should be paid to both comfort and efficiency.

17.3.4. The protectors should be fitted and adjusted by a person who has received training in this task.

17.3.5. Face and eye protectors should give adequate protection at all times even with the use of corrective vision devices.

17.3.6. Eye protectors, including corrective lenses, should be made of appropriate high-impact material.

17.4. Upper and lower limb protection

17.4.1. Protective gloves should be selected with regard to the task to be performed and worn, as appropriate, to protect hands against physical, chemical and other hazards.

17.4.2. Forearm protection and hand-shield type protection should be used in welding operations.

17.4.3. Safety footwear, shin guards, and other leg protection should be used where appropriate.

17.4.4. Slip-resistance properties should be taken into account when choosing footwear.

17.4.5. Knee protectors may be necessary, especially where work involves kneeling.

17.4.6. All protective footwear should be kept clean and dry when not in use, stored upside down and replaced as soon as necessary.

17.5. Respiratory protective equipment (RPE)

17.5.1. When effective engineering controls are not feasible, or while they are being implemented or evaluated, respirators, appropriate to the hazard and risk in question, should be used to protect the health of the worker.

17.5.2. When the employer cannot assess the hazard and risk with sufficient accuracy to define the appropriate level of respiratory protection, the employer should seek competent professional advice.

17.5.3. When the degree of risk so indicates, the employer should make positive pressure air-supplied respiratory protective devices available.

17.5.4. When selecting respirators, an appropriate number of sizes and models should be available from which a satisfactory respirator can be selected. Different sizes and models should be available to accommodate a broad range of facial types and to offer workers choice with regard to comfort. Workers should be fit-tested for respirators.

17.5.5. Respirators should be cleaned and sanitized at the end of the workday. Respirators intended for emergency use should be cleaned and sanitized after each use.

17.5.6. The user should be sufficiently trained and familiar with the respirator in order to be able to inspect the respirator immediately prior to each use to ensure that it is in proper working condition. Inspection may include the following:

- (a) tightness of connections;
- (b) the condition of the respiratory inlet and outlet covering;
- (c) head harness;
- (d) valves;
- (e) connecting tubes;
- (f) harness assemblies;
- (g) hoses;
- (h) filters;
- (i) cartridges;
- (j) end-of-service-life indicator;
- (k) electrical components;
- (l) shelf-life date; and
- (m) the proper function of regulators, alarms and other warning systems.

17.5.7. Respirators should be properly stored in clean and secure conditions. Damage may occur if they are not protected from physical and chemical agents such as vibration, sunlight, heat, extreme cold, excessive moisture or damaging chemicals.

17.5.8. Each respirator should be used with an understanding of its limitations, based on a number of factors such as the type and intensity of work, airborne concentration

levels of the chemical involved, duration of exposure, the characteristics of the chemical and the service life of the respirator.

17.5.9. Workers with a medical condition that affects respirator use should be medically evaluated for their ability to wear a respirator safely before they are required to do so.

17.6. Hearing protection

17.6.1. When effective engineering controls, such as noise damping, are not feasible or while they are being implemented or evaluated, hearing protection should be used to protect the hearing of workers. Commercially produced protective muffs or earplugs are the principal types of hearing protectors. They should be manufactured to specification in order to provide adequate protection. Hearing protectors should be designed to attenuate noise, but to allow safety signals to be heard.

17.6.2. Hearing loss of speech frequencies may occur with elevated long-term exposure to noise. The use of hearing protectors gives the best results to users who are well informed of the risks and trained in their use. If ear plugs are used, special attention should be paid to the proper fitting technique.

17.6.3. Hearing protectors should be comfortable, and the users should be trained to use them properly.

17.6.4. Earplugs should be inserted with clean hands. Earplugs that should be moulded to fit should only be handled with clean hands.

17.6.5. Disposable earplugs should not be reused.

17.6.6. Special attention should be paid to the possible increased risk of accidents due to the use of hearing protectors. Unless designed to overcome this problem, earmuffs reduce the capacity to locate sound sources and prevent warning signals from being heard. This is especially true for workers with considerable hearing loss.

17.6.7. No model is suitable for all persons. Those wearing hearing protectors should be able to choose from alternative products that meet the attenuation criteria. Earplugs should not be the only solution as not all people can wear them.

17.6.8. Hearing protectors should be made available at the entrance to the noisy area and they should be put on before entering the noisy area. Noisy areas should be indicated by appropriate signs.

17.6.9. The attenuation of hearing protectors works well only if they are well maintained. Good maintenance consists of cleaning, changing replaceable parts such as cushions, and overall monitoring of the state of the hearing protector.

17.6.10. The effectiveness of hearing protectors should be evaluated through an audiometric test programme for exposed workers.

17.6.11. The use of eye protectors can reduce the effectiveness of hearing protectors if both are worn at the same time. In such circumstances, employers should provide types of PPE that are compatible with each other.

17.7. Protection from falls from height

17.7.1. Workplaces, such as mobile elevated work platforms, in which there are risks of falling from height, should normally be equipped with suitable guard rails or edge protection (see section 13.4). Where such measures do not eliminate the risk of falling, workers should be provided with and trained in the use of appropriate fall arrest equipment, such as safety harnesses and lifelines.

17.7.2. Safety harnesses should be chosen that can be safely used with other PPE, so that both may be worn simultaneously.

17.7.3. Safety harnesses and lifelines which are made of fabrics are susceptible to UV deterioration and they should be inspected regularly. If found to be defective, they should be immediately replaced. Records should be kept of such inspections.

17.7.4. Harnesses should be worn where required and lifelines should be attached to adequate anchor points.

17.7.5. Appropriate and timely rescue should be provided when using fall-arrest equipment to prevent suspension trauma.

17.7.6. Where anchorage points are provided on buildings for use with lifelines or other fall arrest equipment, these should be regularly inspected, tested and maintained.

17.8. Hygiene facilities and decontamination

17.8.1. Adequate washing facilities, including hot and cold or warm running water, together with soap or other cleaning materials and towels or other drying equipment, should be provided at the relevant worksites in accordance with national law.

17.8.2. The washing facilities should be conveniently accessible but situated so that they are not themselves exposed to contamination from the workplace.

17.8.3. The type of washing facilities should be related to the nature and degree of exposure.

17.8.4. Facilities for storing personal clothing should be provided when protective clothing is used or when there is a risk of contamination of personal clothing by hazardous materials.

17.8.5. Changing facilities should be situated and designed so as to prevent the spread of contamination from protective clothing to personal clothing and from one workplace to another.

18. Welfare facilities

Welfare facilities comprise the basic amenities that employers should provide to workers in agricultural enterprises.

18.1. Water

18.1.1. Dehydration quickly reduces physical and mental ability, thus reducing productivity and increasing the risk of accidents. For this reason, the employer should provide an adequate supply of potable water placed in locations readily accessible to workers. The water should be provided in sufficient amounts to meet the needs of all workers at the worksite, taking into account the air temperature, humidity and the nature of the work performed. For physical work in hot climates, one litre or more per hour per worker may be required (see section 16.2.4 on heat stress).

18.1.2. Mobile drinking water dispensers should be designed, constructed and maintained to ensure sanitary conditions. They should be kept closed. They should be equipped with a tap. Open containers, such as tanks, barrels or pails from which water should be dipped should not be used. Drinking cups and other utensils should be for personal use or, if shared, should be thoroughly washed between users.

18.1.3. The employer should provide potable water for drinking, personal hygiene, cooking, washing of food, washing of cooking and eating utensils, the cleaning of food preparation and eating areas and the washing of clothes, as appropriate.

18.1.4. The employer or supervisor should inform workers of the location of potable water and allow each worker reasonable opportunities during the workday to make use of it.

18.1.5. Outlets for non-potable water should be clearly marked to indicate that the water is unsafe and should not be used for drinking, personal hygiene, cooking, washing of food, washing of cooking and eating utensils, the cleaning of food preparation and eating areas or the washing of clothes.

18.2. Toilets

18.2.1. Employers should provide toilets in accordance with national legislation. They should be of sufficient number and be easily accessible in all worksites.

18.2.2. Employers should provide separate toilet facilities for each sex, which afford suitable privacy. Toilet rooms should be built for single occupancy and should be locked from the inside.

18.2.3. Employers should provide portable toilets at remote worksites, or transportation immediately available to nearby facilities.

18.2.4. Employers should maintain toilet facilities in a clean and sanitary condition. Toilet facilities should be well ventilated and lit.

18.2.5. Hand-washing facilities with an adequate supply of potable water, ideally warm, soap, and single-use towels or air blowers should be conveniently located near the toilets.

18.2.6. The employer or supervisor should inform workers of the location of the sanitation facilities and allow each worker reasonable opportunities during the workday to use them.

18.2.7. The employer should inform workers of the importance of good hygiene practices to minimize exposure to hazards related to heat, communicable diseases, retention of urine and chemical residues.

18.2.8. The sewage disposal system should not endanger the health of workers or threaten contamination of water sources.

18.2.9. Workers should take all reasonable care of the facilities provided to them.

18.3. Food services

18.3.1. Inadequate or insufficient nutrition may result in health problems and a lack of productivity. When food is provided by employers, they should ensure that the energy intake is sufficient for the performance of heavy physical work and that the diet is composed of a good balance of carbohydrates, fats and protein.

18.3.2. Where meals and other food supplies are made available to the workers directly by the employer or by a caterer or contractor, the food should be of good quality, its price should be reasonable and it should be provided without profit to the employer. Workers providing their own food should be provided with a suitable storage place.

18.3.3. All food service facilities should be maintained to a high standard of hygiene.

18.3.4. The persons in charge of food services should be skilled in nutrition, sanitation and food handling, should be licensed by a competent authority, and should be inspected regularly.

18.3.5. Food should be prepared, handled and stored in hygienic conditions so as to protect against contamination.

18.3.6. The food dispensed should be wholesome and free from spoilage and contamination.

18.3.7. Food service facilities, including canteens, should be located at a safe distance from areas where hazardous materials are stored or used. Workers should not eat, drink or smoke in areas contaminated by hazardous materials. Warning signs should be posted.

18.3.8. Where workers are widely dispersed over worksites, arrangements should be made, where practicable, to provide mobile canteens or the transportation of food and beverages to the worksite for consumption during the meal breaks or, if for safety and health reasons the worksite is unsuitable, to facilities in an uncontaminated area conveniently accessible to the worksite. Canteen layout should be in compliance with national legislation, where it exists.

18.4. First aid and medical care ¹

18.4.1. Implementing an effective first-aid programme should be a cooperative effort, involving employers, workers and their representatives, occupational health and public health organizations, and the labour inspectorate.

18.4.2. First aid, including the provision of trained personnel, should be available at every workplace.

18.4.3. First-aid personnel should be selected carefully, taking into account attributes such as reliability, motivation and the ability to cope with people in a crisis situation.

18.4.4. Since it is common for agricultural workers to work in small groups at separate locations, workers should be trained in basic first aid. This training should include the treatment of open wounds and resuscitation. In areas where the work involves the risk of intoxication by chemicals or smoke, snake, insect or spider bites or other specific hazards, first-aid training should be extended accordingly (see section 9.3.7.2 for further guidance on first-aid arrangements with regard to the use of hazardous chemicals at work).

18.4.5. First-aid personnel should be trained to provide first-aid treatment safely to those suffering from hepatitis, tuberculosis, HIV/AIDS and other communicable diseases.

18.4.6. First-aid training should be repeated at regular intervals in accordance with national law and practice to ensure that knowledge and skills do not become outdated or forgotten.

18.4.7. First-aid boxes should always be clearly marked, be easily accessible and located near areas where accidents could occur. They should be able to be reached within one or two minutes. They should be made of suitable materials, and should protect the contents from heat, humidity, dust and abuse.

18.4.8. The content of first-aid boxes should be appropriate to the risks to the workers and for the protection of first-aid providers and should be regularly checked and replaced as necessary. First-aid boxes should contain nothing other than first-aid equipment.

18.4.9. Written instructions about first aid should be displayed by the employer at strategic places at the workplace.

18.4.10. The employer should organize briefings for all workers. The following are essential parts of the briefing:

- (a) the organization of first aid at the workplace, including the procedure for access to additional care;
- (b) identification of colleagues who have been appointed as first-aid personnel;
- (c) location of the first-aid box;
- (d) location of the first-aid room;
- (e) what workers should do in the event of an accident; and
- (f) ways of supporting first-aid personnel in their task.

¹ See also section 9.3.7.2 on first-aid arrangements with regard to hazardous chemicals.

18.4.11. Where medical care is required, such services should be established in cooperation with external emergency services.

18.5. Temporary shelter

18.5.1. Shelters should be made available for protection from inclement weather and for spending breaks, taking meals and drying and storing clothing, at or within easy reach of the worksite.

18.5.2. In hot climates, shaded rest areas should be available at all worksites. Workers and supervisors should be made attentive to the symptoms that may precede heat exhaustion or heat stroke. Workers should have the right to take a reasonable break in the shade should they feel the onset of illness. Further control strategies are discussed in Chapter 16.

18.6. Housing

18.6.1. Decent housing and accommodation and a suitable living environment contribute to the health and well-being of workers and their families. National housing policy should encourage the construction and maintenance of adequate, decent and reasonably priced housing accommodation and a suitable living environment for agricultural workers.

18.6.2. In cases where housing is provided by the employer, housing should comply with minimum housing standards established by the competent authority in the light of local conditions. Accommodation provided for seasonal and migrant workers should meet minimum housing standards.

18.6.3. Housing standards should establish minimum space per person or per family; the supply of potable water in the workers' dwellings; sewage and waste removal systems; protection against heat, cold, damp, noise, fire, and disease-carrying animals, particularly rodents and insects; adequate sanitary and washing facilities; ventilation; cooking and storage facilities; natural and artificial lighting; a minimum degree of privacy, and the separation of living quarters for persons from those for animals.

18.6.4. Where collective housing is provided for workers who are single or are separated from their families, the competent authority should establish housing standards that provide as a minimum a separate bed for each worker; a separate locker for keeping personal belongings; separate accommodation of the sexes; adequate supply of potable water; adequate sanitary and washing facilities; adequate ventilation and, where appropriate, heating; canteens, and rest and recreation facilities.

18.6.5. In so far as is practicable, workers' housing should be within close proximity to community facilities, such as schools, shopping centres, sports facilities and recreation areas.

18.6.6. Where recreational facilities are not otherwise available and where there is a real need, measures should be taken to encourage the provision of such facilities in a location convenient to workers.

18.6.7. Where transport facilities for workers are needed, but are unavailable or inadequate, the enterprise should consider making arrangements for or directly providing transport to and from the workplace.

18.6.8. The enterprise should provide transport of workers to and from worksites, as needed.

18.7. Day-care facilities

18.7.1. Employers should consider providing nursery, day-care and nursing facilities, particularly in enterprises that employ women workers. Such facilities can contribute to higher productivity as they have been shown to reduce absenteeism. Such facilities also reduce the likelihood of parents taking their children into production areas, hence protecting the children from injury and ill health and greatly reducing the incidence of hidden forms of child labour. Such facilities should be located so as to prevent exposure to workplace hazards. Such facilities should be maintained in hygienic condition.

18.7.2. Occupational health services personnel should supervise sanitary installations and other facilities for the workers, such as potable water, canteens, living accommodation, and day-care facilities when provided by the employer.

Emergency response

Checklist	Date	Self-audit			Step 2	Step 3
		Step 1	Yes	No		
Physical conditions		N/A				
1. Are adequate first-aid kits located in standard locations in the workshop? Tractors? Vehicles?						
2. Are emergency numbers posted by all phones?						
3. Is information current?						
Work practices		N/A				
1. Are first-aid kits periodically checked and replenished?						
2. Have a reasonable number of employees been trained in first aid and cardiopulmonary resuscitation to cover work areas?						
3. Do workers know how to call for emergency help?						
4. Do workers know how to shut off all machinery if someone is caught or pinned down?						
5. Do workers know what to do in the event of accidental poisoning?						
6. Do you routinely check with workers by phone, visit, radio or with other appropriate means of communication?						
7. Do you act on issued weather warnings?						

19. Workplace wellness programmes

Basic social protection should be available to all workers. In addition, the workplace can be an important source of information for workers of both sexes on wellness, and how to maintain a healthy lifestyle, through a proper diet, personal hygiene, rest and recreation. Employers should consider establishing an enterprise wellness programme as well as establishing clear policies with regard to alcohol- and drug-related problems, HIV/aids, workplace violence, harassment and bullying, and smoking.

19.1. Social protection

19.1.1. In accordance with national laws and regulations agricultural workers should:

- (a) be covered by an employment contract;
- (b) be entitled to adequate workers' compensation in the event of an occupational injury or disease and be entitled to survivors' and dependants' benefits;
- (c) have access to appropriate services for rehabilitation and return to work; and
- (d) benefit from social security coverage.

19.1.2. In countries where not all agricultural workers currently benefit from such protection, the competent authority should work with employers and workers' organizations to devise innovative approaches to ensuring coverage, paying particular attention to the needs of temporary, casual and migrant workers.

19.2. Working hours

19.2.1. The pace of agricultural work has increased with the use of task rates and piecework. Long hours of work, particularly intense manual labour, contribute to workers' fatigue and lead to accidents on the job.

19.2.2. Daily and weekly working hours should be arranged so as to provide adequate periods of rest which, as prescribed by national laws and regulations, or approved by labour inspectorates or collective agreements, where applicable, should include:

- (a) short breaks during working hours, especially when the work is strenuous, dangerous or monotonous, to enable workers to recover their vigilance and physical fitness;
- (b) sufficient breaks for meals;
- (c) daily or nightly rest of not less than eight hours within a 24-hour period; and
- (d) weekly rest of at least a full calendar day.

19.3.3. Extended workdays (over eight hours) should be contemplated only if:

- (a) the nature of the work and the workload allow work to be carried out without increased risk to safety and health;
- (b) the shift system is designed to minimize the accumulation of fatigue.

19.3. Alcohol- and drug-related problems

19.3.1. The workplace should be drug- and alcohol-free in accordance with national law and practice.

19.3.2. Enterprise policy should not permit the use of alcohol or non-medical drugs at the workplace.

19.3.3. Alcohol- and drug-related problems should be dealt with in the same way as any other health problem at work. The ILO code of practice *Management of alcohol- and drug-related issues in the workplace*, 1996, deals specifically with this issue.

19.3.4. Alcohol and drug policies and programmes should promote the prevention and management of alcohol- and drug-related problems in the workplace. Employers and workers and their representatives should cooperate in developing such programmes for the workplace, including disciplinary procedures.

19.3.5. The same restrictions or prohibitions with respect to alcohol and drugs should apply to both management personnel and workers.

19.3.6. Testing of bodily samples for alcohol and drugs in the context of employment involves moral, ethical and legal issues of fundamental importance, requiring a determination of when it is fair and appropriate to conduct such testing.

19.3.7. Workers who seek treatment and rehabilitation for alcohol- or drug-related problems should not be disciplined or discriminated against by the employer and should enjoy normal job security. Any information communicated should be treated with confidentiality.

19.3.8. It should be recognized that the employer has authority to discipline workers for employment-related misconduct associated with alcohol and drugs. However, counselling, treatment and rehabilitation should be preferred to disciplinary action.

19.4. HIV/AIDS

19.4.1. HIV/AIDS should be treated like any other serious illness/condition in the workplace.

19.4.2. The ILO Recommendation concerning HIV and AIDS and the World of Work 2010 (No. 200) and the ILO code of practice *HIV/AIDS and the world of work* should be instrumental in helping to prevent the spread of the pandemic, mitigate its impact on workers and their families and provide social protection to help cope with the disease.

19.4.3. The work environment should be healthy and safe in order to prevent transmission of HIV. Employers should take steps to prevent the transmission of HIV and other blood-borne pathogens, particularly with respect to emergency response. Universal precaution should be applied with respect to first aid and other medical procedures and to the handling of other potentially infected material.

19.4.4. There should be no disciplinary action nor discrimination against workers on the basis of ongoing medical care or real or perceived HIV status.

19.4.5. In workplaces, it is recommended to have an HIV/AIDS policy and programme, the successful implementation of which requires cooperation and trust between employers, workers and their representatives.

19.4.6. There should be no discrimination against workers with HIV/AIDS in access to and receipt of benefits from statutory social security programmes and occupational health services.

19.5. Workplace violence, harassment and bullying

19.5.1. Every person has the right to be treated with dignity and respect and to be free from all forms of violence, harassment, and bullying, in the workplace.

19.5.2. A safe and healthy working environment, in accordance with the provisions of the Occupational Safety and Health Convention, 1981 (No. 155), facilitates optimal physical and mental health in relation to work, and can help to prevent workplace violence and harassment. Promoting gender equality could help to reduce gender-based workplace violence and harassment. Sexual harassment at work is a human rights and sex discrimination issue, and has accordingly been examined in the light of the requirements of Convention No. 111. It is especially encountered by inexperienced younger women and men whose age and work position make them vulnerable. Sexual harassment is a hazard that lowers the quality of working life, jeopardizes the well-being of women and men, undermines gender equality and can have serious cost implications for firms and organizations.

19.5.3. Policy or action against workplace violence and harassment should be directed at promoting decent work and mutual respect, and combating discrimination at the workplace, in accordance with the Discrimination (Employment and Occupation) Convention, 1958 (No. 111).

19.5.4. The competent authority, employers, workers and their representatives should, in so far as reasonably practicable, cooperate in developing and implementing appropriate policies, procedures and workplace practices that help to eliminate all forms of workplace violence and harassment.

19.5.5. Employers should consult with workers and their representatives to develop and implement appropriate policies and procedures to eliminate or minimize the risk of workplace violence and harassment. These policies and procedures should include risk assessment and control strategies, the inclusion of provisions on the prevention of workplace violence and harassment in national, sectoral, and enterprise agreements, personnel policies to promote mutual respect and dignity at work, and grievance and disciplinary procedures.

19.5.6. Workers and their representatives should take all reasonable care to prevent, reduce and eliminate the risks associated with workplace violence and harassment. They should:

- cooperate with employers in OSH committees in accordance with the Occupational Safety and Health Recommendation, 1981 (No. 164);
- cooperate with employers to develop appropriate risk assessment strategies and prevention policies, paying particular attention to vulnerable workers;

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- ensure that factors that increase the risk of workplace violence and harassment at particular worksites or when carrying out specific activities are addressed by workers and their health and safety representatives in consultation with employers; and
 - report acts of workplace violence and harassment.

18.5.7. In conducting a risk assessment of workplace violence and harassment, account should be taken of the following signs of possible workplace tensions:

- incidents of physical assault leading to actual harm;
- intense or ongoing verbal abuse, including sexual innuendo, aggressive body language, threatening behaviour or the expression of the intent to cause harm; and
- high levels of absenteeism and personnel turnover, which are indicative of problems in the workplace.

19.5.8. Preventive measures concerning work practices should include consideration of:

- staffing levels and the composition of work teams;
- workload;
- scheduling;
- worksite location; and
- proximity to communications for isolated workers.

19.5.9. Appropriate medical treatment should be available, where required, to workers affected by workplace violence.

19.5.10. The competent authority, employers, workers and their representatives should act in collaboration to develop grievance and disciplinary procedures to deal with complaints of workplace violence and harassment. These procedures should include a fair and equitable process for the investigation and resolution of complaints.

19.5.11. The confidentiality of any information on workers exposed to or suffering from workplace violence or harassment should be ensured, in accordance with national laws and regulations.

19.6. Smoking at work

19.6.1. Smoke-free workplace policies should be established, in consultation with workers and their representatives. These policies should be implemented and enforced by the employer in compliance with applicable laws and regulations.

19.6.2. These policies should also specify where smoking may be permitted during agreed rest breaks without creating hazards for other workers or the risk of fire on the premises.

19.6.3. Smoking should be strictly prohibited in or near any areas where flammable, explosive or toxic materials or substances, fumes or gases are stored, used or may accumulate (e.g. chemical storage areas, silos, workshops, fuelling stations, etc.). Warning signs should be posted to that effect.

20. Outreach

20.1. Introduction

20.1.1. In the context of OSH, outreach means raising general public awareness of the importance of preventing occupational accidents and ill health and promoting a preventive OSH culture. Through outreach, many more enterprises can be influenced and motivated to pay attention to OSH than can be visited by labour inspectors.

20.1.2. Thus, outreach on OSH is a vital part of any national OSH system, for agriculture as for other sectors. In agriculture, it particularly benefits the many farms that rarely if ever see an inspector and have little direct contact with OSH advisory services, such as small family farms and the self-employed. Outreach also helps to raise OSH awareness amongst individual workers, such as migrant and seasonal workers and those in the informal economy. Special attention should be paid to reaching both female and male workers with appropriate information.

20.1.3. Outreach involves not only inspectors and government-sponsored agencies such as OSH information and advice centres, but also the private sector, including employers, workers and their organizations, trade associations, manufacturers and suppliers of equipment and products. Intergovernmental organizations, such as FAO and WHO, and non-governmental organizations (NGOs), such as OSH associations and community organizations can also play an important part in outreach, as can educational and training organizations through their curricula and courses.

20.1.4. The involvement of the private sector, NGOs and educational/training organizations in outreach is all the more important in developing countries, where resources for labour inspection are extremely stretched. The lack of transport facilities for inspection in rural areas is one factor here, but in addition where there is little or no OSH legislation covering the agricultural sector, the mandate of labour inspectorates is restricted to mainly industrial enterprises.

20.1.5. Thus, the Labour Inspection (Agriculture) Recommendation, 1969 (No. 133), proposed that competent authorities should undertake or promote education campaigns about the need to apply relevant legal provisions, the dangers of working in agricultural undertakings and the most appropriate means of avoiding them. In particular, the Recommendation proposed that the education campaigns might include:

- the use of the services of rural promoters and instructors;
- the distribution of posters, pamphlets, periodicals and newspapers;
- organization of film shows, radio and TV broadcasts;
- arrangements for exhibitions and practical demonstrations on hygiene and safety;
- inclusion of hygiene and safety and other appropriate subjects in teaching programmes of rural, farm and agricultural technical schools;
- organization of conferences for persons who are working in agriculture who are affected by the introduction of new working methods or of new materials or substances;

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- participation of labour inspectors in agriculture in workers' education programmes; and
 - arrangements of lectures, debates, seminars and competitions with prizes.

20.1.6. Since this Recommendation was adopted, the use of TV as well as radio has become widespread and many labour inspectorates now make good use of TV to broadcast important messages about OSH to a wider audience.

20.1.7. The Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187), and its accompanying Recommendation (No. 197), also promote such broader approaches. In particular, they encourage countries to develop national OSH programmes and systems, which may be targeted at the whole of a sector such as agriculture. Such programmes have been an important means of outreach to enterprises not subject to inspection, encouraging them to manage OSH more effectively and helping to promote a preventive OSH culture more widely.

20.2. Competent authority

20.2.1. In collaboration with ministries of education, competent authorities should consider the feasibility of including safety and health education:

- (i) within the curricula of agricultural education and training establishments; and
- (ii) within the national schools curricula, having due regard to pupils whose future adult working life is likely to be in agriculture.

20.2.2. Competent authorities should develop specific safety and health training initiatives for the agricultural sector, in collaboration with the labour inspectorates, relevant national training associations, employers' and worker's organizations and other stakeholders. Such initiatives may be based on model international programmes and should be practically orientated, targeting enterprises that are not normally subject to labour inspection.

20.2.3. Labour inspectors are encouraged to visit agricultural training colleges and schools from time to time to give talks about safety and health risks in agriculture, as well as more generally.

20.2.4. The competent authority should encourage the dissemination and use of the code amongst family farms, the self-employed, migrant and seasonal workers and those working in the informal economy

20.3. Social partners

20.3.1. Many agricultural employers' and workers' organizations already provide substantial OSH training programmes for their members.

20.3.2. Agricultural employers' and workers' organizations should consider how they can make best use of their own channels of communication to promote OSH in agriculture to a wider audience. They should consider innovative ways of promoting OSH in all agricultural enterprises, and in particular amongst family farms, the self-employed, migrant and seasonal workers and those working in the informal economy.

20.3.3. Employers should consider:

- (i) encouraging their suppliers to promote safety and health amongst their own workers; and
- (ii) as appropriate, making available to those suppliers such safety and health advice as is already available to their own employees, including any relevant training on safety and health.

20.3.4. Workers' and employers' organizations should encourage their trained safety and health representatives to raise awareness of small farmers and agricultural workers outside the enterprise with regard to good practices in OSH in agriculture and provide guidance to enable them to make improvements.

20.4. Tripartite cooperation and collaboration

20.4.1. The competent authority and employers' and workers' organizations should cooperate with each other so that through their joint efforts they can raise awareness of OSH risks in agricultural enterprises, help improve OSH in those enterprises and promote a preventive OSH culture at national, district and local levels, particularly in small and medium-sized enterprises (SMEs).

20.4.2. Employers' and workers' organizations should consider the feasibility of jointly developing accredited training schemes for employers' and workers' safety and health representatives to provide advice to employers and workers as to how OSH standards could be improved or maintained.

20.4.3. Regional or district safety and health representatives offer an important new means of increasing outreach as they ensure that workers in agriculture receive the same level of OSH protection as workers in other economic sectors. They support but do not replace labour inspectors. They visit a given number of farms in a small, designated area to help employers and workers to improve OSH standards on farms and have the same rights and functions accorded to safety and health representatives under national law and practice.

20.4.4. Their overall objective is to stimulate and support local OSH activity with a view to reducing accidents and ill health. They are trained and accredited by their workers' organization solely to address OSH issues. Access to agricultural undertakings and installations is afforded in accordance with national law and practice which would under normal circumstances provide for right of access when prior notification is served except when there is a serious accident in their area when no prior notification is required.

20.5. Other partners: Farmers' associations, agricultural shows, etc.

20.5.1. Competent authorities and labour inspectorates should consider how to engage other partners, such as farmers' associations, agricultural development organizations, financial institutions, insurance companies, NGOs, community-based organizations and others in promoting OSH more widely within the agricultural sector.

20.5.2. Competent authorities and labour inspectorates should consider how to make best use of agricultural trade fairs and exhibitions, through displays of information and promotional material, film shows and other activities. In particular:

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- (i) inspectors should be available at such trade fairs and exhibitions to give information about injuries and ill health in agriculture and how to prevent them; and
 - (ii) competitions may be organized for children to encourage them to think about OSH risks on the farms where their parents work, and where they may work in future.

20.6. Media campaigns

20.6.1. Competent authorities and labour inspectors should seek to reach out to and influence all or part of the agricultural sector through media campaigns, in collaboration with social partners. In particular:

- (i) TV and radio programmes may be targeted at specific types of farms, the self-employed and/or vulnerable workers, including seasonal and migrant workers, highlighting any safety and health risks they may face. These should include both female and male voices and actors;
- (ii) such programmes may combine education and entertainment and seek to change attitudes and behaviour by addressing basic human needs and apprehensions;
- (iii) labour inspectors should provide material for TV and radio programmes on the kinds of accidents and diseases that occur in agriculture and how to prevent them, giving real examples from their experience; and
- (iv) competent authorities and labour inspectors should make use of the trade press in raising awareness of OSH matters within the agricultural sector and highlighting particular concerns, with a view to reaching enterprises not normally subject to inspection.

20.7. National OSH programmes ¹

20.7.1. National programmes for agriculture should seek to promote a preventive OSH culture that addresses the particular needs of men and women and to progressively improve OSH throughout the sector. In particular, they should:

- (i) be time-bound and have clear targets and indicators;
- (ii) target OSH risks that concern small family farms, the self-employed and seasonal and migrant workers; and
- (iii) involve a range of different activities at both national and local levels, including high-level conferences, seminars and meetings to maintain focus on the issues, targeted inspection and enforcement, educational and promotional activities, media coverage, widespread publicity and information through websites, etc.

20.7.2. In drawing up plans for such programmes and managing them, competent authorities should engage a wide range of stakeholders and secure their full commitment to the programmes. Different government ministries, especially those for labour, health and

¹ As envisaged by Conventions Nos 184 and 187.

education should be involved and collaborate in such programmes, in cooperation with relevant employers' and workers' organizations and other stakeholders, such as educational and training establishments, the media, manufacturers and suppliers, etc.

Glossary

In this code of practice, the following terms have the meanings hereby assigned to them:

Active monitoring: The ongoing activities which check that hazard identification, risk assessment and the appropriate preventive and protective measures, as well as the arrangements to implement the occupational safety and health (OSH) management system, conform to defined criteria.

Agricultural enterprise: For the purposes of this code of practice, a farm or agricultural undertaking in which an employer employs one or more workers.

Asphyxiant: A substance that causes injury by decreasing the amount of oxygen available to the body. Asphyxiants may act by displacing air from an enclosed space, or by interfering with the body's ability to absorb and transport oxygen.

Audit: A systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which defined criteria are fulfilled. Audits should be conducted by competent persons internal or external to the workplace who are independent of the activity being audited.

Bullying: Repeated unreasonable actions intended to intimidate, degrade, offend or humiliate, often involving an abuse of power.

Competent authority: A minister, government department or other public authority with the power to issue regulations, orders or other instructions having the force of law. Under national laws or regulations, competent authorities may be appointed with responsibilities for specific activities, such as for the implementation of national policy and procedures for the protection of agricultural workers.

Competent person: A person with suitable training, and sufficient knowledge, experience and skill, for the performance of the specific work.

Contractor: A person or an enterprise providing services to an employer at the workplace in accordance with national laws and regulations, or with agreed specifications, terms and conditions. For the purpose of this code of practice, contractors include principal contractors, subcontractors and labour supply agents.

Dangerous occurrence: Readily identifiable event, as defined under national laws and regulations, with potential to cause injury or disease to people at work or the general public.

Employer: Any physical or legal person that employs one or more workers.

Engineering controls: Use of mechanical or technical measures such as enclosure, ventilation and workplace design to minimize exposure.

Engulfment: The condition of being swallowed up or overwhelmed by loose material, for example in the cave-in of an unshored trench or the shifting of grain in a silo. Engulfment usually causes injury by asphyxiation or crushing.

Exposure limit: An exposure level specified or recommended by a competent authority to limit injury to health. The terms adopted by the competent authority vary from country to country and include: "administrative control levels"; "maximum allowable

concentrations”; “permissible exposure limits”; “occupational exposure limits”; and “threshold exposure values”.

Farm: For the purposes of this code of practice, an agricultural enterprise or undertaking in which an employer employs one or more workers.

Flight zone: The flight zone is an area around an animal, that when entered, will make the animal move away.

Harassment: Refers to any kind of emotional and physical abuse, persecution or victimization. Harassment and pressure at work can consist of various forms of offensive behaviour. Harassment is characterized by persistently negative attacks of a physical or psychological nature on an individual or group of employees, which are typically unpredictable, irrational and unfair.

Hazard: The inherent potential to cause physical or psychological harm to the health of people.

Hazard identification: The systematic process of identifying hazards in the workplace. See Chapter 4 for a description of the process that should be considered.

Hazardous ambient factor: Any factor in the workplace which may in some or all normal conditions adversely affect the safety and health of the worker or other person.

Health: A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

HEPA filter: High-efficiency particulate air filter that is capable of filtering out particles of 0.3 microns or less, such as bacteria.

ILO–OSH 2001: ILO Guidelines on occupational safety and health management systems, ILO–OSH 2001 (Geneva, 2001).

Incident: An unsafe occurrence arising out of or in the course of work where no personal injury is caused.

Insulation wools: A group of products which includes glass wool, rock wool, refractory ceramic fibres (RCFs), refractory fibres other than RCFs and special-purpose glass fibres.

Integrated pest management (IPM): The careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

Labour inspector: See labour inspectorate (below).

Labour inspectorate: The body established by national legislation to secure the enforcement of the legal provisions relating to the conditions of work and the protection of workers while engaged in their work. The term also encompasses specialist OSH inspectorate and likewise the term “labour inspector” includes OSH inspectors, OSH officers and similar designations.

Labour supply agent: Supplier or provider of workers.

Notification: Procedure specified in national laws and regulations which establishes the ways in which:

- (a) the employer submits information concerning occupational accidents, dangerous occurrences or incidents; or
- (b) the employer, the insurance institution or others directly concerned submit information concerning occupational diseases; as appropriate and as prescribed by the competent authority.

Occupational accident: An unexpected occurrence, including acts of violence, arising out of or in the course of work which results in a fatal or non-fatal occupational injury.

Occupational disease: Disease known, under prescribed conditions, to arise out of exposure to substances or dangerous conditions in processes, trades or occupations, including but not limited to those specified in the List of Occupational Diseases Recommendation, 2002 (No. 194).

Occupational health services: Services entrusted with essentially preventive functions and responsible for advising the employer, the workers and their representatives in the facilities on:

- (a) the requirements for establishing and maintaining a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work;
- (b) the adaptation of work to the capabilities of the workers in the light of their state of physical and mental health.

OSH: Occupational safety and health.

OSH management system: A set of interrelated or interacting elements to establish OSH policy and objectives, and to achieve those objectives.

Point of balance: The point of balance is located at the shoulder of an animal. An animal will move depending on a handler's position relative to their point of balance. When a handler is behind the point of balance, the animal will move forward and when a handler is in front of the point of balance the animal will move backward.

Reactive monitoring: The process of identifying gaps or failures in prevention control measures, including OSH management systems, that arise from accidents, injuries, diseases, ill health and incidents, and correcting such deficiencies.

Recording: A procedure, specified in national laws and regulations, for ensuring that the employer maintains information on:

- (a) occupational accidents and diseases;
- (b) dangerous occurrences and incidents.

Reporting: A procedure, specified by the employer, in accordance with national laws and regulations and with the practice of the enterprise, for the submission by workers to their immediate supervisor, the competent person, or any other specified person or body, of information on:

- (a) any occupational accident or injury to health which arises in the course of or in connection with work;

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- (b) suspected cases of occupational diseases;
 - (c) dangerous occurrences and incidents.

Risk: A combination of the likelihood of an occurrence of a hazardous event and the severity of injury or damage to the health of people caused by this event.

Risk assessment and control: A process used to determine the level of risk of injury or illness associated with each identified hazard, for the purpose of control. All risks should be assessed and have control priorities assigned, based on the established level of risk. See Chapter 4 for a description of the process that should be considered.

Safety and health committee: A committee with representation of workers' safety and health representatives and employers' representatives, established and functioning at workplace level according to national laws, regulations and practice.

Sexual harassment: Any unwanted conduct of a sexual nature in the workplace or in connection with work, which in the reasonable perception of the person concerned, is:

- (a) used as a basis for a decision which affects that person's employment or professional situation; or
- (b) creates an intimidating, hostile or humiliating working environment for that person.

Social security: The protection that a society provides to individuals and households to ensure access to health care and to guarantee income security, particularly in cases of old age, unemployment, sickness, invalidity, work injury, maternity or loss of a breadwinner.

Stress: The adverse reaction people have to excessive pressures or other types of demand placed on them at work.

Supervisor: A person responsible for the day-to-day planning, organization and control of a function.

Surveillance of the working environment: A generic term which includes the identification and evaluation of environmental factors that may affect workers' health. It covers assessments of sanitary and occupational hygiene conditions, factors in the organization of work that may pose risks to the health of workers, collective and PPE, 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.

Welfare: Statutory procedure or social effort designed to promote the basic physical and material well-being of people in need.

Worker: Any person who performs work, either regularly or temporarily, for an employer.

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.

Workers and their representatives: Where reference is made in this code of practice to workers and their representatives, the intention is that, where representatives exist, they should be consulted as the means to achieving appropriate worker participation. In some instances, it may be appropriate to involve all workers and all representatives.

Workers' representative: In accordance with the Workers' Representatives Convention, 1971 (No. 135), any person who is recognized as such by national law or practice, whether they are:

- (a) trade union representatives, namely, representatives designated or elected by trade unions or by members of such unions; or
- (b) elected representatives, namely, representatives who are freely elected by the workers of the enterprise in accordance with provisions of national laws or regulations or of collective agreements and whose functions do not include activities which are recognized as the exclusive prerogative of trade unions in the country concerned.

Workers' safety and health representative: Workers' representative elected or appointed in accordance with national laws, regulations and practice to represent workers' interests in OSH issues at the workplace.

Workplace: Area where workers need to be, or to go, on the instruction of an employer to carry out their work. A workplace need not be a fixed location.

Workplace violence: Any action, incident or behaviour that departs from reasonable conduct in which a person is assaulted, threatened, harmed or injured in the course of his or her work or at the workplace, whether the violence takes place between workers, including managers and supervisors, or between workers and any other person present at the workplace.

Work-related injury: Death or any personal injury resulting from an occupational accident.

Work-related injuries, ill health and diseases: Negative impacts on health arising from exposure to chemical, biological, physical and organizational factors at work.

Worksite: Physical area where workers need to be or to go due to their work which is under the control of an employer.

Bibliography

The International Labour Conference has adopted a large number of international labour Conventions and accompanying Recommendations directly concerned with OSH issues. The ILO has also developed many codes of practice and technical publications applicable to agriculture. They represent a body of definitions, principles, obligations, duties and rights, as well as technical guidance reflecting the consensual views of the ILO's tripartite constituents from its 183 member States on most aspects of OSH.

1. Relevant ILO Conventions and Recommendations

1.1. *Fundamental ILO Conventions and accompanying Recommendations*

Eight Conventions were included by the International Labour Conference in the ILO Declaration on Fundamental Principles and Rights at Work. These eight Conventions cover the following four areas:

Freedom of association

- Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)
- Right to Organise and Collective Bargaining Convention, 1949 (No. 98)

The elimination of forced labour

- Forced Labour Convention, 1930 (No. 29)
- Abolition of Forced Labour Convention, 1957 (No. 105)

The abolition of child labour

- Minimum Age Convention (No. 138) and Recommendation (No. 146), 1973
- Worst Forms of Child Labour Convention (No. 182) and Recommendation (No. 190), 1999

The elimination of discrimination

- Discrimination (Employment and Occupation) Convention (No. 111) and Recommendation (No. 111), 1958
- Equal Remuneration Convention (No. 100) and Recommendation (No. 90), 1951

1.2. *Conventions and Recommendations on occupational safety and health and working conditions*

- Labour Inspection Convention (No. 81) and Recommendation (No. 81), 1947
- Protection of Workers' Health Recommendation, 1953 (No. 97)

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- Plantations Convention (No. 110) and Recommendation (No. 110), 1958
 - Reduction of Hours of Work Recommendation, 1962 (No. 116)
 - Guarding of Machinery Convention (No. 119) and Recommendation (No. 118), 1963
 - Employment Injury Benefits Convention (No. 121) and Recommendation (No. 121), 1964
 - Labour Inspection (Agriculture) Convention (No. 129) and Recommendation (No. 133), 1969
 - Workers' Representatives Convention, 1971 (No. 135)
 - Occupational Cancer Convention (No. 139) and Recommendation (No. 147), 1974
 - Working Environment (Air Pollution, Noise and Vibration) Convention (No. 148) and Recommendation (No. 156), 1977
 - Occupational Safety and Health Convention (No. 155) and Recommendation (No. 164), 1981
 - Protocol of 2002 (recording and notification of occupational accidents and diseases) to the Occupational Safety and Health Convention, 1981 (No. 155)
 - Occupational Health Services Convention (No. 161) and Recommendation (No. 171), 1985
 - Asbestos Convention (No. 162) and Recommendation (No. 172), 1986
 - Chemicals Convention (No. 170) and Recommendation (No. 177), 1990
 - Night Work Convention (No. 171) and Recommendation (No. 178), 1990
 - Maternity Protection Convention (No. 183) and Recommendation (No. 191), 2000
 - Safety and Health in Agriculture Convention (No. 184) and Recommendation (No. 192), 2001
 - List of Occupational Diseases Recommendation, 2002 (No. 194)
 - Promotional Framework for Occupational Safety and Health Convention (No. 187) and Recommendation (No. 197), 2006
 - Recommendation concerning HIV and AIDS and the world of work, 2010 (No. 200)

1.3 Other relevant Conventions and Recommendations

- Welfare Facilities Recommendation, 1956 (No. 102)
- Workers' Housing Recommendation, 1961 (No. 115)

2. Selected ILO codes of practice with provisions which are relevant and applicable to agriculture

- *Protection of workers against noise and vibration in the working environment*, 1977
- *Guide to health and hygiene in agricultural work*, 1979
- *Safety in the use of asbestos*, 1984
- *Safety, health and working conditions in the transfer of technology to developing countries*, 1988
- *Safety in the use of chemicals at work*, 1993
- *Management of alcohol- and drug-related issues in the workplace*, 1996
- *Recording and notification of occupational accidents and diseases*, 1996
- *Protection of workers' personal data*, 1997
- *Safety and health in forestry work*, 1998
- *Ambient factors in the workplace*, 2001
- *HIV/AIDS and the world of work*, 2001

3. Relevant publications

- ILO. 1998. Declaration on Fundamental Principles and Rights at Work and its Follow-up, International Labour Conference, 86th Session (Geneva).
- . 1998. *Encyclopaedia of occupational health and safety*, fourth edition (Geneva) (four-volume print version and CDROM).
- . 1998. *Technical and ethical guidelines for workers' health surveillance*, Occupational Safety and Health Series, No. 72 (Geneva).
- . 2001. *Guidelines on occupational safety and health management systems, ILO-OSH 2001* (Geneva).
- . 2006. *Tackling hazardous child labour in agriculture: Guidance on policy and practice*, ISBN 978-92-2-118933
- ILO and IUF. 2004. *Health, safety and environment: A series of trade union education manuals for agricultural workers*.
- FAO. 2005. *International Code of Conduct on the Distribution and Use of Pesticides* (revised).
- United Nations. 2009. *Globally harmonized system of classification and labelling*, third revised edition (Geneva).
- World Health Organization. 2004. *Recommended Classification of Pesticides by Hazard and Guidelines to Classification*.

4. Web-based publications

International Forum on Chemical Safety (IFCS)

- *National profiles to assess the national infrastructure for management of chemicals* (available on the UNITAR website)

International Programme on Chemical Safety (IPCS)

- *Environmental Health Criteria*
- *Health and safety guides*
- *International chemical safety cards*
- *Pesticide safety data sheets*

Appendix I

Workers' health surveillance

(adapted from the ILO Technical and ethical guidelines for workers' health surveillance, 1998)

1. General principles

1.1. Competent authorities should ensure that laws and regulations governing workers' health surveillance are properly applied.

1.2. Workers' health surveillance should be carried out in consultation with workers and/or their representatives:

- (a) with the central purpose of primary prevention of occupational and work-related injuries and diseases;
- (b) under controlled conditions and within an organized framework, as may be prescribed by national laws and regulations and in accordance with the Occupational Health Services Convention, 1985 (No. 161), and Recommendation, 1985 (No. 171), and the ILO *Technical and ethical guidelines for workers' health surveillance*, Occupational Safety and Health Series, No. 72 (Geneva, 1998).

2. Organization

2.1. The organization of workers' health surveillance at different levels (national, industry, enterprise) should take into account:

- (a) the need for a thorough investigation of all work-related factors and the nature of occupational hazards and risks in the workplace which may affect workers' health;
- (b) the health requirements of the work and the health status of the working population;
- (c) the relevant laws and regulations and the available resources;
- (d) the awareness of workers and employers of the functions and purposes of such surveillance;
- (e) the fact that surveillance is not a substitute for monitoring and control of the working environment.

2.2. In accordance with the needs and available resources, workers' health surveillance should be carried out at national, industry, enterprise and/or other appropriate levels. Provided that surveillance is carried out or supervised by qualified occupational health professionals, as prescribed by national laws and regulations, it can be undertaken by:

- (a) occupational health services established in a variety of settings, e.g. within one enterprise or among enterprises;
- (b) occupational health consultants;
- (c) the occupational and/or public health facilities available in the community where the enterprise is located;
- (d) social security institutions;
- (e) worker-run centres;
- (f) contracted professional institutions or other bodies authorized by the competent authority;
- (g) a combination of any of the above.

2.3. A comprehensive system of workers' health surveillance should:

- (a) include individual and collective health assessments, occupational injury and disease recording and notification, sentinel event notification, surveys, investigations and inspections;

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- (b) comprise the collection of information from various sources, and the analysis and evaluation with regard to quality and intended use;
 - (c) determine action and follow-up, including:
 - (i) guidance on health policies and occupational safety and health programmes;
 - (ii) early warning capabilities so that the competent authority, employers, workers and their representatives, occupational health professionals and research institutions can be alerted to existing or emerging occupational safety and health problems.

3. Assessment

3.1. Medical examinations and consultations as the most commonly used means of health assessment of individual workers, either as part of screening programmes or on an as-needed basis, should serve the following purposes:

- (a) the assessment of the health of workers in relation to hazards or risks, giving special attention to those workers having specific needs for protection in relation to their health condition;
- (b) detection of pre-clinical and clinical abnormalities at a point when intervention is beneficial to individual health;
- (c) prevention of further deterioration in workers' health;
- (d) evaluation of the effectiveness of control measures in the workplace;
- (e) reinforcement of safe methods of work and health maintenance;
- (f) assessment of fitness for a particular type of work with due regard for the adaptation of the workplace to the worker, taking into account individual susceptibility.

3.2. Pre-assignment medical examinations, where appropriate, carried out before or shortly after employment or assignment, should:

- (a) collect information which serves as a baseline for future health surveillance;
- (b) be adapted to the type of work, vocational fitness criteria and workplace hazards.

3.3. During employment, medical examinations should take place at periodic intervals, as prescribed by national laws and regulations, and be appropriate to the occupational risks of the enterprise. These examinations should also be repeated:

- (a) on resumption of work after a prolonged absence for health reasons;
- (b) at the request of the worker, for example, in the case of change of work and, in particular, change of work for health reasons.

3.4. Where persons have been exposed to hazards and, as a consequence, there is a significant risk to their health in the long term, suitable arrangements should be made for post-employment medical surveillance for the purposes of ensuring the early diagnosis and treatment of such diseases.

3.5. Biological tests and other investigations should be prescribed by national laws and regulations. They should be subject to the workers' informed consent and performed according to the highest professional standards and least possible risk. These tests and investigations should not introduce unnecessary new hazards to the workers.

3.6. Genetic screening should be prohibited or limited to cases explicitly authorized by national legislation, in accordance with the ILO code of practice *Protection of workers' personal data*.

4. Use and records of data

4.1. Workers' personal medical data should:

- (a) be collected and stored in conformity with medical confidentiality, in accordance with the ILO code of practice *Protection of workers' personal data* (Geneva, 1997);

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- (b) be used to protect the health of workers (physical, mental and social well-being) individually and collectively, in accordance with the ILO *Technical and ethical guidelines for workers' health surveillance*.

4.2. The results and records of workers' health surveillance should:

- (a) be clearly explained by professional health personnel to the workers concerned or to persons of their choice;
- (b) not be used for discrimination, for which there should be recourse in national law and practice;
- (c) be made available, where requested by the competent authority, to any other party agreed by both employers and workers, to prepare appropriate health statistics and epidemiological studies, provided anonymity is maintained, where this may aid in the recognition and control of occupational injuries and diseases;
- (d) be kept during the time and under conditions prescribed by national laws and regulations, with appropriate arrangements to ensure that workers' health surveillance records are securely maintained for establishments that have closed down.

Appendix II

Surveillance of the working environment (according to the Occupational Health Services Recommendation, 1985 (No. 171))

1. The surveillance of the working environment should include:
 - (a) identification and evaluation of the hazards and risks which may affect the workers' safety and health;
 - (b) assessment of conditions of occupational hygiene and factors in the organization of work which may give rise to hazards or risks to the safety and health of workers;
 - (c) assessment of collective and PPE;
 - (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.
2. Such surveillance should be carried out in liaison with the other technical services of the undertaking and in cooperation with the workers concerned and their representatives in the undertaking and/or the safety and health committee, where they exist.
3. In accordance with national law and practice, data resulting from the surveillance of the working environment should be recorded in an appropriate manner and be available to the employer, the workers and their representatives in the undertaking concerned or the safety and health committee, where they exist.
4. These data should be used on a confidential basis and solely to provide guidance and advice on measures to improve the working environment and the safety and health of workers.
5. The competent authority should have access to these data. They may only be communicated to others with the agreement of the employer and the workers or their representatives in the undertaking or the safety and health committee, where they exist.
6. The surveillance of the working environment should entail such visits by the personnel providing occupational health services as may be necessary to examine the factors in the working environment which may affect the workers' health, the environmental health conditions at the workplace and the working conditions.
7. Without prejudice to the responsibility of each employer for the safety and health of workers in his/her employment, and with due regard to the necessity for the workers to participate in matters of occupational safety and health, personnel providing occupational health services should have such of the following functions as are adequate and appropriate to the occupational risks of the undertaking:
 - (a) carry out monitoring of workers' exposure to hazards and risks, when necessary;
 - (b) advise on the possible impact on the workers' health of the use of technologies;
 - (c) participate in and advise on the selection of the equipment necessary for the personal protection of the workers against occupational hazards;
 - (d) collaborate in job analysis and in the study of organization and methods of work with a view to securing a better adaptation of work to the workers;
 - (e) participate in the analysis of occupational accidents and occupational diseases and in accident prevention programmes;
 - (f) supervise sanitary installations and other facilities for the workers, such as drinking water, canteens and living accommodation, when provided by the employer.
8. Personnel providing occupational health services should, after informing the employer, workers and their representatives, where appropriate:

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- (a) have free access to all workplaces and to the installations the undertaking provides for the workers;
 - (b) have access to information concerning the processes, performance standards, products, materials and substances used or whose use is envisaged, subject to their preserving the confidentiality of any secret information they may learn which does not affect the safety and health of workers;
 - (c) be able to take for the purpose of analysis samples of products, materials and substances used or handled.

9. Personnel providing occupational health services should be consulted concerning proposed modifications in the work processes or in the conditions of work liable to have an effect on the safety and health of workers.

Appendix III

Standards with regard to occupational exposure limits for hazardous substances, heat and cold, noise and vibration and the assessment and monitoring of agricultural hazards related to machinery

1. Purpose

1.1. This appendix gives a general introduction to exposure limits for the use of employers and others, and indicates where more information can be obtained. Although some illustrative values are quoted, it is not the purpose of this appendix to list values, because these change continually as more technical information becomes available, and it is the responsibility of the competent authority to specify which exposure limits should be used and how.

1.2. Certain standard-setting bodies rely on technical expertise only. They do not accurately reflect the views of the social partners, e.g. trade unions. This should be taken into account when referring to the standards mentioned in this appendix.

2. General

2.1. An exposure limit (EL) is a level of exposure specified by a competent authority, or some other authoritative organization such as a professional body, as an indicator of the level to which workers can be exposed without serious injury. It is used as a general term and covers the various expressions employed in national lists, such as “maximum allowable concentration”, “threshold limit value”, “permissible level”, “limit value”, “average limit value”, “permissible limit”, “occupational exposure limit”, “industrial hygiene standards”, and so on. The exact definition and intended application of ELs vary widely from one authority to another, and the underlying definitions and assumptions and the requirements of the appropriate competent authority should be taken into account if they are used. For example, some authorities have promulgated ELs that are used as legally permitted “safe” levels of exposure and are intended to protect against injury, not against every health effect. Other authorities provide for limits intended as guidelines or recommendations in the control of potential workplace health hazards.

2.2. In Japan, administrative control levels are provided by the competent authority. These levels are not limits for individual exposure; they constitute an index to determine the control category (level of cleanliness), and to assess the adequacy of control measures in the working environment. The control category is based on the results of working environment measurements in the work area.

2.3. An important example of the caution to be applied in using ELs is provided in the introduction to the annual publication *Threshold limit values for chemical substances and physical agents and biological exposure indices* of the American Conference of Governmental Industrial Hygienists (ACGIH): threshold limit values (TLVs) “represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit; a smaller percentage may be affected more seriously”. Consequently, any EL represents a risk that is felt to be acceptable based on a particular criterion, and where such limits are promulgated there is usually an additional requirement to keep exposure as low as practicable, rather than simply below the EL.

2.4. It is also important to take into account the averaging period for which the limit is intended. Some limits are ceiling values to be continuously applied; others apply to average exposures over a period of up to several years. A short-period limit requires stricter control than a longer-period limit at the same exposure value. For example, a limit applying to a month might allow the exposure to range above the value for days at a time, provided there was a compensating period of low exposure that maintained the monthly average. If the same value were applied to 15-minute averages, the control would have to be good enough to keep every 15-minute average below the value.

2.5. ELs generally limit exposure of the individual, and measurements to be compared with the EL should therefore be taken close to the individual (“personal exposure”), unless the EL in question is clearly stated to be applicable to the general value in the workplace environment. A measurement result sometimes depends on the measurement method, and quality control of measurements is often important; employers should consult the occupational health service, including the competent authority, on these issues.

2.6. Some authorities issue lists of values to be used in biological monitoring or in biological effect monitoring. As with ELs, different lists are derived from different assumptions and are intended to be used in different ways. They include lists of values that are believed to be safe, and values that are not necessarily safe but that represent an acceptable standard of control.

3. General sources

3.1. It is the responsibility of the competent authority to specify what ELs should be used, and the responsibility of the employer to obtain this information from the competent authority for any particular hazard and to compare the EL values with exposure levels in workplaces in order to verify whether exposure is being properly controlled. A large number of international, national and other authorities have published lists of legal or recommended ELs of various sorts, but usually only for chemicals. The most wide-ranging is the ACGIH TLV list, updated annually, which includes recommended EL values for airborne chemicals; biological monitoring limits; ionizing, non-ionizing and optical radiation; thermal stress; noise; and vibration. The International Programme on Chemical Safety (IPCS) produces IPCS International Chemical Safety Cards, which are peer-reviewed assessment documents. International organizations, such as the International Organization for Standardization (ISO), produce technical standards on the measurement and control of several ambient factors with the objective of their being transferred to regional or national legislation.

3.2. For all the ambient factors dealt with in this code of practice, detailed guidance on ELs and other aspects of assessment and control is provided by the ILO *Encyclopaedia of occupational health and safety* (Geneva, fourth edition, 1998). Some references concerning ELs for particular ambient factors are given in the following sections.

4. Hazardous substances

4.1. ELs for solids and non-volatile liquids are usually in mg/m³ (milligrams of the chemical in a cubic metre of air). ELs for gases and vapours are usually in ppm (parts of the substance in a million parts of air, by volume), and also in mg/m³ at a specified temperature and pressure. A smaller number of lists of ELs is available for biological monitoring.

4.2. Many authorities have issued lists of ELs for airborne chemicals, on various assumptions. The International Occupational Safety and Health Information Centre (CIS) of the ILO maintains a database of the limits from different parts of the world. For the time being, peer-reviewed IPCS International Chemical Safety Cards are available for around 1,650 chemical substances.

4.3. There are European standards for:

- (a) the performance of measurement methods for airborne chemicals: EN 482: *Workplace atmospheres – General requirements for the performance of procedures for the measurement of chemical agents* (2006);
- (b) comparison of the results with ELs: EN 689: *Workplace atmospheres – Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy* (1995).

4.4. Recommended values are given in *Threshold limit values for chemical substances and physical agents and biological exposure indices* (see paragraph 2.3 above).

4.5. Prominent national standards are:

- (a) EH 40: *Occupational exposure limits* (United Kingdom, Health and Safety Executive (HSE)) (revised annually);
- (b) Technical code of practice TRGS 900 (Technische Regeln für Gefahrstoffe): *Grenzwerte in der Luft am Arbeitsplatz [Limit values relating to air in the workplace]* (Germany) (revised annually);

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- (c) Code of Federal Regulations, 1910. Subpart Z: *Toxic and hazardous substances* (United States Department of Labor, Occupational Safety and Health Administration, 2001).

5. Heat and cold

5.1. A series of international standards, including those of the ISO, is helpful in the assessment and monitoring of the thermal environment. ISO 11399:1995 *Ergonomics of the thermal environment – Principles and application of relevant international standards* is a useful guide to their application. ISO 15265:2004 describes a strategy for assessing and interpreting the risk of physiological constraints, or of discomfort, while working in a given climatic environment with steady or varying conditions of the climate, metabolic rate or clothing. It is oriented towards the prevention and/or control of these working problems in the heat or cold.

5.2. In hot environments, ISO 7243:1989 *Hot environments – Estimation of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature)* gives a rapid method based on the WBGT index, which will be satisfactory under most conditions. It may provide insufficient protection for work in impervious clothing, in high radiant temperature, or a combination of high temperature and high air velocity. Under these more severe conditions, ISO 7933:2004 *Hot environments – Analytical determination and interpretation of heat stress using calculation of the predicted heat strain* and ISO 9886:2004 *Ergonomics – Evaluation of thermal strain by physiological measurements* provide guidance for assessing individual response.

5.3. EN 563: *Safety of machinery – Temperatures of touchable surfaces – Ergonomics data to establish temperature limit values for hot surfaces* (1994) is also relevant.

5.4. For cold environments, ISO 15743:2008 presents a strategy and practical tools for assessing and managing cold risk in both indoor and outdoor work situations and includes: models and methods for cold risk assessment and management; a checklist for identifying cold-related problems at work; a model, method and questionnaire intended for use by occupational health-care professionals; guidance and instructions for individual cold protection; guidelines on how to apply thermal standards and other validated scientific methods when assessing cold-related risks. ISO 11079:2007 specifies methods and strategies for assessing the thermal stress associated with exposure to cold environments. These methods apply to continuous, intermittent as well as occasional exposure and type of work, indoors and outdoors.

5.5. The ACGIH publication *Threshold limit values for chemical substances and physical agents and biological exposure indices* (see paragraph 2.3 of this appendix) gives details of work/rest regimes and is revised annually.

6. Noise

6.1. Noise is conventionally measured in terms of the pressure of the sound wave. Because the ear responds roughly to the logarithm of the pressure, rather than its linear value, noise intensity is measured in decibels (dB), which are related to the logarithm of the ratio of the pressure of the sound to the pressure of a standardized least detectable sound. Also, the ear is more responsive to some frequencies than others, so measurements and ELs are in terms of dB(A), which takes a frequency weighting into account. All authorities specify an EL in terms of dB(A) applicable to eight-hour exposures, with a formula to deal with other exposure periods, and in most cases a peak EL as well. Some authorities apply stricter standards to particular environments. Users should apply standards that are adopted or recognized by the competent authority. These include a series of ISO standards on acoustics (1999:1990; 4871:1996; 9612:2009; 7196:1995; 11690:1996).

7. Vibration

7.1. ELs for vibration are usually in terms of the root-mean-square (rms) acceleration, frequency weighted to take human response into account. The standard is usually applied to eight-hour exposures, with a formula to account for shorter or longer periods.

7.2. For whole-body vibration, limits are applied to the longitudinal component (through the head and feet), to the two axes at right angles to this, and to a weighted combination of all three (ISO 2631-1:1997).

7.3. For hand-transmitted vibration, limits are applied to frequency-weighted acceleration along three orthogonal axes centred at the point of contact of the hand and the tool (ISO 5349-1:2001) provide guidance on measurement and evaluation.

8. Machinery

8.1. A series of international reports, including those of the ILO, is helpful in the assessment and monitoring of the agricultural hazards related to use of machinery. These include the *Safe construction and operation of tractors*, ILO code of practice (Geneva, International Labour Office, 1976); sections on machine safety of the *Encyclopaedia of occupational safety and health* (Geneva, International Labour Office, 1998); and *Safety and health in the iron and steel industry* (2005).

8.2. A number of international standards including those from the ISO may be helpful in the assessment and monitoring of agricultural machinery and equipment including: ISO 23.140 – Compressor and pneumatic machines; ISO 21.020 – Characteristics and designs of machines, apparatus and equipment; ISO 21.120 – Shafts and couplings; ISO 21.080 – Hinges, eyelets and other articulated joints; ISO 21.180 – Housing, enclosures and machine parts; ISO 21.220 – Flexible drives and transmissions; ISO 13.110 – Safety and machinery; ISO 13.140 – Noise with respect to humans; ISO 13.160 – Vibration and shock with respect to humans; ISO 13.240 – Protection against excessive pressure; ISO 13.340 – Protective equipment. Specific to agricultural machinery are a number of standards that are published and under development: ISO 65.060 – Agricultural machines, implements and equipment; ISO 65.060.01 – Agricultural machines and equipment in general; ISO 65.060.10 – Agricultural tractors and trailed vehicles; ISO 65.060.20 – Soil-working equipment; ISO 65.060.25 – Equipment for storage, preparation and distribution of fertilizers; ISO 65.060.35 – Irrigation and drainage equipment; ISO 65.060.40 – Plant care equipment; ISO 65.060.50 – Harvesting equipment; ISO 65.060.99 – Other agricultural machines and equipment.

Appendix IV

Additional information

Further guidance on the development and implementation of a cholinesterase monitoring programme is available from the Washington Department of Labor and Industries (<http://lni.wa.gov/Safety/Topics/AtoZ/Cholinesterase/>).

Appendix V

International instruments related to hazardous substances

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989

The Basel Convention was adopted in 1989 to set up a framework for controlling the movement of hazardous wastes across international frontiers. One of its central goals has been to promote environmentally sound management (ESM) in order to protect human health and the environment. ESM comprises an integrated life-cycle approach that seeks to minimize hazardous waste production whenever possible and involves strong controls from the generation of hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal. Current implementation efforts include focusing on prevention, minimization, recycling, recovery and disposal of hazardous and other wastes; the active promotion and use of cleaner technologies and production methods; and the improvement of institutional and technological capabilities, especially for developing countries and countries in transition.

Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 1998

The Rotterdam Convention, adopted in 1998, has two key objectives: to promote shared responsibility and cooperative efforts in the international trade of certain hazardous chemicals in order to protect human health and the environment; and to contribute to the environmentally sound use of those hazardous chemicals by facilitating information exchange. The Convention covers pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons. Some 40 such chemicals are currently included in the Prior Informed Consent (PIC) procedure, of which 25 are pesticides and four are severely hazardous pesticide formulations. Many more chemicals are expected to be added in the future. The Convention promotes the exchange of information on a broad range of chemicals. It does so through: the requirement for a party to the Convention to inform other parties of each national ban or severe restriction of a chemical; the possibility for a party which is a developing country or a country in transition to inform other parties that it is experiencing problems caused by a severely hazardous pesticide formulation under conditions of use in its territory; the requirement for a party that plans to export a chemical that is banned or severely restricted for use within its territory, to inform the importing party that such export will take place, before the first shipment and annually thereafter; the requirement for an exporting party, when exporting chemicals that are to be used for occupational purposes, to ensure that an up-to-date safety data sheet is sent to the importer; and labelling requirements for exports of chemicals included in the PIC procedure, as well as for other chemicals that are banned or severely restricted in the exporting country.

Stockholm Convention on Persistent Organic Pollutants (POPs), 2001

The Stockholm Convention, adopted in 2001, aims to protect human health and the environment from highly dangerous, long-lasting chemicals by restricting and ultimately eliminating their production, use, trade, release and storage. POPs are a group of compounds that possess toxic properties, resist degradation, and bio-accumulate. They are transported through air, water and migratory species across international boundaries and are deposited far from their place of release, where they accumulate in terrestrial and aquatic ecosystems. Health concerns associated with POPs include the fact that they accumulate in the fatty tissues of living organisms, can cause cancer and birth defects and may disrupt immune and reproductive systems. The first 12 compounds covered under the Convention are aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene, polychlorinated biphenyls, DDT, PCDD (dioxin) and PCDF (furans).

Appendix VI

A. Fluid intake table

Heat category	WBGT index °F	Light (easy) work		Moderate work		Hard (heavy work)	
		Work/rest	Water intake (quart/hr)	Work/rest	Water intake (quart/hr)	Work/rest	Water intake (quart/hr)
1	78-81.9	NL	1/2	NL	3/4	40/20 min	3 April
2 (green)	82-84.9	NL	1/2	50/10 min	3/4	30/30 min	1
3 (yellow)	85-87.9	NL	3/4	40/20 min	3/4	30/30 min	1
4 (red)	88-89.9	NL	3/4	30/30 min	3/4	20/40 min	1
5 (black)	>90	50/10 min	1	20/40 min	1	10/50 min	1

1. If wearing mission oriented protective posture 4, add 10 °F to WBGT
2. If wearing personal body armour, add 5 °F to WBGT in humid climates
3. Daily fluid intake should not exceed 12 quarts
4. Caution: Hourly fluid intake should not exceed one quart
5. Rest means minimal physical activity (sitting or standing), accomplished in shade if possible
6. NL=no limit to work time per hour
7. These work/rest time and fluid replacement volumes sustain performance and hydration for at least four hours of work in the specified work category. Individual water needs may vary $\pm 1/4$ qt/hr

B. Wind chill indices

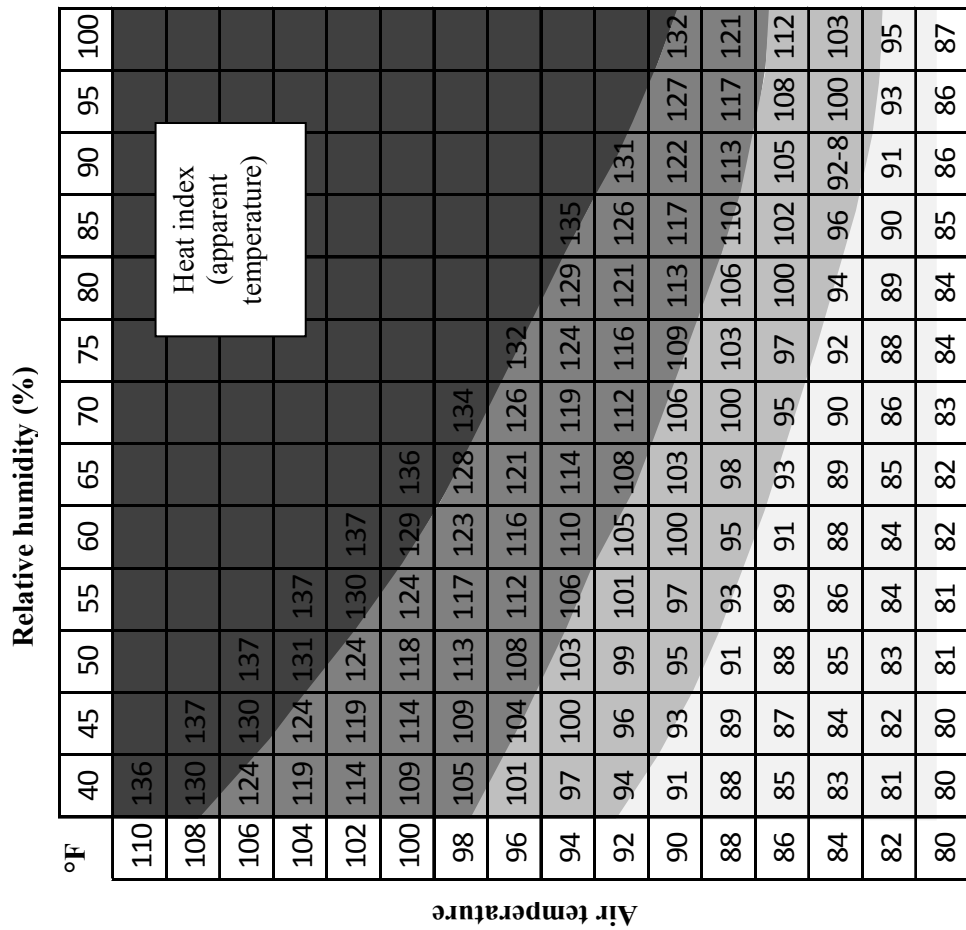
		Air temperature (Celsius)																									
		0	-1	-2	-3	-4	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60									
Wind speed (km/hr)	6	-2	-3	-4	-5	-7	-8	-14	-19	-25	-31	-37	-42	-48	-54	-60	-65	-71									
	8	-3	-4	-5	-6	-7	-9	-14	-20	-26	-32	-38		-50	-56	-61	-67	-73									
	10	-3	-5	-6	-7	-8	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63	-69	-75									
	15	-4	-6	-7	-8	-9	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66	-72	-78									
	20	-5	-7	-8	-9	-10	-12	-18	-24	-30	-37	-43	-49	-56	-62	-68	-75	-81									
	25	-6	-7	-8	-9	-10	-12	-19	-25	-32	-38	-44	-51	-57	-64	-70	-77	-83									
	30	-6	-8	-9	-10	-12	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72	-78	-85									
	35	-7	-8	-10	-11	-12	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73	-80	-86									
	40	-7	-9	-10	-11	-13	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74	-81	-88									
	45	-8	-9	-10	-12	-13	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75	-82	-89									
	50	-8	-10	-11	-12	-14	-15	-22	-29	-35	-42	-49	-56	-63	-69	-76	-83	-90									
	55	-8	-10	-11	-13	-14	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77	-84	-91									
	60	-9	-10	-12	-13	-14	-16	-23	-30	-36	-43	-50	-57	-64	-71	-78	-85	-92									
	65	-9	-10	-12	-13	-15	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93									
	70	-9	-11	-12	-14	-15	-16	-23	-30	-37	-44	-51	-58	-65	-72	-80	-87	-94									
	75	-10	-11	-12	-14	-15	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80	-87	-94									
	80	-10	-11	-13	-14	-15	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95									
	85	-10	-11	-13	-14	-16	-17	-24	-31	-39	-46	-53	-60	-67	-74	-81	-89	-96									
	90	-10	-12	-13	-15	-16	-17	-25	-32	-39	-46	-53	-61	-68	-75	-82	-89	-96									
	95	-10	-12	-13	-15	-16	-18	-25	-32	-39	-47	-54	-61	-68	-75	-83	-90	-97									
	100	-11	-12	-14	-15	-16	-18	-25	-32	-40	-47	-54	-61	-69	-76	-83	-90	-98									
	105	-11	-12	-14	-15	-17	-18	-25	-33	-40	-47	-55	-62	-69	-76	-84	-91	-98									
	110	-11	-12	-14	-15	-17	-18	-26	-33	-40	-48	-55	-62	-70	-77	-84	-91	-99									
		0 to -10 low							-10 to -25 moderate							-25 to -45 cold				-45 to -59 extreme				-60 plus very extreme			

C. Relative humidity

Relative humidity													
	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
80°	80	80	81	81	82	82	83	84	84	85	86	86	87
82°	81	82	83	84	84	85	86	88	89	90	91	93	95
84°	83	84	85	86	88	89	90	92	94	96	98	100	103
86°	85	87	88	89	91	93	95	97	100	102	105	108	112
88°	88	89	91	93	95	98	100	103	106	110	113	117	121
90°	91	93	95	97	100	103	105	109	113	117	122	127	132
92°	94	96	99	101	105	108	112	116	121	126	131		
94°	97	100	103	106	110	114	119	124	129	135			
96°	101	104	108	112	116	121	126	132					
98°	105	109	113	117	123	128	134						
100°	109	114	118	124	129	136							
102°	114	119	124	130	137								
104°	119	124	131	137									
106°	124	130	137										
108°	130	137											
110°	136												

Heat index	Category	Dangers
80-90	Caution	Fatigue possible with prolonged exposure and/or physical activity
91-105	Extreme caution	Sunstroke, heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity
106-129	Danger	Sunstroke, heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
130 or higher	Extreme danger	Heatstroke/sunstroke highly likely with continued exposure

D. Humidity chart



Extreme danger
High stroke or sunstroke highly likely
Danger
Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme caution
Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution
Fatigue possible

E. Heat stress index

Heat stress index	
Relative humidity	Air temperature F°
	70° 80° 90° 100° 110° 120°
0%	64° 73° 83° 91° 99° 107°
10%	65° 75° 85° 95° 105° 116°
20%	66° 77° 87° 99° 112° 130°
30%	67° 78° 90° 104° 123° 148°
40%	68° 79° 93° 110° 137°
50%	69° 81° 96° 120° 150°
60%	70° 82° 100° 132°
70%	70° 85° 106° 144°
80%	71° 86° 113°
90%	71° 88° 122°
100%	72° 91°

Heat sensation	Risk of heat injury
90°-105°	Possibility of heat cramps
105°-130°	Heat cramps or heat exhaustion likely; heat stroke possible
130°+	Heat stroke a definite risk