



16th Meeting of the Inter-Agency Committee on Radiation Safety

12-13 May 2011, ILO Geneva, Switzerland

ILO Activities on Occupational Radiation Protection

Dr. Shengli Niu



International Labour Organization



- The ILO is a tripartite organization with worker and employer representatives taking part in its work on equal status with those of governments.
- The number of the ILO member countries now stands at 183.
- In 1969 the ILO was awarded the Nobel Peace Prize



International Labour Organization (ILO)

Decent Work Agenda





Decent work



Four strategic objectives:

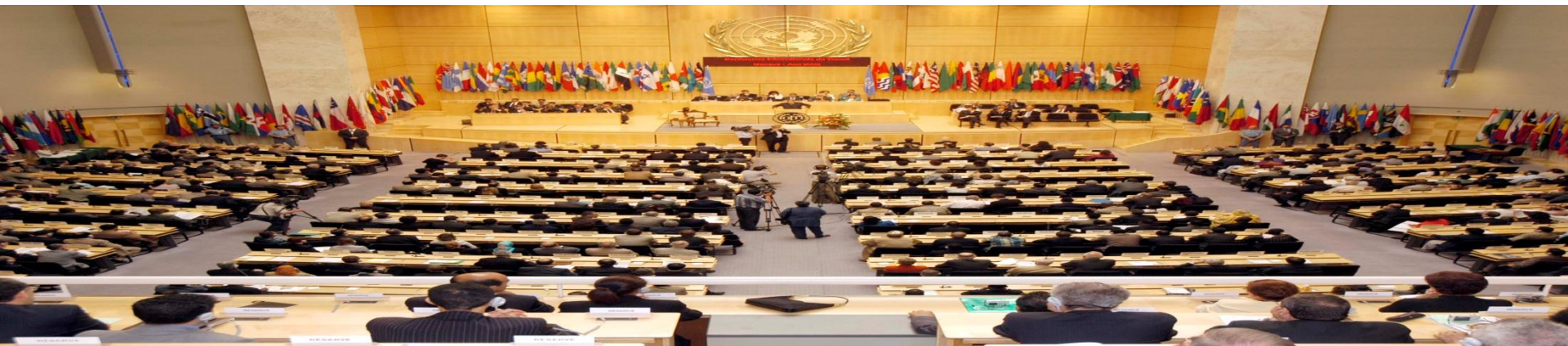
- fundamental principles and rights at work and international labour standards;
- employment and income opportunities;
- social protection and social security; and
- social dialogue and tripartism.



International Labour Organization



- **Standard-setting** is one of the ILO's major means of action to improve conditions of life and work worldwide.
- ILO standards are **Conventions** and **Recommendations** adopted by the International Labour Conference.



International Labour Conference

- Between 1919 and 2010, 188 Conventions and 199 Recommendations were adopted.
- Many of these instruments relate to occupational safety and health.





International Labour Standards



Ratifications of the last twelve months

April 2011

Kazakhstan

Asbestos Convention, 1986 (No. 162)

5.04.2011

March 2011

Czech Republic

Labour Inspection Convention, 1947 (No. 81)

16.03.2011

Labour Inspection (Agriculture) Convention, 1969 (No. 129)

16.03.2011

February 2011

Belgium

Occupational Safety and Health Convention, 1981 (No. 155)

28.02.2011

Occupational Health Services Convention, 1985 (No. 161)

28.02.2011

Russian Federation

Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)

24.02.2011

Switzerland

Maritime Labour Convention, 2006

21.02.2011

★ Cape Verde (All Fundamental Conventions have been ratified)

Minimum Age Convention, 1973 (No. 138)

7.02.2011

Minimum age specified: 15 years

November 2010

Turkmenistan

Worst Forms of Child Labour Convention, 1999 (No. 182)

15.11.2010

Portugal

Protocol of 2002 to the Occupational Safety and Health Convention, 1981

12.11.2010

Saint Vincent and the Grenadines

International Labour Organization

In June 1960, the International Labour Conference adopted Convention (No. 115) and Recommendation (No. 114) concerning the protection of workers against ionizing radiations.

International Labour Organization

- The C. 115 applies to **all activities** involving **exposure** of workers to ionizing radiations **in the course of their work** and provides that each Member of the ILO who ratifies it shall give effect to its provisions by means of laws or regulations, codes of practice or other appropriate methods.

Convention No. *CI15*

(Source: ILOLEX - 6.1.2010)

Ratified: 48 Conditional ratification: 0 Declared applicable: 0 Denounced: 0

Country	Ratification date	Status
Argentina	15.06.1978	ratified
Azerbaijan	19.05.1992	ratified
Barbados	08.05.1967	ratified
Belarus	26.02.1968	ratified
Belgium	02.07.1965	ratified
Belize	15.12.1983	ratified
Brazil	05.09.1966	ratified
Chile	14.10.1994	ratified
Czech Republic	01.01.1993	ratified
Denmark	07.02.1974	ratified
Djibouti	03.08.1978	ratified
Ecuador	09.03.1970	ratified
Egypt	18.03.1964	ratified
Finland	16.10.1978	ratified
France	18.11.1971	ratified
Germany	26.09.1973	ratified
Ghana	07.11.1961	ratified
Greece	04.06.1982	ratified
Guinea	12.12.1966	ratified
Guyana	08.06.1966	ratified
Hungary	08.06.1968	ratified
India	17.11.1975	ratified

Iraq	26.10.1962	ratified
Italy	05.05.1971	ratified
Japan	31.07.1973	ratified
Kyrgyzstan	31.03.1992	ratified
Latvia	08.03.1993	ratified
Lebanon	06.12.1977	ratified
Luxembourg	08.04.2008	ratified
Mexico	19.10.1983	ratified
Netherlands	29.11.1966	ratified
Nicaragua	01.10.1981	ratified
Norway	17.06.1961	ratified
Paraguay	10.07.1967	ratified
Poland	23.12.1964	ratified
Portugal	17.03.1994	ratified
Russian Federation	22.09.1967	ratified
Slovakia	01.01.1993	ratified
Spain	17.07.1962	ratified
Sri Lanka	18.06.1986	ratified
Sweden	12.04.1961	ratified
Switzerland	29.05.1963	ratified
Syrian Arab Republic	15.01.1964	ratified
Tajikistan	26.11.1993	ratified
Turkey	15.11.1968	ratified
Ukraine	19.06.1968	ratified
United Kingdom	09.03.1962	ratified
Uruguay	22.09.1992	ratified

International Labour Organization

The C. 115 and R.114 lay down **basic principles** and establish a **fundamental framework** for radiation protection of workers. They also contain provisions which concern the **protective measures** to be taken, the **monitoring** of radiation and the **medical supervision** of workers.

Convention No. 115

Issues of concern to the ILO:

- **Protective measures** be taken in the light of knowledge available at the time. *Article 1*
- **Exposure of workers to ionising radiations to the lowest practicable level** & any unnecessary exposure be avoided. *Article 5*
- **Dose limits for various categories of workers** be fixed and be kept under constant review in the light of current knowledge. *Article 6*
- Dose limits for young workers and worker under 16 be forbidden in work involving ionising radiations. *Article 7*

Convention No. 115

Issues of concern to the ILO:

- **Appropriate levels shall be fixed for workers who are not directly engaged in radiation work**, but who remain or pass where they may be exposed to ionizing radiations or radioactive substances. *Article 8*
- **Appropriate warnings** to indicate the presence of hazards from ionizing radiations and **adequate training and education** of workers before and during employment. *Article 9*
- **Requirements for notification of work involving exposure** of workers to ionizing radiations in the course of their work. *Article 10*
- **Monitoring** of working environment and assessment of workers' exposure. *Article 11*

Other ILO Conventions and Recommendations Relevant to the Radiation Protection of Workers

Occupational Cancer Convention No. 139 and Recommendation No. 147, 1974.

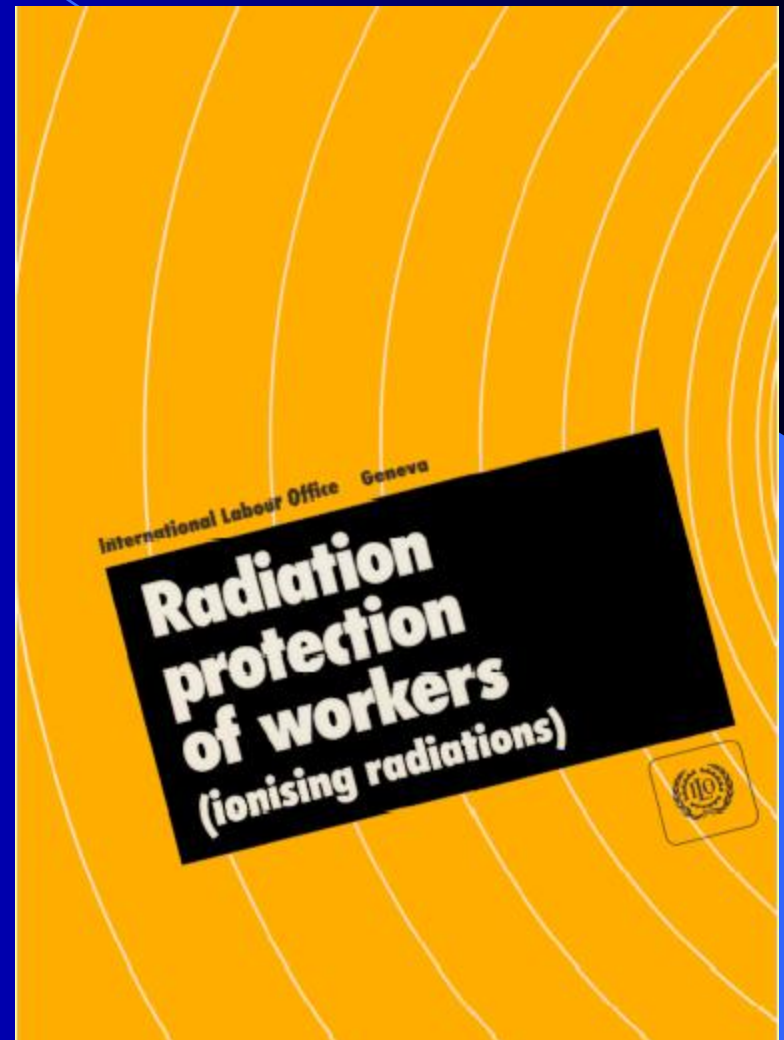
Working Environment (air pollution, noise and vibration) Convention No. 148 and Recommendation No. 156, 1977.

Employment Injury Benefit Convention No. 121, 1964.

The List of Occupational Diseases Recommendation No. 194, 2002.

Codes of Practice & Guidelines

ILO also provides **practical guidance** in the form of codes of practice or guidelines. They are used as reference work by anyone in charge of formulating detailed regulations or framing occupational safety and health programmes.





ILC.100/III/1A

International Labour Conference, 100th Session, 2011

Report of the Committee of Experts on the Application of Conventions and Recommendations

(articles 19, 22 and 35 of the Constitution)

Third item on the agenda:
Information and reports on the application of Conventions and Recommendations

Report III (Part 1A)

General Report
and observations concerning particular countries

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Appl 22.115

INTERNATIONAL LABOUR OFFICE

REPORT FORM

FOR THE

RADIATION PROTECTION CONVENTION, 1960 (No. 115)

The present report form is for the use of countries which have ratified the Convention. It has been approved by the Governing Body of the International Labour Office, in accordance with article 22 of the ILO Constitution, which reads as follows: "Each of the Members agrees to make an annual report to the International Labour Office on the measures which it has taken to give effect to the provisions of Conventions to which it is a party. These reports shall be made in such form and shall contain such particulars as the Governing Body may request."

Annexed to this report form will be found the text of a Recommendation whose provisions supplement those of the present Convention. The sole object of appending the text of this Recommendation to the report form is to contribute to a better understanding of the requirements laid down in the Convention and to facilitate its application.

The government is under no obligation to supply in its report on the application of the Convention information on the measures which may have been taken to give effect to the Recommendation as such; however, if the government deems it useful to supply such information in its report, by way of information on practical application, this would make it possible to assess more precisely the extent to which the Convention is applied and the problems which may have arisen in its application.

GENEVA 1960

Radiation Protection Convention, 1960 (No. 115) (ratification: 1978)

The Committee notes the information provided regarding effect given to *Article 7(1)(b) and (2) of the Convention*, and references made to new legislation adopted giving further effect to the Convention, as well as the detailed information provided regarding regulatory guides for different types of work involving possible exposure to radiation. The Committee further notes the observations from the Central Organisation of Finnish Trade Unions (SAK) included in the Government's report.

Articles 3(1) and 6(1) of the Convention. Effective protection of workers in the light of available knowledge; maximum permissible doses. The Committee notes from the SAK's comments that the dose limits for work-related exposure to radiation defined by the Radiation and Nuclear Authority (STUK) should be stricter on the basis of current research data. Noting that the Government does not address these concerns in its report, the Committee asks the Government to respond to the SAK's comments in its next report.

Article 12. Medical examinations. The Committee notes from the SAK's comments that health inspections are not carried out on all workers because of the use of temporary and subcontracted workers. *Noting that the Government does not address these concerns in its report, the Committee asks the Government to respond to the SAK's comments in its next report.*

Article 14. Alternative employment or other measures offered for maintaining income where continued assignment to work involving exposure is medically inadvisable. The Committee notes the Government's response that, according to the Employment Accidents Insurance Act (608/1948) compensation for injury or illness covers medical treatment, daily allowances, accident pension and handicap allowance, including any relevant supplements, compensation for costs and loss of income arising from physical therapy. However, with reference to its previous comments the Committee would again like to draw the Government's attention to what is stated in paragraph 32 of the 1992 general observation under the Convention, and the fact that this provision also relates to situations before any occupational disease has been declared but after a determination that continued assignment to work involving exposure to ionizing radiation has been found to be medically inadvisable. In such cases, paragraph 32 makes it clear that every effort must be made to provide the workers

concerned with suitable alternative employment, or to maintain their income through social security measures or otherwise. The Committee requests the Government to provide further information on measures taken to ensure that workers are offered alternative employment or to maintain their income when it has been determined that it is medically inadvisable for them to continue their work, including information on the situation of workers who have been employed for less than three years.

Part V of the report form. Application in practice. The Committee notes from the comments by the SAK that the occupational health-care provisions are not supervised and that no statistics are available on the implementation of statutory health inspections, or on negligence and related sanctions. *The Committee requests the Government to indicate measures taken to address the comments raised by the SAK and to provide a general appreciation on the application of the Convention including, for instance, extracts from inspection reports as well as statistical information on the number and outcome of such inspections.*

Basic Principles in Occupational Safety and Health

- **Responsibilities of the employer** towards the health and safety of the workers in his/her employment;
- **Role of the competent authority:** national policy, regulation, inspection, enforcement;

Basic Principles in Occupational Safety and Health

- **Basic workers' rights:** right to know, to participate, to stop work in case of imminent danger, etc.

Basic Principles in Occupational Safety and Health

Hierarchy of preventive measures(C.148,1977):

- technical measures,
- organizational measures,
- personal protective equipment;

And more recently (C. 176, 1995 Article 6):

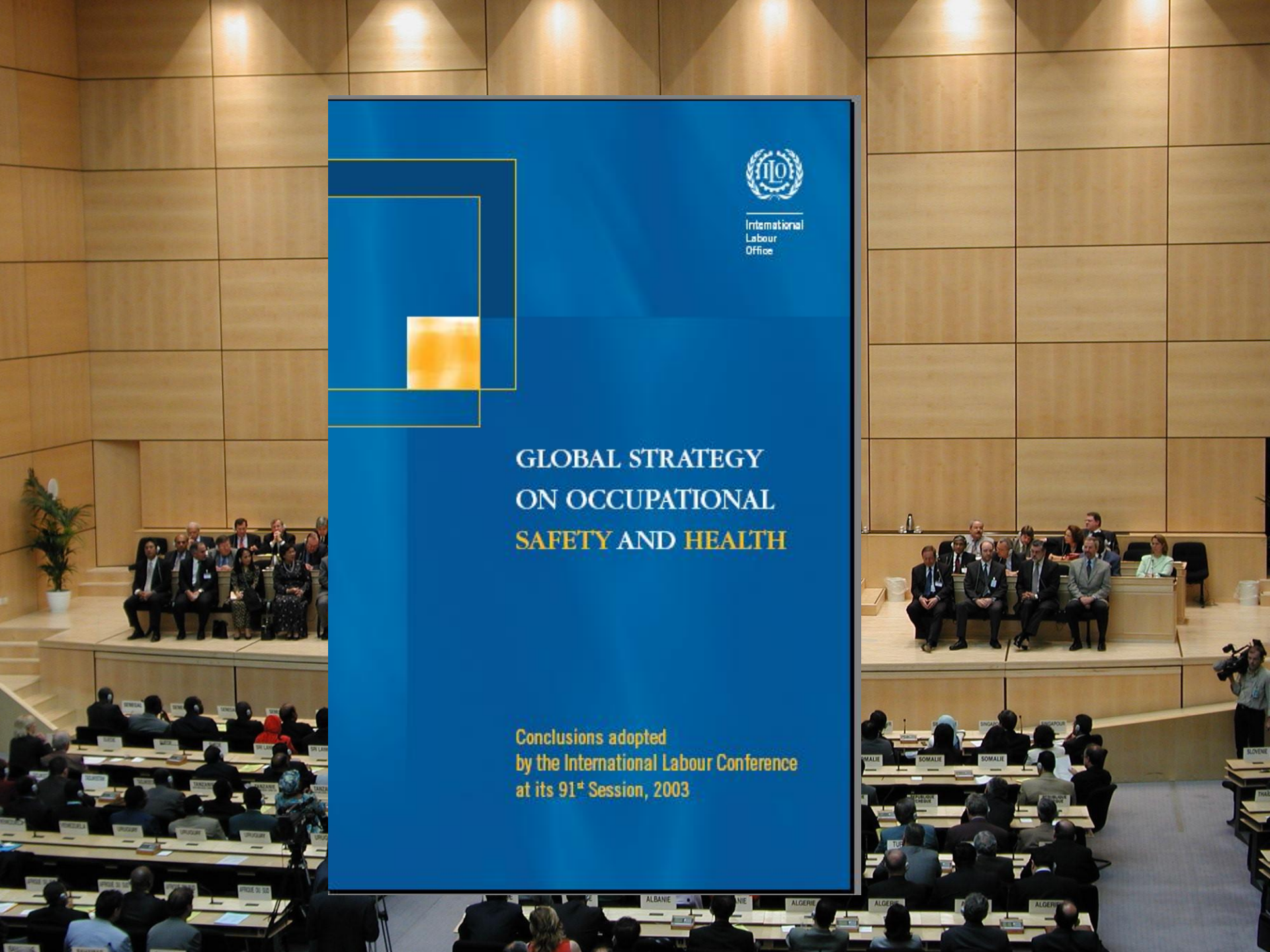
- elimination of risks,
- control measures, minimization of risks,
- personal protection equipment;



International
Labour
Office

GLOBAL STRATEGY ON OCCUPATIONAL SAFETY AND HEALTH

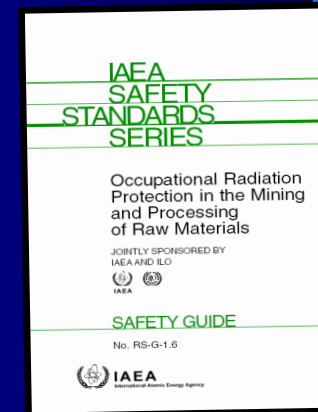
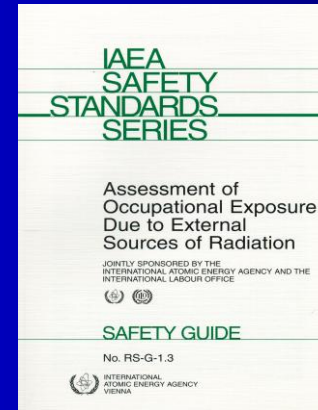
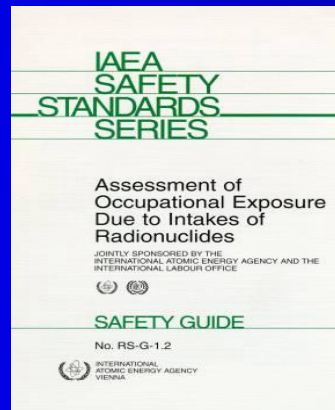
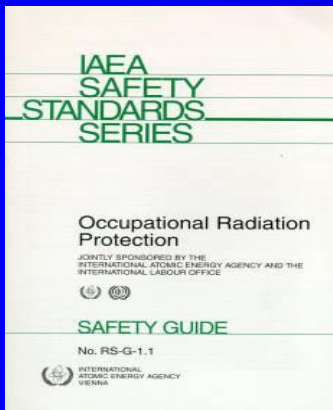
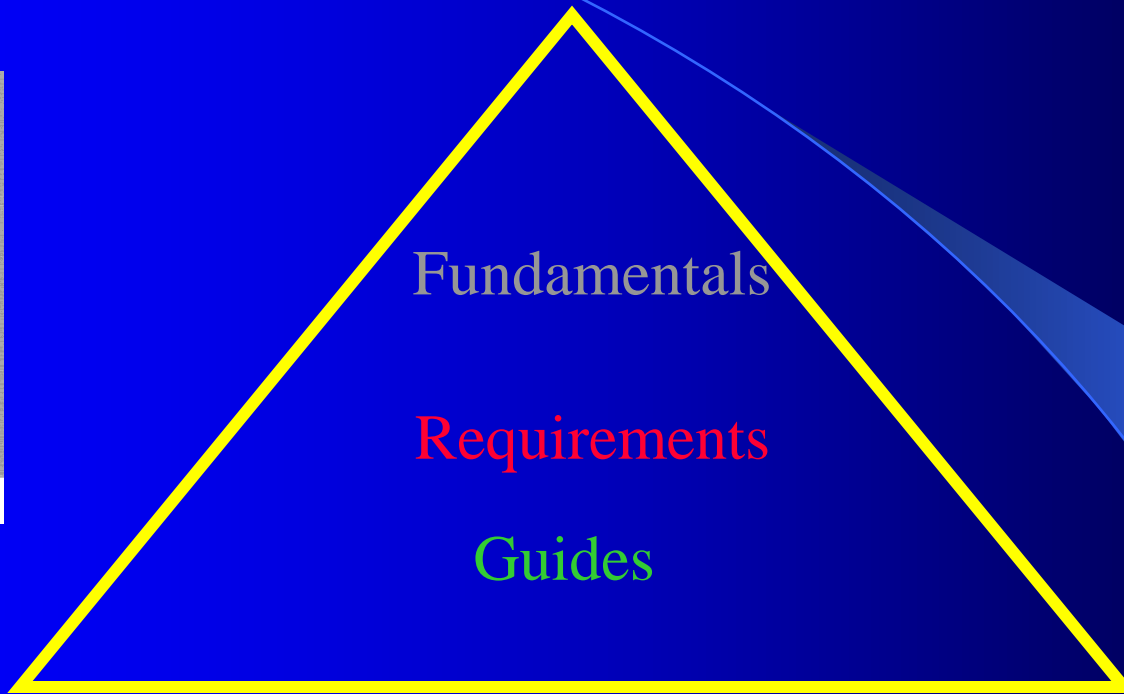
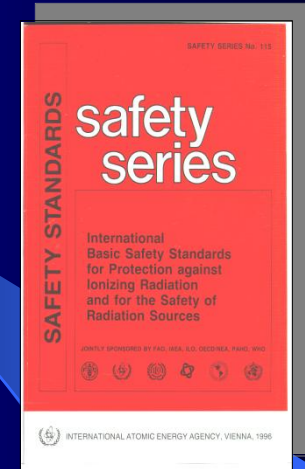
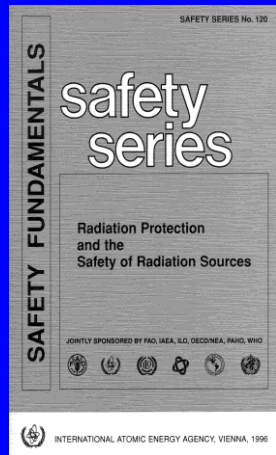
Conclusions adopted
by the International Labour Conference
at its 91st Session, 2003

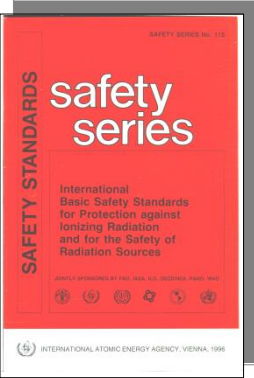


Fundamentals for Global Strategy

- **Building and maintenance of Safety Culture**
- **Integrated approach to OSH**
- **Concept of OSH Management Systems**
- **Active participation of**
 - *Government*
 - *Employers*
 - *Workers*

Hierarchy of IAEA standards





Revision of BSS



GB.298/152
29th Session

Governing Body

Geneva, March 2007

FOR DECISION

FIFTEENTH ITEM ON THE AGENDA

Report of the Director-General

Second Supplementary Report: International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources

- At its 261st (November 1994) Session, the Committee on Sectoral and Technical Meetings and Related Issues of the Governing Body was informed of the process which led to the elaboration of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS), jointly sponsored by the Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA), the ILO, the Organisation for Economic Co-operation and Development/Nuclear Energy Agency (OECD/NEA), the Pan American Health Organization (PAHO) and the World Health Organization (WHO).¹ The Committee recommended that the Governing Body approve publication of the Standards, which it did on 17 November 1994.
- The IAEA's Board of Governors approved the Standards on 12 September 1994. They were endorsed by PAHO on 28 September 1994. The Director-General of the FAO confirmed the FAO's technical endorsement of the Standards on 14 November 1994. The WHO completed its adoption process on 27 January 1995 and the Steering Committee of the OECD/NEA approved the Standards on 2 May 1995. After having completed this process of authorization, the Standards were published by the IAEA in 1996 (BSS – 1996 edition, Safety Series No. 115).
- Since then all the sponsoring organizations have worked in their own field of competence and jointly to assist member States in the implementation of the requirements of the Standards. The ILO has focused on occupational radiation protection and the promotion of the active involvement of employers, workers and their respective organizations. For the purpose of avoiding duplication of effort, providing uniform guidance and allowing an effective use of resources, the ILO has centred its radiation protection activities on cooperation with the IAEA and other international organizations aiming at the elaboration of a number of publications relevant to the radiation protection of workers.

¹ GB.261/STM.14/13 (Nov. 1994).

* Reference: GB.261/8/26.

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- An "International Conference on Occupational Radiation Protection: Protecting Workers against Exposure to Ionizing Radiation" took place at ILO headquarters from 28 to 30 August 2002. It was hosted by the Government of Switzerland, organized by the IAEA and convened jointly with the ILO. It was co-sponsored by the European Commission and was held with the cooperation of the WHO, OECD, United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), International Commission on Radiological Protection (ICRP), International Commission on Radiation Units and Measurements (ICRU), International Electrotechnical Commission (IEC), International Radiation Protection Association (IRPA) and the International Society of Radiology. The International Conference was attended by 324 participants from 70 countries and 13 organizations.² Its recommendations highlighted the cooperation between the IAEA and the ILO, suggested the formulation and implementation of an international action plan for occupational radiation protection and referred specifically to the ILO Radiation Protection Convention, 1960 (No. 115).
- Following the findings and the recommendations of this first International Conference, the IAEA General Conference in September 2002 made a request for the Agency's Director-General to look into the possibility of IAEA cooperation with the ILO and other relevant bodies on formulating and implementing, subject to the availability of resources, an international action plan for occupational radiation protection.³ A draft international action plan was elaborated and adopted by the General Conference of the IAEA in 2003.⁴ The Action Plan for Occupational Radiation Protection places the ILO Radiation Protection Convention, 1960 (No. 115), in focus and refers in this connection to the safety requirements on occupational exposure contained in the International Basic Safety Standards for Protection against Ionizing Radiation and the Safety of Radiation Sources (BSS – 1996 edition). This remark is particularly relevant in view of the reference to "knowledge available at the time" and "current knowledge", included in Article 3, paragraph 1, and Article 6, paragraph 2, of the Radiation Protection Convention, 1960 (No. 115). To facilitate the implementation of the international action plan, a steering committee was established consisting of representatives of member States, the European Community (EC), IAEA, ICFTU, ILO, IOE and WHO. The IAEA General Conference in 2004 and 2006 twice welcomed the implementation of the action plan and encouraged the Agency and the ILO secretariat to continue their productive cooperation.
- Two years have passed since the publication of the Standards (BSS – 1996 edition), and in 2005 the IAEA General Conference encouraged the Agency secretariat to undertake a review of them.⁵ Consequently, a thorough review has been conducted by the IAEA with the participation of the co-sponsors and other international organizations which might co-sponsor the revised BSS and has come to the conclusion that, while no single issue creates a compelling need to revise the BSS, there is a case to be made for revision to deal with the many improvements that have been suggested. A secretariat has been established, addressing the September 2006 IAEA General Conference Resolution "... that the

² IAEA – Board of Governors/General Conference: GOV/2002/33: A4.2 – GC(46)/11:AM.2, 6 Sep. 2002.

³ IAEA General Conference Resolutions: GC(46)/RES-9, para. 17, Sep. 2002.

⁴ IAEA Board of Governors/General Conference: GOV/2003/47 – GC(47)/7.4, Aug. 2003.

⁵ IAEA General Conference Resolutions: GC(48)/RES-10, para. 20, and GC(50)/RES-10, para. 31.

⁶ IAEA General Conference Resolutions: GC(49)/RES-9, para. 10.

⁷ IAEA General Conference Resolutions: GC(50)/RES-10, para. 16.

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revision of the BSS is to be co-ordinated by a secretariat established by the Agency with the participation of the co-sponsors, and urges that secretariat to carefully consider and justify potential changes, taking into account their implications for national regulations."

- The IAEA is to start the drafting process to revise the Standards (BSS – 1996 edition) and invites all the current and potential (EC and the United Nations Environment Programme (UNEP)) co-sponsors to participate. The intention is to proceed with the elaboration of the current Standards (BSS – 1996 edition). This would include:
 - development of the draft standards through ad hoc drafting working meetings and technical committee meetings in 2007 and 2008;
 - review and approval by the IAEA Safety Standards Committees;
 - revision of the draft, taking into account the comments by member States, representatives of employers and workers, co-sponsoring organizations and other stakeholder organizations;
 - appointment of experts nominated after consultations with the Employers' and Workers' groups of the Governing Body to participate in the technical committee meetings alongside the Office;
 - approval by the IAEA Safety Standards Committees and by the IAEA Board of Governors;
 - approval or endorsement by the other co-sponsoring organizations; and
 - approval of the publication of the revised Standards by the ILO Governing Body.
- Direct involvement of employers' and workers' organizations alongside governments in the revision of the Standards is very important. The Office will work with the IAEA and other co-sponsoring organizations to extend invitations to the international employers' and workers' organizations having consultative status with the ILO, as well as to the International Social Security Association (ISSA), so that they can be represented at the technical committee meetings.
- The Governing Body is invited to take note of the information included in this paper and invite the Employers' and Workers' groups of the ILO Governing Body to appoint one expert and one alternative each for participation in the technical committee meetings which are tasked with revising the BSS.

Geneva, 31 January 2007.

Point for decision: Paragraph 9.

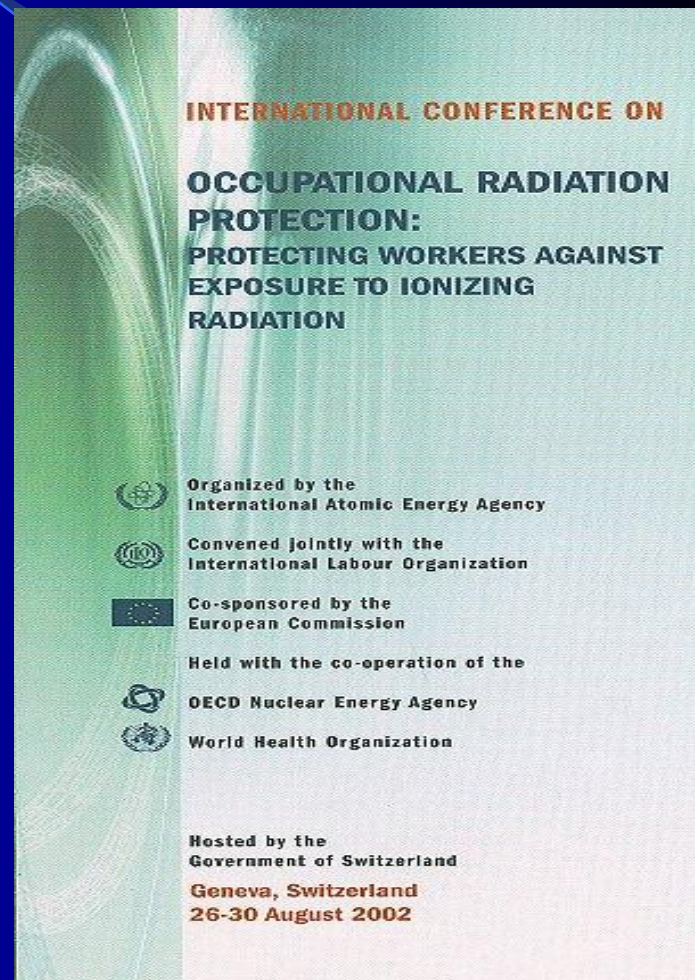
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3



International Action Plan for Occupational Radiation Protection

- Developed by IAEA in co-operation with ILO.
- Approved by the IAEA Board of Governors on 8 September 2003.
- Fourteen actions grouped in areas, such as:
 - ILO Convention 115
 - Information exchange
 - Education and awareness
 - Promotion of a holistic approach to workplace safety
 - Protection of pregnant workers
 - Probability of causation



Summary Outline from ILO/IAEA Steering Committee Secretariat

DEVELOPING COHERENT APPROACH TO RADIATION AND OTHER RISKS FACTORS AT WORK PLACE

Joint publication

Foreword (cosponsors IAEA, ILO, WHO...)

Preface

Objectives (balancing risk management, interface between risks, cross fertilisation) and target audience (health physicists, and counter part in occupational health and safety, managers, workers, regulatory bodies)

Introduction

Background information (historical background occupational radiation protection and other occupational risks management are quite separated).

Chapter 1 Philosophy, principles and system

Discussion of fundamental principles from a philosophical point of view and their implications on the risk management principles for radiological and non-radiological risks (different approaches for controlling, preventing and protecting).

Start with UN human rights; radiological protection approach (philosophical principles precaution, equity and impact on radiological protection system principles); ILO principles (right to be protected, to participate, systemic approach, working environment as part of human environment ILO/UNEP); WHO principles (.....)

Chapter 2 Technical tools for risk assessment, management, communication

ALARA programmes features for radiological protection; technical optimisation of radiological protection; Who is doing what? Taking care of the four risk factors (technological, behavioural, working conditions, work organisation)

Use ILO guidelines (ILO OSH 2001 the occupational safety and health management system), ILO list of occupational risks

Use of WHO documents

As appropriate, use IATA, IMO, documents

Chapter 3 Examples of managing risks in different activity sectors

Management of several risks in different activity sectors (nuclear, petroleum, mines, medical sector, chemical)

1/ What are the main characteristics of your risk management systems? What are the main risks you are dealing with? Provide numerical values on risks and costs?

2 How do you avoid conflicts between different risks management?

3/ How do you increase coherence, complementarities and synergies between different risks management?

4/ Is an ALARA approach worthwhile outside radiological risk management?

5/ Is the cradle to grave approach useable for radiological protection? ...

6/ Do you include benchmarking in your risk management system?

Chapter 4 Examples of regulating and controlling occupational risks in different countries

Examples of regulatory infrastructures and institutional arrangements, actions and behaviour dealing with radiological protection and dealing with other risks management, from countries including industrialised, in transition and developing, with and without nuclear facilities.

Chapter 5 Findings and conclusions

Recommendation on holistic approach of risk assessment, management and communication at the work place

Flowcharts;

Recommendations on how to implement risk assessment and balancing of risks at the workplace.

Glossary (mix ILO, EAN-Antwerp,...)

Annexe : examples in different industries and countries

Action 14: The IAEA, in collaboration with ILO, WHO, NEA and other relevant bodies and drawing on the experience of other stakeholders, to continue its work on developing international guidance for aiding decision-making on the attribution of cases of detrimental health effects to occupational exposure to ionizing radiation.

APPROACHES TO ATTRIBUTION OF DETRIMENTAL HEALTH EFFECTS TO OCCUPATIONAL IONIZING RADIATION EXPOSURE AND THEIR APPLICATION IN COMPENSATION PROGRAMMES FOR CANCER

Edited by
Shengli Niu, Pascal Deboodt and Hajo Zeeb



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Labour
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Geneva



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Occupational
safety and health
series 73

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Consultants Meetings

Vienna, Austria: 13-17 October 2003
Bad Münstereifel, Germany, 22-24 May 2006

Social Protection

Programme on Safety and Health at Work and the Environment (SAFEWORK)

> [SAFEWORK home](#)

Fukushima nuclear accidents: Information resources

Following a major 9.0 magnitude earthquake and tsunami which struck north-eastern Japan on 11 March 2011, the Fukushima nuclear power plants have experienced equipment failures which caused a series of explosions, fires, injuries to the plant workers and emergency responders and radiation releases.

Type	Resource list
Date issued	18 March 2011
Regions and countries covered	Japan
Unit responsible	Programme on Safety and Health at Work and the Environment (SAFEWORK)
Subjects	hazardous work, occupational safety and health, natural disasters

The status of the Fukushima Daiichi Nuclear Power Plant accident and its effects on the safety and health of the workers and the public are regularly updated on-line on the websites of the related national and international nuclear and health authorities and on the website of the operator of the Fukushima nuclear power plant.

List of reliable on line sources for the latest information on the status of nuclear reactors and radioactive releases:

- [International Atomic Energy Agency](#)
- [World Health Organization](#) (FAQs: Japan nuclear concerns)
- [Japan Nuclear and Industrial Safety Agency](#) (national nuclear regulatory authority)
- [Japan Atomic Industrial Forum](#) (national nuclear industry forum)
- [Tokyo Electric Power Company](#) (operator of the Fukushima nuclear power plant)
- [Information on levels of radioactivity](#) (from the Ministry of Education, Culture, Sports, Science and Technology of Japan)
- [Location of nuclear power plants in Japan](#)
- [Basic design information for boiling water reactors \(BWRs\)](#)

For more information about ILO's activities on radiation protection

- [Protecting workers against radiation: ILO activities](#)
- [Main ILO Instruments and Publications on Radiation Protection](#)

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Radiation Safety and Protection of Workers in Nuclear and Radiological Emergency Operations

Workers working in response to the emergency at the site of the Fukushima Daiichi's nuclear plant are exposed to traditional OSH risks including explosion and fire as well as to radiation. The International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS) provide a worldwide basis for harmonized radiation protection standards that complement the ILO Convention No. 115 and for the protection of workers engaged in nuclear and radiological emergency operation.

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Unit responsible	Programme on Safety and Health at Work and the Environment (SAFework)
Contact(s)	niu@ilo.org , Dr Shengli Niu - Senior Specialist in Occupational Health
Subjects	hazardous work, occupational safety and health

Background

The massive earthquake and resulting tsunami on 11 March 2011 that struck the northeast coast of Japan disabled the Fukushima Daiichi nuclear plant. The earthquake triggered the shutdown of the three active reactors at the plant and the subsequent tsunami stopped the plant's backup diesel generators, causing a station blackout. The subsequent lack of cooling led to explosions and partial meltdowns at the plant facility, with problems at all six reactor units and the central spent fuel pool. Radiation releases¹ caused large evacuations, concern over food and water supplies, and the treatment of nuclear and emergency workers.

Risks for the emergency workers

Workers working in response to the emergency at the site of the Fukushima Daiichi's nuclear plant are exposed to traditional OSH risks including explosion and fire as well as to radiation.

Exposure to ionizing radiation can induce the death of cells on a scale that can be extensive enough to impair the function of the exposed tissue or organ. At whole-body doses approaching 1Gray (Gy) and above, acute health effects such as acute radiation syndrome may develop. The effect is more severe for a higher dose.

Exposure to moderate levels can result in radiation sickness, which produces a range of symptoms. Nausea and vomiting often begin within hours of exposure, followed by diarrhoea, headaches and fever.



Workers operated this type of water canon to cool the plant at Fukushima

Related information

Document

▶ [Radiation Protection](#)

Normative instrument

▶ [C115 Radiation Protection Convention, 1960](#)

Publication

▶ [International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources. IAEA Safety Series No. 115 - \[pdf 3478 KB\]](#)

Resource list

▶ [Fukushima nuclear accidents: Information resources](#)

After the first round of symptoms, there may be a brief period with no apparent illness, but this may be followed within weeks by new, more serious symptoms.

At higher levels of radiation, all of these symptoms may be immediately apparent, along with widespread - and potentially fatal - damage to internal organs. Exposure to a radiation dose of 4 Gy will typically kill about half of all healthy adults.

Exposure to radiation can also induce the non-lethal transformation of cells, which may still retain their capacity for cell division. The human body's immune system is very effective in detecting and destroying abnormal cells. However, there is a possibility that the non-lethal transformation of a cell could lead, after a latency period, to cancer in the individual exposed, if it is a somatic cell; or may lead to hereditary effects, if it is a germ cell. Such effects are assumed to be proportional to the dose received and have no threshold. The "detriment-adjusted nominal risk coefficient of dose", which includes the risks of all cancers and hereditary effects, is 5% per sievert (Sv).

Prevention and protection measures for emergency workers

The [International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources \(BSS\)](#) - [pdf 3478 KB], formally published in 1996, are jointly developed and sponsored by the Food and Agriculture Organization of the United Nations (FAO), the IAEA, the ILO the Nuclear Energy Agency of the Organization for Economic Co-operation and Development (OECD/NEA), the Pan American Health Organization (PAHO) and the World Health Organization (WHO). The BSS provide a worldwide basis for harmonized radiation protection standards that complement the [ILO Convention No. 115](#). As to the protection of workers engaged in nuclear and radiological emergency operation, the BSS stipulate:

V.27. *No worker undertaking an intervention² shall be exposed in excess of the maximum single year dose limit for occupational exposure specified in Schedule II, except:*

(a) *for the purpose of saving life or preventing serious injury;*

(b) *if undertaking actions intended to avert a large collective dose; or*

(c) *if undertaking actions to prevent the development of catastrophic conditions.*

When undertaking intervention under these circumstances, all reasonable efforts shall be made to keep doses to workers below twice the maximum single year dose limit, except for life saving actions, in which every effort shall be made to keep doses below ten times the maximum single year dose limit in order to avoid deterministic effects on health. In addition, workers undertaking actions in which their doses may approach or exceed ten times the maximum single year dose limit shall do so only when the benefits to others clearly outweigh their own risk.

V.28. *Workers who undertake actions in which the dose may exceed the maximum single year dose limit shall be volunteers³ and shall be clearly and comprehensively informed in advance of the associated health risk, and shall, to the extent feasible, be trained in the actions that may be required.*

V.29. *The legal person responsible for ensuring compliance with the foregoing requirements shall be specified in emergency plans.*

V.30. Once the emergency phase of an intervention has ended, workers undertaking recovery operations, such as repairs to plant and buildings, waste disposal or decontamination of the site and surrounding area, shall be subject to the full system of detailed requirements for occupational exposure prescribed in Appendix I.

V.31. All reasonable steps shall be taken to provide appropriate protection during the emergency intervention and to assess and record the doses received by workers involved in emergency intervention. When the intervention has ended, the doses received and the consequent health risk shall be communicated to the workers involved.

V.32. Workers shall not normally be precluded from incurring further occupational exposure because of doses received in an emergency exposure situation. However, qualified medical advice shall be obtained before any such further exposure if a worker who has undergone an emergency exposure receives a dose exceeding ten times the maximum single year dose limit or at the worker's request.

Annex – Dose limits for workers engaged in nuclear and radiological emergencies in selected countries

Canada

The Radiation Protection Regulations state the following under the heading "Emergencies":

15. (1) During the control of an emergency and the consequent immediate and urgent remedial work, the effective dose and the equivalent dose may exceed the applicable dose limits prescribed by sections 13 and 14, but the effective dose shall not exceed 500 mSv and the equivalent dose received by the skin shall not exceed 5 000 mSv.

(2) Subsection (1) does not apply in respect of pregnant nuclear energy workers who have informed the licensee in accordance with subsection 11(1).

(3) The dose limits prescribed by sections 13 and 14 and subsection (1) may be exceeded by a person who acts voluntarily to save or protect human life.

Note that sections 13 and 14 stipulate the "regular" equivalent and effective dose limits for both workers and the public.

France

The present regulation is the following:

- 100 mSv during the whole intervention (emergency exposure situations)
- 300 mSv when the intervention is for saving lives which can be exceeded in exceptional circumstances for saving human lives. These exceptional cases require special authorization with voluntary rescue operators well informed about the risk they take.
- In no case the total cumulated effective dose must exceed 1 Sv.

The above values are for "specialists" of interventions in emergency situations (people who have received a special training).

For "non-specialists" the reference level is 10 mSv per intervention (these people are only informed about the risk).

The Republic of Korea

The Korean regulations which adopted the 1990 ICRP Recommendations set the dose limits for emergency workers as follows:

- Effective dose: 500 mSv
- Skin (extremity): 5 Sv(Gy)
- No limits in case of life saving actions.

The regulations include no specific criteria for applying these limits.

The Russian Federation

The Russian regulations of Radiation Safety Standards NRB-99/2009

Maximum doses for emergency workers in the emergency exposure situations are:

- Effective dose 200 mSv;
- Equivalent dose to the lens of the eye – 600 mSv;
- Equivalent dose to the skin – 2000 mSv;
- Equivalent dose to the extremity – 2000 mSv.

¹ On 11 March 2011, the Japanese government declared a "nuclear power emergency", evacuated residents living within a 20 km (12 mile) zone around the plant and urged that those living between 20 km and 30 km from the site to stay indoors. The latter zone was later subject to voluntary evacuation. About 170,000–200,000 people were evacuated after officials voiced the possibility of core damage. On 18 March, based on the International Nuclear and Radiological Event Scale (INES), the Japanese Ministry of Economy, Trade and Industry assessed the safety significance rating of the accident at the plant as Level 5. On 12 April, this assessment was revised to Level 7 following information obtained from estimations of the amount of radioactive material discharged to the atmosphere.

² Workers undertaking an intervention may include, in addition to those employed by registrants and licensees, such assisting personnel as police, firemen, medical personnel and drivers and crews of evacuation vehicles.

³ Workers undertaking an intervention may include, in addition to those employed by registrants and licensees, such assisting personnel as police, firemen, medical personnel and drivers and crews of evacuation vehicles.

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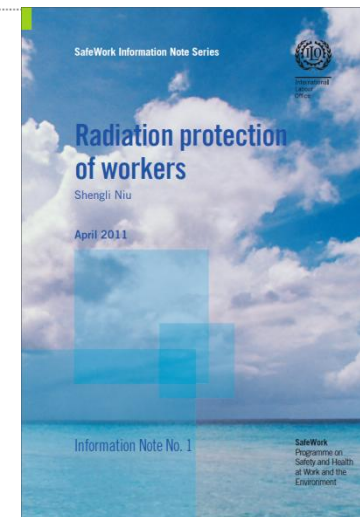
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Radiation protection of workers

SafeWork Information Note Series, Information Note No. 1

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<i>Download</i>	English - pdf 5434 KB

The purpose of this Information note is to provide information about the size of the workforce affected by, and the occupational activities associated with, exposure to radiation and the relevant ILO instruments on the protection of workers.



Related information

Document

[▶ Radiation Protection](#)[^ top](#)

ILO & Collaboration on Radiation Protection

- RASSC
- IACRNE
- IACRS

An aerial photograph of a city, likely Oslo, Norway, showing a dense urban area with various buildings, a harbor with many boats, and a large mountain range in the background. The foreground is filled with lush green trees.

Thank you all!

Dr. Shengli Niu
ILO/SafeWork

