Software for the IAEA Occupational Radiation Protection Standards

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INTRODUCTION

The International Atomic Energy Agency (IAEA) is, according to its statute, charged with establishing or adopting, in collaboration with other competent international bodies, standards for safety for protection of health and to provide for the application of these standards. Basic requirements for radiation protection against exposure to ionizing radiation of workers, members of the public and patients are given in the *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (hereafter referred to as the BSS), jointly sponsored by the Food and Agriculture Organization (FAO), the International Atomic Energy Agency (IAEA), the International Labour Organisation (ILO), the OECD-Nuclear Energy Agency (OECD-NEA), the Pan American Health Organization (PAHO) and the World Health Organization (WHO)[1].

The objective of the IAEA Occupational Protection Programme, within the Division of Radiation and Waste Safety, is to promote an internationally harmonized approach for optimizing occupational radiation protection through:

– developing safety standards for restricting radiation exposures in the workplace - in collaboration with the ILO - and for applying current occupational radiation protection techniques, and

– providing for the application of these standards through: the fostering of information exchange on occupational techniques in specific working environments, the promotion of education and training in techniques for occupational radiation protection and the rendering of services through the Information System on Occupational Exposure (ISOE).

The Safety Standards Series comprises three levels of documents: Safety Fundamentals, Safety Requirements and Safety Guides. The Safety Fundamentals, *Radiation Protection and the Safety of Radiation Sources* [2], explain the approaches to radiation protection and safety for persons in senior political or regulatory positions and persons who, although not safety specialists, make decisions relating to the uses of radiation in medicine, industry, agriculture and other areas.

The BSS deal with the basic requirements which must be met in order to ensure the safety of particular activities. These requirements are governed by the basic objectives, concepts and principles presented in the Safety Fundamentals documents. The written style of the BSS, with "shall" statements is that of regulatory documents so that the Safety Requirements may be adopted by States, at their own discretion, as national regulations. The BSS, which were published in English in 1996, establish basic requirements for radiation protection and safety, specify obligations and responsibilities and set out the requirements for application to practices and in intervention situations.

A set of three Safety Guides concerning the application of the BSS to the control of occupational exposures have been developed in a co-ordinated fashion as indicated by their related titles. They are co-sponsored by the International Labour Office (ILO) and were published in Autumn 1999. The Safety Guides documents contain recommendations, with "should" statements.

The Safety Guide on *Occupational Radiation Protection* [3] deals with the overall implementation of the requirements in the BSS, giving general advice on the exposure conditions for which monitoring programmes should be set up to assess radiation doses arising from external radiation and from intakes of radionuclides by workers. This Safety Guide addresses the technical and organizational aspects of the control of occupational exposures, in situations of both normal and potential exposure. The intention is to provide an integrated approach to the control of normal and potential exposures due to external and internal irradiation from both artificial and natural sources of radiation.

The supplementary Safety Guide [4] on the *Assessment of occupational exposure due to external sources of radiation* contains guidance on establishing monitoring programmes for external exposure and the second supplementary Guide [5] on *Assessment of occupational exposure due to intakes of radionuclides* addresses the assessment of exposure due to intakes of radionuclides in the workplace.

While the recommendations in these three Safety Guides are intended for regulatory authorities, they will also be useful to employers, licensees and registrants, to management bodies and their special advisers, to health and safety committees concerned with the radiation protection of workers and to those responsible for the operation of individual monitoring.

Following upon a successful publication of the BSS on Diskette in 1997 (SS 115 version 3.1 Windows

program, ISBN 92-0-100997-6) it was decided to develop a software program including the three Safety Guides on Occupational Radiation Protection. The ORPGUIDE program (ORPGUIDE version 4.1 Windows program) contains, in addition to the three Safety Guides on Occupational Radiation Protection [3-5] also the Safety Fundamentals [2] and the BSS [1] . This software will be issued by the IAEA in 2000. The purpose of this paper is to introduce these two IAEA Software programs as useful tools for the Radiation Protection community.

THE BASIC SAFETY STANDARDS SOFTWARE

The program - SS115 - contains the text and data from the BSS. The program enables the user to search for and retrieve any topic directly through the Table of contents tree, with access based on keyword searches, a subject index or cross-referencing. The definitions of the main concepts can be found in the 'Glossary' list.

To run the program, the user must have an IBM compatible Personal Computer with an 80386 processor or better, more than 4 MB internal memory, at least 4 MB free memory on hard disk and 'Windows 3.11' or 'Windows '95'. The software runs in the same way as most Windows based programs.

The opening window of the title page presents a horizontal button bar representing the seven major sections of the BSS (Fig.1). In addition the button bar contains Search and Exit buttons, as well as a message bar that indicates the possible actions or available information relating to the button or zone to which the pointer is pointing.

Fig. 1. First window of the SS115 program.

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SS115 provides three basic ways to access the contents of the BSS: Major section button, Table of Contents, or Keyword search. The user can click on one of the seven buttons and the first page of that section will appear. Specific subsections can be accessed directly using the Table of Contents (Fig.2).
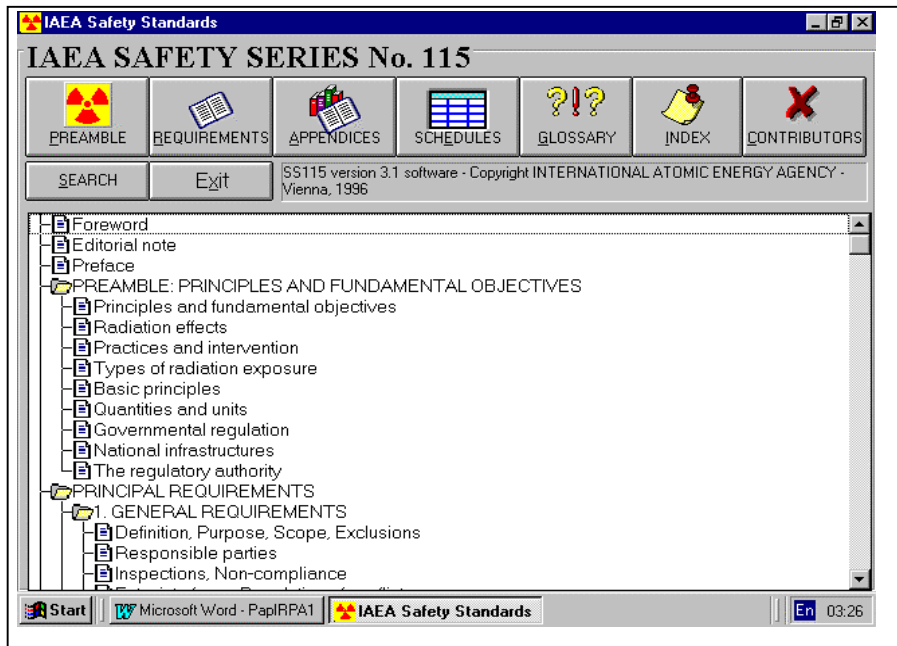

Fig. 2. The Contents window of the SS115 program.

Folders are used as icons to represent the sections and subsections, while text page icons are used for the topic page level. Once a topic is open, the user can access any part of the text or data in that subsection (Fig.3).
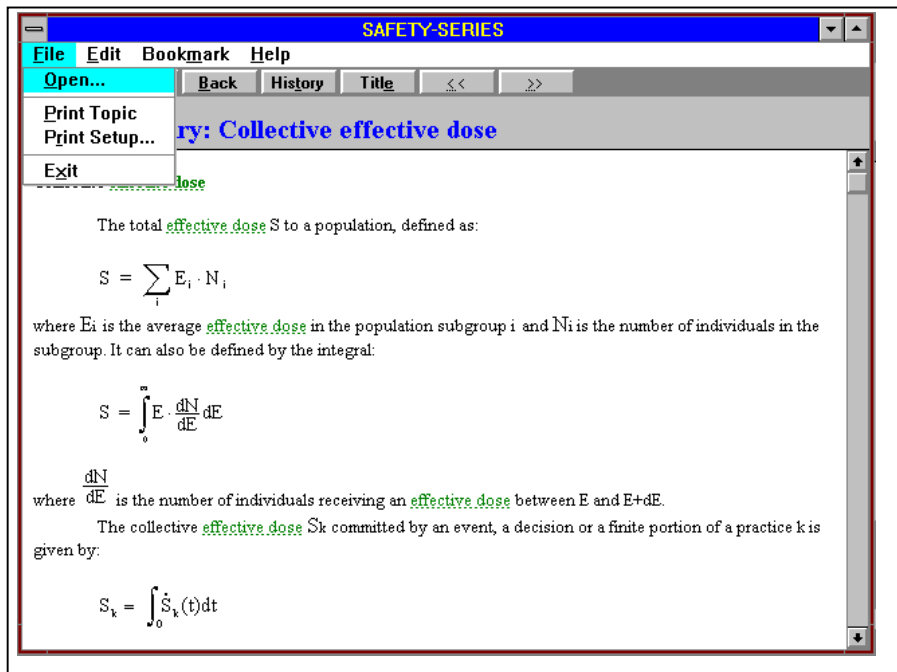

Fig. 3. Window of the SS115 program with a topic displayed.

A keyword search is conducted using the Search button. The keyword is displayed by typing the first few letters and making a selection or scrolling through the list of keywords. Keywords occurring in the text are

highlighted in colour and slightly underlined (Fig. 3). Clicking on a highlighted word opens a window with the list of related topics where the keyword occurs (the same list that resulted from the initial search for that keyword). Another topic which contains the keyword can be selected from the list and opened.

The user can create and use a bookmark. This allows direct return to the bookmarked page within a given topic. A list of the topics previously opened can be viewed by clicking the History button. Any topic page can be printed and the Copy command can be used to move selected text to the Windows clipboard for use in other programs such as word processors.

OCCUPATIONAL RADIATION PROTECTION GUIDE SOFTWARE

The program - ORPGUIDE - contains the text and data from Safety Series No. 120: Radiation Protection and the Safety of Radiation Sources, Safety Series No. 115: International Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources (the BSS), Safety Series No. RS-G-1.1: Occupational Radiation Protection, Safety Series No.RS-G-1.3: Assessment of Occupational Exposure due to External Sources of Radiation and Safety Series No. RS-G-1.2: Assessment of Occupational Exposure due to Intakes of Radionuclides. The program is intended for use in conjunction with the three Safety Guides and assumes that the user is familiar with their organization and content.

Taking into consideration the complete volume of these documents, the ORPGUIDE program had to be produced using a more versatile presentation, suitable for several books and using modern operating systems. From the available software products (Adobe Acrobat, Help Compiler, HTML Workshop and Media View) the Media View program was selected for each book, in conjunction with an application program written under Visual Basic [6] for 16 or 32 bits. It was also specified by the IAEA that the software should run under Windows 3.11, 95, 98, NT 4.0 and Windows 2000 and take into account the possibility to use it also on rather "old" computers.

Some new features brought into ORPGUIDE are briefly described below:

Split working window. The main working window can be divided by a movable vertical line into two parts, containing the Table of Contents and the selected Topic, or used exclusively for one of them (Fig.4).
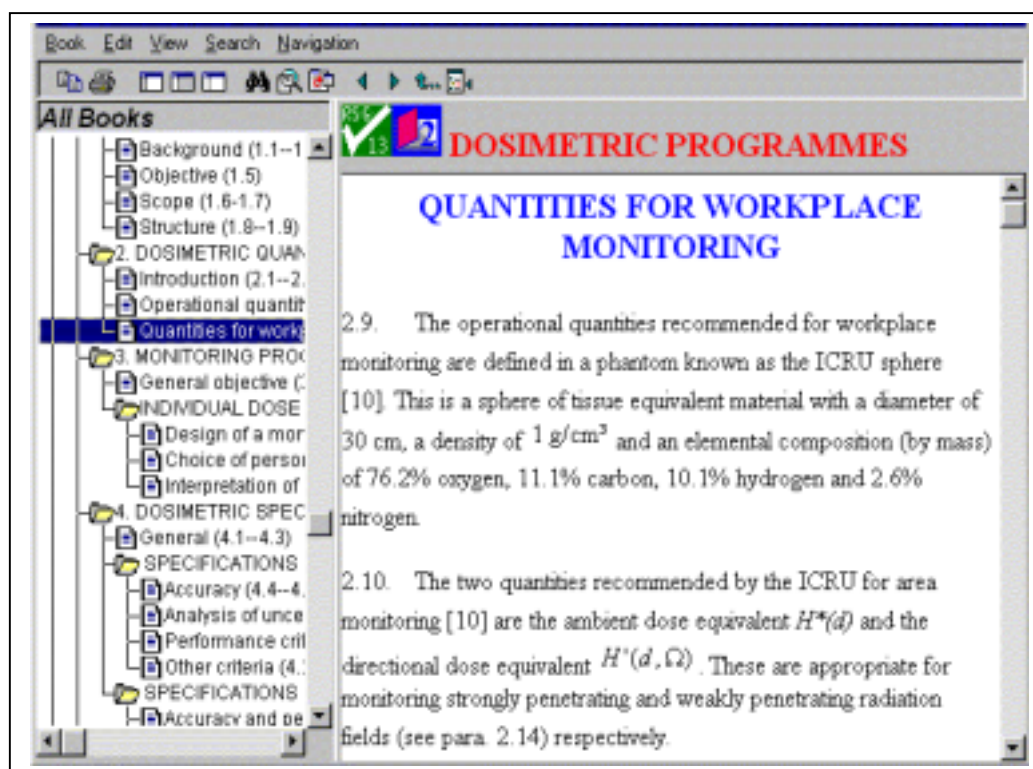

Fig. 4. The main window of the ORPGUIDE, displaying both the Table of Contents and a topic.

Full Text Search. A full text search facility (Fig.5) was introduced to search and find any words or string of characters in one or all books. A list of topics containing the selected text is displayed as a Search Result.

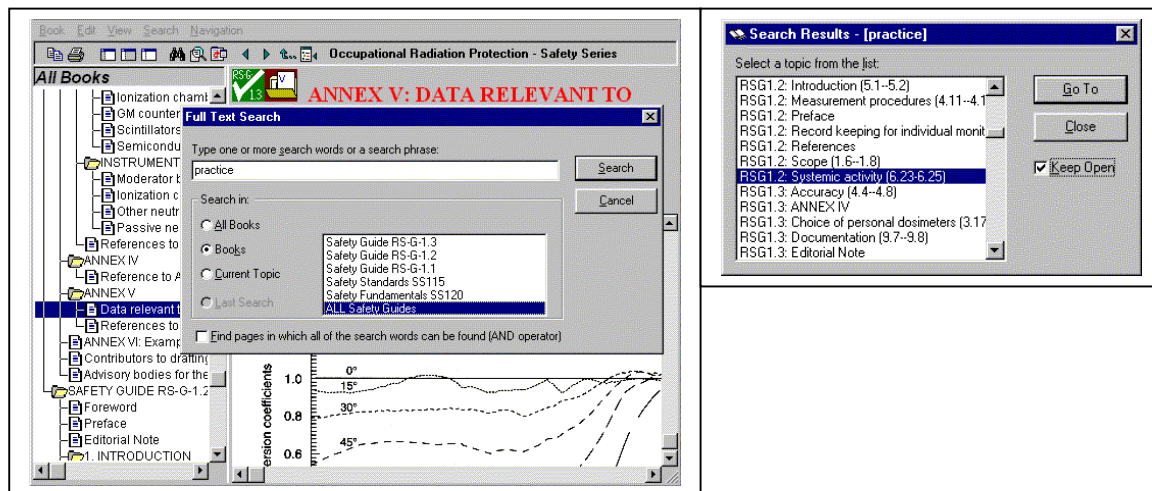The possibility to search for a phrase or an expression will be a very useful tool.

Fig. 5. Activation of the Full Text Search and the Search Results windows.

Menu bar. This bar (Fig. 6) facilitates the navigation through the contents of the books permitting the user: an easy access to each book (Book menu); to copy a selected block of data or entire topic (Edit menu); to choose a split working window or not and to modify the displayed text (View menu); to search through the Keyword index or as Full text search (Search menu); to navigate, e.g. to the previous topic or to the history list of topics (Navigation menu).

Fig. 6. The menu bar of the ORPGUIDE.

Icon bar. This bar enables an easy access to the most used commands through the self explanatory icons shown in Fig.7:

Fig.7. The icon bar of the ORPGUIDE.

Common list of keywords. Although each book has its own keywords (words with explications in Glossary, Terms, Definitions or Index chapters), the Keyword Index Search can deal with one or all books (Fig.8).
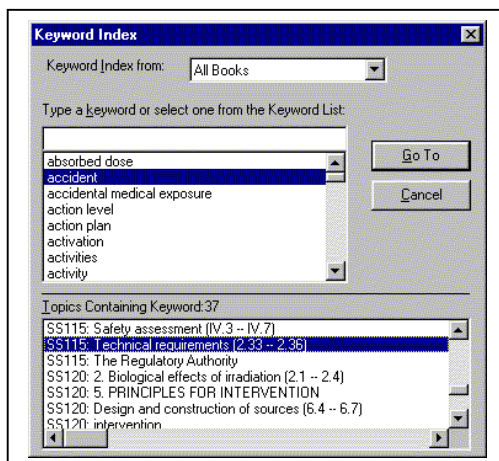

Fig. 8. The Keyword Index Search window activated for search in all books.

Cross referencing to another book. Clicking on words or paragraph numbers coloured in green, will give the user a list of "Crosstab references" (Fig.9), i.e. a list of topics in the other books where the same keyword appears and from which the user can select any topic. With the "Back" command the user can go back to continue the browsing.
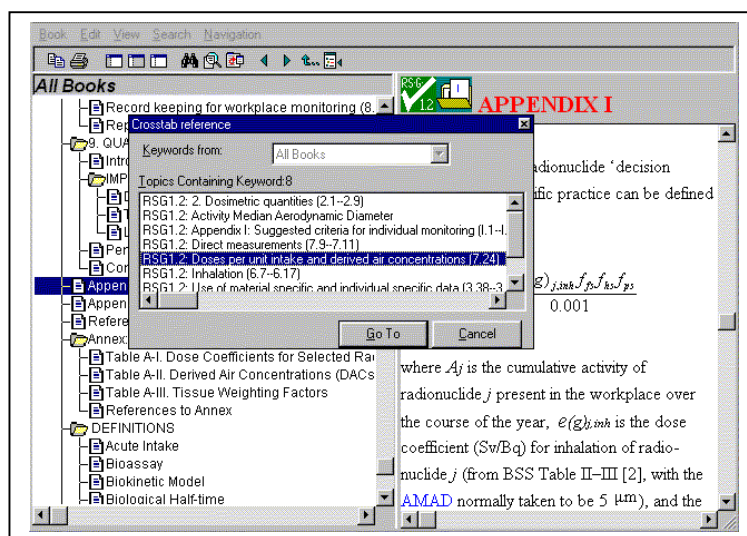

Fig. 9. Displaying the list with topic titles correlated with a selected keyword.

The program ORPGUIDE will thus allow multiple ways to access the text and data of the included books. To facilitate the work with ORPGUIDE, a User's Guide is included as text in the software.

CONCLUSION

The Software program ORPGUIDE is expected to be an effective tool for all those concerned with and responsible for occupational protection management. Further information on IAEA radiation protection programmes can be found on the Web site at: www.iaea.org/ns/rasanet/.

REFERENCES

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ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANISATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources*, Safety Series No. 115, IAEA, Vienna (1996).

[2]   FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANISATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, *Radiation Protection and the Safety of Radiation Sources*, Safety Series No. 120, IAEA, Vienna (1996).

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[4]   INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, *Assessment of Occupational Exposure due to External Sources of Radiation*, Safety Standards Series No. RS-G-1.3, IAEA, Vienna (1999).

[5]   INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, *Assessment of Occupational Exposure due to Intakes of Radionuclides*, Safety Standards Series No. RS-G-1.2, IAEA, Vienna (1999).

[6]   Microsoft® Visual Basic and MSDN Library, 1992 - 1998.