

RADIATION PROTECTION TRAINING PROGRAMMES SPANISH APPROACH

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1. - INTRODUCTION

Radiation Protection Programmes are being considered the best way to promote safety culture and to spread and propagate European basic safety standards. It is widely accepted that training is an important tool to upgrade competence for radiation exposed workers.

The Spanish Radiation Protection Education and Training Programmes provide a solid and integrated educational model, which takes into account the variety of applied fields, the different levels of responsibilities, the technological and methodological advances, as well as the international tendencies. The needs for a specialised training on Radiation Protection (RP) for exposed workers appears into the Spanish regulation in 1964. National initial training programmes are well established since 1972. Individual certifications, based on personal licences are required for exposed workers. The Spanish regulation also includes continuous and on the job RP training. The educational programmes are being continuously updating and improving.

CIEMAT plays an important role in RP Spanish training, improving and modifying the previous RP courses and developing new programmes in order to complete the RP training levels. To achieve Radiation Protection objectives, new technological media for educational methods and material are taking into account.

Nevertheless, Spanish RP education and training model has to be improved in some aspects. The purpose of this paper is to analyse the situation and the future needs to be considered in order to complete the RP training processes.

2. - SPANISH SITUATION: CONTEXT

Initial and continuous training for exposed workers, based on the European Basic Safety Standards, are well established in the Spanish Regulation. Training and experience requirements of attendance, objectives and syllabus of educational programmes, as well as certifications and personal licenses are defined and developed, taking into account the different level of responsibility and discipline (nuclear, industrial, research and medical sector).

Exposed workers are defined as the employees exposed to ionising radiation likely to receive an expose above the public limit established in the national regulation. In a **radioactive or nuclear facility**, exposed workers have to be trained, taking into account their responsibility

and applied field (nuclear medicine, radiotherapy, non-sealed sources, industrial radiographer, etc.). Specific radiation protection training programmes for exposed workers includes: post-graduate educational courses, specialised training courses, workshops, seminars, scientific visits, etc.

- The different levels of RP **initial training programmes for exposed workers** of a radioactive or nuclear facility are defined as follows:
 - ✓ **Supervisors**, professionals who supervises the operation of a radioactive installation and guarantees the application of technical specifications, regulations, emergency plans and other official document approved. A **license**, conceded by the Regulatory Body, CSN, is required. (1, 2)
 - ✓ **Operators**, professionals who operates in a radioactive facility under the supervision of the facility supervisor. A **license** conceded by the Regulatory Body, CSN, is required.(1, 2)
 - ✓ **Exposed worker without license**

Specific training requirements are established for workers of **X Ray facilities** devoted to **medical diagnostic**. Special **accreditation** to operate and supervise the facility is required (3, 4).

In the last two years, CIEMAT has held some pilot projects on different and specific courses, improving and modifying the previous RP courses for radioactive facilities in the medical and industrial application fields. In table 1, the basic syllabus for supervisor is shown.

During this year and next years, CIEMAT is updating and improving the objectives, programmes and documentation of the courses devoted to obtain the accreditation to operate in a X Ray Facility.

- Training requisites and specific accreditation for **qualified experts** on radiation protection at different levels, are, as well, defined in national regulation, as follows:
 - ✓ A high level postgraduate course, in industrial, nuclear, environmental or medical applications, to achieve the accreditation, conceded by the Regulatory Body, to be a **Radiation Protection Officer**.

This specialised training is established since 1986 (5). The syllabus and objectives of the course have been updated and improved taking into account the standards of the Council Directive 96/29/Euratom. CIEMAT has make a great effort in the development and organisation of this course. A RP Officer is the professional, expert in RP, responsible of a **RP Technical Unit or Service**. This kind of Institution has to be authorised by the Regulatory Body and its role is to advise radioactive and nuclear facilities in RP aspects and to carry out the tasks in this matter established in the regulation.
 - ✓ A RP course for **Technical qualified expert**.

In 2001, the **technical qualified expert in RP** appears in the national Regulations (6) to carried out the tasks of a RP Technical Unit or Service under the supervision of the RP

officer. During 2002, CIEMAT has developed, organised and implement a specialised course to become a technical qualified expert in RP. This course, considered as a pilot course, have been finally carried out in June, 2002, following the national requirements and taking into account the previous experience in the advanced RP courses. The results of the course were very positive and the experience will help to improve the objectives, syllabus and documentation of this specialised training.

In table 2, the basic syllabus for the Technical Qualified Expert on RP is shown.

✓ **Initial and continuous training for Experts on Medical Physics.**

In the medical sector, special educational programme, practical training and specific accreditation are established for **experts on medical physics** (7). This training includes a previous exam and a three-year practical training in a hospital. An Expert on Medical Physics is the professional who has the knowledge to apply the techniques used in the radiation physics in the medical procedures involved with ionising radiation.

- **Continuous training for exposed workers** is also established is national standards. This continuous training has to be shown in the radiological card of exposed workers (6, 8). In the medical field, the continuous training is specially designed to promote and to profit the benefit of the new emerging technologies, being one of the bases in the RP optimisation programmes (9).
- Spanish RP Education and Training Programmes provide, as well, **training and information devoted to non-radiological or nuclear sectors**, which are likely to be involved with ionising radiation, as iron and steel industry, security guards, etc. CIEMAT, together with another Spanish institutions, has make a great effort to carry out this training, specially for iron and steel sector, being one of the first international initiative in this field.
- RP training is also considered in the national **academic programmes of Universities and technical schools**, specially in the training of sanitary staff, following the requirements of 97/43/EURATOM directive (9).

A resume of RP training requirements for exposed workers is shown in table 1.

TRAINING TOPICS:	RADIO-THERAPY	NON SEALED SOURCE LABORATORY	RADIOLOGY (INDUSTRIAL)
BASIC AREA:			
1. Atomic and nuclear structure and radioactivity	2 h.	2 h.	2 h.
2. Production and interaction of radiation	2 h.	2 h.	2 h.
3. Radiological quantities and units. Shields	3 h.	3 h.	3 h.
4. Fundamentals of radiation detection	4 h.	4 h.	4 h.
5. Radiobiology: biological effects	2 h.	2 h.	2 h.
6. Radiation Protection. General criteria	1 h.	1 h.	1 h.
7. Operational Radiological protection	1 h.	1 h.	1 h.
8. National and European regulations	2 h.	2 h.	2 h.
9. Evaluation and exercises	1 h.	1 h.	1 h.
10. Practical sessions and seminars	14 h.	14 h.	14 h.
<i>TOTAL (Basic area):</i>	<i>32 h</i>	<i>32 h</i>	<i>32 h</i>
SPECIFIC AREA:			
11. SPECIFIC AREA: uses, biological effects and associated risks, radiation protection operation, design and specific normative	10 h.	9,5 h.	10 h.
12. Specific practical sessions	10 h.	10 h.	6 h.
Technical visit	4 h.		4 h.
TOTAL:	57 h.	54,5 h.	55 h.

TABLE 1: COURSES OF RP FOR SUPERVISOR OF MEDICAL INSTALLATIONS, RP Training Unit (IEE -Ciemat), june 2000

THEORETICAL ASPECTS:	
MODULE 1: BASIC ATOMIC AND NUCLEAR PHYSICS	6
MODULE 2: QUANTITIES AND UNITS	2
MODULE 3: RADIOLOGICAL EQUIPMENT	6
MODULE 4: DETECTION AND MEASUREMENT METHODS	8
MODULE 5: IONISING RADIATION RISKS. BIOLOGICAL EFFECTS	4
MODULE 6: RADIOLOGICAL PROTECTION	11
MODULE 7: NORMATIVE	6
PRACTICAL ASPECTS:	
SESSIONS P1: DETECTION AND MEASUREMENT METHODS	12
SESSIONS P2: OPERATIONAL RADIOLOGICAL PROTECTION	6
SESSIONS P3: RADIOLOGICAL PROTECTION IN MEDICAL FACILITIES(NUCLEAR MEDICINE, RADIOTHERAPY, X-RAY)	13
COLLOQUIA	1
TOTAL HOURS:	75

TABLE 2: BASIC SYLLABUS FOR THE TECHNICAL QUALIFIED EXPERT ON RADIATION PROTECTION IN SPAIN

	Requirements	Training and Experience		Specific training
		Background requested	Professional experience	
Nuclear Sector	Supervisor/ license	Sciences degree, engineer or equivalent	3 years	18m, specific course + evaluation
	Operators/license	Univ. Degree	2 years	1 year of specific training + evaluation
	D. Technician RP	Professional education		40h specific course + evaluation
	Radiation protection officer	High Univ. Degree on Sciences	3 years	Advanced RP course - 300h -+ evaluation
Industrial, medical and research Sector	Operators (license)	Professional education, Technical School	-	30-46 h specific course + evaluation
	Supervisor (license)	Univ. Degree on Sciences	-	35-54 h specific course + evaluation
	Radiation protection officer	High Univ. Degree on sciences	3 years	Advanced RP course - 300h -+ evaluation
	Technical expert on RP	Professional education, Technical School	-	75 h specific course + evaluation
Medical Sector	Operators (license/ accreditation-RX)	Health professionals and technicians		1 week specific course
	Supervisor (license accreditation-RX))	Doctors / Degree on sciences		1 week specific course
	RX –radiation protection officer	High Univ. Degree on sciences	6 month	Advanced RP course - 300h -+ evaluation
	medical physics expert /radiophysics	High Univ. Degree on sciences	3 years	National evaluation/specific regulation

TABLE 3: TRAINING REQUIREMENTS FOR EXPOSED WORKERS IN SPAIN

The new national and international framework and the technological advances make the National RP Educational Programmes have to be improved to cover future needs. In this sense, there are some aspects which have to be reinforced. Some examples of this needs are: multimedia tools, distance learning, standardised documentation of RP courses, etc. Furthermore, the new European framework makes necessary a harmonisation of RP training programmes, specially in the accreditation and recognition requirements of the European Expert on RP.

3. CONCLUSIONS

- ✓ Spain has a solid and integrated RP educational model, which takes into account the variety of applied fields and the different levels of responsibilities.
- ✓ To achieve RP objectives, educational programmes have to be continuously updating and improving, considering technological advances and the new national and international recommendations.
- ✓ CIEMAT plays an important role in RP Spanish training. RP courses are designed, organised, implemented and up-dated by CIEMAT, together with the Regulatory Body, CSN, since 1964. It is appropriate to underline, the effort of CIEMAT, in the last years, in order to improve and develop specialised courses to obtain supervisor and operator licences and to design and implement the technical expert on RP.
- ✓ In order to satisfy future needs, the following aspects of the Spanish educational programmes have been identified:
 - To develop, implement and improve continuous, refresher and on the job training in the industrial and medical sector.
 - To standardise training material
 - To develop and implement new multimedia tools for each level of training.
 - To set up and promote distance learning as a training tool for those people who are unable to attend conventional learning institutions.
- ✓ European harmonisation of RP educational programmes have to be carried out, specially in the accreditation and recognition requirements of training.

4. REFERENCES

1. RD 1846/1999 por el que se aprueba el reglamento de Instalaciones Nucleares y Radiactivas.
2. Guía de seguridad del CSN 5.12: Homologación de cursos de formación de supervisores y operadores de instalaciones radiactivas, CSN, 1988.
3. RD 1891/1991 sobre instalación y utilización de aparatos de rayos X con fines de diagnóstico médico.
4. Resolución del 5 de noviembre de 1992, del CSN, por la que se establece las normas de homologación de cursos o programas que habiliten para la dirección y operación de las instalaciones de rayos X con fines diagnósticos.
5. Guía de seguridad del CSN 7.2: Cualificación para obtener el reconocimiento de experto en PR para responsabilizarte del correspondiente servicio o unidad técnica de PR, CSN, 1986.

6. RD 783/2001, por el que se aprueba el Reglamento sobre Protección Sanitaria contra las radiaciones ionizantes.
7. RD 220/1997, por el que se crea y regula la obtención del título oficial de Especialista en Radiofísica Hospitalaria.
8. RD 413/1997, sobre protección operacional de los trabajadores externos con riesgo de exposición a radiaciones ionizantes por intervención en zona controlada.
9. RD 815/2001, sobre justificación del uso de las radiaciones ionizantes para la protección radiológica de las personas con ocasión de exposiciones médicas.
- 10.96/29/Euratom Directive. BSS protection of the health of workers and the general public against the dangers arising from ionizing radiation.E.C. L-159 vol.39; Comunicación 98/C 133/03.