
ESS RULES FOR SUPERVISED AND CONTROLLED RADIATION AREAS

	Name	Role/Title
Owner	Sigrid Kozielski	Group leader Radiation Protection, ES&H
Reviewer	Lena Johansson	Radiation Protection Expert, RP group, ES&H
Approver	Peter Jacobsson	Head of ES&H Division

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1 INTRODUCTION

Based on the legal changes in radiation protection regulation in the EU and in Sweden (EU council directive 2013/59/EURATOM and SSMFS 2018:1 [1]) the ESS classification of radiation areas and their implementation at the facility has been updated. Classification of workplaces is part of Chapter 2 of the ESS Handbook for Radiation Protection [2]. This document gives details about the implementation of radiation protection legislation for radiation areas at ESS. The dose objectives for workers, the public and the environment and the design criteria of the facility are given in the General Safety Objectives [3].

1.1. Purpose

In accordance with the Swedish radiation protection regulation, SSMFS 2018:1 [1], areas at ESS shall be classified as non-designated areas or designated areas, where the latter comprises radiation areas, i.e. supervised areas (Swedish: "skyddat område") and controlled areas (Swedish: "kontrollerat område").

2. CLASSIFICATION OF WORKPLACES

The general definitions of non-designated and designated areas are given in chapter 2 of the radiation protection handbook [2]. It shall be stated, that the classification of a radiation area may change as a result of changing operational conditions (e.g. beam on or beam off). Any classification of radiation areas shall be approved and carried out by the radiation protection group.

The classification of an area shall be based on the annual radiation dose that workers can receive during continuous work in the area (assuming 2000 hours of work annually for permanent workplaces). Such an assessment shall also include radiation doses from unplanned events that are likely to occur (frequency equal to or higher than once per year) in the practices during the same period.

2.1. Non-designated area (white)

2.1.1. Swedish legislation

It can be concluded from chapter 4 paragraph 4 of the radiation protection regulation SSMFS 2018:1 [1], that an area is classified as non-designated if

1. The annual effective dose a person is expected to receive in this area, from normal operation is less than 1 mSv.
2. The annual equivalent dose to the lens of the eye is less than 15 mSv.
3. The average equivalent dose to any square centimetre of the skin is less than 50 mSv.

Furthermore, in a non-designated area, the removable surface contamination and air contamination should be indistinguishable from background [4].

2.1.2. ESS implementation

The ESS requires that in all non-designated areas no removable surface contamination is present and air contamination is close to background levels, specific values are given in [2]. No work with materials or equipment emitting ionising radiation or temporary hotspots are allowed. Handling and transport of open radioactive sources is strictly prohibited. Non-designated areas will include areas that are permanently occupied (e.g. offices, workshops) and areas that are not permanently occupied (e.g. car parks, staircases, technical facility rooms). In non-designated areas the effective dose shall be

less than 1 mSv per year for people on ESS premises. This translates to an ambient equivalent dose rate of less than 0.5 $\mu\text{Sv/h}$, assuming 2000 hours working time. The dose constraint for a non-exposed worker at ESS is 0.1 mSv/year [3].

2.2. Radiation area: Supervised area

2.2.1. Swedish legislation

According to chapter 4 paragraph 4 of the radiation protection regulation SSMFS 2018:1 [1] a radiation area shall be classified as supervised if a worker can receive an annual dose where:

1. The effective dose exceeds 1 mSv and is less than 6 mSv,
2. The equivalent dose to the lens of the eye of a person exceeds 15 mSv,
3. The equivalent dose to a person's extremities exceeds 50 mSv,
4. The average equivalent dose to any square centimetre of the skin exceeds 50 mSv,

2.2.2. ESS implementation

ESS implements the requirements for supervised areas as described in 2.3.2 of *ESS Handbook for Radiation Protection - Chapter 2 General Radiation Protection Rules* [2].

2.3. Radiation area: Controlled area

2.3.1. Swedish legislation

According to chapter 4 paragraph 3 of the radiation protection regulation SSMFS 2018:1 [1] an area shall be classified as controlled if at least one of the following conditions applies:

1. The expected annual effective dose to a worker exceeds 6 mSv.
2. There is a risk that removable surface and air contamination may be spread to surrounding premises or workplaces.

2.3.2. ESS implementation

ESS implements the requirements for supervised areas as described in 2.3.3 of *ESS Handbook for Radiation Protection - Chapter 2 General Radiation Protection Rules* [2].

2.3.2.1. Blue controlled area

In this area, a worker needs a valid radiation work permit [5]. The blue controlled area is classified as such in accordance with Table 2 of *ESS Handbook for Radiation Protection - Chapter 2 General Radiation Protection Rules* [2].

2.3.2.2. Yellow controlled area

In this area, a worker needs a valid radiation work permit [5]. The yellow controlled area is classified as such in accordance with Table 2 of *ESS Handbook for Radiation Protection - Chapter 2 General Radiation Protection Rules* [2].

2.3.2.3. Red controlled area

In this area, a worker needs a valid radiation work permit [5]. Work must be on voluntary basis. The red controlled area is classified as such in accordance with Table 2 of *ESS Handbook for Radiation Protection - Chapter 2 General Radiation Protection Rules* [2].

2.3.2.4. Magenta controlled area

This area is access prohibited [2].

3. CONTROLS

From a radiological point of view personal and global controls shall be implemented considering the following conditions:

1. Dose due to prompt radiation.
2. Dose due to non-removable volume activation.
3. Dose due to removable surface contamination.
4. Dose due to airborne contamination.

The control measures are described in detail in section 2.4 of *ESS Handbook for Radiation Protection - Chapter 2 General Radiation Protection Rules* [2].

4. GLOSSARY

Term/Abbreviation	Explanation	Definition
RP	Radiation Protection	
ESH	Environment Safety and Health	

5. REFERENCES

- [1] SSMFS 2018:1 The Swedish Radiation Safety Authority regulations on basic provisions for practices with ionising radiation subject to licence, English translation (ESS-0322687)
- [2] ESS Handbook for Radiation Protection – Chapter 2 (ESS-0239718)
- [3] ESS General Safety Objectives (ESS-0000004)
- [4] SSMFS 2018:3 The Swedish Radiation Safety Authority's regulations on exemptions from the Radiation Protection Act and on the release of materials, building structures and areas (Strålsäkerhetsmyndighetens föreskrifter om undantag från strålskyddslagen och om friklassning av material, byggnadsstrukturer och områden), English translation (ESS-0333252)
- [5] ESS rules for radwork permit and implementation of ALARA in operation (ESS-0150296)

6. DOCUMENT REVISION HISTORY

Revision	Reason for and description of change	Author	Date
1	First revision	Thomas Hansson	2013-01-01
2	Updates	Günter Muhrer	2013-07-01
3	For the purpose of clarifying radiological zoning, meetings with SSM have been held in November 2014 and May 2015. Based on these discussions the ESS classification of radiological areas have been updated.	Günter Muhrer, François Javier	2015-12-07
4	Change into new CHESS document template, change of ownership from Günter Muhrer to new RP group leader, revision of ESS-0001786 due to new regulations	Sigrid Kozielski	2019-03-01
5	Have moved most of the text to ESS-0239718 RP Handbook Chapter 2. The long-term intention is to transfer the content of this document to ESS-0239718 but it will have to be a step wise implementation due to other documents referring to ESS-0001786.	Lena Johansson	2020-02-12