



# Human performance management

# **Human Performance**

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## **Human Performance**

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October 2000, *P-119, Policy on Human Factors*

March 2019, REGDOC-2.2.1, *Human Factors*

## Preface

This regulatory document is part of the CNSC's Human Performance Management series of regulatory documents, which also covers personnel training, personnel certification, fitness for duty and minimum staff complement. The full list of regulatory document series is included at the end of this document and can also be found on the [CNSC's website](#).

Regulatory document REGDOC-2.2.1, *Human Performance* clarifies requirements and provides guidance for understanding and managing human, technology and organizational factors with the aim of achieving safe and effective human performance.

This document is the second version and supersedes REGDOC-2.2.1, *Human Factors* published in March 2019.

For information on the implementation of regulatory documents and on the graded approach, see REGDOC-3.5.3, *Regulatory Fundamentals*.

The words "shall" and "must" are used to express requirements to be satisfied by the licensee or licence applicant. "Should" is used to express guidance or that which is advised. "May" is used to express an option or that which is advised or permissible within the limits of this regulatory document. "Can" is used to express possibility or capability.

Nothing contained in this document is to be construed as relieving any licensee from any other pertinent requirements. It is the licensee's responsibility to identify and comply with all applicable regulations and licence conditions.

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# Human Performance

## 1. Introduction

### 1.1 Purpose

This regulatory document is part of the CNSC's Human Performance Management series of regulatory documents and clarifies the requirements and provides guidance for a licensee's human performance program.

### 1.2 Scope

This regulatory document contains requirements and guidance for all Class I and uranium mines and mills applicants and licensees. For all other applicants and licensees, this document serves as guidance.

### 1.3 Relevant legislation

The requirements and guidance outlined in this regulatory document are associated with the [Nuclear Safety and Control Act](#) and its regulations, including the [General Nuclear Safety and Control Regulations](#), [Class I Nuclear Facilities Regulations](#) and [Uranium Mines and Mills Regulations](#).

### 1.4 National and international standards

The International Atomic Energy Agency (IAEA) has identified the need for regulators and licensees to address human, technology and organizational considerations in a systemic way. This regulatory document has incorporated requirements and concepts from the following IAEA standards and guidance:

- IAEA Safety Standards Series No. SF-1, *Fundamental Safety Principles* [1]
- IAEA Safety Standards Series No. GSR Part 2, *Leadership and Management for Safety* [2]
- IAEA Safety Standards Series No. GSR Part 3, *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards* [3]
- IAEA Safety Standards Series No. GS-G-3.5, *The Management System for Nuclear Installations* [4]
- IAEA TECDOC No.1846, *Regulatory Oversight of Human and Organizational Factors for Safety of Nuclear Installations* [5]

Other important standards that are relevant to this regulatory document include:

- CSA Group, N286-12, *Management system requirements for nuclear facilities* [6]
- ISO International Standard 27500:16 *The human-centred organization – Rationale and general principles* [7]
- ISO International Standard 27501:2019 *The human-centred organization – Guidance for managers* [8]

## 2. The Human Performance Program

The human performance program provides an overarching view of the factors that influence human performance, including how they are co-ordinated across the business to support workers and teams in carrying out their work safely and successfully [3]. This includes defining and implementing practices that contribute to excellence in worker performance [6].

Human performance relates to the work activities carried out by people and teams, as well as their results [5]. These [activities](#) are the work as it is actually performed, as opposed to a [task](#), which is a generic description of the work [9]. It is only by looking at the details of the work activities themselves—the practical, real-world application of a given task—that a business can make improvements [8].

Although the scope of the human performance program is broad, it provides a human-centric view [7] of the work activities within the business to understand the work and its context, to be able to learn and continually improve. It considers the integration of work activities and how the people are supported to strengthen the ways that desired outcomes can be achieved and sustained.

Looking at the organization at different levels can be useful in building a picture of the systems of work, for example:

- At an individual level, how a worker, in a given environment, with specific equipment, training, procedures, protective equipment, etc., carries out work activities safely and to the desired standards of performance. This level considers the activity.
- At the group level, how teams/departments organize, supervise and resource the work, the importance they place on various aspects of the work, how they interpret the organization's policies and priorities, and how they interface and communicate within their group and with other groups in the organization. This level considers the process.
- Across the business, how the priorities and policies promoted by top management guide and influence organizational culture at the department, team and individual level. This level considers the strategy.

CNSC staff, through the safety and control area framework, already consider individual factors in detail, as discrete areas or topics, such as training, human factors in design and fitness for duty. The human performance program does not replace this consideration, but rather complements it by looking at the overarching view of human performance and the connections and relationships between the factors that influence work activities.

## 3. Understanding the Influences on Human Performance

At its most elemental, human performance relates to the work carried out by a single person. However, even at an individual level, a person's work activities are heavily influenced by the actions of their co-workers, how they use technology and how they are supported to perform the work. This fact requires licensees to take a broader view to establish a complete picture of human performance. This broader view, known as the systemic\* approach, helps to establish and make explicit the relationships between the humans, technology and organization (HTO) in the business and is key to supporting and improving human performance [1]. By understanding these influences and their interactions, licensees are better positioned to move towards an approach to safety where people within an organization are supported and empowered to make things go

right, rather than simply preventing them from going wrong [10]. This view is an ongoing evolution of understanding the role of humans to ensure safety and successful work outcomes.

One of the fundamental purposes of a human performance program is to continue to learn about the factors that influence human performance. By collecting data and information about people's work activities, and their ability to achieve the desired outcomes, as well as the licensee's performance as a whole, the human performance program can provide a comprehensive, integrated view of how the licensee is achieving or failing to meet its goals related to safety and performance. This approach acknowledges that people are fundamental to safety because their inherent adaptability and flexibility creates resilience, in particular where aspects of the organization and technology are rigid [10]. A key part of a human performance program is recognizing where this human adaptability and flexibility can be leveraged to strengthen safety [8].

\*Systemic refers to something that is system-wide, affecting or relating to a group or system as a whole, instead of its individual members or parts (not to be confused with systematic, which means methodical).

### **3.1 Managing human performance to strengthen safety**

When events are analyzed, analysis often stops at the performer level—that is, the individual or team who are seen to be responsible for errors. This stopping point does not allow for effective organizational learning since errors, once analyzed using the systemic approach, are almost always found to be a symptom of deeper issues. Factors that contributed to errors usually appear in multiple places, at multiple levels and parts of the business—from design, planning, maintenance, supervision or top management [11].

Licensees can enhance robustness by developing a strong foundation of barriers and defences across the HTO system to prevent errors from propagating into problems, at all levels of the business. The understanding of error as a human characteristic within a situational context [11] is a key part of a just culture, which considers "What went wrong?" rather than "Who caused the problem?" [12].

With a just culture and effective work supports, people can provide a constant detection and correction function across the business systems and processes, which creates resilience [10]. Another way an organization can introduce resilience within the system is to include learning from successful daily work activities, which leaves it better prepared to deal with the unexpected [14].

#### **3.1.1 Documenting the program's strategy and practices**

The licensee shall document the strategy and practices of their systemic approach for managing human performance by describing:

- a. the goals and scope of the strategy and practices
- b. how the licensee implements a systemic approach to human performance
- c. how the licensee supports workers in day-to-day work
- d. how the licensee supports and prepares workers to respond during accidents and emergencies
- e. the ways in which the business learns about and seeks continual improvement of human performance

- f. the ways in which the human performance program is monitored and evaluated for effectiveness

### **Guidance**

Documenting the human performance program can take the form of a roadmap or overview that references and describes how the management system policies, processes, procedures, and other documents relate to human performance. The documented human performance program may also be a stand-alone document. Separate from the documentation approach, the human performance program should be implemented using the management system to achieve the necessary cross-cutting scope and integration in relation to the business.

For goals and scope of the strategy and practices, the scope of the human performance program should specify the departments, processes, procedures and work tasks to which the program applies, and where it applies to contractors and vendors. This can also include the rationale for the program, which explains why a human performance program is important to the licensee's goals.

For how the licensee implements a systemic approach to human performance, licensees may describe how the collection of elements is considered as a whole, including the relationships and influences, such as:

- describing any systemic analyses across the breadth and depth of the business, such as self-assessments, event analysis or audits
- identifying any performance indicators and how this data is analyzed
- specifying any roles or responsibilities for oversight of human performance across the business, with links to the related procedures, reviews, analyses and techniques

Note that workers refers to anyone in the business who performs work that is referred to in a licence [15], such as knowledge workers, supervisors, top managers, front-end workers and contractors.

### **3.1.2 Implementing a systemic approach**

The licensee shall implement a systemic approach to managing human performance that supports safe and effective work for all workers.

### **Guidance**

The systemic approach considers human performance within the context in which people work, viewing the business as a system [13]. Using the arrangements and practices of the human performance program, licensees should use a systemic approach when analyzing, recording and evaluating the HTO factors associated with:

- events and problems
- work that is known to be difficult or challenging
- work that went well (cases of performance excellence)
- feedback and suggestions for improvement from a range of sources
- proposed changes to be made
- outcomes of the changes made



Examples of how this can be accomplished include:

- establishing a team, made up of a diverse representation of key functions of the business, that is tasked with reviewing events and close calls from a systemic perspective - this can gain a deeper understanding of systemic issues and move the organization towards proactive ways to improve safety
- creating systems maps to model and comprehend the interconnections in the system
- conducting periodic assessments of human performance by analyzing key work activities to understand the gaps between tasks and activities
- using the learning team approach to leverage the knowledge and experience of workers to gain a deep understanding of a given work activity [16]
- analyzing the goals, workflows, demands, pressures, conflicts, resources and uncertainties within the system [13]

### **3.2 Organizational learning**

An effective strategy for supporting safe and successful work is to make it easy for people to do the right thing and difficult to do the wrong thing. Actively understanding, learning and putting measures in place to enable work to go well enhances safety. This includes having processes and methods to learn from both success and failure in the business, to understand the work as it is actually done and the system within which the work happens. Supporting the day-to-day work by seeking out and addressing known factors that can disrupt the work and increase workload, provides workers with the increased capacity to identify and respond to any abnormal conditions, unusual factors or disruptions. The people who perform the work are often best positioned to provide suggestions for improving safety and performance, as well as helping to understand the work activities [11].

Building capacity for safety throughout the organization needs to be driven by management as a strategic and intentional priority that is active and visible [9]. Management directly supports human performance by providing workers with all that they need to carry out their work activities— such as resources, training, and equipment, to name a few examples. Management should promote the importance of organizational learning as an ever-present part of the business, as opposed to being a one-off activity or in response to an event. A good practice is to review a given situation with honest enquiry, accept the reality of what is found, and in turn to use the understanding gained to learn and improve.

Another enabler of organizational learning is creating a just culture [10]. A strong foundation for continual learning is created when management fosters an environment where workers are encouraged to report concerns or suggestions for improvement and feel acknowledged when voicing issues, without fear of reprisal. Openness and sharing information regarding failures or problems is needed to learn and improve, because without it there will be poor understanding of the work activities.

#### **3.2.1 Identifying responsibility for human performance**

The licensee shall identify a member of top management who is responsible for the human performance program and define and document their associated roles, responsibilities and authorities.

## **Guidance**

Roles and responsibilities for the human performance program should include:

- establishing and communicating the goals, vision and core values related to human performance
- establishing and maintaining the measures to promote a just culture, such as policies and processes that allow personnel to raise safety concerns freely
- encouraging feedback and suggestions for improvements from across the workforce
- establishing the requirements for the identification and systemic analysis of factors related to human performance related to events [2]

### **3.2.2 Developing and sustaining organizational learning**

The licensee shall implement processes to enable the business to understand and learn about factors that influence human performance and to ensure they are considered in continual improvement.

## **Guidance**

Organizational learning should consider goals, such as:

- to develop knowledge and understanding of work activities and the provisions that support them, using a systemic approach
- to enable improved work processes, practices, supports as well as the characteristics and performance of technical systems, to achieve the desired results
- to identify and share results and knowledge across the organization so that the systemic nature of work is understood and leveraged

In analyzing any past performance, licensees should consider both work as it was done in practice (activities), as well as work as prescribed in procedures (tasks). Another good practice is to analyze and understand proposed changes using the context identified through the HTO systemic approach, as well as post-implementation evaluation of the results of the changes.

Licensees' processes for learning related to human performance and safety should include:

- ways to collect feedback and data on the processes and factors supporting the desired human performance
- leadership training on supporting and improving human performance across the organization
- training for all personnel on the aims of learning and improving work and what this means for their roles
- a description of the protections for workers who participate in self-reporting of events or who highlight practices that need improvement
- using the principles of a just culture in conducting event analyses and disciplinary measures

## Glossary

For definitions of terms used in this document, see [REGDOC-3.6, \*Glossary of CNSC Terminology\*](#), which includes terms and definitions used in the [Nuclear Safety and Control Act](#) and the regulations made under it, and in CNSC regulatory documents and other publications. REGDOC-3.6 is provided for reference and information.

The following terms are either new terms being defined or include revisions to the current definition for that term. Following public consultation, the final terms and definitions will be submitted for inclusion in the next version of REGDOC-3.6, *Glossary of CNSC Terminology*.

**(new)**

**activity** (*activité*)

With respect to human performance, the actual work carried out by people and teams in a work environment. Also called work as done.

**(modify)**

**human performance** (*performance humaine*)

Human activities carried out in a work setting and the results of these activities [5].

**(new)**

**just culture** (*culture d'équité*)

A workplace environment where issues related to human performance are assessed in the full context of a given situation to provide fair decisions, and where people are encouraged to provide honest feedback and report errors without fear of reprisal. Note: A just culture does not tolerate negligence, or destructive acts.

**(new)**

**program** (*programme*)

A group of related management system elements, such as policies, processes and procedures, that are managed in a coordinated way.

**(new)**

**systemic approach** (*approche systémique*)

An approach in which an entity is considered to have the properties of a system, such as interdependency and connectedness. Note: An example of a systemic approach is where the interactions across the human, technology and organizational aspects of a business are considered at various levels of abstraction to understand, learn and improve performance.

**(additional entry)**

**task** (*tâche*)

With respect to human performance, a description of work to be done. Also called work as prescribed.

**(new)**

**top management** (*haute direction*)

The highest-ranking worker(s) responsible for the nuclear facility (Source : CSA-N286-12, *Management system requirements for nuclear facilities*).

## References

The CNSC may include references to information on best practices and standards such as those published by CSA Group. With permission of the publisher, CSA Group, all nuclear-related CSA standards may be viewed at no cost through the CNSC Web page “[How to gain free access to all nuclear-related CSA standards](#)”.

1. International Atomic Energy Agency, IAEA Safety Standards Series No. SF-1, *Fundamental Safety Principles*, Vienna, 2006.
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## CNSC Regulatory Document Series

Facilities and activities within the nuclear sector in Canada are regulated by the CNSC. In addition to the *Nuclear Safety and Control Act* and associated regulations, these facilities and activities may also be required to comply with other regulatory instruments such as regulatory documents or standards.

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  - 1.3 Uranium mines and mills
  - 1.4 Class II facilities
  - 1.5 Certification of prescribed equipment
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### 2.0 Safety and control areas

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  - 2.5 Physical design
  - 2.6 Fitness for service
  - 2.7 Radiation protection
  - 2.8 Conventional health and safety
  - 2.9 Environmental protection
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  - 2.14 Packaging and transport

### 3.0 Other regulatory areas

- Series
- 3.1 Reporting requirements
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