SLOVENSKI STANDARD
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Iskanje in reševanje v mestih - Smernice za uporabo preskusne metode za inovativne tehnologije za odkrivanje žrtev v ruševinah

Urban search and rescue - Guideline for the application of a test method for innovative technologies to detect victims in debris

Städtische Suche und Rettung - Leitfaden für die Anwendung eines Prüfverfahrens für innovative Technologien zur Erkennung von Opfern in Trümmern

Recherche et sauvetage en milieu urbain - Directive pour l'application d'une méthode pour tester les technologies innovantes de détection des victimes dans les débris

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CEN WORKSHOP AGREEMENT

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English version

Urban search and rescue - Guideline for the application of a test method for innovative technologies to detect victims in debris

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This CEN Workshop Agreement (CWA 17947:2022) has been developed in accordance with CEN-CENELEC Guide 29 "CEN/CENELEC Workshop Agreements– A rapid way to standardization" and with the relevant provision of CEN/CENELEC Internal Regulations – Part 2. It was approved by a Workshop of representatives of interested parties on 2022-11-04, the constitution of which was supported by CEN following the public call for participation made on 2021-10-29. However, this CEN Workshop Agreement does not necessarily reflect the views of all stakeholders who may have an interest in its subject matter.

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The following organizations and individuals developed and approved this CEN Workshop Agreement:

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Introduction

In the face of natural or man-made disasters, search and rescue teams and other first responders like police, medical units, civil protection or volunteers, race against the clock to locate survivors within the critical 72-hour timeframe (Golden Hours), facing challenges such as instable structures or hazardous environments but also insufficient situational awareness – all resulting in lengthy search and rescue processes. In order to speed up the detection of survivors trapped in collapsed buildings and to improve working conditions for the first responders, the EU-funded research project CURSOR designed an innovative Search and Rescue Kit (CURSOR USaR Kit) based on drones, miniaturized robotic equipment, advanced sensors and incident management applications. The overreaching aim of CURSOR is to develop a USaR kit that will be easy and fast to deploy, leading to a reduced time in detecting and locating trapped victims in disaster areas. To make sure that these solutions meet the needs of the first responders in the field, the system was tested by first responders of the CURSOR consortium as well as by external practitioners (e.g. INSARAG secretariat, Regione Liguria, USaR NL, Bavarian Red Cross, Japan NRIFD) throughout the whole development process. Several lab and small scale field trials were conducted. Against this background the consortium identified the standardisation potential for this CEN Workshop Agreement, which describes a field test and the associated methodology for assessing the use of innovative technologies such as the USaR kit.

In this document, the following verbal forms are used:

— “shall” indicates a requirement,

— “should” indicates a recommendation,

— “may” indicates a permission,

— “can” indicates a possibility or capability.

1 Scope

This document specifies requirements and recommendations on the set-up of a field test and a test methodology for Urban Search and Rescue (USaR) equipment for the detection of victims under debris. A realistic field test is described to gather information to test for example a Soft Miniaturized Underground Robot (SMURF) or drones equipped with specialized sensors, e.g. preparation of debris cones made of different materials. Furthermore, a performance test method for each component and the complete USaR system is described. The purpose of the test method is to specify the apparatuses, procedures and performance metrics necessary to quantitatively measure a search and rescue kit's abilities.

This document is intended to be used by Urban Search and Rescue (USaR) equipment manufacturers and developers. The document is not primary intended to be used by first responders, although the user community is benefitted by the relevant guidelines to be put in place.

The current document discusses and provides guidelines around the following questions:

— How to set up a test field for an innovative USaR kit?

— What should be tested?

— How should be tested?

— Who should conduct the testing?

— What is the minimum set of specifications for the technological tools?

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
field test
test that is performed in near real-life conditions in collaboration between solution provider and end user

3.2
use case
intended use of a technology within an application

3.3
collaborative lab test
test that is performed in a laboratory-controlled environment in collaboration between solution provider and end user

3.4
end user
person or group of persons that ultimately uses the evaluated technology, first or second responder

3.5
search and rescue
use of specialised personnel and equipment to locate people in distress or in danger and remove them from a place of actual or potential danger to a place of relative safety

Note 1 to entry: Urban search and rescue refers to scenarios in metropolitan areas.

[SOURCE: EN 17173:2020-09, definition 3.548, modified – added note]

3.6
personal protective equipment
special device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards

[SOURCE: IEC 82079-1:2012, definition 3.27]

3.7
integration test
type of testing in which the different units, modules or components of a solution/technology are tested as a combined entity

3.8
sniffer
device with inherited capability to detect and analyse a variety of chemical substances

4 Test procedures for Urban Search and Rescue (USaR) equipment

4.1 General

The fundamental question Urban Search and Rescue (USaR) operators, industry solution providers and interested stakeholders are trying to answer is: To what extent does the technology solution under consideration address capability gaps articulated by the end users?

This assessment involves an iterative exchange of information between the solution provider and end user on the instrument or device under consideration.

NOTE From the perspective of the end user, the INSARAG guidelines [1] will be a familiar way to help frame the various roles, responsibilities, detailed operating procedures, and doctrine such as the 'INSARAG marking and signalling system' during actual USaR operation.

For their part, the end users should articulate and cite any standards or other objective measures of performance that they perceive to be relevant to how their offerings may perform in the USaR environment. The testing procedures of any lab or field test is potentially complex, requiring a resource intensive planning, implementation and follow-up activities.

This document positions end users to measure capabilities necessary to perform operational tasks defined by end users. Standardised test approaches encourage evaluations of the performance of USaR technologies in a realistic environment.

This clause is structured as followed:

— Select technology to be tested

— Identify test environment (lab or field)

— Identify and define evaluation criteria

— Define test scenario (e.g. earthquake, floods) and use case (detailed description of the test set-up)

— Define documentation

4.2 Select technology to be tested

The first step is determining and selecting the technologies for the evaluation test.

Who determines the technologies for testing depends on the evaluation test objective and intended audience of the results.

If the test takes place for commercialisation purposes then the solution provider determines the concrete tested technologies and functionalities.

EXAMPLE The technology to be tested is a ground robot and the functionality to be tested is its mobility.

4.3 Roles and tasks in collaborative and field tests

The following table defines roles and tasks during the test that assesses, if a technology solution under consideration addresses capability gaps articulated by end users.

Table 1 — Roles and tasks in collaborative lab tests and field tests

Role	Tasks in collaborative lab tests	Tasks in field tests
Solution provider	Provides the location and the technology. Demonstrates the solution. Explains the functionalities. Actively supports the test coordinator with test preparations.	Provides the solution. Explains the testing purpose. Provides the basic training for the end user. Actively supports the test coordinator with test preparations.
End user	Observes the technology demonstration or participates hands on if applicable. Provides feedback about the test based on the provided evaluation method. Actively supports the test coordinator with test preparations.	Hosts the test. Defines the requirements, scenario and use case. Sets up the testing site. Makes sure that the suitable end user profiles are considered when choosing the test participants (e.g. for drones test, certified pilots shall be chosen). Conducts the hands-on testing. Provides feedback about the test based on the provided evaluation method. Actively supports the test coordinator with test preparations.
Test coordinator*	Coordinates the preparations and communication between solution provider and end user. Informs the participants about the agenda, test aims. Provides all the relevant templates and forms for the test evaluation.	Coordinates the preparations and communication between solution provider and end user. Informs the participants about the agenda, test aims. Provides all the relevant templates and forms for the test evaluation. This is done

	This is done together with end user and solution provider. Coordinates the evaluation.	together with end user and solution provider. Coordinates the evaluation.
Observers	Observes the test. Provides feedback, if required.	Observes the test. Provides feedback.
* In some countries (e.g. United States or Canada) there are third party organisations who are able to take over the test organisation and implementation completely. They also have facilities that provide the necessary structures for field testing.		

Collaborative lab tests take place in the solution provider premises and serve the purpose of early feedback from the end user. Collaborative lab tests are in most cases technology demonstrations, but if the maturity of the technology allows, end users can also hands-on test them.

The solution provider demonstrates the technology and explains the development and functionalities during the collaborative lab tests. End users' feedback shall be collected and documented.

Field tests usually take place in emergency forces exercise sites, which require the usage of personal protective equipment (PPE). Every test shall have a dedicated safety officer, who instructs the participants before entering the testing site and monitors the safety conditions throughout the test. If necessary, the test shall to be stopped to make sure that the testing ground is safe for all the participants. Special attention to safety shall be given, when unmanned aerial vehicles are tested. The safety protocol shall be agreed upon between the test partners before the field test, considering the test nature and the technologies tested.

4.4 Identify and define evaluation criteria

The identification and definition of evaluation criteria is a critical task of the end users. Criteria can be categorised into:

— functional (e.g. mobility, usability, deployability etc.), and

— non-functional requirements (e.g. affordability, maintenance etc.).

Followed by identifying the operational requirements.

Each evaluation criterion has to be prioritised and weighted.

NOTE Supporting material for defining the requirements can be found on the International Forum to Advance First Responders Innovation (IFAFRI) webpage [2]. IFAFRI has defined ten first responder capability gaps and those gap descriptions also include requirements for the technology considered in the respective gap.

In addition to functional and non-functional requirements, it may be relevant to consider regulatory authorities that may have a role in approving the use of a solution in their respective jurisdictions. These authorities may be separate from the intended customers themselves. Some jurisdictions may insist that equipment's, devices, or apparatus designed for a particular part of fire-fighting domain comply with national standards.

EXAMPLE National Fire Protection Association (NFPA) standards.

These standards or codes may be voluntary or prescribed in laws, regulations or local procurement rules.

EXAMPLE A fire service or regulatory authority may make it obligatory that thermal imagers comply with NFPA 1801 Standard on *Thermal Imagers for the Fire Service*. It is then necessary to design scenarios and use cases in which the equipment will be used by the responder evaluators in the assessment.

4.5 Define test scenario and use case

Based on the technologies chosen, test aims and requirements identified, the test scenario and use cases are designed.

The test scenario shall indicate in what kind of disaster the equipment will be used (e.g. earthquake, floods, etc.).

The use case should specify the concrete application case (e.g. type of the building, which building materials, day/night time, duration etc.) of the technology.

Use cases provide a more detailed description of the test set-up. Given the risks and hazards presented in a USaR operating environment, the vantage point(s) or positioning of the end user in the response environment should be specified. For instance, some end users will be in situ, some operating from a safe stand-off vantage and other consumers of the solutions information may be located in command and control or partner vantage points.

NOTE For USaR technology tests it is useful to consider the INSARAG Guidelines, which determine the process flow during a deployment. In addition to the activities of end users during a deployment, the INSARAG Guidelines may illuminate the possible roles of logistics, information technology support, and communications personnel during a use case testing. The mission has been divided into five Assessment, Search and Rescue (ASR) levels, each level can be considered as one use case.

4.6 Documentation of the evaluation tests

Evaluation tests shall be documented so that the data collected is captured and so that it provides input for further research and development. The reports typically provide an overview of the tests conducted and present results as well as weighted scores. The test report should differentiate the results based on the test nature (verification or validation). Validation document tests are used to confirm solution provider claims, those of interest to end users making acquisition or operational decisions.

Table 2 — Example of test documentation

Test procedure:					
Test ID:					
Functionality to be tested:					
Required test environment:					
Overview of the test procedure:					
No.	Requirement description	Pass/Fail/Undefined	Verification	Validation	Comments
Date of execution:					

5 Testing evaluation methodology development

5.1 General

Designing and developing a technology involves regular testing and evaluation to make sure that the requirements and quality standards are satisfied. Test evaluation is a process that critically examines the progress of the technology development and achievements done to accomplish the set objectives. It involves collecting and analysing information and data about a characteristic of the certain technology and its performance in different development stages. This evaluation methodology targets to measure the fulfilment of the user requirements, but could be adapted also to evaluate the achievement of the technical requirements.