Appendix B

Canadian Urban Search and Rescue (USAR) classification guide

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Introduction

Background

Public Safety and Emergency Preparedness Canada (PSEPC) has the federal lead in developing Canada's capacity to rescue victims from major structural collapse or other entrapments. Urban Search and Rescue (USAR) is the general term for a group of specialized rescue skills supplemented by search, medical and structural assessment resources combined in a mobile, highly integrated team.

Origin and development

This edition of the proposed *Canadian Urban Search and Rescue Classification Guide* was prepared by Public Safety and Emergency Preparedness Canada for review by its Urban Search and Rescue (USAR) advisory committee following the identification of a need to describe a continuum of USAR capacities in Canada. Heavy USAR is a demanding developmental challenge for all jurisdictions and it was apparent that a proposed classification system would serve two purposes:

- To characterize the capabilities of developing teams to better categorize their operational capabilities and equipment; and

- To distinguish between team capacities in order to develop funding criteria.

The premise of the classification system is that USAR is a continuum of technical rescue capabilities from light USAR (carried out with few technical resources), to heavy USAR, (multi-disciplinary teams that integrate large amounts of technical equipment and diverse professional skills in demanding rescue scenarios). It should be noted that effective rescue work is often accomplished by local rescuers using even more basic hand tools and less equipment than ascribed to the light operational level in this guide. While this work is extremely valuable and saves lives, the emphasis of this guide is on the national heavy USAR capability that PSEPC is mandated to develop.

This classification guide fulfills in part a PSEPC commitment to provincial and territorial officials responsible for emergency preparedness to develop and describe key national guidelines (and, where required, standards) to maintain a consistent national approach across the country. For Canada, the *USAR Classification Guide* provides a description of the capabilities that USAR teams at light, medium and heavy levels bring to disaster response. In this respect, the classification guide aims to help authorities match available resources to the demands of the rescue scenario.

Scope

The *Canadian USAR Classification Guide* draws on existing bodies of knowledge for definitions of operational skills, systems, and health and safety standards. In the main, these are professional references for fire, rescue and emergency medical services, and the building trades. Many activities carried out by USAR teams are regulated at federal and provincial levels in Canada for occupational health and safety, equipment certification and other standards. In any Canadian jurisdiction, several authorities may be involved in regulating the disciplines that make up USAR teams. For this reason, the *Canadian USAR Classification Guide* offers recommended practices and points to consider in developing a USAR capability. In interpreting the general guideline, the reader should research and apply codes and regulations relevant to their own jurisdiction. Further specific advice that applies to emergency operations in their own jurisdiction and disciplines may be required.

The classification of USAR team capabilities is a matter of domestic and international interest. A standard classification is an aid to better enable disaster-afflicted countries to match team capabilities to their response needs. The United Nations International Search and Rescue Advisory Group (INSARAG) is developing an international standard using categories of light, medium and heavy. PSEPC reviewed a draft INSARAG standard and began to evaluate the context of Canadian definitions that would meet international classification criteria in the context of Canadian practice and standards. The result is a document that focuses on Canadian construction materials and building techniques, safety and operational standards while at the same time conforming to INSARAG classification criteria for light, medium and heavy international USAR teams.

The summarized standards, terminology and concepts may not be readily meaningful to a general readership. Therefore each reference (e.g. *NFPA 1006*) is described in the list of references attached as Appendix "A" with links to the responsible authorities.

Organization

The *Canadian USAR Classification Guide* is organized in three sections: light, medium and heavy. Each section lists a summary of the key response criteria characterizing each USAR operational level. The table at the beginning of each section highlights these important attributes.

Each of the three sections lists the associated performance criteria, training requirements and equipment. For further information on training requirements, a summary list of key concepts is included in each section. Readers should note that the guide is progressive: heavy USAR operations incorporate the criteria for medium USAR which incorporates the criteria for light USAR.

Light USAR operational level

Operational USAR level and area of response	**Time period (sustained response)**	**Victim care capacity (numbers of Persons)** **B = Black (mortality)** **R = Red (critical)** **Y = Yellow (moderate)** **G = Green (minor)**				**Structural response *(Type of construction teams are equipped and trained to search and stabilize)***
		B	**R**	**Y**	**G**	
Light: Within jurisdiction	One operational shift: (up to 12 hours)	N/A	0	5	10	• Structural wood systems • Light metal components • Un-reinforced masonry which support floors, other wall-cladding and roofing systems
Medium: Within mutual aid boundaries	One operating day (24 hours)	N/A	1-2	5	10	• All collapsed or failed structures • Includes search and rescue operations for heavy timber,

Light USAR operational level

Operational USAR level and area of response	Time period (sustained response)	Victim care capacity (numbers of Persons) B = Black (mortality) R = Red (critical) Y = Yellow (moderate) G = Green (minor)				Structural response *(Type of construction teams are equipped and trained to search and stabilize)*
		B	R	Y	G	
						reinforced masonry construction, or steel frame)
Heavy: Across Canada.	Up to 10 operating days, (Re-supplied within 3 days)	N/A	10	15	25+	• All collapsed or failed structures • Includes structural engineering and rigging for massive structural collapse

Note to "Victim care capacity"

Since the fundamental purpose of USAR teams is to locate and extricate trapped victims, immediate life support is a critical function. The column *Victim care capacity* is the notional limits that teams at each level can treat with their integral resources. A standard medical triage colour coding system is used for the reader's reference since Canadian classification of medical first responder skills can vary across jurisdictions.

It is expected that mobilized USAR teams will integrate their victim care capability with capacity resident in the system of the afflicted jurisdiction. Discussions on the mechanisms and protocols required to support the desired level of integration are ongoing.

Light USAR operational level

Training	Performance requirements
Basic Urban Search and Rescue:	
Initial assessment	Recognize the risk presented by light frame structures and potential consequences
Safety procedures	Maintain and take action under relevant codes and standards for workplace occupational health and safety
Rescue equipment	Properly operate and maintain rescue equipment
Common hand tools	Properly operate and maintain hand tools
Search procedures	Apply basic visual and verbal search techniques
Basic rope rescue techniques	Single point anchor systems, knots hitches and bends, construct and operate a belay system
Patient packaging	Demonstrate proper patient immobilization techniques
Extrication	Demonstrate extrication procedures for partially buried or lightly trapped victims
Structural collapse theory – types of building construction and collapse/voids	Apply rescue techniques, including removal of light rubble in damaged or failed light frame structures
Emergency building shores (EBS)	Construct various applicable shoring components, apply mechanical advantage and cribbing to lift loads and stabilize collapse structures
Basic life support (BLS)	Provide BLS, patient packaging, and extrication
Hazardous materials awareness	Apply basic procedures for hazardous material incidents safety

Light USAR operational level

Training	Performance requirements
Basic Urban Search and Rescue:	
Incident management system (IMS)	Establish an incident management system and/or join command already established. Demonstrate ability to implement IMS principles.
Relevant codes and standards for workplace occupational safety and health	Demonstrate knowledge of relevant and applicable codes and standards, e.g. CSA, COSH
INSARAG marking systems	Apply the INSARAG marking systems

Light USAR operational level training requirements

Many of the skills and knowledge requirements for light USAR are covered in *NFPA 1670: Operations and Training for Technical Rescue Incidents*.

1. Basic Urban Search and Rescue
    - Introduction to Urban Search and Rescue (USAR)
    - Risk assessment
    - Heavy lifting, cribbing, and shoring
    - Ropes and knots
    - Patient packaging and extrication
    - Ladder rescue procedures
    - Search (hailing and visual method)
    - Physical search / search patterns
    - INSARAG marking systems for structures and victim location
2. Medical first responder or equivalent
    - Emergency medical services (EMS)
    - Infectious disease precautions
    - Anatomical references
    - Initial assessment and physical exam
    - Basic life support and cardio pulmonary resuscitation (BLS and CPR)
    - Haemorrhage and shock
    - Soft-tissue injuries
    - Musculoskeletal injuries
    - Injuries to the skull, spine, and chest

- Burns and environmental emergencies
- Poisoning
- Medical emergencies: cardiovascular and cerebral-vascular respiratory emergencies
- Medical emergencies: seizures: diabetic, and abdominal
- Childbirth emergencies
- Moving and lifting patients
- Triage
- Protocols for oxygen therapy

3. HazMat first responder
   - HazMat incidents (awareness level *NFPA 472*)
   - Use of the Transport Canada *CANUTEC Emergency Response Guidebook* (latest Edition) or equivalent
   - Occupational safety and health
   - Workplace Hazardous Materials Information System (WHMIS)
4. Incident management system (IMS)
   - IMS principles and structure
   - Expansion and contraction of IMS structure
   - Facilities
   - Resources
   - Action plan
   - Activation, operations, and demobilization
   - Closure

Light USAR operational level equipment requirements

The following is a recommended list of tools for a light USAR team.

1. Basic manual operated and powered cutting tools, for example:
   - Circular saw
   - Chain saw
   - Chisels
   - Hack saw
   - Reciprocating saw
   - Side and bolt cutters
2. Manual breaking / breaching tools, for example:
   - Sledge hammer
   - Halligan tool
   - Pry bar
   - Cold chisel
3. Basic rope rescue equipment, for example:
   - Harness
   - Webbing

    - Prussics
    - Carabiners
    - Pulleys
4. Assortment of levers
5. Dimensional lumber
6. Handheld mobile communications equipment sufficient for SAR operations
7. Basic life support equipment
8. Personal protective equipment suitable for relevant codes and standards for workplace occupational safety and health, for example:
    - Respirators and filter cartridges
    - Steel-toed boots
    - Hard hat
    - Safety eye wear
9. Whistles and / or horns for signalling
10. Building marking supplies, for example:
    - Spray paint
    - Lumber crayons
    - Flagging tape
    - Marking pens
11. Portable rehabilitation shelter facility (complete with bottled water and food energy supplies), for example:
    - Tent
    - Military style or freeze dried food components
12. Heavy-duty bumper hitch or gooseneck hitch trailer
    - Maximum GVW of 6,750 kg (15,000 lbs.)

Medium USAR operational level

Operational USAR level and area of response	Time period (sustained response)	Victim care capacity (numbers of Persons) B = Black (mortality) R = Red (critical) Y = Yellow (moderate) G = Green (minor)				Structural response *(Type of construction teams are equipped and trained to search and stabilize)*
		B	R	Y	G	
Light: Within jurisdiction	One operational shift: (up to 12 hours)	N/A	0	5	10	• Structural wood systems • Light metal components • Un-reinforced masonry which support floors, other wall-cladding and roofing systems
Medium: Within mutual aid boundaries	One operating day (24 hours)	N/A	1-2	5	10	• All collapsed or failed structures • Includes search and rescue operations for heavy timber, reinforced masonry construction, or steel frame)
Heavy: Across Canada.	Up to 10 operating days, (Re-supplied within 3 days)	N/A	10	15	25+	• All collapsed or failed structures • Includes structural engineering and rigging for massive structural collapse

Note to "Victim care capacity"

Since the fundamental purpose of USAR teams is to locate and extricate trapped victims, immediate life support is a critical function. The column *Victim care capacity* is the notional limits that teams at each level can treat with their integral resources. A standard medical triage colour coding system is used for the reader's reference since Canadian classification of medical first responder skills can vary across jurisdictions.

It is expected that mobilized USAR teams will integrate their victim care capability with capacity resident in the system of the afflicted jurisdiction. Discussions on the mechanisms and protocols required to support the desired level of integration are ongoing.

Medium USAR operational level

Training	Performance criteria
	Recognize the risks associated with all types of construction, their characteristics, collapse patterns and their potential consequences.
Collapsed structure search and rescue	• Apply lifting techniques for loads up to 10 metric tons, using mechanical, hydraulic, electrical, and pneumatic equipment. • Apply stabilizing and cribbing techniques to loads and drag and roll loads (not with use of cranes). • Construct shoring systems for all construction types.
Safety officer	Demonstrate knowledge of relevant and applicable codes and standards (e.g. CSA, COSH).
HazMat operations technician level (optional)	Operate air monitoring / gas detection equipment. Apply basic procedures for hazardous material incidents safety.
CBRN awareness level	Recognition of CBRN threats.
Medical equipment and protocols	Apply medical protocols in delivery of ALS and HazMat care related to *NFPA 472*.
Confined space rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Trench rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Rope rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Vehicle and machinery rescue	Conduct rescue operations consistent with *NFPA 1670* (*NFPA 1006* optional).
Technical search (optional)	Apply optical, acoustic / seismic search techniques (optional).
Canine search (optional)	Control / handle USAR trained search dog (optional).
Surface water rescue (optional)	Demonstrate knowledge of surface water rescue *(NFPA 1670 / 1006).*

Medium USAR operational level training requirements

(Includes light USAR training requirements 1 through 4.)

Many of the skills and knowledge requirements listed below at 1-6 are covered in *NFPA 472: Professional Competence of Responders to Hazardous Materials Incidents, 1006: Standard for Rescue Technician Professional Qualifications,* and *1670: Operations and Training for Technical Rescue Incidents*.

1. Technical rescue (Structural collapse, confined space, trench, rope, vehicle and machinery, and surface water rescue)
    - Organizing and starting a technical rescue operation
    - Operational safety
    - Equipment, tools, and accessories
    - Rescue strategies and techniques
    - Patient packaging and extrication
2. Rescue specialist Operation of the specialized equipment and procedures necessary for completing any technical rescue operation, for example:
    - Structural triage
    - Atmospheric monitoring
    - Soil assessment
    - Constructing haul systems
    - Vehicle stabilization
    - Lock out / tag out procedures
    - Assessing water hazards
3. Emergency medical care
    - Regional procedures to provide pre-hospital medical care to critical patients
    - critical incident stress management (CISM)
    - Field health procedures
4. Safety officer
    - Risk management standards
    - Technical rescue procedures
    - Regional and national safety codes
5. Environmental assessment
    - Atmospheric monitoring equipment
    - HazMat / CBRN detection and monitoring equipment
    - Hazardous materials containment
    - Bio-hazard waste management
6. Advanced training in incident management systems (IMS)
    - IMS principles and structure
    - Personnel accountability
    - Expansion and contraction of IMS structure
    - Facilities
    - Resources
    - Action plan
    - Position descriptions
    - Unified command
    - Demobilization

Medium USAR operational level equipment requirements

The following is a recommended list of tools for a medium USAR team.

1. Hydraulic, pneumatic, and mechanical equipment for cutting plate steel or rebar up to 40 mm thick, for example:
    - Petro-Gen cutting torch
    - K-12 saw and blades
    - Electric rebar shears
2. Hydraulic, pneumatic, and mechanical equipment for breaking material up to 15 cm thick, for example:
    - Air or electric jack hammers
    - Hammer drills
3. Hydraulic, pneumatic, and mechanical equipment for lifting loads up to 10 metric tons, for example:
    - High or low pressure lifting bags
    - Hydraulic jacks
4. Hydraulic, pneumatic, and mechanical equipment for shoring, for example:
    - Aluminum shoring struts
    - Manufactured shoring boxes or panels
5. Equipment and accessories for raising and lowering loads, anchoring, securing, moving, and dragging loads, for example:
    - Turfer hoist
    - Chain or cable come-along
    - Cable blocks and sheaves
6. Self-contained breathing apparatus (SCBA) and replacement cylinder
    - Must conform to current NFPA rescue criteria for supplied air breathing apparatus (SABA)
7. Advanced life support equipment for at least 1 to 2 patients, including:
    - Stabilization
    - Packaging
    - Extrication
8. Equipment accessories for generating, supplying, and measuring electricity, for example:
    - Gas powered generator – maximum 7000 watts
    - Ohm meter
    - "Hot stick"
9. Air monitoring / gas detection equipment, for example:
    - 3 or 4 sensor handheld monitor
10. Asset Management System (bar code equipment programs)
11. Optical, acoustic / seismic search equipment (optional)
12. Associated canine care equipment (optional), for example:
    - Canine medical kit and pharmaceuticals
    - Dog food
    - Decontamination shower

- Leash and anchor tie down

13. Water surface rescue personal protective equipment (optional), for example:
    - Personal floatation device
    - Water rescue helmet
    - Exposure suit
    - Throw rope

Heavy USAR operational level

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Heavy USAR operational level

Training	Performance criteria
Technical search	Apply optical, acoustic/seismic search techniques
Canine search	Implement USAR trained search dog procedures
Advanced cardiac life support (ACLS) and Advanced trauma life support (ATLS) medical equipment and protocols	Apply medical protocols in delivery of ACLS / ATLS care
Rigging Specialist	Apply rigging and lifting safety and operating standards
Technical information	Collect and disseminate relevant technical information
HazMat / CBRN specialist	Ability to mitigate HazMat / CBRN incident effects
Planning Specialist	Ability to develop and record operational plans
Structural Specialist	Registered professional structural engineer with demolition experience

Heavy USAR operational level

Training	Performance criteria
Logistics Specialist	Ability to procure and manage equipment and supplies for team operation
Communications Specialist	Licensed to operate and ability to maintain all team communication systems
Dedicated Public Communications / liaison Specialist(s)	Ability to liaise with outside agencies and / or act as a public information officer

Heavy USAR operational level training requirements

(Includes light USAR training requirements 1 through 4 and medium USAR training requirements 1 through 6.)

Many of the skills and knowledge requirements for heavy rescue are covered in:

- ***NFPA 1670 – Operations and Training for Technical Rescue Incidents*; and**
- ***NFPA 1006 – Standard for Rescue Technician Professional Qualifications* (Operations / Technician Levels).**

HazMat skills and knowledge requirements are covered in:

- ***NFPA 472 Professional Competence of Responders to Hazardous Materials Incidents* (Operations / Technician Levels).**

1. Rigging specialist
    - Assessing the capacity and capability of construction related equipment
    - Various rigging techniques, including the development of rigging plans and procedures
2. Structural specialist – Typical work of a registered professional structural engineer, in USAR
    - Identifying structure types, assessing risks posed by structural damage
    - Designing, inspecting, and supervising structural hazard reduction interventions
    - Structural monitoring
    - Demolitions

    - Could work with assistance of a civil engineering technologist with experience in structural and demolition work
3. Technical search specialist
    - Advanced principles and theories of electronic search
    - Operation of selected technical electronic, optical, and acoustic search equipment
    - Coordinating multiple search operations
4. Canine search specialist
    - Canine search operations
    - Search pattern selection criteria, including:
        - Terrain
        - Structures
        - Weather
        - Air circulation characteristics
5. Medical specialist – Advanced care paramedic under the supervision of a Medical Director (minimum).
    - Advanced trauma / life support / advanced cardiac life support.
6. Logistics specialist – International Air Transportation Association (IATA) loadmaster.
    - Transportation of dangerous goods (road and air).
    - Asset tracking and management systems.
7. Communications specialist – Licensed amateur radio operator.
    - Equipment scheduling and maintenance procedures.
    - Planning, establishing, and maintaining all team communications systems and networks.
8. HazMat / CBRN specialist – Certified HazMat technician per *NFPA 472*.
    - Development and implementation of operational plans to mitigate HazMat / CBRN incident effects.
9. Technical information and planning specialist
    - Data management, word processing, and graphic software.
    - Technical report writing.
    - Emergency management.
10. Public information specialist
    - Media relations
    - Crisis communications
    - USAR operations

Heavy USAR operational level equipment requirements

The following is a recommended list of tools for a heavy USAR team.

1. Optical, acoustic, seismic search equipment.
    - Associated canine care equipment.

2. Appropriate advanced cardiac life support / advance trauma life support monitoring equipment and pharmaceuticals.
3. Hydraulic, pneumatic, and mechanical equipment for lifting loads up to 10 metric tons.
4. Appropriate information technology and reference materials / library and equipment.
5. Radiological monitoring, personal protective equipment and decontamination (for team requirements).
6. Appropriate equipment and office supplies.
7. Appropriate engineering tools, measuring devices, software, and reference materials.
8. Complete base camp facilities for all weather conditions including:
    - Medical treatment
    - Field kitchen
    - Sanitation / shower
    - Water storage / purification
    - Food storage
    - Cache, maintenance, and storage
    - Equipment and personnel deployment vehicles including trucks, forklifts, trailers, and ATV's.
9. Warehousing space – approximately 1,000 m^2 or 10,000 ft^2.
10. Training simulators and equipment.
11. Complete communications system including pagers, sat-com, internet, fax and operations site team communications.

Appendix "A"

References

Canadian occupational safety and health (COSH)

Occupational safety and health (OSH), is assured through a network of regulators – some operating on a national basis, Provincial and Territorial levels or in the federal government workplace. For a number of specified federally regulated and international industries, the *Canada Labour Code, Part II* applies. Other OSH codes may be more or less prescriptive and it is important to know the relevant codes applicable to the jurisdiction in which you will operate.

The *Canada Labour Code* establishes the legislative framework and outlines the duties and responsibilities of the work place parties pertaining to occupational health and safety. The *Canada Occupational Safety and Health (COSH) Regulations* identifies, in detail, the specific requirements to ensure a healthy and safe work place.

The Canadian Standards Association (CSA)

The CSA develops a broad range of occupational health and safety standards, certifies electrical equipment including tools used in USAR and contributes to standards referenced in the *Canadian Building Code* and the *Canadian Electrical Code*.

For example, in Canada, the use of self-contained breathing apparatus is effectively governed by the CSA International standard *CSA Z94.4-93, Selection, Use and Care of Respirators*. It deals with program administration, hazard identification, fit testing, training, the use and maintenance of equipment, health surveillance of users and program evaluation. The standard does not however deal with respirator manufacture.

International Search and Rescue Advisory Group (INSARAG)

The confined space search and rescue marking system (CSSR) promoted as a Canadian standard is the CSSR marking system developed by the International Search and Rescue Advisory Group (INSARAG), United Nations Office of the Coordinator for Humanitarian Assistance (UNOCHA). It provides for conspicuous identification of work site hazards, standardized mapping, sketch and landmark labelling with common symbols, ensures the accuracy of search assessment markings and documents USAR team accomplishments.

The National Institute for Occupational Safety and Health (NIOSH)

A division of the U.S. Centre for Disease Control, NIOSH is a leading standards organization noted particularly in the USAR classifications for manufacturing standards of respirators.

National Fire Protection Association (NFPA)

The NFPA develops standards and codes through a consultative process. Of particular interest are the following consensus-based performance standards related to urban search and rescue.

NFPA 472 – *Standard for Professional Competence of Responders to Hazardous Materials Incidents.*

Document Scope: Covers the requirements for first responder, hazardous materials technician, and hazardous materials specialist.

Current Edition: 2002

NFPA 1006 – *Standard for Rescue Technician Professional Qualifications*

Document Scope: This standard establishes the minimum job performance requirements necessary for fire service and other emergency response personnel who perform technical rescue operations.

Current Edition: 2003

NFPA 1670 – *Standard on Operations and Training for Technical Rescue Incidents*

Document Scope: Identifies and establishes performance levels for safely and effectively conducting operations at technical rescue incidents.

Current Edition: 2004

Standards development organizations

There are four standards development organizations (SDOs) in Canada that have been accredited by the Standards Council of Canada:

- Bureau de normalisation du Québec (BNQ)
- Canadian General Standards Board (CGSB)
- Canadian Standards Association (CSA)
- Underwriters' Laboratories of Canada (ULC)

Through their technical committees, each has developed consensus standards bearing on occupational health and safety or product registration affecting USAR operations. Exhaustive listings of relevant technical standards are not possible but see for example the discussion on the CSA and its products.

Workplace Hazardous Materials Information System (WHMIS)

The Workplace Hazardous Materials Information System (WHMIS) is Canada's hazard communication standard. The key elements of the system are cautionary labelling of containers of WHMIS "controlled products", the provision of material safety data sheets (MSDSs) and worker education programs.

WHMIS is implemented through coordinated federal, provincial and territorial legislation. Supplier labelling and MSDS requirements are set out under the *Hazardous Products Act* and associated Controlled Products Regulations. The *Hazardous Products Act* and its regulations are administered by the Government of Canada Department of Health, commonly referred to as Health Canada.

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