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BLUEPRINT FOR THE CANADIAN REGISTERED SAFETY TECHNICIAN EXAMINATION (CRSTEX)

2019

6700 Century Ave, Ste. 100
Mississauga, ON L5N 6A4
Tel: (905) 567-7198 or 1-888-279-CRSP
E-mail: info@bcrsp.ca
www.bcrsp.ca

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PREFACE

The Board of Canadian Registered Safety Professionals (BCRSP) is pleased to present the *Blueprint for the Canadian Registered Safety Technician Examination* (CRSTEX). Administration of the first examination developed from the Blueprint is targeted for February 2019.

The Blueprint was developed to guide those involved in the development of the *Canadian Registered Safety Technician Examination* and to provide the public (e.g., examinees, educators, administrators) with practical information about the examination.

The Blueprint has two major components: (1) the content domain to be measured and, (2) the explicit guidelines on how this content is to be measured. The content domain consists of the CRSTEX set of competencies (i.e., the competencies expected of entry-level registered safety technicians), and the guidelines are expressed as structural and contextual variables. The Blueprint also includes: a *Summary Chart* (p.10) that summarizes the examination guidelines; a *Glossary* (p. 12) that provides definitions of terms appearing in bold throughout the document.

BCRSP wishes to thank all the individuals who have contributed to the creation of this Blueprint. In particular, thanks are extended to registered safety professionals who participated in the development of the competency framework and to those who responded to the competency validation survey.

The Blueprint will be evaluated regularly to reaffirm that the competencies and the guidelines for examination development continue to reflect what is expected of an entry-level registered safety technician beginning to practice, and is differentiated from that of entry-level registered safety professionals.

BCRSP encourages all users of this document to provide feedback which may be useful in future revisions of the Blueprint. Please forward all such comments to:

Executive Director
Board of Canadian Registered Safety Professionals
6700 Century Ave, Ste. 100
Mississauga, ON L5N 6A4

INTRODUCTION

The Board Canadian Registered Safety Professionals develops the Canadian Registered Safety Technician Examination (subsequently referred to as the CRSTEX) for registering purposes. It fulfills this service by working in collaboration with certified OHS practitioners from across Canada who serve as the content experts for developing and validating the examinations.

Registration/licensure/certification examinations have a well-defined purpose: to protect the public by ensuring that those who are licensed possess sufficient knowledge and skills to perform important occupational activities safely and effectively (Canadian Psychological Association, 1987). In the case of the CRSTEX, the purpose is to determine whether or not examinees are prepared to practice occupational health and safety, without risk to the public and to the environment.

The purpose of this Blueprint is to describe how the examination is to be developed.

The primary function of the Blueprint for the Canadian Registered Safety Technician Examination is to describe how the examination is to be developed. Specifically, this Blueprint provides explicit instructions and guidelines on how the **competencies**[1] (e.g., knowledge, abilities, skills, attitudes, and judgment) are to be expressed within the examination in order for accurate decisions to be made on the ability of examinees to practice safely and effectively.

Prior to producing this Blueprint, BCRSP undertook an extensive study to identify the competencies required for the safe and effective practice of registered safety technicians in Canada. Individual registered safety professionals from across the country were active participants in all phases of the investigation, which served to identify and validate a comprehensive set of 81 competencies expected of the registered safety technician. With this set of competencies, and the validation data obtained, the essential components of the CRSTEX could be clearly described.

The periodic and comprehensive review of the competencies measured by the CRSTEX assists the BCRSP in maintaining the validity of the CRSTEX, and to develop psychometrically sound and legally defensible registration examinations. Because of changes that occur in the practice of health and safety technicians and professionals alike, a validation

study of the competencies is conducted at least every five years, or as needed. In addition to the periodic comprehensive review and validation study, the competencies are reviewed and evaluated on a regular basis by content experts. This helps to ensure that the CRSTEX remains differentiated from the registration examination used for safety professionals in Canada, the CRSPEX.

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[1] The terms appearing in bold are defined in the Glossary.

TECHNICAL SPECIFICATIONS

The following section presents the technical specifications that are to guide the development of the CRSTEX. In the first part, issues related to the competencies are addressed. The second part describes the guidelines to be followed in addressing the structural and contextual variables of the CRSTEX.

The CRSTEX is a **criterion-referenced examination**. That is, a fundamental component of the development of the CRSTEX is a comprehensive description of the content domain being measured. In the case of the CRSTEX, the content domain of interest consists of the competencies a registered safety technician is required to possess in order to practice safely and effectively at the technician level. These competencies form the basis of the CRSTEX.

This section describes the competencies that were obtained as a result of the validation process, the way they have been grouped, and the manner in which they are to be sampled in the examination development process.

DEVELOPING THE SET OF COMPETENCIES

The competencies were evaluated by approximately 1170 Canadian Registered Safety Professionals.

As a starting point for developing the competencies, a Committee on Technician Competencies was formed that was representative of all areas of practice of registered safety professionals in Canada. This committee began by reviewing the competency lists, the nine category classification used in the 2014 CRSPEX Blueprint, and other reference materials that outline the competencies of a safety technician). The competency lists and domains were then systematically reviewed by a focus group of safety professionals using the Delphi method to identify which competencies where deemed appropriate for technician level certification, and what additional or new competencies should be included. This resulting set of competencies were then evaluated by a sample of approximately 1170 Canadian Registered Safety Professionals (CRSP's), including practitioners, educators, and administrators, who were asked to rate each competency in terms of its applicability, importance and frequency for the registered safety technician. The Committee reviewed the results of the survey. The CRSTEX Set of Competencies has the primary purpose of providing the content domain for the examination.

COMPETENCY DOMAINS

The classification of the competencies consisted of the following nine domains defined below (the number and the percentage of competencies are indicated in parentheses following the category name):

1. Applied Safety Fundamentals (23 competencies or 28% of the set of competencies)

2. Auditing (3 competencies or 4% of the set of competencies)

3. Ergonomics (6 competencies or 7% of the set of competencies)

4. Fire Prevention and Protection (8 competencies or 10% of the set of competencies)

5. Health and Wellness (9 competencies or 11% of the set of competencies)

6. Law and Ethics (9 competencies or 11% of the set of competencies)

7. Management Systems (4 competencies or 5% of the set of competencies)

8. Occupational Hygiene (12 competencies or 15% of the set of competencies)

9. Risk Management (7 competencies or 9% of the set of competencies)

Some of the competencies lend themselves to being placed in one or more of the domains, so these nine domains should be viewed simply as an organizing framework. It should be recognized that the competency statements vary in scope, with some representing global activities and others more discrete and specific actions.

STRUCTURAL VARIABLES

In addition to the specifications related to the competencies, other variables must be considered during the development of the CRSTEX. Structural variables include those characteristics that determine the general appearance and design of the examination. They define the length of the examination, the format/presentation of the examination questions (e.g., multiple-choice format), and the cognitive objective that each question measures (e.g., basic knowledge/comprehension). The weightings of the nine domains are also included as structural variables.

There will be 190 to 210 operational multiple choice questions on the Canadian Registered Safety Technician Examination.

- Examination Length and Format: The examination will consist of between 190 and 210 operational multiple choice questions. With 81 competencies to measure and a sound sampling approach for these competencies, an examination of between 190 and 210 operational questions is sufficient to make both reliable and valid decisions about an examinee's readiness to practice safely and effectively.

- Question Presentation: The multiple choice questions of the CRSTEX are presented in one of two formats, case-based or independent questions.

The Canadian Registered Safety Technician Examination represents the different areas of practice of registered safety technicians.

- Cognitive Objective: This examination will include questions that fall under three cognitive taxonomy categories: knowledge/comprehension, application and critical thinking. Knowledge/comprehension questions test a candidate's ability to recognize previously learned material and to understand its meaning; and know and understand definitions, facts, concepts and principles. Application questions test a candidate's ability to apply knowledge and learning to new or practical situations; can apply rules, methods, principles and theories; and identify consequences from a given situation. Critical thinking questions test a candidate's ability to make a correct decision and identify correct practices based upon information given; and can judge the relevance of data, evaluate the effectiveness of different actions, and solve problems.

CONTEXTUAL VARIABLES

In addition to structural variables, contextual variables qualify the content domain by specifying the contexts in which the examination questions will be set (i.e., technician context).

It is recognized that the practice environment of entry-level registered safety technicians can be any setting or circumstance within which occupational health and safety can be practiced, and is distinct from that of registered safety professionals. The competencies assessed by the examination are not setting dependent. The practice environment will be specified when necessary.

In each setting, the safety technician may serve as a practitioner, technologist, or advisor). This will be considered in forming the context of examination items.

COMPETENCY WEIGHTINGS

To ensure that the examination accurately reflects the profile of the registered safety technician, the competencies were weighted according to their relative importance and frequency based on the survey ratings and a quantitative review by content experts.

The CRSTEX Set of Competencies presents the competencies grouped on the basis of the ratings from the validation survey.

These weightings were used to establish the relative emphasis that the competencies will receive on the examination. The competencies have been weighted using the application, importance and frequency ratings obtained in the competency validation study. The weightings represented in the 2014 CRSPEX Blueprint were also used as a guide.

Based on these sources, and with the guideline that the CRSTEX will consist of between 190 and 210 questions, the sampling scheme presented in the table below was developed. The distribution of weights in this sampling scheme was selected: (1) to provide differentiation on the rating variables (importance and frequency); (2) to provide

comparison and differentiation from the weights in the registered safety professional examination (the CRSPEX); and (3) to conform with the examination length requirement. The following table presents the percentage range of questions in each of the nine domains of competencies.

Competency Domains	Percentage of Questions on the CRSTEX
1. Applied Safety Fundamentals	30%-40%
2. Auditing	10%-13%
3. Ergonomics	3%-5%
4. Fire Prevention and Protection	4%-8%
5. Health and Wellness	3%-5%
6. Law and Ethics	11%-15%
7. Management Systems	3%-5%
8. Occupational Hygiene	10%-13%
9. Risk Management	13%-17%

CONCLUSION

The *Blueprint for the Canadian Registered Safety Technician Examination* is the product of a collaborative effort between BCRSP and Canadian Registered Safety Professionals (CRSP's). Their efforts have resulted in a compilation of the competencies required of the entry level registered safety technician to practice and of the guidelines on how the competencies will be measured on the CRSTEX. A summary of these guidelines can be found in the CRSTEX Examination Development Summary Chart, on page 10.

It is recognized that the health and safety profession will continue to evolve. As this occurs, the Blueprint (i.e., the competencies and the test

development guidelines) may require revision so that it accurately reflects the scope of practice, roles, and responsibilities of the entry level safety technician, and that these remain differentiated from the registered safety professional. CRSPEX will ensure this revision takes place in a timely manner and will communicate it in updated editions of this document.

CRSTEX Examination Development Summary Chart

Examination Length and Format	190 to 210 operational multiple choice questions. Three and a half (3.5) hours will be allocated for the completion of the examination.	
Question Presentation	Independent questions Case-based questions	80-90% 10-20%
Competency Domains and Weightings	1. Applied Safety Fundamentals 2. Auditing 3. Ergonomics 4. Fire Prevention and Protection 5. Health and Wellness 6. Law and Ethics 7. Management Systems 8. Occupational Hygiene 9. Risk Management	30-40% 10-13% 3-5% 4-8% 3-5% 11-15% 3-5% 10-13% 13-17%

Cognitive Taxonomy	The specific competency determines which cognitive taxonomy a question falls under. This is specified in the CRSTEX Competency Profile, on pages 13-16. For the entire examination, the percentage of questions that represent each cognitive taxonomy is as follows: Knowledge/Comprehension 75% Application 23% Critical Thinking 2%* *pertains only to competencies LE7 and LE9, see the CRSTEX Competency Profile, on page 15.

GLOSSARY

case-based questions: A set of questions associated with a brief scenario.

competencies: The behaviour statements which reflect the combined knowledge, abilities, skills, attitudes, and judgment expected of an entry level registered safety technician.

criterion-referenced (C-R) examination: A test that measures the degree of command of a specified content/skills domain or list of instructional objectives. Scores are interpreted in comparison to a predetermined performance standard, or as a degree of mastery of a defined domain (e.g., percent correct and mastery scores), independently of the results obtained by other candidates. (Brown, 1983)

independent items: Stand-alone objective examination items which contain the information necessary for responding.

operational questions: Questions appearing on the examination that have been pre-tested and that are suitable for the examination. The answer to these questions count in the candidate's score.

CRSTEX COMPETENCY PROFILE

		Cognitive level 1 = Knowledge/ Comprehension 2 = Application 3 = Critical Thinking
Applied Safety Fundamentals (ASF)		
ASF1	Ability to conduct basic workplace inspections.	2
ASF2	Ability to conduct basic incident investigations.	2
ASF3	Basic knowledge/comprehension of statistical analysis (e.g., mean, percentage, standard deviation, time weighted average, etc.).	1
ASF4	Ability to conduct basic task analyses/job hazard analyses/job safety analyses.	2
ASF5	Basic knowledge/comprehension of material/process flow analyses.	1
ASF6	Basic knowledge/comprehension of the importance of safety in the design and procurement process for tools, equipment and materials.	1
ASF7	Ability to apply the fundamentals of safe use, handling, storage, disposal and risks associated with chemicals, explosives and radioactive material in the workplace (i.e., WHMIS/GHS).	2
ASF8	Ability to assess the hazards and controls of machinery safeguarding (e.g., point-of-operation, light curtains, interlocks, etc.).	2
ASF9	Ability to assess the appropriate use of personal protective equipment.	2
ASF10	Basic knowledge/comprehension of electrical safety (e.g., bonding, grounding, circuit interrupter, etc.).	1
ASF11	Ability to assess the hazards and controls of safe material handling and storage.	2
ASF12	Ability to assess the hazards and controls of hoisting and conveying equipment (e.g., ropes, chains, slings, cranes, conveyors, etc.).	2
ASF13	Ability to assess the hazards and controls of powered mobile equipment and vehicles (e.g., forklifts, scissorlifts, bucket trucks, pickup trucks, vans, etc.).	2
ASF14	Ability to assess the hazards and controls of hand and portable tools.	2
ASF15	Ability to assess the hazards and controls of shop machinery (e.g., lathes, table saws, drill presses, etc.).	2
ASF16	Ability to assess hazards and controls associated with hot work (e.g., welding, cutting, brazing, etc.).	2
ASF17	Ability to assess hazards and the control of hazardous energy and harmful substances (e.g. lockout/tagout of hydraulic, pneumatic, steam, mechanical, electrical hazards, etc.).	2
ASF18	Basic knowledge/comprehension of hazards and controls associated with automated systems, equipment and processes (e.g., robotics, remote starts, computer controlled systems, nanotechnology, etc.).	1
ASF19	Basic knowledge/comprehension of process safety (e.g., chemical, manufacturing, etc.).	1
ASF20	Ability to assess the hazards and controls related to confined space entry.	2
ASF21	Ability to assess the hazards and controls related to elevated work (e.g., ladders, fall protection, platforms, scaffolds, etc.).	2
ASF22	Basic knowledge/comprehension of laboratory safety.	1
ASF23	Ability to assess the hazards and controls associated with working alone and remotely.	2
Auditing (AUD)		
AUD1	Basic knowledge/comprehension of auditing principles and techniques.	1
AUD2	Basic knowledge/comprehension of inspections, compliance audits and management system audits.	1
AUD3	Ability to conduct basic inspection, compliance, and management system audits.	2

Ergonomics (ERG)		
ERG1	Basic knowledge/comprehension of ergonomics (e.g., anatomical, physiological, biomechanical, etc.).	1
ERG2	Basic knowledge/comprehension of the signs and symptoms of musculoskeletal injuries.	1
ERG3	Basic knowledge/comprehension of regulatory requirements related to ergonomics (e.g., regulations, guidelines, standards, etc.).	1
ERG4	Basic knowledge/comprehension of the components of an ergonomics program (e.g., CSA Z412, etc.).	1
ERG5	Basic knowledge/comprehension of the role of ergonomics in design and procurement (e.g., workspace layout, tools, equipment, materials, etc.).	1
ERG6	Basic knowledge/comprehension of the role of an ergonomist.	1
Fire Prevention and Protection (FPP)		
FPP1	Basic knowledge/comprehension of the roles and functions of standard-setting bodies (e.g., National Fire Prevention Association, Underwriters Laboratory, Factory Mutual, Canadian Standards Association, European Union, etc.).	1
FPP2	Basic knowledge/comprehension of codes and standards as applied to fire safety (e.g., National Building Code, National Fire Code, etc.).	1
FPP3	Basic knowledge/comprehension of life safety (e.g., building design, construction, location, materials, etc.).	1
FPP4	Basic knowledge/comprehension of fire chemistry and behaviour.	1
FPP5	Ability to implement basic fire safety programs.	2
FPP6	Ability to implement basic fire prevention procedures.	2
FPP7	Basic knowledge/comprehension of fire detection systems and devices (e.g., design, application, maintenance, inspection, etc.).	1
FPP8	Basic knowledge/comprehension of fire control systems and devices (e.g., design, application, maintenance, inspection, etc.).	1
Health and Wellness (HW)		
HW1	Basic knowledge/comprehension of workplace health promotion.	1
HW2	Basic knowledge/comprehension of injury, illness, and disease prevention programs (e.g., immunizations, personal protective equipment, hand hygiene, medical screening, etc.).	1
HW3	Basic knowledge/comprehension of employee and family assistance programs.	1
HW4	Basic knowledge/comprehension of wellness programs (e.g., stress management, physical fitness, weight management, etc.).	1
HW5	Basic knowledge/comprehension of disability management programs (e.g., modified work, rehabilitation, return to work, etc.).	1
HW6	Basic knowledge/comprehension of addiction control programs (e.g., tobacco, alcohol, drugs, gambling, etc.).	1
HW7	Basic knowledge/comprehension of the effects of fatigue on worker health and performance (e.g., shift work, fitness for work, overtime, etc.).	1
HW8	Basic knowledge/comprehension of the influence of the psychosocial work environment on worker health and wellness (e.g., leadership, expectations, civility, respect, etc.).	1
HW9	Basic knowledge/comprehension of the influence of work/life balance on worker health and wellness.	1
Law and Ethics (LE)		
LE1	Basic knowledge/comprehension of occupational health and safety law in Canada (e.g., Internal Response System (IRS), due diligence, criminal liability, general duty clause, etc.).	1

LE2	Basic knowledge/comprehension of environmental legislation (e.g., Canadian Environmental Protection Act, Hazardous Products Act, Transportation of Dangerous Goods Act, WHMIS/GHS, etc.).	1
LE3	Basic knowledge/comprehension of the duties of workplace parties (e.g., supervisors, workers, joint health and safety committees/representatives, etc.).	1
LE4	Ability to apply the principles of worker rights (i.e., right to know, right to participate and right to refuse).	2
LE5	Basic knowledge/comprehension of the duties and powers of enforcement agencies (e.g., orders to comply, prosecutions, ticketing, administrative penalties, the appeal process, etc.).	1
LE6	Ability to meet the obligations of a certified OHS Technician (e.g., with respect to employers, co-workers, public, fellow professionals, contractors, etc.).	2
LE7	Ability to critically evaluate the certified OHS Technician obligations with respect to *The Rules of Professional Conduct* (Code of Ethics).	3
LE8	Basic knowledge/comprehension of consequences of professional errors and omissions.	1
LE9	Ability to critically evaluate the role of the certified OHS Technician and limits of professional practice (e.g., interaction with government agencies, scope of practice, boundaries of competence, etc.).	3
Management Systems (MS)		
MS1	Basic knowledge/comprehension of the integration of health and safety into organizational structure, function, culture and design.	1
MS2	Basic knowledge/comprehension of training needs analyses (e.g., development, delivery and evaluation, etc.).	1
MS3	Basic knowledge/comprehension of adult learning principles.	1
MS4	Ability to deliver routine training programs.	2
Occupational Hygiene (OH)		
OH1	Basic knowledge/comprehension of routes of entry (i.e., inhalation, absorption, ingestion, injection).	1
OH2	Basic knowledge/comprehension of the characteristics, hazards and controls associated with gases, vapours, solvents, fumes, mists, nanomaterials and dusts.	1
OH3	Basic knowledge/comprehension of physical hazards and controls (e.g., noise, ionizing and non-ionizing radiation, thermal stress, vibration, etc.).	1
OH4	Basic knowledge/comprehension of biological hazards and controls (e.g., mold, mycotoxins, influenza, viruses, etc.).	1
OH5	Basic knowledge/comprehension of indoor air quality.	1
OH6	Basic knowledge/comprehension of occupational hygiene measurement and sampling (e.g., air, noise, radiation, chemical, etc.).	1
OH7	Basic knowledge/comprehension of ventilation (e.g., local, general, supply, exhaust, etc.).	1
OH8	Ability to implement occupational hygiene prevention and protection programs (e.g., respiratory, hearing, thermal stress, medical surveillance, etc.).	2
OH9	Basic knowledge/comprehension of occupational exposure limits (e.g., Threshold Limit Values (TLVs), Biological Exposure Indices (BEIs), action levels, etc.) .	1
OH10	Basic knowledge/comprehension of hazards and controls associated with lasers.	1
OH11	Basic knowledge/comprehension of occupational illness and disease (e.g., asthma, chemical and environmental sensitivity, dermatitis, cancer, etc.).	1
OH12	Basic knowledge/comprehension of the role of an occupational hygienist.	1
Risk Management (RM)		
RM1	Basic knowledge/comprehension of risk management principles.	1
RM2	Ability to conduct basic risk assessments (e.g., inventory, risk matrix, prioritization, etc.).	2

RM3	Ability to apply risk control processes (e.g., weight of evidence, precautionary principle, ALARA, etc.).	2
RM4	Basic knowledge/comprehension of emergency preparedness and response planning (e.g., CSA Z731, NFPA 1600, etc.).	1
RM5	Basic knowledge/comprehension of workplace violence and harassment prevention programs.	1
RM6	Ability to apply the hierarchy of controls.	2
RM7	Ability to implement hazard communication (e.g., symbols, safety data sheets, labeling, database research resources, hazard awareness training, etc.).	2