

OSH

Certifications Behind the Exams

By Cheryl L. (Cheri) Marcham, Treasa M. Turnbeaugh and Nicola J. Wright

OSH professionals inherently understand the value of holding certification credentials such as certified safety professional (CSP), Canadian registered safety professional (CRSP) and certified industrial hygienist (CIH), but knowledge about how the certification program is established and maintained may not be as prevalent. OSH professionals might also have questions about the process, such as who determines what topics go on the exam? How are questions written and approved for inclusion on the exam? How are passing scores determined? A great deal of science and mathematics is behind the process. This article aims to answer these questions and help explain why and how a properly developed and administered certification examination shows the mark of excellence in the field of safety and health.

Certification vs. Certificate Program

To understand the certification process, one must first understand the difference between certification and a certificate program. Professional certification is defined by Institute for Credentialing Excellence (ICE) as a “voluntary process by which a nongovernmental entity grants a time-limited recognition and use of a credential to an individual after verifying that he or she has met predetermined and standardized criteria” (Knapp, Fabrey, Rops, et al., 2006,

p. 6). It is a process based on existing legal and psychometric requirements by which individuals who have demonstrated a specific level of knowledge or skill required by a profession are identified to the public and other stakeholders (Knapp, et al., 2006).

Certification programs evaluate professionals against an established industry standard set through a defensible process (often called a job task analysis or role delineation process) resulting in the establishment of appropriate benchmarks of required knowledge and skills (Wright, Turnbeaugh, Weldon, et al., 2015). Certification is awarded for a specific duration with required continuing professional development reported on a set cycle (Wright, et al., 2015). If a certificant does not fulfill the required maintenance activities, the certification award expires.

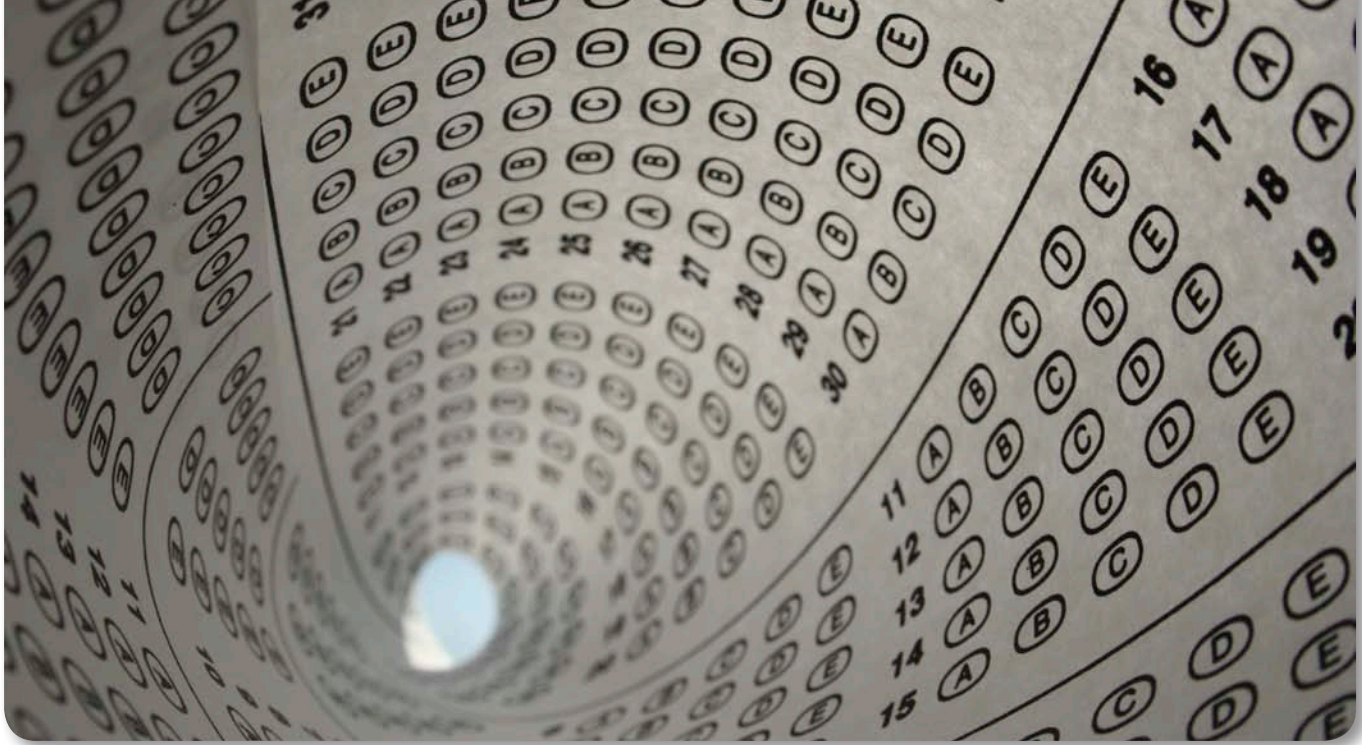
In contrast, a certificate program generally results from attendance or participation in a particular course; successful demonstration of achieving course objectives may or may not be required. If assessment is performed, the evaluation method is typically not set through a formal standard-setting process, but rather is established by the program (Knapp, et al., 2006; Wright, et al., 2015). In addition, no continuing professional development is required to maintain the certificate (Wright, et al.) and the awarded certificate has no expiration.

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Value of Certification

A certification program is a process that identifies individuals who are “qualified in a profession, occupation, role or skill” (Knapp, et al., 2006). Certification programs raise the bar within a profession because they provide a benchmark of professionalism (Wright, et al., 2015). Accredited certification programs, including those accredited by organizations such as ANSI or National Commission for Certifying Agencies, provide professionals, employers, consumers and government agencies an assurance of competency (Wright, et al.).

Research has shown that in some fields, hiring managers may view holding a certification credential as “a more objective measure of a candidate’s skill level than self-reported skills and competency” (Microsoft, 2007, p. 2). Requiring an applicant to hold a specified certification allows an employer to easily screen for those candidates who meet a specified education, experience and competency level.

Organizations that use the services of professionals who hold BCSP certifications report benefits including:

- improved competence in safety decisions;
- improved quality of safety inspections and audits;
- improved trust and confidence from clients in the ability to manage safety at job sites;
- continued professional development through the required certification process (Wright, et al., 2015, p. 2).

A research study on the perceived value of certification among OSH professionals conducted for Board of Canadian Registered Safety Professionals (BCRSP) identified that certification:

- is an indication of professional growth;
- enhances professional credibility;
- provides evidence of professional commitment;
- enhances employability and mobility;
- increases earning potential (Assessment Strategies, 2011; Wright, et al., 2015).

The increased earning potential of certified professionals is also supported through salary survey data collected by BCSP, American Board of Industrial

Hygiene (ABIH), ASSE, AIHA, Alliance of Hazardous Materials Professionals (AHMP) and Institute of Hazardous Materials Management (IHMM) (BCSP, 2015b). The survey confirms that employers recognize the value of certification and reflect this value through increased salaries and promotions (Wright, et al., 2015). However, how many certificants or employers thoroughly understand how the certification process and exams are created and implemented?

Standard Setting & Examination Development

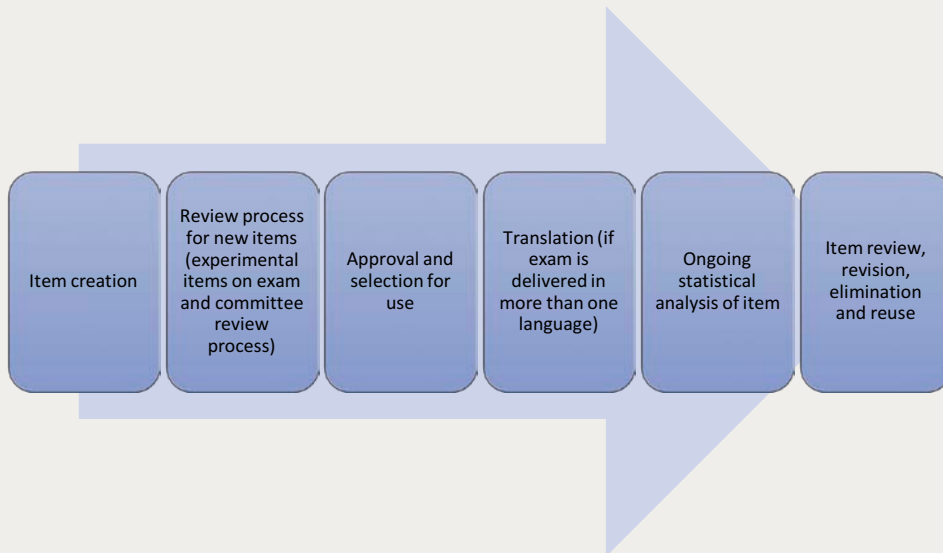
When developing certification examinations, a quality credentialing program must follow logically sound and legally defensible procedures (Wright, et al., 2015). BCSP, BCRSP and ABIH credentialing programs are accredited to the International Organization for Standardization and International Electrotechnical Commission (ISO/IEC, 2012) 17024 standard, Conformity Assessment—General Requirements for Bodies Operating Certification of Persons, which provides “a global benchmark for personnel certification programs to ensure that they operate in a consistent, comparable and reliable manner worldwide, thereby allowing individuals to have skills that translate across national lines” (Gasiorowski-Denis, 2012). In the U.S., the certification of OSH professionals through the use of a standardized assessment tool, such as a multiple-choice examination, has been the industry standard for more than 40 years (Wright, et al.). Using standardized tests ensures a consistent method of scoring and facilitates legal defensibility (Wright, et al.).

Developing and administering the standardized test is accomplished through what is called a *psychometric* process. The study of psychometrics is defined as “a branch of clinical or applied psychol-

IN BRIEF

- **The process of developing and scoring a certification exam is complicated and uses a scientific and mathematic psychometric process to achieve defensible outcomes.**
- **How much of the process is well understood by either the general public, employers or even safety and health professionals?**
- **This article presents information intended to help OSH professionals understand why and how a properly developed and administered certification exam shows the mark of excellence in the field of safety and health.**

FIGURE 1
Item Development Process



Note. Adapted from "Certification of OSH Professionals Through an Accredited Competency Assessment Model," by T. Wright, T. Turnbeaugh, C. Weldon, et al., 2015, Proceedings of WOS 8th International Conference, Porto, Portugal, p. 4.

ogy dealing with the use and application of mental measurement." Essentially, the psychometric process consists of a systematic method of establishing and delivering a quality certification examination measurement tool that will objectively measure an individual's skills and knowledge. The process includes six steps:

- 1) job-task analysis/role delineation;
- 2) validation survey;
- 3) item development;
- 4) cut score determination;
- 5) statistical analysis;
- 6) continuous improvement (Wright, et al., 2015).

Job-Task Analysis/Role Delineation

Before an examination is developed, a certifying body must establish the critical knowledge and skills to be tested (Wright, et al., 2015). This process is known as the job-task analysis or role delineation process, and is usually performed by a group of representative (e.g., geographically, industry and demographically dispersed) subject-matter experts (SMEs) who have already achieved the particular certification under review (Wright, et al.). These SMEs review and determine domains of tasks, knowledge and skills required to practice in a field (Wright, et al.). They also create a list of tasks that may be performed as part of the certificant's job, and a list of knowledge and skills that may be needed to perform the job under each of the identified domains.

To ensure that the competencies identified as critical to practice within the certification are reflective of current practices, BCSP and BCRSP undertake this job-task analysis/role delineation process at least every 5 years (Wright, et al., 2015). This periodic review allows for knowledge of new scientific and technological advances in the profession to be incorporated and evaluated for potential candidates.

Validation Survey

The next step in the examination development process is the validation survey, which uses another representative sample of SMEs to review and validate the outcome from the job-task analysis/role delineation panel (Wright, et al., 2015). This is typically conducted by survey in which the SMEs rate the importance, criticality and frequency of use of each task or skill identified in the job-task analysis (Wright, et al.). The certifying body uses the results of this validation survey to provide the framework for the examination structure (Wright, et al.).

For example, if the survey reveals that the SMEs identified a task, such as "participate in incident investigations using rec-

ognized techniques to prevent recurrence of workplace incidents," as both an important and frequent task for the potential candidate to have at certification, then the certifying body includes questions designed to measure that knowledge or skill on the examination.

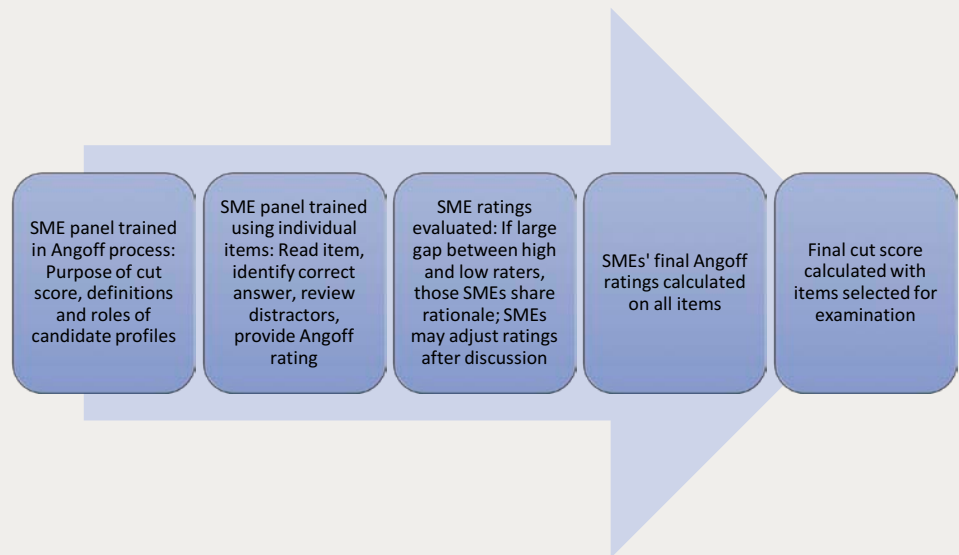
The certifying body compiles the results of the job-task analysis/role delineation and validation process into what is called an *examination blueprint*, which typically provides information on domains and competencies that may be tested (Wright, et al., 2015), as well as how many items or questions should come from each domain and knowledge/skills area. The appropriate board or committee authorized to do so then approves the final blueprint (Wright, et al.). These blueprints are published (ABIH, 2015; BCSP, 2015a; BCRSP, 2014) for potential candidates or employers to review to understand the competencies required of successful candidates, and to provide an outline of topics and concepts to review when preparing for the examination.

Examination & Item Development

Once the competencies to be tested have been finalized and the structure of the examination has been determined, the certifying body can develop the certification examination. It develops *items*, or potential test questions for the examination, to evaluate the candidate's ability to meet a particular knowledge or skill requirement identified on the blueprint. The item development process (Figure 1) is designed to develop test questions that are fair and representative of current and relevant industry practice for the profession (BCSP, 2017b; Wright, et al., 2015).

Another group of SMEs who hold the certification for which the items are being developed is gathered and trained on the process. These SMEs write items using applicable globally recognized resources and references, and document the reference source of the information in the test question

FIGURE 2
Cut Score Determination Process Using Angoff Ratings



Note. Adapted from “Certification of OSH Professionals Through an Accredited Competency Assessment Model,” by T. Wright, T. Turnbeaugh, C. Weldon, et al., 2015, Proceedings of WOS 8th International Conference, Porto, Portugal, p. 4.

for each item (Wright, et al., 2015). Items undergo multiple levels of review to confirm that the item is relevant to the profession and certification, grammatically correct, applicable to a global audience, and linked to the examination blueprint (Wright, et al.). The test question answers must all be of similar length and must contain one correct or best alternative and credible distractor answers—those that are possible but not quite the best alternative.

Before the item is used for scoring on an exam, it must go through a beta testing process to ensure that it appropriately meets certain criteria to appropriately evaluate the candidate’s knowledge or skills. During this phase, items that are too easy (e.g., more than 80% of the candidates answer it correctly) and items that are too difficult (e.g., less than 40% of the candidates answer correctly) are tagged for revision or removal.

By eliminating both the too easy and the too difficult questions, those that remain can truly differentiate between minimally qualified candidates and those unqualified to hold the credential. This point is key to understanding why the cut score (discussed next) appears to the general public to be a relatively low passing score (usually below 70%). When questions that every candidate or most candidates would answer correctly are removed, the overall score will be lower than a typical academic-style examination.

Cut Score Determination

The goal of a certification exam is to determine whether a candidate has the minimum knowledge and skills to be considered competent. This determination is based on whether the candidate’s score on the exam meets or exceeds what is called the *cut score*, or passing score, for the exam (BCSP, 2017b). A common and generally accepted best practice for setting the cut score for certification examinations is using the Angoff Method or Modified Angoff Method (BCSP, 2017b; Wright, et al., 2015).

Using these methods, the process begins with a panel of representative SMEs that is provided information on the Modified Angoff process, the purpose of a cut score, and the definitions and roles of the not acceptable, minimally acceptable and superior candidate profiles for the exam (Young, 2015). A common understanding of the experience level and expectations of the minimally acceptable candidate, which is the target audience for the examination, is critical because the process involves the SMEs’ evaluation of what percentage of these candidates would be expected to know the answer (BCSP, 2017b). This process (Figure 2) takes into

consideration difficulty and whether there would be a universal application of the knowledge or skill across all job settings (BCSP, 2017b).

The certifying body trains SMEs in the Angoff rating process by first using individual test items. Participants read the test item, identify the correct answer, review the distractors and provide an Angoff rating in terms of the SMEs’ estimate of the percentage of minimally acceptable candidates that would correctly answer the item (Young, 2015). The certifying body then evaluates SME ratings and, if ratings show too much variation (e.g., the ratings exceeded a 30-point spread or *SD* of 0.10), the SMEs with high and low ratings share the rationales for their ratings so that the group may discuss the differences in opinions (Young, 2015). Then, the SMEs may adjust their initial ratings; this process is repeated until SMEs are consistently rated with little variation (e.g., a 30-point or less spread, or *SD* of 0.10 or less) (Young, 2015).

Finally, the SMEs provide an Angoff rating for all scored items on the examination and a psychometrician calculates an Angoff cut score (i.e., a tentative cut score) from these values (Young, 2015). Based on the calculated cut score and data from previously administered exams, the certifying body sets an appropriate cut score, then the board or a committee authorized to do so approves this final pass mark for the examination (Wright, et al., 2015). This complicated method results in a pass mark that is reflective of current, relevant and applicable knowledge and skills established through a peer-review process.

Statistical Analysis

Statistical analysis of each test item and the exam as a whole provides a benchmark of the overall performance of a certification examination (Wright, et al., 2015). A psychometrician develops an annual statistical report to provide information on the reliability and validity of the examination forms, item bank

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statistics, program activities/initiatives undertaken for process improvement and recommendations based on industry best practices (Wright, et al.).

The methodology for assessment reliability and validity is a key component within ISO/IEC 17024 (2012), as Clause 9.3.5 states: "Appropriate methodology and procedures shall be documented and implemented to reaffirm, at justified defined intervals, the fairness, validity, reliability and general performance of each examination, and that all identified deficiencies are corrected."

ISO/IEC 17024 (2012) defines *reliability* as an "indicator of the extent to which examination scores are consistent across different examination times and locations" and *validity* as "evidence that the assessment measures what it is intended to measure, as defined by the certification scheme." BCSP (2017a), BCRSP and ABIH (2017) each produce an annual report that provides information on the measurement of the validity and reliability of their respective certification exams (Assessment Strategies, 2014a; Assessment Strategies; 2014b) providing assurance to candidates and the public that the certification meets the highest quality standards.

Continuous Improvement

The certifying body works in a continuous improvement mode to regularly monitor, measure and analyze each step, including established standardized review periods for the examination blueprint, ongoing item bank development and maintenance, and policy review (Wright, et al., 2015). For example, BCSP and BCRSP review and update the ASP, CSP and CSRP blueprints at least every 5 years to ensure that the certification reflects current professional requirements and practices (Wright, et al.).

Certification bodies may also benchmark their policies and procedures to other similar organizations or certification industry best practices as published by organizations such as ICE or the Association of Test Publishers (ATP) (Wright, et al., 2015). Third-party agencies such as the National Commission for Certifying Agencies (NCCA) and ANSI may also evaluate and accredit certification programs as a whole to evaluate whether the process meets ISO/IEC 17024 or other national or international standards for certification (BCSP, 2017b). These continuous improvement and external review processes ensure that the certification is relevant, reliable, valid and defensible.

Conclusion

In both the U.S. and Canada, certification is often used by employers, recruiters and clients as a minimum qualification for OSH professional positions. Research suggests that up to 70% of career advertisements for OSH professionals require or prefer a certified professional (Wright, et al., 2015). Employers may believe that individuals holding these certification credentials have proven their expertise in OSH by demonstrating competency through the certification process, are committed to the continuous learning process and are governed by a code of ethics (Wright, et al.).

However, the certification process is not often understood by either the employer or those holding the certification. Knowing and understanding that the process is methodical, reliable, statistical and validated, and that it demonstrates that it is the mark of excellence in the field of safety and health, are important components of the value of the certification. **PS**

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