Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025 ASEE
Paper ID #45914

Technical Standards as a Form of National Literature: Exploring Early 20th Century Canadian National Standards, 1919-1950

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Introduction

Professional engineers use a wide variety of information resources in their work. For example, journals, trade magazines, conference proceedings, dissertations, handbooks, maps, preprints, technical reports, patents, datasets, and so on [1]. Perhaps the most essential information resource in modern engineering is the technical standard. Virtually every product, system, material, process, and structure manufactured, constructed, or used today must conform to one or more technical standards. Some complex high-tech products, such as airplanes, automobiles, medical devices, and smartphones, must conform to dozens or even hundreds of standards. Standards also provide critical evidence in forensic investigations of engineering failures [2]. To understand why a device, system, or structure failed, it is necessary to understand the standards in force at the time it was made.

Standards are also important in the education of new engineers and engineering technicians. This is highlighted by accreditation criteria for engineering programs in North America. Both the Canadian Engineering Accreditation Board (CEAB) and the Accreditation Board for Engineering and Technology (ABET) require standards and codes to be included in the engineering curriculum [3, 4]. Engineering librarians have been teaching students to use standards at least since the 1980s, and probably earlier [5]. Consequently, academic libraries that support engineering programs have been collecting standards for decades.

Purpose

The inspiration for this paper was the author's discovery in 2022 of a large cache of early (pre-1950) Canadian national standards in a library storage facility. The standards were developed by the Canadian Engineering Standards Association (CESA), Canada's first national standards development organization (SDO). CESA changed its name to CSA in 1944 in recognition of its increasing portfolio of non-technical standards [6]. To avoid confusion, CSA will be used throughout the rest of this paper.

The CSA standards in the author's library had been withdrawn from the general collection years ago and placed in storage until a decision could be made regarding their fate. Over the years the collection was forgotten.

This discovery prompted several questions that this paper will attempt to answer. First, how complete is the collection held by the author's library? When did CSA publish its first standard? How many standards did CSA publish prior to 1950? How many early CSA standards are held by other libraries? In exploring these questions, the author hopes to shed light on how North American libraries collected and organized early CSA standards, and whether there is evidence

of systematic acquisition of CSA standards prior to the 1950s. Finding answers to these questions will help libraries make decisions regarding their collections of historical standards.

Finally, the author hopes that this study will be the first step in assembling a complete archive of early CSA standards, in print or online, from existing library holdings. Technical standards, especially standards developed by a national standards body like CSA, are a form of national literature worthy of preservation, study, and appreciation. The term "national literature" emerged in the 1820s. In 1830, the Reverend William E. Channing defined national literature as "the expression of a nation's mind in writing" and "the manifestation of a nation's intellect in the only forms by which it can multiply itself at home, and send itself abroad" [7]. Today, "national literature" is generally defined as the corpus of written works from a specific country or geographical region, or from people with ties to a specific country or region, that reflects the history, culture, and society of the people who live within its boundaries. For example, Canadian Literature, Québec Literature, Caribbean Literature, and so on.

Standards and other technical documents are not usually included in popular notions of national literature, which tend to focus on literature, songs, poetry, folklore, and history. However, standards are important because they influence, directly and indirectly, every aspect of modern life. Standards also document the technological, economic, and social development of a nation or society. Preserving historical Canadian national standards will allow future researchers to explore the history of standardization in Canada and its impact on Canadian society.

Brief History of Standards

The history of standards is beyond the scope of this paper. For a detailed account of standardization from the late 1800s to the present, see *Engineering Rules: Global Standard Setting Since 1880* by Yates and Murphy [8]. The concept of standardization has been known since ancient times across many civilizations. Ancient Egyptians, Greeks, Chinese, and Romans were highly skilled architects, engineers, and inventors who applied standardization to their works large and small. For example, Roman roads, many of which are still in use today, are famous for their meticulous design, uniform construction, innovative use of local materials, and durability [9]. However, standards did not exist in the ancient world, at least not in a form that a modern architect or engineer would recognize. Most were akin to "rules of thumb" or "best practices". Some ancient standards were codified by law. For example, Roman architects and builders had to navigate numerous municipal building codes [10].

The Industrial Revolution, which began in Europe in the mid-1700s and spread around the world through the mid-1800s, increased the need for standardization and written standards. Early nineteenth century manufacturers created their own proprietary standards, often referred to as specifications. As transportation and communication networks grew in the mid-1800s, the need for standardization increased to ensure the smooth flow of people, goods, and information across regions and countries [8]. Railroads, telegraphy, and postal services were some of the earliest sectors to adopt standardization.

During the late 1800s, engineering societies and institutes actively promoted standardization. For example, the first British engineering standards committee, formed in 1901, was organized under the auspices of the Institution of Civil Engineers (ICE), the Institution of Mechanical Engineers, Institute of Naval Architects, Iron and Steel Institute, and the Institution of Electrical Engineers (IEE). National governments also began to support standardization. For example, the U.S. Bureau of Standards, now the National Institute of Standards and Technology, was established in 1901.

History of the Canadian Standards Association

The Canadian Standards Association (CSA) is one of North America's oldest and most prolific standards development organizations (SDO). Interest in standardization emerged in Canada in the early 1900s. In 1905, the Canadian Society of Civil Engineers (CSCE), the principal Canadian engineering society since 1887, formed a small committee to investigate collaborative standardization activities in Great Britain and the United States and to make recommendations for Canada. In its report, the CSCE committee recommended adopting existing British and American standards, where appropriate and feasible, rather than creating duplicative Canadian standards [11]. The Society issued several of its own standards in the 1910s [12, 13].

CSA was organized as a committee in 1917, at the height of the First World War, by a group of Canadian engineers interested in promoting standardization, and at the suggestion of the British Board of Trade and the British Engineering Standards Association (BESA) [14]. The committee received its charter in 1919 and was incorporated as the Canadian Engineering Standards Association (CESA) [15].

CSA was organized along the lines of similar SDOs in Great Britain and the United States. The British Engineering Standards Association (BESA), which was established in 1918, and the American Engineering Standards Committee (AESC), also formed in 1918, influenced the development of CSA. BESA became the British Standards Institution (BSI) in 1931; AESC became the American Standards Association (ASA) in 1928. National standards bodies were organized in 27 countries during the 1920s. From their inception, CSA, BSI, and ASA shared common goals and cooperated closely to promote standardization across industries in North America and the British Empire. This cooperation increased during the Second World War due to the Allies' urgent need for compatible equipment, material, and parts, and to increase production and promote the efficient use of materials. In 1946, ASA, BSI, and CSA under the auspices of the United Nations led the reestablishment of the International Organization for Standardization (ISO), which effectively had been disbanded during the war [16].

CSA was initially interested in establishing standards for aircraft parts to ensure that the fledgling Canadian aviation industry would have access to international markets after the First World War [17]. Although CSA obtained government support by promoting Canadian aviation interests, its first ventures were in land-based transportation and electrical systems. CSA published its first standards in 1920: "Standard Specification for Steel Railway Bridges" and "Standard

Requirements for Single-phase Distribution Type Transformers". CSA's first aviation standard was published in 1923: "Standard Specification for Flexible Steel Wire Rope and Flexible Strand for Aircraft Purposes." CSA standards were pamphlet-sized with thin cardstock covers.

By the end of the 1920s, CSA had published approximately 40 standards including the first edition of the Canadian Electrical Code in 1927 [18]. Canadian industries embraced standardization. CSA's first secretary, Bertram Stuart McKenzie, noted in 1930 that standardization had reduced the number of designs of electric lamp sockets from 169 to 6 [18].

CSA's second secretary, William R. McCaffrey, described the mission of CSA as representing "the interests of the manufacturer and consumer alike, with the object of co-ordinating the elements of quality, economy, and safety…" [6]. By 1944, CSA had published around 200 standards compared to 400 published by ASA [6]. Support for standardization increased during the 1940s. The number of CSA members grew from 600 in 1937 to more than 1,400 in 1949 [19].

CSA in the Current Canadian Standards Landscape

CSA is one of about twenty SDOs that are accredited by the Standards Council of Canada (SCC) to develop, publish, and maintain National Standards of Canada (NSC). SCC is a national body that coordinates standardization activities within Canada and represents Canadian interests as a member of the ISO. It maintains a database of published National Standards of Canada and international standards, mainly ISO and IEC standards.

SCC accredited Canadian SDOs include Underwriters' Laboratories of Canada (ULC), Canadian General Standards Board (CGSB), Accessibility Standards Canada (ASC), and the Bureau de normalization du Québec (BNQ). SCC accredited international SDOs include, among others, the Air-conditioning, Heating, and Refrigeration Institute (AHRI), ASTM International, Compressed Gas Association (AGA), IEEE, and NSF International. CSA maintains more than 3,000 active standards and codes in 57 sectors. In addition to developing standards, CSA also provides testing and certification services.

ULC is the second oldest SDO operating in Canada. Established in Chicago in 1894, UL began operating in Canada in the early 1900s. In 1920, ULC was incorporated in Canada to meet the growing demand for safety standards and testing services [20]. Today, ULC maintains approximately 1,500 standards including several hundred approved by CSA.

CGSB was established in 1934 as the Government Purchasing Standards Committee. It adopted its current name in 1980 and is now located in Public Services and Procurement Canada [21]. It maintains several dozen standards in 19 areas ranging from petroleum and fuel to the national flag of Canada. Most CGSB standards are available for free [22].

BNQ was established in 1961 and adopted its current name in 1966. It is the only SDO accredited by SCC to develop standards in the province of Québec. It also represents Québec in

national and international standards organizations such as the ISO [23]. BNQ's main sectors are agri-food, business management, civil engineering and urban infrastructure, construction, customer service, environment, forestry, health in the workplace, horticulture, hydrogen, protection and safety, and sustainable development. Since the 1960s, BNQ has developed hundreds of standards and currently maintains approximately 200, many of which are available for free in English and French on the BNQ website [24].

Accessibility Standards Canada (ASC) was established in 2019 under the *Accessible Canada Act*. ASC develops accessibility standards for federal organizations and federally regulated entities such as banks, national transportation companies, and broadcasting and telecommunications firms. ASC has published five standards including two NSCs and has 20 more under development [25].

Literature Review

Since the 1980s, librarians have published numerous articles and books on collecting, organizing, and teaching standards. A recent excellent example is *Teaching and Collecting Technical Standards*, edited by Leachman, Rowley, Phillips, and Solomon [26]. However, most of these articles focused on current issues, not managing historical standards collections. There are few publications prior to the 1980s that describe how libraries collected, organized and used standards.

In 1949, Blanche Dalton, the engineering librarian at the University of California, Berkeley, published one of the earliest guides to engineering literature [27]. She included a brief chapter (p. 106-109) on standards and specifications which lists the addresses of three dozen national standards organizations and a few secondary sources. She noted that standards "present a problem to libraries, since they are so numerous and since there is no one agency, national or international, responsible for all of them." However, she offered no guidance on collecting, organizing, or using standards.

In 1963, Thomas Minder, an engineering librarian at Pennsylvania State University, completed a master's thesis on engineering standards [28]. He also commented on the many challenges standards pose to libraries, noting that they are "rarely organized or published in a form that allows itself to normal classification, cataloging, and filing" (p. 21) and are "one of the most elusive forms of literature to find through normal bibliographic sources" (p. ii). Minder's thesis focused on how standards are published, indexed, advertised, and distributed. He did not address how libraries collect, organize, or use standards.

A. S. Tayal of the Indian Standards Institution recommended in 1961 that libraries should classify and catalog standards under the classification system they use for other materials and that standards should be shelved in three groups: national standards, standards from government agencies, and standards from other organizations [29].

Methodology and Limitations

The author's first task was to compile an inventory of CSA standards published from 1920 through 1949. This proved challenging as CSA did not publish a catalog of standards until the 1950s. The author reached out to CSA several times and requested a list of early CSA standards. Each time, CSA's response was evasive and unhelpful. Compendex, the engineering literature database, contains approximately 129 records for CSA standards published from 1927-49. However, these records lack standard numbers, which made it difficult to track editions.

The author used historical standards and secondary sources to compile an inventory. Lists of CSA standards available for purchase were included in the inside covers of standards published from 1920 through the early 1930s. See Fig. 1 below. The *Quarterly Bulletin of the CESA*, which began in 1927, also included lists of available standards in each issue. See Fig. 2 below. Another useful source was the *Industrial Standardization and Commercial Standards Monthly*, a trade magazine published in the 1930s and 1940s by the American Standards Association (ASA) and the U.S. National Bureau of Standards. The ASA Library collected foreign standards and announced new acquisitions in the magazine, which may be viewed in the HathiTrust Digital Library.

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2 CANADIAN ENGINEERING STANDARDS ASSOCIATION

LIST OF PUBLICATIONS

No. A 1 —1928 Standard Specification for Steel Railway Bridges (third edition). Price 50c.
A 1a—1928 Material Specifications, Steel Railway Bridges (second reprint). Price 15c.
C 2 —1920 Standard Requirements for Distribution Type Transformers.
C 3 —1924 Standard Specification for Galvanized Telegraph and Telephone Wire (reprint).
B 4 —1921 Standard Specification for Wire Rope for Mining, Dredging and Steam Shovel Purposes.
A 5 —1927 Standard Specification for Portland Cement (second edition).
A 6 —1929 Standard Specification for Steel Highway Bridges. (second edition). Price 50c.
D 7 —1922 Standard Specification for Flexible Steel Wire Rope and Flexible Strand for Aircraft Purposes.
G 8 —1923 Replaced by G26-1929 and G27-1929 (see below).
A 9 —1923 Standard Specifications for Reinforcing Materials for Concrete.
C10 —1923 Standard Specification for Tungsten Incandescent Lamps.
D11 —1924 Interim Report on the Manufacture, Testing and Use of Gasoline.
B12 —1924 Standard General Specification for Galvanized Steel Wire Strand.
E13 —1924 Standard Specification for Railway Wire-Fencing and Gates.
C14 —1924 Standard Specification for Reinforced Concrete Poles.
C15 —1924 Standard Specification for Eastern Cedar Poles.
A16 —1924 Standard Specification for Steel Structures for Buildings.
C17 —1925 Standard Requirements for A. C. Watthour Meters.
B18 —1925 Standard Specification for Stove Bolts.
A19 —1926 Standard Classification of Items of Highway Expenditure.
A20 —1927 Standard Specification for Movable Bridges.
C21 —1927 Standard Specification for Control Cable for Electrical Power Plant Equipment.
C22 —1927 Canadian Electrical Code—Part I.
A23 —1929 Standard Specification for Concrete and Reinforced Concrete. Price $1.00.
G24 —1929 Standard Specification for Sampling for Check Analysis of Steel Billets, Bars and Shapes.
G25 —1929 Standard Specification for Carbon Steel Billets and Bars of Forging Quality.
*G26 —1929 Standard Specification for Commercial-Quality Hot-Rolled Bar Steels.
*G27 —1929 Standard Specification for Commercial Cold-Finished Bar Steels and Cold-Finished Shafting.
G28 —1929 Standard Specification for Carbon Steel Castings.

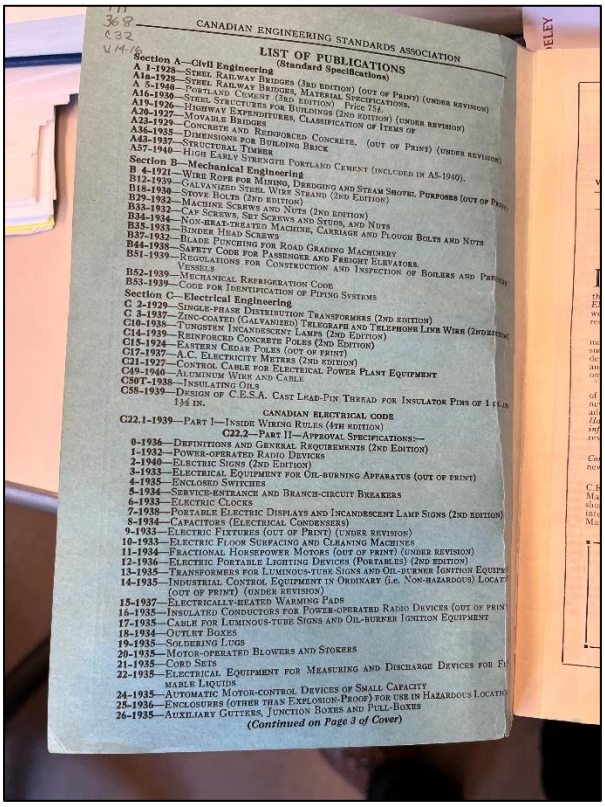
*NOTE:—*G26-1929 and G27-1929 are published in one volume.*

The above are on sale at 25 cents per copy, *except as noted*, and may be obtained from:—

The Secretary,
Canadian Engineering Standards Association,
178 Queen Street,
Ottawa.

NOTE:—*In order to keep abreast of progress in the industries concerned, C.E.S.A. Publications*

Fig. 1. List of CSA standards from the inside cover of CSA Standard A23, Specification for Concrete and Reinforced Concrete, 1929. Source: HathiTrust Digital Library.



CANADIAN ENGINEERING STANDARDS ASSOCIATION

LIST OF PUBLICATIONS
(Standard Specifications)

Section A—Civil Engineering
A 1-1928—Steel Railway Bridges (3rd edition) (out of Print) (under revision)
A 5-1940—Portland Cement Bridges, Material Specifications.
A16-1930—Steel Structures (3rd Edition) Price 75¢.
A19-1926—Highway Expenditures, Classification of Items of
A20-1927—Movable Bridges
A23-1929—Concrete and Reinforced Concrete. (out of Print) (under revision)
A36-1938—Dimensions for Building Brick
A43-1937—Structural Timber
A57-1940—High Early Strength Portland Cement (included in A5-1940).

Section B—Mechanical Engineering
B 4-1921—Wire Rope for Mining, Dredging and Steam Shovel, Purposes (out of Print)
B12-1939—Galvanized Steel Wire Strand (2nd Edition)
B18-1930—Stove Bolts (2nd edition)
B29-1932—Machine Screws and Nuts (2nd edition)
B33-1932—Cap Screws, Set Screws and Studs, and Nuts
B34-1934—Non-heat-treated Machine, Carriage and Plough Bolts and Nuts
B35-1933—Binder Head Screws
B37-1932—Blade Punching for Road Grading Machinery
B44-1938—Safety Code for Passenger and Freight Elevators.
B51-1939—Regulations for Construction and Inspection of Boilers and Pressure Vessels
B52-1939—Mechanical Refrigeration Code.
B53-1939—Code for Identification of Piping Systems

Section C—Electrical Engineering
C 2-1929—Single-phase Distribution Transformers (2nd edition)
C 3-1937—Zinc-coated (Galvanized) Telegraph and Telephone Line Wire (2nd edition)
C10-1935—Tungsten Incandescent Lamps (2nd Edition)
C14-1939—Reinforced Concrete Poles (2nd Edition)
C15-1924—Eastern Cedar Poles (out of print)
C17-1937—A.C. Electricity Meters (2nd edition)
C21-1927—Control Cable for Electrical Power Plant Equipment
C49-1940—Aluminum Wire and Cable.
C50T-1938—Insulating Oils
C58-1939—Design of C.E.S.A. Cast Lead-Pin Thread for Insulator Pins of 1 1/4 in.

CANADIAN ELECTRICAL CODE
C22.1-1939—Part I—Inside Wiring Rules (4th edition)
C22.2—Part II—Approval Specifications:—
0-1936—Definitions and General Requirements (2nd Edition)
1-1932—Power-operated Radio Devices
2-1940—Electric Signs (2nd Edition)
3-1933—Electrical Equipment for Oil-burning Apparatus (out of print)
4-1935—Enclosed Switches
5-1934—Service-entrance and Branch-circuit Breakers
6-1933—Electric Clocks
7-1938—Portable Electric Displays and Incandescent Lamp Signs (2nd edition)
8-1934—Capacitors (Electrical Condensers)
9-1933—Electric Fixtures (out of Print) (under revision)
10-1933—Electric Floor Surfacing and Cleaning Machines
11-1934—Fractional Horsepower Motors (out of print) (under revision)
12-1936—Electric Portable Lighting Devices (Portables) (2nd edition)
13-1935—Transformers for Luminous-tube Signs and Oil-burner Ignition Equipment
14-1935—Industrial Control Equipment in Ordinary (i.e. Non-hazardous) Locations (out of print) (under revision)
15-1937—Electrically-heated Warming Pads
16-1935—Insulated Conductors for Power-operated Radio Devices (out of print)
17-1935—Cable for Luminous-tube Signs and Oil-burner Ignition Equipment
18-1934—Outlet Boxes
19-1935—Soldering Lugs
20-1935—Motor-operated Blowers and Stokers
21-1935—Cord Sets
22-1935—Electrical Equipment for Measuring and Discharge Devices for Flammable Liquids
24-1935—Automatic Motor-control Devices of Small Capacity
25-1936—Enclosures (other than Explosion-Proof) for use in Hazardous Locations
26-1935—Auxiliary Gutters, Junction Boxes and Pull-Boxes
(Continued on Page 3 of Cover)

Fig. 2. List of CSA standards from the inside cover of an issue of the *Quarterly Bulletin of the CESA.*

CSA supported the use of standards for educational purposes and offered schools, universities, and prisons a 50 percent discount on the price of its standards, which generally cost from 25 cents to $1 [30]. Presumably, many CSA standards purchased by educational institutions would have been catalogued and stored in a library. Tracking standards held by libraries is challenging because libraries over the years have used a variety of practices for managing standards. Some libraries catalogued individual standards as if they were books or reports. Others created a single catalog record for multiple standards. Many libraries did not catalog standards, relying instead on an in-house index or database. It would be impossible to search the catalogues of every library that might hold CSA standards. Instead, the author searched WorldCat, HathiTrust Digital Library, and the catalogues of research libraries most likely to have CSA standards. These included Library and Archives Canada (LAC), Ingenium (formerly the Canadian Science and Technology Museum), National Science Library (NRC), Toronto Public Library (TPL), and the library catalogues of Queen's University, University of Toronto, University of Alberta, University of British Columbia, and McGill University. Bibliographic and holdings data were compiled in a spreadsheet for analysis.

Of course, library catalogues are not perfect sources of information. Catalogue records may be incomplete or out-of-date. A catalogue record does not guarantee that a given publication is still in the collection.

Discussion of Results

Using the sources mentioned above, the author identified 266 CSA standards published from 1920 through 1949. The first few CSA standards were assigned plain serial numbers in the order they were published; for example, 1, 2, 3, and so on. In 1922, CSA added a letter code prefix indicating the technical sector of the standard. See Table 1 below. Standards issued in 1920-21 were also assigned codes retrospectively. New codes were created as needed.

Table 1. CSA Sector Codes, 1920-1950

Code	Sector	First Use
A	Civil engineering	1922
B	Mechanical engineering	1922
C	Electrical engineering	1922
D	Automotive work	1922
E	Railway work	1924
G	Ferrous metallurgy	1923
H	Non-ferrous metals	1950s
M	Mining machinery	1950s
S	Steel	1935
W	Welding	1946
Z	Information technology	1943
ARP	Civil defense	1942-44

Fig. 3 below shows the number of CSA standards by year and category. The Canadian Electrical Code (C), first published in 1927, accounted for 58.6 percent of standards issued during CSA's first three decades.

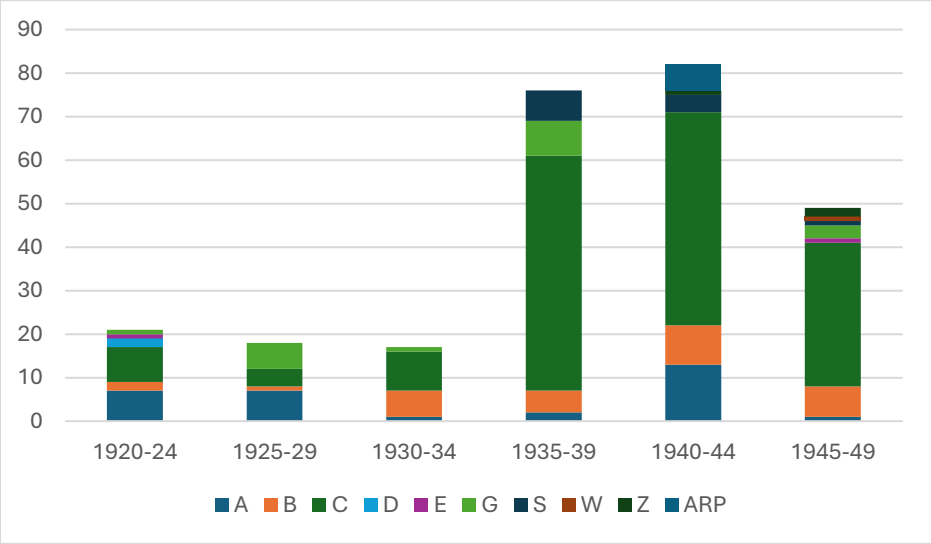


Fig. 3. CSA Standards by Year and Category, 1920-49

Of course, standards are frequently revised. Dozens of CSA standards were revised and reissued from 1922 onward. Second editions accounted for 25.6 percent of standards. There were fifteen third editions and two fourth editions. Some of the most frequently updated standards were steel highway bridges (S6) and steel railway bridges (A1), portland cement (A5), and the Canadian Electrical Code (C22).

Early CSA Standards in Libraries

The author found library catalog records for 157 of the 266 CSA standards published from 1920-49, or about 59 percent. The University of Toronto held the most with 100 records, about 38 percent. The University of Alberta ranked second with 45 records. Library and Archives Canada and Ingenium had 17 records each; Queen's University had 16 records; and the University of British Columbia had 12 records. HathiTrust had only five CSA standards, four from the 1920s and one from 1942. WorldCat revealed a handful of CSA standards held by various libraries. See Table 2 below.

Table 2. CSA Library Holdings by Five-Year Interval

Library	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	Total	% of 266
HathiTrust	2	2	0	0	1	0	5	1.9
Ingenium	9	3	0	2	3	0	17	6.4
LAC	3	4	0	4	3	3	17	6.4
McGill U.	6	0	0	0	0	0	6	2.3
Queen's U.	9	4	0	1	1	1	16	6.0
U. Alberta	1	1	1	4	7	31	45	16.9
UBC	5	2	0	1	2	2	12	4.5
U. Toronto	11	13	5	30	32	9	100	37.6
# unique	18	15	6	36	37	40	157	59
% total	85.7	83.3	35.2	47.4	45.1	76.9		

More than 80 percent of CSA standards published in the 1920s were found in library catalogues. This suggests that some libraries, most notably the University of Toronto, were actively collecting standards. However, the number of holdings drops sharply in the early 1930s. Only 35 percent of CSA standards published from 1930-34 were found in library catalogs. It is possible that financial austerity measures imposed by the Great Depression curtailed active collecting by libraries. Library holdings rebounded during the late 1930s and early 1940s but remained below fifty percent. In the postwar years library holdings increased to almost 77 percent, perhaps because improving economic conditions allowed libraries more flexibility to purchase standards.

There was an interesting shift between the University of Alberta and the University of Toronto. In the late 1930s and early 1940s, the University of Toronto acquired a significant number of CSA standards but apparently lost interest after 1944. The University of Alberta acquired only a

handful of CSA standards from 1920-44, but from 1945 onward acquired many. There isn't a clear pattern of acquisitions among other libraries. It is possible that early CSA standards held by other academic libraries were acquired by donation or purchased on request. It is curious that Library and Archives Canada holds so few CSA standards. Of course, it is also possible that the libraries included in this study and other libraries hold many early CSA standards that are not catalogued. See the appendix for a complete list of CSA standards and library holdings.

Table 3 below shows CSA library holdings by sector. Given that nearly two-thirds of CSA standards were classified under Electrical Engineering (C), it is not surprising that these account for the bulk of holdings in libraries. No holdings were found for civil defense standards (ARP) issued from 1942-44.

Table 3. CSA Library Holdings by Sector

Library	A	B	C	D	E	G	S	W	ARP
HathiTrust	5	-	-	-	-	-	-	-	-
Ingenium	5	2	10	-	-	-	-	-	-
LAC	9	1	6	-	-	-	1	-	-
McGill U.	1	-	3	1	1	-	-	-	-
Queen's U.	6	1	3	1	1	4	-	-	-
U. Alberta	4	5	30	-	1	4	1	-	-
UBC	5	1	1	1	1	-	2	1	-
U. Toronto	12	14	48	1	1	15	3	1	-

Conclusions and Future Work

This study has described the history of early CSA standards and documented library holdings of CSA standards through 1949. The collection of early CSA standards in the author's library is not as complete as they had hoped. In fact, most of the libraries included in this study hold only a handful of CSA standards. The exceptions are the University of Alberta and the University of Toronto, which appear to have actively collected CSA standards during different periods. It is possible that most early CSA standards held by libraries were acquired through donations or one-time purchases to meet a specific need. It is also possible that some libraries actively collected early CSA standards but discarded them when they were superseded.

The list of early CSA standards compiled for this study is a useful starting point for creating an archive, in print or online, of early Canadian National Standards. CSA standards published before 1948 are in the public domain, so the creation of a digital archive would be relatively straightforward.

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Appendix: CESA Standards, 1920-1949, Held by Selected Research Libraries

Civil Engineering (A)

No-Yr	E	Title	H	Libraries
A1-1920	1	Standard specification for steel railway bridges	■	C
A1-1922	2	Standard specification for steel railway bridges	■	A, C, F, I, J
A1-1928	3	Standard specification for steel railway bridges	■	A, C, F, J
A1a-1922	1	Material specifications, steel railway bridges (separate reprint)	□	-
A5-1922	1	Standard specification for Portland cement	■	B
A5-1927	2	Standard specification for Portland cement	■	B
A5-1940	3	Standard specification for Portland cement	■	B, J
A6-1922	1	Standard specification for steel highway bridges	■	A, B, C, F, H, J
A9-1923	1	Standard specification for reinforcing materials for concrete	■	B, J
A16-1924	1	Standard specification for steel structures for buildings	■	D, I
A16-1930	2	Steel structures for buildings	□	-
A19-1926	1	Standard classification of items of highway expenditure	■	I, J
A20-1927	1	Standard specification for movable bridges	■	C, I, J
A23-1929	1	Standard specification for concrete and reinforced concrete	■	A, C, F
A23-1942	2	Standard specifications for concrete and reinforced concrete	■	A, C, H, I
A36-1935	1	Dimensions for building brick	■	J
A43-1937	1	Structural timber	■	C, J
A54-1940	1	Procedure for fire tests on building construction and materials	■	J
A56-1942	1	Round timber piles	■	F, H
A57-1940	1	High early strength Portland cement	■	J
A60-1941	1	Vitrified clay sewer pipe	□	-
A72T-1942	0	Alkali sulphate resisting cement	■	J
A82.1-1944	1	Building brick	□	-
A82.2-1944	1	Standard methods for sampling and testing brick	□	-
A82.3-1944	1	Standard specification for sand-lime building brick	□	-
A82.4-1944	1	Structural clay load-bearing wall tile	□	-
A82.5-1944	1	Structural clay non-load-bearing tile	□	-
A82.6-1944	1	Standard method for sampling and testing structural clay tile	□	-

A100-1949	1	Specifications for asphalt floor tile	■	C, F, H

Mechanical Engineering (B)

No-Yr	#	Title	H	Libraries
B4-1921	1	Standard specification for wire rope for mining, dredging and steam shovel purposes	■	F, I, J
B12-1924	1	Standard general specification for galvanized steel wire strand	■	B, J
B12-1939	2	Galvanized steel wire strand	■	B, J
B18-1925	1	Standard specification for stove bolts	■	J
B18-1930	2	Standard specification for stove bolts	■	J
B29-1932	2	Machine screws and nuts	■	J
B29-1940	3	Machine screws and nuts	■	J
B33-1932	1	Cap screws, set screws and studs, and nuts	□	-
B34-1934	1	Non-heat-treated machine, carriage and plough bolts and nuts	□	-
B35-1933	1	Binder head screws	■	J
B35-1949	2	Established list of binding head machine screws	■	J
B37-1932	1	Blade punching for road grading machinery	□	-
B44-1938	1	Safety code for passenger and freight elevators	□	-
B51-1939	1	Regulations for construction and inspection of boilers and pressure vessels	□	-
B51-1945	2	Regulations for construction and inspection of boilers and pressure vessels	■	J
B52-1939	1	Mechanical refrigeration code	■	J
B53-1939	1	Code for identification of piping systems	□	-
B62-1940	1	Welded genuine wrought-iron pipe	■	-
B62-1949	2	Welded genuine wrought-iron pipe	■	H
B63-1942	1	Welded and seamless steel pipe	□	-
B63-1949	2	Welded and seamless steel pipe	■	H
B64-1940	1	Cooper and brass pipes, standard sizes	□	-
B65-1940	1	Wood screws	■	H
B66-1940	1	Copper water tubes	□	-
B67-1941	1	Lead pipe	□	-
B70-1941	1	Cast iron soil pipe	□	-
B71-1942	1	Standard dimensions of small rivets	■	J

B75-1937	-	Code of practice for use and care of chain	■	C, H
B89.2-1949	1	Specification for 2 1/2 inch fire hose couplings and fittings	□	-
B97-1948	1	Specifications for limits and fits for engineering and manufacturing	■	H, J

Electrical Engineering (C)

No-Yr	#	Title	H	Libraries
C2-1920	1	Standard requirements for single-phase distribution type transformers	□	-
C2-1929	2	Standard specification for single-phase transformers	■	B, J
C2-1944	3	Standard specification for single-phase transformers	■	J
C3-1921	1	Standard specification for galvanized telegraph and telephone wire	■	J
C3-1924	2	Standard specification for galvanized telegraph and telephone wire (reprint)	□	-
C3-1937	2	Zinc-coated (galvanized) telegraph and telephone line wire	■	J
C3-1941	3	Galvanized (zinc-coated) steel line wire	■	J
C10-1923	1	Standard specification for regular tungsten incandescent lamps	■	B, D, F, J
C10-1938	2	Tungsten incandescent lamps	■	B, J
C14-1924	1	Standard specification for reinforced concrete poles	■	B, D, F, J
C14-1939	2	Reinforced concrete poles	■	J
C15-1924	1	Standard specification for eastern cedar poles	■	B, D, F
C15(A)-1940	2	Eastern white cedar poles	■	J
C15(B)-1940	1	Western red cedar poles	■	J
C15(C)-1940	1	Red, jack and lodgepole pine timber for poles and reinforcing stubs	■	J
C15(D)-1940	1	Creosote treatment for pine poles, etc.	□	-
C15(E)-1948	1	Specification for physical properties and preservative treatment of Douglas fir poles	■	H
C17-1925	1	Standard requirements for A. C. watthour meters	■	B, J
C17-1937	2	A.C. electricity meters	□	-
C21-1927	1	Standard specification for control cable for electrical power plant equipment	■	C, J
C22-1927	1	Canadian Electrical Code - Part I	□	-
C22.1-1935	3	Canadian Electrical Code, Part I: Inside Wiring Rules	■	C
C22.1-1939	4	Canadian Electrical Code, Part I: Inside Wiring Rules	■	C
C22.2-1939	-	Canadian Electrical Code, Part II: Approval Specifications	□	-
C22.2-1942	2	Electrical equipment for oil-burning apparatus	□	-

C22.2/0-1936	1	Definitions and General Requirements	☐	-
C22.2/0-1941	3	Definitions and General Requirements	■	C, H, J
C22.2/1-1932	-	Power-operated radio devices	■	J
C22.2/1(A)-1940	2	Power-operated radio devices, inductively-coupled (transformer) type	■	J
C22.2/1(B)-1941	2	Power-operated radio devices, conductively-coupled (transformerless) type	■	J
C22.2/2-1940	2	Electric signs	☐	-
C22.2/2-1949	3	Electric signs	■	J
C22.2/3-1933	1	Electric equipment for oil-burning apparatus	☐	-
C22.2/3-1942	2	Electric equipment for oil-burning apparatus	☐	-
C22.2/4-1935	1	Enclosed switches	■	J
C22.2/5-1934	1	Service-entrance and branch-circuit breakers	☐	-
C22.2/5-1942	2	Service-entrance and branch-circuit breakers	■	J
C22.2/6-1933	1	Electric clocks	☐	-
C22.2/6-1942	2	Electric clocks	☐	-
C22.2/7-1938	2	Portable electric displays and incadescent lamp signs	☐	-
C22.2/7-1945	-	Essential requirements and minimum standards covering electrical equipment	☐	-
C22.2/7-1948	-	Essential requirements and minimum standards covering electrical equipment	☐	-
C22.2/7-1949	2	Construction and test of portable electric displays and incandescent-lamp signs	■	H
C22.2/8-1934	1	Capacitors (electrical condensers)	☐	-
C22.2/9-1933	1	Electric fixtures	☐	-
C22.2/9-1941	2	Electric fixtures	☐	-
C22.2/10-1933		Electric floor surfacing and cleaning machines	■	H
C22.2/11-1934	1	Fractional horse-power motors	☐	-
C22.2/11-1942	2	Fractional horsepower electric motors	☐	-
C22.2/12-1936	2	Electric portable lighting devices (portables)	☐	-
C22.2/13-1935	1	Transformers for luminous-tube signs and oil-burner ignition equipment	☐	-
C22.2/13-1949	2	Construction and test of electric portable lighting devices (portables)	■	H
C22.2/14-1935	1	Industrial control equipment in ordinary (i.e. non-hazardous) locations	☐	-
C22.2/14-1942	2	Industrial control equipment in ordinary (i.e. non-hazardous) locations	☐	-
C22.2/15-1937	1	Electrically-heated warming pads	☐	-
C22.2/16-1935	1	Insulated conductors for power-operated radio devices	☐	-
C22.2/16-1940	2	Insulated conductors for power-operated radio devices	☐	-

C22.2/17-1935	1	Cable for luminuous-tube signs and oil burner ignition equipment	☐	-
C22.2/17-1949	2	Construction and test of cable for luminous-tube signs and for oil-burner ignition equipment	☐	-
C22.2/17-1949	2	Construction and test of cable for luminous-tube signs and for oil-burner ignition equipment	☐	-
C22.2/18-1934	1	Outlet boxes	☐	-
C22.2/19-1935	1	Construction and test of soldering lugs	☐	-
C22.2/19-1949	2	Construction and test of soldering lugs	☐	-
C22.2/20-1935	1	Motor-operated blowers and stokers	☐	-
C22.2/20-1942	2	Motor-operated blowers and stokers	☐	-
C22.2/20-1949	2	Construction and test of motor-operated blowers and stokers	■	H
C22.2/21-1935	1	Cord sets	☐	-
C22.2/21-1941	2	Cord sets	☐	-
C22.2/22-1935	1	Electrical equipment for measuring and discharge devices for flammable liquids	■	H
C22.2/24-1935	1	Automatic motor-control devices of small capacity	☐	-
C22.2/25-1936	1	Enclosures (other than explosion-proof) for use in hazardous locations	☐	-
C22.2/26-1935	1	Auxiliary gutters, junction boxes and pull-boxes	☐	-
C22.2/27-1936	1	Wireways and bus ways	■	J
C22.2/28-1941	1	Asbestos insulated wire and cables	☐	-
C22.2/28-1949	2	Construction and test of all-asbestos and asbestos varnished cambric insulated wires and cables	■	H, J
C22.2/29-1936	1	Construction and test of panelboards	☐	-
C22.2/29-1949	2	Construction and test of panelboards	☐	-
C22.2/30-1936	1	Enclosed branch circuit cutouts	☐	-
C22.2/30-1949	2	Construction and test of enclosed branch-circuit cutouts	■	H
C22.2/31-1939	1	Switchboards, construction and test of	■	J
C22.2/32-1936	1	Electrically operated refrigeration machines	☐	-
C22.2/33-1936	1	Electric cranes and hoists	☐	
C22.2/34-1936	1	Electrode receptacles for luminous-tube signs	■	H
C22.2/35-1936	1	Low-voltage control-circuit wire and cable	■	J
C22.2/35-1940	2	Low-voltage control-circuit wire and cable	■	J
C22.2/36-1936	1	Electrical appliances for hair dressing and hand drying, etc.	■	J

C22.2/37-1937	1	Christmas-tree and other decorative-lighting outfits	■	H
C22.2/38-1936	1	Rubber-covered wire and cables	■	J
C22.2/39-1936	1	Cutout bases	□	-
C22.2/39-1949	2	Construction and test of cutout bases	■	J
C22.2/40-1936	1	Cabinets and cutout boxes	□	-
C22.2/40-1949	2	Construction and test of cabinets and cutout boxes	■	H
C22.2/41-1937	1	Ground clamps	■	J
C22.2/42-1937	1	Receptacles, plugs and similar wiring devices	□	-
C22.2/42-1942	2	Receptacles, plugs and similar wiring devices	■	J
C22.2/43-1937	1	Lamp-holders have socket-screw shells	□	-
C22.2/43-1949	2	Construction and test of lamp-holders having socket screw-shells	■	H
C22.2/44-1937	1	Flexible tubing (non-metallic)	□	-
C22.2/44-1949	2	Construction and test of flexible tubing (non-metallic)	■	H
C22.2/45-1938	1	Rigid steel conduit	■	J
C22.2/46-1938	1	Electric air-heaters	■	J
C22.2/46-1942	2	Electric air-heaters, construction and test of	■	C, H, J
C22.2/47-1940	1	Construction and test of air-cooled transformers (dry type)	□	-
C22.2/47-1949	2	Construction and test of air-cooled transformers (dry type)	■	J
C22.2/48-1938	1	Non-metallic sheathed cable	■	J
C22.2/49-1937	1	Flexible cord and fixture wire	□	-
C22.2/49-1941	2	Flexible cord and fixture wire	■	J
C22.2/50-1938	1	Construction and test of knife switches	□	-
C22.2/50-1949	2	Construction and test of knife switches	■	H, J
C22.2/51-1938	1	Armoured cable and armoured cord	□	-
C22.2/51-1941	2	Armoured cable and armoured cord	■	J
C22.2/52-1941	1	Service-entrance cables	■	J
C22.2/53-1939	1	Domestic electric clothes-washing machines	□	-
C22.2/54-1942	1	Integral-horsepower electric motors	□	-
C22.2/54-1949	2	Construction and test of integral-horsepower electric motors for other than hazardous locations	■	H
C22.2/55-1942	1	Snap switches	□	-
C22.2/55-1949	2	Construction and test of snap switches	■	H

C22.2/56-1938	1	Flexible steel conduit	☐	-
C22.2/57-1940	1	Pull-off plugs for electro-thermal appliances	☐	-
C22.2/59-1939	1	Fuses (both plug and cartridge type)	☐	-
C22.2/61-1942	1	Electric ranges, construction and test of	■	J
C22.2/64-1942	1	Cooking and liquid-heating appliances (domestic and commercial types)	☐	-
C22.2/66-1942	1	Specialty transformers	☐	-
C22.2/66-1949	2	Construction and test of specialty transformers	■	H, I
C22.2/67-1942	1	Portable electric vacuum cleaners	☐	-
C22.2/67-1949	2	Construction and test of portable electric vacuum cleaners	■	-
C22.2/68-1942	1	Motor-operated appliances-domestic and commercial (fractional horsepowers)	☐	-
C22.2/68-1949	2	Construction and test of motor-operated appliances domestic and commercial (fractional horsepowers)	■	H
C22.2/69-1940	1	Porcelain cleats, knobs and tubes	☐	-
C22.2/72-1942	1	Heating and heater elements-replacement types	■	J
C22.2/73-1941	1	Electrically equipped machine tools	■	J
C22.2/75-1943	1	Synthetic-insulated wires and cables	■	J
C22.2/77-1942	1	Inherent overheating protective devices for motors	☐	-
C22.2/78-1943	1	Varnished-cloth-insulated wires and cables	☐	-
C22.2/79-1943	1	Weatherproof (Neutral) wires and cables (Type WPN)	■	J
C22.3-1936	1	Canadian Electrical Code, Part III: Outside Wiring Rules	☐	-
C22.3/1(A)-1940	1	Supply and trolley lines crossing railways	■	B, H
C22.3/1(B)-1940	1	Communication lines crossing railways	■	B
C22.3/3-1936	1	Inductive coordination (definitions and principles)	☐	-
C22.3/4-1936	1	Conductive coordination (principles and practices)	☐	-
C22.4/102-1948	1	Tolerable limits and special methods of measurement of radio interference from trolley buses, tramways, and electric railways	■	H
C22.4/103-1948	1	Tolerable limits and special methods of measurement of radio interference from high voltage lines and apparatus	■	H
C22.4/106-1949	1	Tolerable limits of radio interference from radio frequency generators -- Industrial, scientific and medical	■	H
C22.4/107-1949	1	Tolerable limits and special methods of measurement of radio interference from wire communication and signal systems	☐	-

C22.5/1-1949	1	Use of electricity in metalliferous and industrial mineral mines and quarries	■	H
C22.5/2-1949	1	Use of electricity in coal mines	■	C, H
C49-1940	1	Aluminum wire and cable	■	J
C50T-1938	1	Insulating oils	□	-
C58-1939	1	Design of C.E.S.A. cast lead-pin thread for insulator pins of 1 in. and 1 3/8 in.	□	-
C68(A)	1	Paper-insulated lead-covered cable	■	J
C77-1942	1	Standard specification for oil circuit-breakers	■	J
C83-1942	1	Standard specification for pole line hardware	□	-
1947	-	Fire hazards specification for construction and test of class II domestic oil burning appliances for use as or in space heaters, etc.	□	-

Automotive Work (D)

No-Yr	#	Title	H	Libraries
D7-1922	1	Standard specification for flexible steel wire rope and flexible strand for aircraft purposes	■	D, F, I, J
D11-1924	1	Interim report on the manufacture, testing and use of gasoline	■	G

Railway Work (E)

No-Yr	#	Title	H	Libraries
E13-1924	1	Specification for railway wire-fencing and gates	■	D, F, I, J
E13-1949	2	Specification for railway wire-fencing and gates	■	H

Ferrous Metals (G)

No-Yr	Ed.	Title	H	Libraries
G8-1923	1	Standard general specification for commercial bar steels	■	F
G24-1929	1	Standard specification for sampling for check analysis of steel billets, bars and shapes	■	F, H, J
G24-1948	2	Standard specification for sampling for check analysis of steel billets, bars and shapes	□	-
G25-1929	1	Standard specification for carbon steel billets and bars of forging quality	■	F, J
G26-1929	1	Standard specification for commercial-quality hot-rolled bar steels	■	J

G26-1929	2	Standard specification for commercial-quality hot-rolled bar steels	■	J
G26-1938	3	Commercial-quality hot-rolled bar steels	■	F, H, J
G27-1929	1	Standard specification for commercial cold-finished bar steels and cold-finished shafting	■	J
G27-1938	3	Commercial cold-finished bar steels and cold-finished shafting	■	J
G28-1929	1	Standard specification for carbon steel castings	■	J
G28-1949	2	Specification for carbon steel castings	■	H
G30-1938	3	Billet-steel concrete reinforcing bars	■	J
G31-1938	3	Rail-steel concrete reinforcing bars	■	J
G32-1930	1	Cold-drawn steel wire for concrete reinforcement	■	J
G32-1938	3	Cold-drawn steel wire for concrete reinforcement	■	J
G38-1935	1	Carbon-steel forgings	■	J
G45-1938	1	Fabricated steel bars or rod mats for concrete reinforcement	■	J
G46-1938	1	Welded steel wire fabric for concrete reinforcement	■	J

Steel Construction (S)

No-Yr	#	Title	H	Libraries
S6-1938	3	Steel highway bridges	■	C, I, J
S16-1940	3	Steel structures for buildings	■	I, J
S39-1935	1	Mild structural steel	■	J
S40-1935	1	Medium structural steel	■	J
S41-1935	1	Structural silicon steel	□	-
S42-1935	1	Structural rivet steel	□	-
S47T-1938	1	Tentative welding qualification code for fabricators, contractors, supervisors and welders	■	J
S48T-1938	1	Tentative electrode specification for electrode manufacturers and structural steel fabricators	■	J
S59-1940	1	Metallic arc welding (bridges and buildings)	■	J
S61-1940	1	Cast iron	□	-
S61-1948	2	Cast iron	■	H
S69-1941	1	Welders' helmets, and hand shields and goggles and general purpose anti-glare goggles	□	-

Welding (W)

No-Yr	#	Title	H	Libraries
W59-1946	2	Welding of bridges, buildings and machinery (metallic-electric arc process)	■	I, J

Information Technology (Z)

No-Yr	#	Title	H	Libraries
Z7.1.15-1948	1	Specifications for motion picture photography (Includes Z7.1.15 through Z7.1.20)	☐	-
Z27.1.21-1948	1	Projection rooms and lenses for motion picture theatres	☐	-
Z85-1943	1	CESA standard specification for abbreviations for scientific and engineering terms	■	J

Civil Defense (ARP)

No-Yr	#	Title	H	Libraries
ARP501-1942	1	Strengthening of cellars in houses	☐	-
ARP502.1-1942	1	Blackout illumination-blue light prohibited	☐	-
ARP503-1942	1	Street lighting during blackouts	☐	-
ARP504-1942	1	Blackout of buildings	☐	-
ARP505-1943	1	Blackout requirements for highway movement	☐	-
ARP507-1943	1	Specification for dimounts	☐	-

Libraries

A. HathiTrust Digital Library
B. Ingenium (National Museum of Science and Technology)
C. Library and Archives Canada
D. McGill University
E. National Science Library (NRC)
F. Queen’s University
G. Toronto Public Library

H. University of Alberta
I. University of British Columbia
J. University of Toronto