

*Industrial Building in the West:
The Dominion Government Elevators
at Saskatoon, Moose Jaw and Calgary*

B Y P A T R I C I A V E R V O O R T



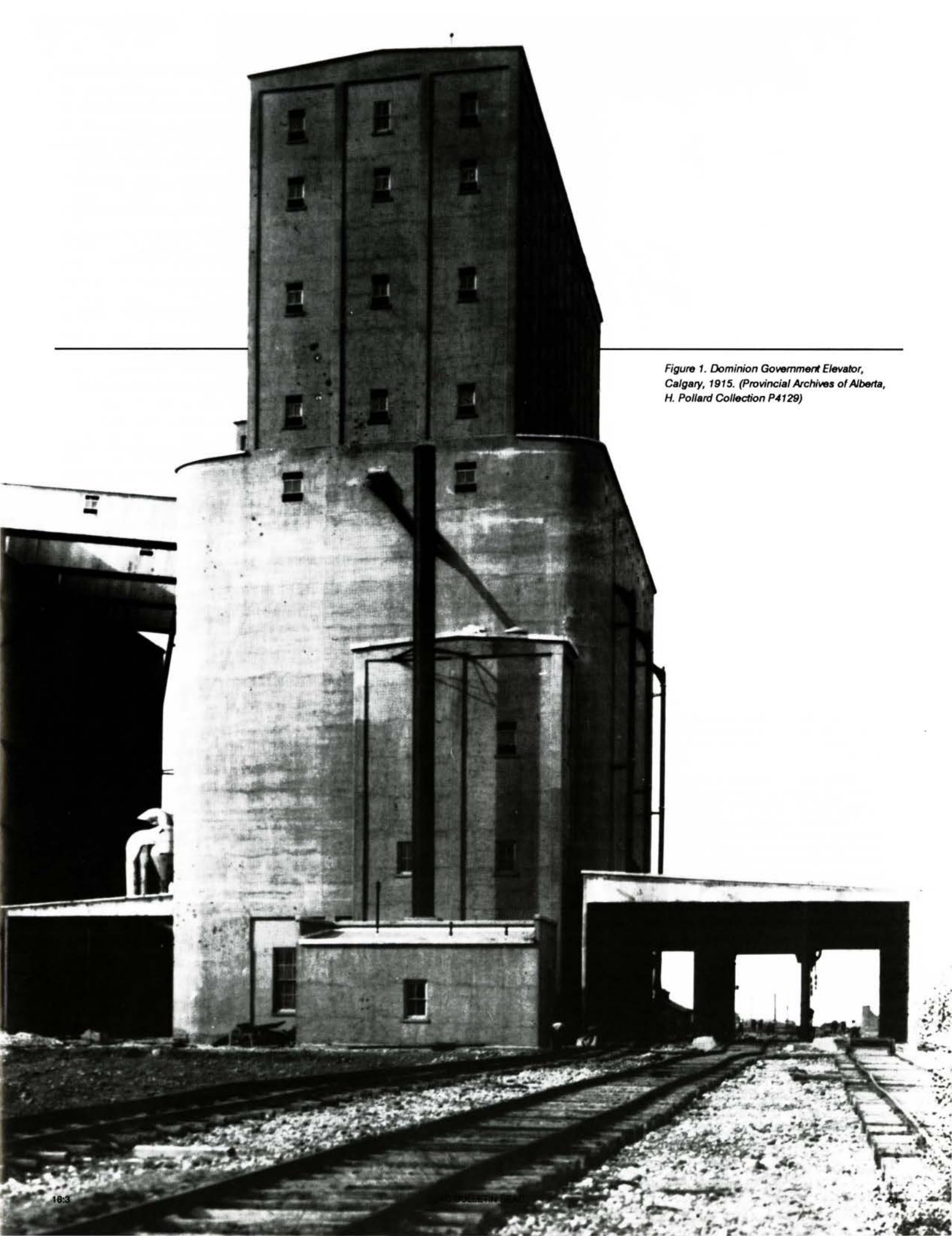


Figure 1. Dominion Government Elevator,
Calgary, 1915. (Provincial Archives of Alberta,
H. Pollard Collection P4129)

Among the earliest large-scale reinforced concrete structures built on the Prairies were the Dominion Government Elevators built between 1913 and 1916 at Saskatoon, Moose Jaw, and Calgary. Of these three elevators, the one at Calgary is best known because its photograph appeared in *Le Corbusier's* book, *Vers une architecture*, in 1923 (figure 1).¹ Recent publications assert that for years the Calgary elevator was "the most internationally renowned piece of Alberta architecture...."² Yet the Calgary elevator, even when called architecture rather than engineering, has remained anonymous. This paper explores the Calgary elevator and its almost identical Saskatchewan counterparts in Saskatoon and Moose Jaw to demonstrate that these important industrial buildings were created by significant Canadian engineers.

These Dominion Government Elevators built by the Board of Grain Commissioners for Canada instituted not only new methods of handling grain in Western Canada, but also brought new industrial building techniques to the West. All three elevators were designed by the Barnett-McQueen Company, Ltd., an engineering firm from Fort William (now Thunder Bay), Ontario. Barnett-McQueen was the Canadian branch of the Barnett-Record Company of Minneapolis; Barnett-Record pioneered slip-form reinforced concrete construction in Canada. Chief Engineer for the Board of Grain Commissioners and supervisor of construction for these three elevators was C.D. Howe (1886-1960). It was during his years with the Grain Commissioners from 1913 to 1916 that Howe learned the elevator business; in 1916 he established his own firm specializing in elevator construction. Thus, the Prairie elevators constructed by the Board of Grain Commissioners for Canada have an importance in Canadian engineering history that has been totally overshadowed by the fact that Le Corbusier used a photograph of the Calgary elevator in *Vers une architecture*.

In 1912, The Canada Grain Act consolidated all of the Canadian grain legislation and placed it under the control of the newly established Board of Grain Commissioners who, in turn, reported to the Minister of the Department of Trade and Commerce. The duties of the Board consisted of administrative work, which included inspecting and weighing grain, licensing elevators, and maintaining statistics; judicial work, investigating all complaints about grain handling; and commercial work, which involved constructing and operating the Dominion Government Elevators.³ The Board's "commercial work" is the focus of this paper. Under section 13 of The Canada Grain Act, the Board of Grain Commissioners was empowered to build public terminal elevators across Western Canada.⁴ Between 1912 and 1916 the Board planned six Dominion Government Elevators, and five of these were constructed: at Port Arthur (now Thunder Bay), Saskatoon, Moose Jaw, Calgary, and Vancouver. The sixth was planned, but not built, for Hudson Bay, specifically at Port Nelson, Manitoba.⁵ Until 1912, all of the terminals serving western grain farmers were located at the Lakehead (Thunder Bay). Most of these terminals were owned by the railroads, although a few were private. For years, farmers had complained about unfair practices at the terminals and disagreed about weights, pricing, and grain mixing. As an alternative, farmers demanded that the government take over the grain terminal business and operate it as a public utility. Instead, the Board of Grain Commissioners compromised first by building its own elevators to offer the farmers a choice between private and government elevators as a means of moving the grain; and second, by allowing the Commissioners to gain first-hand experience in terminal elevator operation.

A terminal elevator is defined as one which receives grain on or after official inspection and weighing. Then the grain is cleaned, stored, treated, and moved forward.⁶ Until 1912, Canadian grain in the Western Division was inspected at Winnipeg and Fort William.

1 Le Corbusier [Charles-Edouard Jeanneret-Gris], *Towards a New Architecture [Vers une architecture]*, trans. Frederick Etchells (1923; New York: Praeger, 1946), 32.

2 Trevor Boddy, *Modern Architecture in Alberta* (Regina: Alberta Culture and Multiculturalism and the Canadian Plains Research Center, 1987), 56-57. Reyner Banham, *A Concrete Atlantis: U. S. Industrial Building and European Modern Architecture 1900-1925* (Cambridge: The M.I.T. Press, 1986), 155: "notable chiefly because it was illustrated by Le Corbusier"; 224, "not identified by Le Corbusier, but now known to be outside Calgary, Alberta." Trevor Boddy, "Introduction: Notes for a History of Prairie Architecture," *Prairie Forum* 5 (Fall 1980): 136.

3 Robert Magill, *Grain Inspection in Canada* (Ottawa: The Department of Trade and Commerce, 1914), 63-64.

4 Statutes of Canada, 2 Geo. V, C27 (1912), 5. C.F. Wilson, *A Century of Canadian Grain: Government Policy to 1951* (Saskatoon: Western Producer Prairie Books, 1978), 42-44.

5 Port Nelson was to be located near the mouth of the Nelson River on Hudson Bay. In the papers of the Grain Commissioners, the port was usually called "Hudson's Bay."

6 Canadian Grain Commission, *Grain Elevators in Canada* (Ottawa: Canadian Government Publishing Centre, 1989), II.

All the facilities for storing grain were in the Lakehead at Fort William and Port Arthur, or to the east, where grain was received from trains and moved on by ship. With the Board of Grain Commissioners and their “commercial work,” the intention was to provide inland terminals, a totally new concept in grain handling which would bring the inspection, weighing, cleaning, drying, and other operations closer to the farmers producing the grain. The inland terminals on the Prairies, with no water access, both received and shipped by train; they also received by truck and wagon. The Board’s terminals, then, were an attempt to appease the farmer’s complaints about the grain handling system in Canada and to make the system more efficient by providing more facilities.

To administer the Canada Grain Act, the federal government appointed three people to form the Board of Grain Commissioners. Each appointment was for a ten year term. On 10 April 1912, Dr. Robert Magill, a professor of philosophy at Dalhousie University, was named as the first Chief Commissioner.⁷ Magill was experienced in the problems of the grain industry; in 1910, he had chaired the Elevator Commission of the Province of Saskatchewan, which investigated the problems encountered by farmers in the handling and shipping of grain. The report advised against government ownership of elevators and favoured a co-operative plan where ownership was in the hands of the farmers.⁸ The other two commissioners appointed in 1912 were Frank Gibbs, a grain inspector from Fort William, and W.D. Staples, a former Manitoba grain farmer and former Conservative Member of Parliament. Gibbs resigned early in 1913 after less than a year in office. Gibbs was not a young man: he had held the appointment of federal grain inspector at the Lakehead from at least 1889.⁹ He was replaced by J.P. Jones, manager of the Empire Elevator Company terminal in Fort William.¹⁰ Also, as Magill indicated in his second annual report, commissioners in one year “travelled individually, approximately 32,000 miles each.”¹¹ The headquarters of the Board of Grain Commissioners was also specified by the legislation, at Fort William. The Board, then, was close to Canada’s existing grain terminals.

The Board evidently tried to lease terminals at the Lakehead before going ahead with its own construction plans. Magill, in his first annual report, wrote:

They claim their terminal elevators are each part of a system of which large lines of interior elevators are also a part ... that to lease their terminals would dislocate their whole system.... Further, the greatest immediate need as regards terminal elevator facilities at the head of the lakes is that of increasing the facilities.

Magill explained that the Board had many pressing duties and could not dislocate the whole existing “system of handling grain built up under the law....” The Chief Commissioner then wrote:

The Board, therefore, decided to recommend the government to build a large terminal elevator thoroughly equipped for storing, cleaning, drying and handling grain. The Board considered that in this way they would acquire a knowledge of terminal elevators that would be invaluable, increase the capacity at the head of the lakes, and have both time and money left for the provision of inspection and terminal elevator facilities for the Hudson bay and Panama canal routes.¹²

In his first annual report Magill justified not only an elevator at Port Arthur, but also one on Hudson Bay and another at Vancouver. The Board did not waste any time, either, for the site selection at Port Arthur took place only weeks after the appointment of the first Board of Grain Commissioners.

The sites for the inland terminals were a different story. Magill wrote pages in justification of inland terminal elevators, a concept new to Canada. He pointed out that in the United States large storage elevators are “not confined to ports on lake and sea, but are found throughout the whole grain growing area at strategic points for assembling, marketing, milling and distributing the grain.”¹³ Further, Magill listed seven “advantages” for large inland terminal elevators, saying such elevators would: (1) bring inspection and terminal storage nearer to the grain producer; (2) allow stored grain to be shipped by any of the alternate routes available; (3) be equipped with cleaning and drying apparatus; (4) assist the milling industry in the west; (5) preserve local grain dealers and independent buyers; (6) distribute the shipping of grain more equally throughout the year; and (7) provide the reserve storage capacity which western Canada now lacks.¹⁴ While Magill justified the reasons for inland terminals, the first report did not name any specific locations. The closest he came to naming sites was in another portion of the report, “Revenue and Expenditures, The Eastern Division,” where he said: “The milling interests at Regina, Moosejaw [sic], Medicine Hat and Lethbridge desire to have inspectors at their respective points.”¹⁵

During 1913, Commissioner Staples carried on negotiations with the cities of Moose Jaw, Saskatoon, and Calgary “for sites for elevators.”¹⁶ By the time Magill wrote his

7 National Archives of Canada, MG 30, E 299, File 1912, letter from F.C.T. O'Hara, Deputy Minister of Trade and Commerce, to Magill.

8 *Report of the Elevator Commission of the Province of Saskatchewan* (Regina: King's Printer, 1910), 96-98.

9 Gibbs died in 1918. J. Blanchard, *A History of the Canadian Grain Commission* (Ottawa: Canadian Grain Commission, 1987), 31. See also “F.E. Gibbs, Pioneer Grain Commissioner, Dead at Port Arthur,” *The Daily Times Journal*, Fort William, 11 November 1918, 3.

10 “Government Officials, Federal Grain Inspector, F. E. Gibbs,” *Port Arthur Illustrated*, supplement to the *Manitoba Colonist*, Winnipeg, May 1889, 40.

11 Sessional Paper No. 10d, 1914, 256.

12 Sessional Paper No. 10d, 1913, 141.

13 Sessional Paper No. 10d, 1913, 137.

14 Sessional Paper No. 10d, 1913, 137-138.

15 Sessional Paper No. 10d, 1913, 167.

16 National Archives of Canada, MG 30, E299, Papers of Robert Magill, undated typed report, “Changes Recommended.”

Figure 2 (top). Dominion Government Elevator, Port Arthur, 1912. Pile driving, Thunder Bay Elevator in the background. (Thunder Bay Historical Museum Society, 972.2.228)

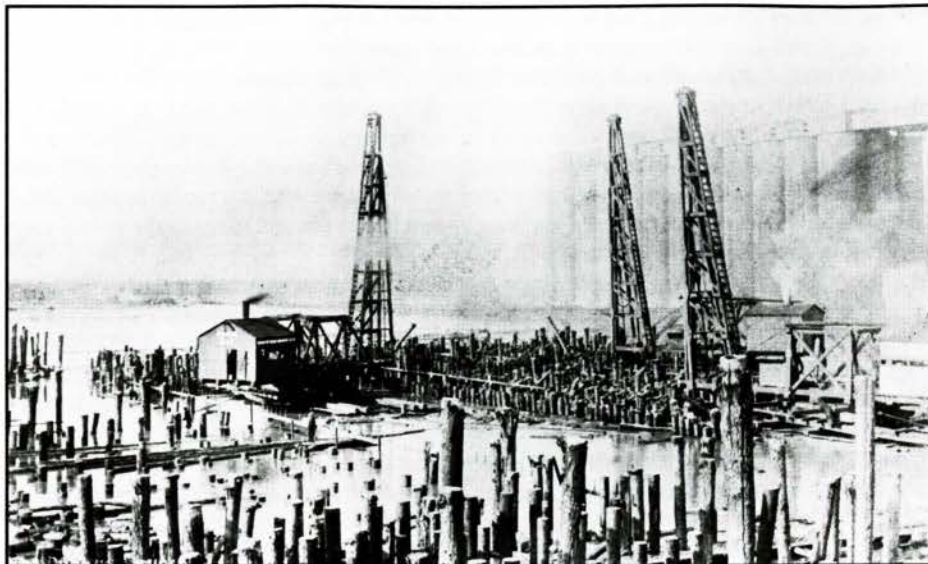
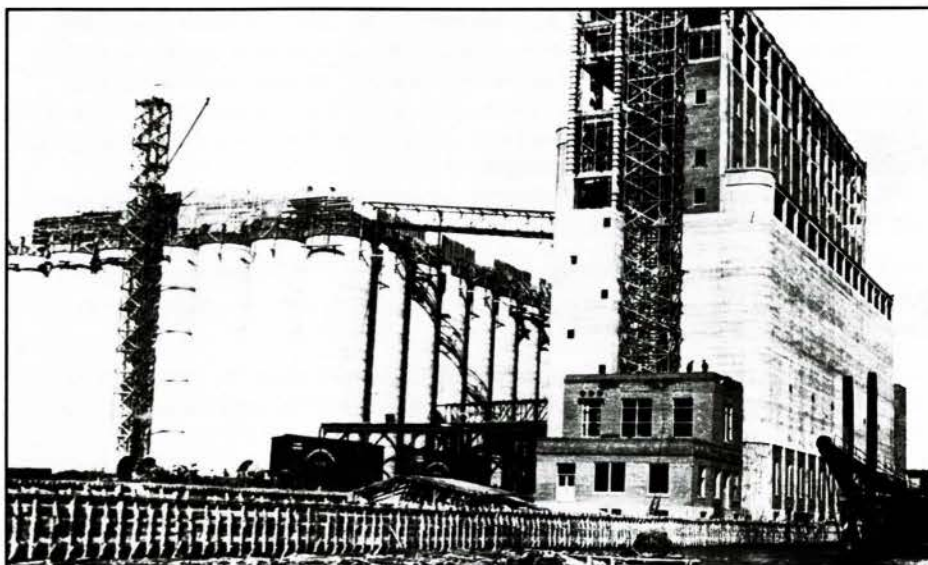


Figure 3 (bottom). Dominion Government Elevator, Port Arthur, 1913. Construction in progress. (Saskatchewan Archives Board, R-A2038)



second report a year later, the sites at Saskatoon, Moose Jaw, and Calgary had been determined. The sites at Moose Jaw and Saskatoon were evidently selected without argument. By the beginning of June, 1913, the Saskatoon site had been selected by Commissioner Staples and F.R. McQueen of the Barnett-McQueen Company, "who is drawing the plans for the Interior Government Terminal Elevator."¹⁷

The site for an Alberta inland terminal was not so easily settled. In a letter of 16 August 1913, Magill wrote: "When the Commissioners discussed the location of an elevator in Alberta each Commissioner had a favourite place of his own. Jones preferred Calgary, Staples MacLeod [sic] and I, Lethbridge."¹⁸ In January of 1914, Chief Engineer Howe submitted a report to the Board of Grain Commissioners about three possible elevator sites, which he visited with Commissioner Jones; all three sites were in Calgary.¹⁹

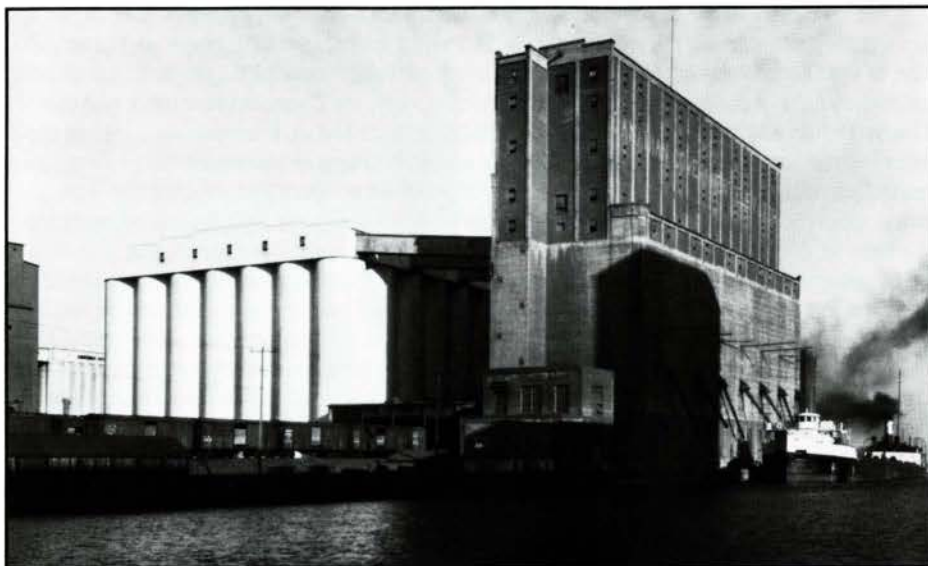
Soon after it was established, the Board decided to build its first elevator at the Lakehead. Ever mindful of its obligation to appear objective and non-partisan to all groups involved in the grain business, the Board adopted elaborate procedures to determine the site, the elevator plan, the selection of contractors, and the actual construction of the Port Arthur Government Elevator. These procedures introduced the Board to a number of individuals who later came to assume important roles in their elevator business.

Before selecting a site, the Board asked for reports from three engineers: Mr. Merrick, District Engineer of the Department of Public Works for Fort William, Mr. McQueen of Barnett-McQueen Company, and Mr. Folwell, engineer of the Canadian Stewart Company. The site itself consisted partially of a water lot, which had never been patented, and frontage to this lot which had been purchased from McKenzie, Mann & Company, of the

17 National Archives of Canada, RG 80, Vol. 26, File t-14-148, letter of 2 June 1913, W. D. Staples to Robert Magill.

18 National Archives of Canada, MG 30, E299, Papers of Robert Magill, letter of 16 August 1913, Magill to George H. Perley, Acting Minister, Trade and Commerce.

19 National Archives of Canada, RG 80, Vol. 11, File t-14-75, "Report on Possible Sites for an Interior Terminal Elevator at Calgary," 23 January 1914.



Canadian Northern Railway. The next step involved a call for plans from Canadian elevator builders and these were examined by “two expert elevator operators,” Mr. J.P. Jones, manager of the Empire Elevator which had been built by the Barnett-McQueen Company, and Mr. R. Edmond, manager of the Grand Trunk Elevator which had been built by the Canadian Stewart Company. Jones and Edmond recommended the Barnett-McQueen plans which were further confirmed by Mr. Fairbairn, Assistant Chief Engineer of the Canadian Pacific Railway. The Board accepted these recommendations and awarded the contract to the Barnett-McQueen Company. Preliminary work on the site and the pile driving was supervised by Mr. Harcourt, District Engineer of Port Arthur for the Department of Public Works. The actual elevator construction was supervised by Messrs. Woodman & Carey of Winnipeg.²⁰ The foundations were prepared in the fall of 1912 (figure 2) and the actual construction took place from the spring of 1913 (figure 3). The sequence of preparing and pouring the foundations in the fall and beginning construction of the superstructure in the spring was used by the Board for all its inland elevators.

The Port Arthur Government Elevator (figure 4) by Barnett-McQueen established the precedent for the design used for the inland terminals at Saskatoon, Moose Jaw, and Calgary. The overall appearance of the four elevators was remarkably similar. At Port Arthur the workhouse was aligned with a slip, whereas the inland terminals had track sheds beside the workhouse. The method of driving piles at Port Arthur, since they were driven in water, also varied from the inland elevators. Outwardly, the shapes of the Port Arthur complex and their arrangement were similar to the Prairie elevators, the main difference being in the measurements of the various parts. For example, the workhouse, 185 feet above the water line, contained 75 circular bins, 56 interspace bins, and 36 outerspace bins, with a total capacity of 750,000 bushels. The storage annex had 70 circular bins, each 24 feet in diameter and 90 feet high, and 54 interspace bins giving a total storage capacity of 2,500,000 bushels. According to *The Grain Dealers Journal*, “the elevator is of reinforced concrete thruout [sic], except that in the walls of the working house brick panelling is used in a skeleton of reinforced concrete, in order to hasten rapid construction.”²¹ The site at Port Arthur required the length of the storage annex to be parallel the workhouse, whereas those on the Prairies were perpendicular to the workhouse. The Prairie elevators also had a greater capacity. Remarkable was the flexibility of this plan and the fact that it could be used for terminals placed on either water or land.

Before the Port Arthur terminal was completed, the Board realized that the detailed attention required to supervise the construction of the terminal should be directed by an engineer employed by the Board.²² Chairman Magill offered this new position to a fellow faculty member at Dalhousie,²³ C.D. Howe, who was reported to have accepted the challenge with the statement, “I’ve never seen one of those things in my life. But I’ll take the job.”²⁴ Howe had experience with reinforced concrete construction although he had not built grain elevators before.²⁵ By the time Howe arrived in Fort William to take up his duties as Chief Engineer for the Board of Grain Commissioners the Port Arthur elevator was almost finished.²⁶ Howe remained on hand to see the completion of the concrete work and some of the interior finishing. He then went west to set up his office in the new Ross Building in Saskatoon (figure 5).

Figure 4 (above left). Dominion Government Elevator, Port Arthur, in operation. (Thunder Bay Historical Museum Society, 984.53.838A)

Figure 5 (above). Ross Building, Saskatoon, Saskatchewan (1912-1986). Howe listed his address as 413 Ross Building, Saskatoon. (Saskatoon Public Library – Local History Room)

20 Sessional Paper No. 10d, 1912, 154-156.

21 “Grain Handling Facilities of Fort William-Port Arthur,” *The Grain Dealers Journal* (January 1914): 71.

22 National Archives of Canada, RG 80, File t-14-81, letter of 22 August 1912, Magill to O’Hara: “As you are aware that an engineer has to be appointed by the Government to supervise the building of the elevator ...”

23 National Archives of Canada, MG 30, E299, Papers of Robert Magill, typewritten list of “Appointments.” “Recommended by Chief Commissioner, Mr. Howe as Chief Engineer.” Robert Bothwell and William Kilbourn, *C.D. Howe: A Biography* (Toronto: McClelland and Stewart, 1979), 18-23. Howe received his engineering training at the Massachusetts Institute of Technology, then known as “Boston Tech,” graduating in 1907. He remained at M.I.T. for another year as a teaching assistant and then taught engineering at Dalhousie from 1908 to 1913.

24 John D. Harbron, *C.D. Howe* (Don Mills, Ont.: Fitzhenry and Whiteside, 1980), 16.

25 Dalhousie University Archives. Howe worked in the Halifax area from 1908 to 1913 as a consulting engineer specializing in reinforced concrete construction.

26 “Engineer for Board,” *The Daily Times Journal*, Fort William, 8 July 1913, 1: “C.D. Howe, ex-professor of engineering in Dalhousie University, Halifax, N. S., has been appointed engineer for the Board of Grain Commissioners of Canada, his duties being to look after all construction work for the grain commissioners.” “Government Elevator Ready by Fall,” *The Daily Times Journal*, Fort William, 24 July 1913, 1: “The concrete work of the storage tanks was finished on Friday after five weeks’ work.” The work was completed on 18 July 1913, nine days after Howe arrived in the Lakehead. National Archives of Canada, RG 80, Vol. 11, File t-14-82: On 22 July 1913 Howe drew a plan for the dredging required at the Port Arthur site.

The task of the supervising engineer was a varied one and required the ability to keep track simultaneously of myriad details. Howe, for example, had to negotiate the acquisition of land and railway access, the latter involving consultations with the three transcontinental railway lines of the day (the Canadian Pacific Railway, the Canadian Northern, and the Grand Trunk) and the Ministers of Trade and Commerce and of Transportation. Howe represented the Board and the Minister of Trade and Commerce by examining the tenders submitted and signing contracts with the contractors. He was constantly in consultation with cities about the power sources for each elevator and new street car lines for transporting the workers. In addition to the details of immediate acquisition and future use, Howe also checked the plans and approved them, made alterations to some plans, made numerous visits to each site to keep track of the progress of construction, and checked and approved all requisitions for materials and expenses. Howe also examined the completed work, was on hand for the testing of equipment, and, once everything was in satisfactory working order, accepted the completed elevator on behalf of the government. Since several of the elevators were under construction simultaneously, the number of details coordinated by Howe was extraordinary. Like the members of the Board of Grain Commissioners, Howe was constantly travelling. During the period from 1913 to 1916 he received mail at the Board's Fort William office, his own office in Saskatoon, from a box number in Calgary, and at a street address in Vancouver.

The design of the Dominion Government elevators was created by the Barnett-McQueen Co., Ltd., of Fort William, and the same firm carried out the construction of the two Saskatchewan elevators. Building these grain elevators in reinforced concrete using the slip-form technique was new to the Prairies. Barnett-McQueen was qualified in this method of construction and evidently brought to these Saskatchewan sites an experienced construction crew from Fort William.²⁷

Barnett-McQueen was the independent Canadian branch of the Barnett-Record Company of Minneapolis. Barnett-Record had constructed the first Canadian example of round reinforced concrete bins in the slip-form technique, at King's elevator, owned by the C.P.R., at the Lakehead in 1903-04.²⁸ The same firm built the Empire Elevator, the first private terminal at the Lakehead, but instead of using concrete, the storage bins were built of vitreous tile. One of the engineers for Barnett-McQueen was William H. Souba, whose signature appears on the plans and elevation drawings of the Government Elevators. Such drawings have numerous signatures since the plans were examined and approved by various officials in the firm; C.D. Howe also signed the plans as Chief Engineer of the Board. In fact, several letters from the Office of the Chief Engineer in Saskatoon to Deputy Minister F.C.T. O'Hara, written late in 1914 and early in 1915, were signed by W.H. Souba.²⁹ When Howe established his own firm in 1916, Souba became a partner.³⁰

In slip-form construction, the forms were left in place and slipped upwards after each successive pouring of concrete. It was an appropriate technique for building the storage bins of grain elevators since they were hollow cylinders without openings. In order to build with the slip-form technique, special jacks were required for moving the forms upward; the jacks were mounted on scaffolding inside the bins and raised as the forms were raised. For one of the engineers who patented the system, Russell Folwell, it was the movable jack that was the major innovation, rather than the slipping of the forms.³¹ Folwell developed this system when he was General Superintendent of Barnett-Record and first tried it out in 1903 on the construction of the storage annex at the C.P.R. King's elevator at the Lakehead.³²

Reinforced concrete construction was still new in the West at this time. The new Legislature Building for Saskatchewan (1909) "was one of the first large-scale applications of concrete on the prairies."³³ While the Legislature Building was of reinforced concrete, it was not of slip-form construction. Slip-form was not suitable to structures requiring elaborate window and door openings. In a recent pamphlet entitled *Legislature Building* published by the Legislative Assembly of Saskatchewan the concrete was not mentioned. Instead was described the "Three hundred men worked day and night for a year and a half to prepare the Tyndall stone facing."³⁴ The concrete construction behind the stone must have been too mundane or too practical to mention in the description of a grand and elegant building.

Before construction began on the inland terminals, a photograph of a sketch (figure 6) identified as the "Design for Dominion Government Elevators at Saskatoon, Moose Jaw, and Calgary" was circulated by C.D. Howe.³⁵ This drawing, signed by C.W. Graham (probably of Barnett-McQueen), showed a pristine elevator complex with an immensely high and boxy workhouse above the workhouse bins. The severe rectangular shape of the workhouse was distinguished by rounded corners which contrasted with the pure geometry of the cylindrical storage silos. In the drawing, the three-track receiving shed was to the left of the workhouse and the two-track shipping shed was between the workhouse and the storage

27 "City and District," *Moose Jaw Evening Times*, 16 October 1914, 5: "Moose Jaw men who are on the regular employment list of the Barnett McQueen firm, contractors for the terminal elevator at Britannia Park are anxiously awaiting the awarding of the contract of the elevator at Vancouver as it is the custom of this firm to take their regular employees with them to the points where work is brisk."

28 See P. Vervoort, "Lakehead Terminal Grain Elevators: Aspects of their Engineering History," *Canadian Journal of Civil Engineering* 17 (June 1990): 404-12.

29 National Archives of Canada, RG 80, Vol. 26, File t-14-148, letters of 19 December 1914 and 12 February 1915, W.H. Souba to O'Hara.

30 Bothwell and Kilbourn, *C.D. Howe*, 35. In 1916, "... Howe asked an engineer with long experience in elevator construction, William Souba of Minneapolis, to join him as a design partner."

31 R.H. Folwell and R.P. Durham, "The Development of Methods of Raising Slip Forms Used in Forming Concrete Bins," in *Grain Elevators of North America*, ed. Charles S. Clark (Chicago: Grain & Feed Journals Consolidated, 1942), 8-10; Folwell with William Sinks patented the hollow-screw jack on 4 June 1907, No. 855,452. *The Canadian Patent Office Record* lists the same device as "No. 114,796 Mould for Concrete," XXXVI (31 October 1908), 2661.

32 Folwell and Durham, "Slip Forms," 8-9. "The Canadian Pacific Grain Elevator at Port Arthur, Ontario," *The Engineering Record* 49 (9 April 1904): 451.

33 T. Ritchie, *Canada Builds 1867-1967* (Toronto: University of Toronto Press, 1967), 249.

34 Legislative Assembly of Saskatchewan, *Legislative Building* (Regina, 1988), unpag.

35 National Archives of Canada, RG 80, Vol. 26, File t-14-148, letter of 21 April 1914, F.C.T. O'Hara, Deputy Minister, to Charles Birkett; the letter identifies it as a sketch of the Saskatoon elevator, and on the accompanying sketch only "Saskatoon" appears. In Magill, *Grain Inspection in Canada*, 57, the same sketch appears with all three inland terminal locations indicated.

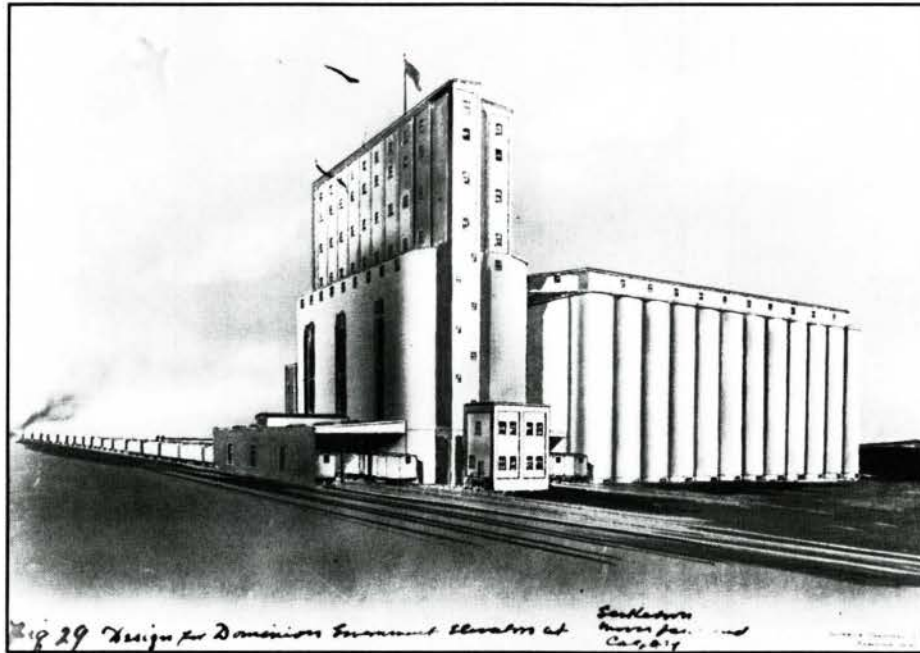


Figure 6 (top). Sketch for proposed Dominion Government Elevators: Saskatoon, Moose Jaw, and Calgary. (Saskatchewan Archives Board, R-A2036)

Figure 7 (bottom). Dominion Government Elevator, Moose Jaw, 1914. (Saskatchewan Archives Board, R-B9689)



annex. The two-storey building below the workhouse housed the transformers and switch-board which provided power for the elevator. In the sketch, the contrast between the flat landscape and the immense height of the elevator exaggerated the size of the industrial complex.

A comparison between the sketch and a photograph of the Moose Jaw Elevator (figure 7), both from the same angle, demonstrate the accuracy of the preliminary drawing. In the drawing, the workhouse appeared to be immensely tall, but the window openings were identical to the number actually constructed. The lower portion of the workhouse was slightly altered, but otherwise the design was carried out as proposed. Indicating on the drawing three place names implied that all three elevators were identical, and, in the preliminary stages, they were. Saskatoon and Moose Jaw were constructed with the same plan, but at Calgary the number of storage bins was reduced by one-third. The workhouse and arrangement of train sheds remained identical for all three.

Photographs of the three inland terminals reveal the similarity of the structures, although the Board of Grain Commissioners's official photographs depicted each elevator from a different angle of view. The Board of Grain Commissioners published pictures of their Prairie grain elevators in their annual reports, in the Lakehead newspapers, and in a publication by Robert Magill.

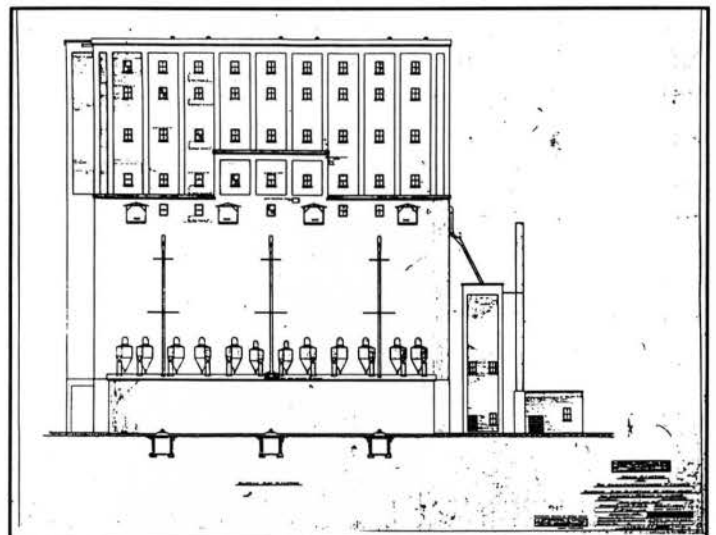
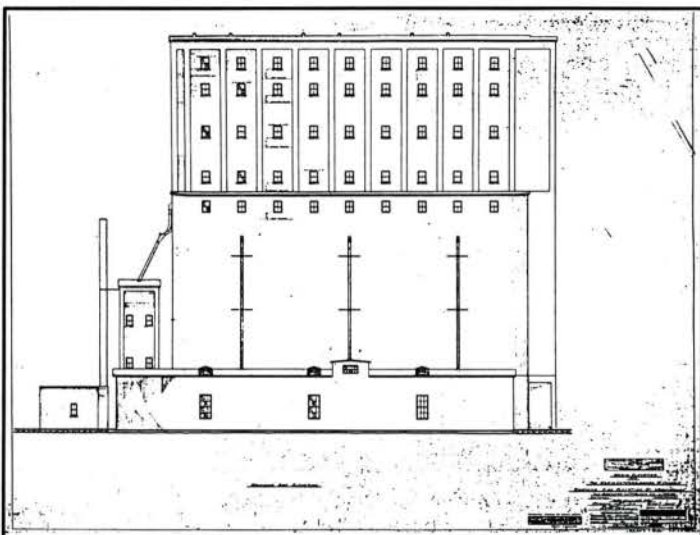
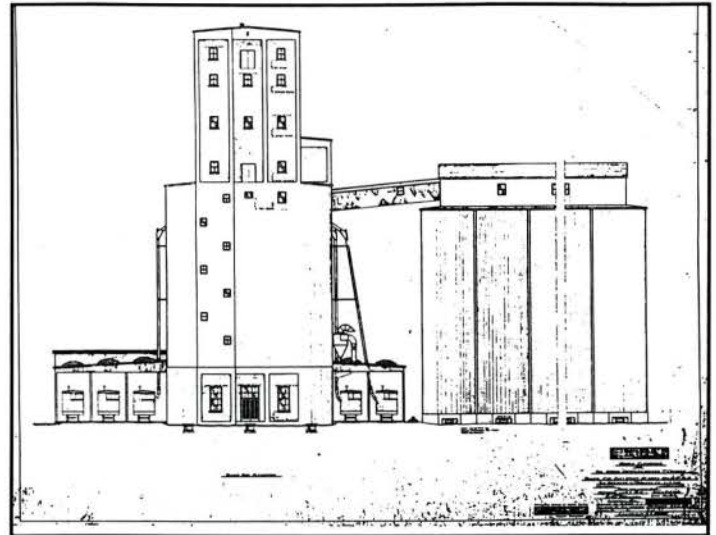
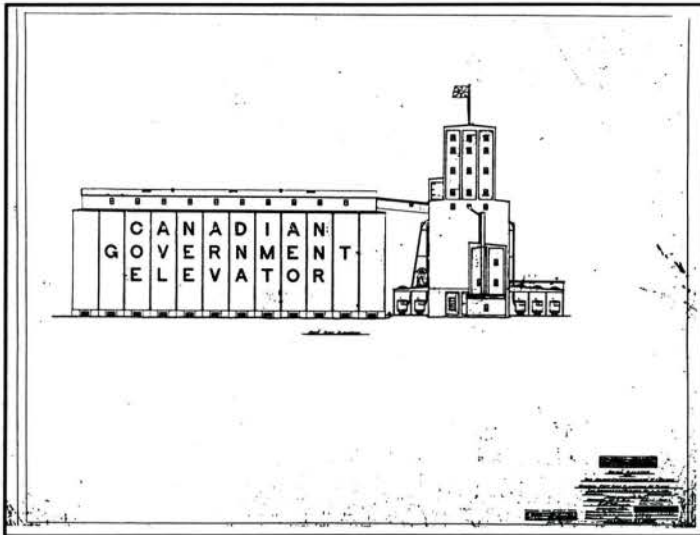


Figure 8 (top left). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, east elevation. (C.D. Howe Central Limited, Thunder Bay)

Figure 9 (top right). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, west elevation with partial view of storage annex. (C.D. Howe Central Limited, Thunder Bay)

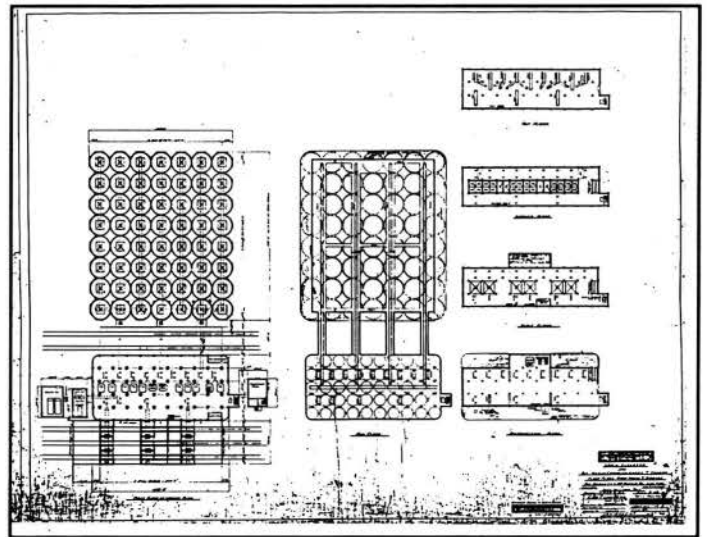
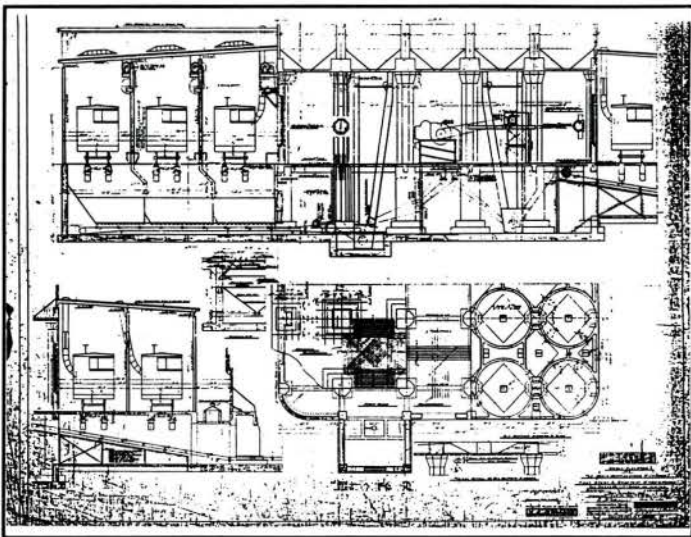
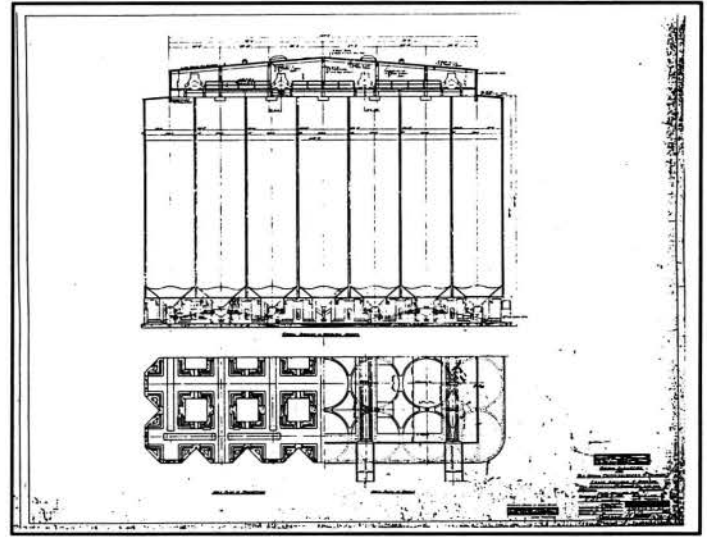
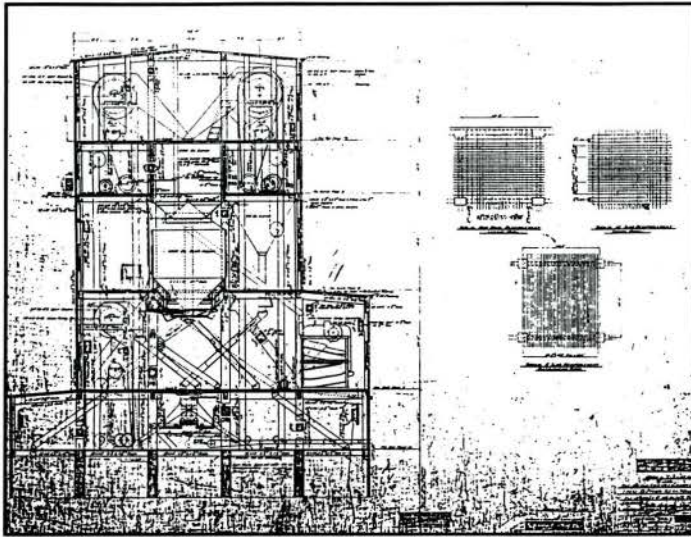
Figure 10 (bottom left). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, south elevation, receiving side of workhouse. (C.D. Howe Central Limited, Thunder Bay)

Figure 11 (bottom right). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, north elevation, shipping side of workhouse. (C.D. Howe Central Limited, Thunder Bay)

The working drawings of the elevators disclosed the basics of construction. For example, the drawings of the east side elevation (figure 8) showed the workhouse and storage annex as two apparently separate structures, connected by the enclosed gallery at cupola level. The workhouse had a three-track receiving shed on one side and a two-track shipping shed on the other. From the opposite or west side elevation (figure 9), the same effect was achieved, although the number of storage bins was reduced on the blueprint. The receiving side of the workhouse (figure 10) clearly distinguished the brick-paneled workhouse above the tall windowless section containing the workhouse bins. Three vertical receiving legs rose from the receiving shed to the workhouse. Train cars discharged the grain into grating-covered bins below the shed and the grain was then transferred up the receiving legs into the workhouse.

On the shipping side of the workhouse (figure 11) four gable-roofed galleries connecting the two main portions of the complex were located beneath the workhouse machinery floors and above the workhouse bins. Inside these galleries, conveyor belts moved the grain to storage bins where each grade and type was contained in a separate silo. Also on the wall of the shipping side of the workhouse were three vertical dividers or shipping spouts which moved the grain from the workhouse into the train cars within the shipping shed. On the roof of the shipping shed were a dozen conical dust collectors.

The interior arrangement of the workhouse (figure 12) displayed the complexity of machinery and spouting systems which controlled the movement of the grain. The topmost floor contained pulleys and other mechanisms which pulled or elevated the grain up to the top of the workhouse. From here, the grain moved downward by gravity into the garner, then into the scales from which spouts distributed the grain to the drier if needed, to the workhouse bins or into the storage annex. This blueprint included diagrams of the concrete



reinforcements, with some areas reinforced in a grid pattern and others, such as the distribution floor, with reinforcements indicated only as parallel rods.

The cut-away section drawing of the storage annex (figure 13) indicated the working facilities both above and below the storage silos. Each bin had a conical base for ease of emptying. Conveyor belts under the bins were indicated in the partial floor plan; these conveyor belts moved the grain from storage to the shipping shed. Above the storage silos was a cupola, also with conveyor belts, which distributed the treated grain from the workhouse into the appropriate storage bin. On the lower left side of this blueprint was a partial plan indicating the concrete foundation which supported the storage annex. The round bins were placed upon square sections of a grid design at foundation level.

Cross-sections and floor plans of the sheds and basement of the elevator (figure 14) revealed the variety of equipment and conveyor systems located at and below ground level. Beneath both sheds were indications of grain-moving machinery. These blueprints displayed the interconnections of the basic parts of the terminal grain elevator. Finally, the floor plans (figure 15) indicated the arrangement of silos and equipment at ground level, bin floor level (top of the bins), and the layout of the workhouse floors. The top floor showed the three receiving legs with spouts leading to the cleaning machines and the garners on the floor below. Next floor down was for scales and below again was the distributing floor, with numerous spouts leading to the storage and shipping areas of the complex.

The blueprints and the accompanying documents do not reveal details of the concrete mixture used. In 1913-15, formulas for concrete were not standardized and the amount of water in particular was not regulated. Decisions about the proportions would have been established by Barnett-McQueen and approved by Chief Engineer Howe.

Figure 12 (top left). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, section of workhouse above bins. (C.D. Howe Central Limited, Thunder Bay)

Figure 13 (top right). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, section of storage annex with partial foundation plan and view of top of bins. (C.D. Howe Central Limited, Thunder Bay)

Figure 14 (bottom left). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, sections and plans of track sheds and basement. (C.D. Howe Central Limited, Thunder Bay)

Figure 15 (bottom right). Dominion Government Elevators: Saskatoon, Moose Jaw, Calgary, floor plans. (C.D. Howe Central Limited, Thunder Bay)

From headquarters in the Ross Building in downtown Saskatoon, Howe undertook the supervision of construction of both the Saskatoon and Moose Jaw elevators simultaneously. Barnett-McQueen Company drove approximately 8,500 piles for each of the foundations in the fall of 1913, and the superstructures were commenced in the spring of 1914. When the Saskatoon elevator was completed ahead of schedule, Howe wrote to the Board's secretary, Charles Birkett: "The first concrete for the elevator was poured about April 1st, and the concrete work was completed by September 10th. This, I believe, breaks all records for speed in building a concrete elevator of this size." Both elevators were completed and began operation within days of each other in October. Saskatoon was "opened for business on October 12th."³⁶

The elevator complexes at Saskatoon and Moose Jaw consisted of a workhouse, two train sheds for receiving and shipping, the large storage annex with circular bins, and miscellaneous smaller buildings which contained the boiler, switchboard, and transformer. Other than the train sheds, which were constructed of structural steel, the buildings were constructed of reinforced concrete. The lower portion of the workhouse and the storage annex were slip-formed. The workhouse's upper portion, which contained the elevating, weighing, and drying equipment, was constructed as a concrete skeleton with panel walls of brick. The appearance of the lower portion of the workhouse and the bins of the storage annex differed noticeably in appearance because tangent walls encircled the workhouse bins. This provided not only additional storage, but added to the appearance of the structure. In the workhouse, the bins were arranged five across and ten deep. For the storage annex, there were 84 circular tanks and 66 interspace bins arranged seven across and twelve deep. All of these circular bins were constructed with the slip-form technique.³⁷ The sites were of different sizes, with Moose Jaw containing 40 acres and Saskatoon 47 acres.³⁸ Acquiring additional land around the elevators was a practical consideration and forward-looking in the event of possible expansion of the elevators.

The Calgary Elevator site was recommended by W.D. Staples, the grain commissioner who examined a number of available locations with F.R. McQueen of the Barnett-McQueen Company.³⁹ Chief Engineer Howe and Commissioner Jones were sent to examine the possible sites and agreed with the recommendation made by Commissioner Staples.⁴⁰ Before construction began, newspaper publicity in Calgary stated that "...Calgary was selected as one of the important grain centres of the west for the site of one of these mammoth elevators, designed to assist in some measure in relieving the grain blockades, of which the West has had so much experience."⁴¹ Tenders for the Calgary elevator were called for the first of June, 1914; applicants were referred to Chief Engineer Howe, who prepared the call for tenders, in Saskatoon for further particulars.⁴² Contractors for the Calgary elevator were Janse Brothers, Boomer, Hughes & Crain of Calgary, whose bid was the lowest received; in a letter of 1 June Howe recommended their tender be accepted.⁴³ A letter received by the Department of Trade and Commerce on 20 September 1915 indicated the elevator had been completed, tested, and accepted by C.D. Howe. Curiously, this letter was typed on the letterhead of Janse Drilling Company, Limited, as if they had prepared it and presented it to Howe for his signature.⁴⁴

The Calgary Elevator was smaller in size than those in Saskatoon and Moose Jaw. Although the reasoning for this was never explained in the available official documents, it is possible to surmise two reasons. First, the site was smaller than the others, and second, the elevators at Saskatoon and Moose Jaw were also intended to serve as storage facilities for seed grain needed by the farmers in the immediate vicinity. At Calgary, the grain was to be inspected and graded before it was shipped west to Vancouver and then to Europe via the Panama Canal. Grain from Saskatoon and Moose Jaw was to be shipped via the Lakehead. Although Barnett-McQueen designed the Calgary complex, the alterations to make it smaller in capacity were probably done by C.D. Howe.⁴⁵ One obvious difference between the three Prairie elevators was the words painted on the storage annexes: "Canadian Government Elevator" appeared on both Saskatoon and Moose Jaw, but at Calgary, because there were fewer bins, the identification read "Canadian Govt. Elevator."⁴⁶

The Calgary elevator complex repeated the workhouse design found on the previous Board elevators, differing only in the number of annex storage bins. As described in the *City of Calgary Year Book* of 1919, the Dominion Government Elevator had "a storage house of 56 circular bins 23 ft. 2 in. in diameter, and 92 ft. high with a capacity, including the interspace bins of 2,000,000 bushels." The year book said its purpose was "to provide storage and cleaning facilities for grain grown in the Province of Alberta, and to act as a reservoir for shipments to the East via the Great Lakes, or more especially for shipments westward to Vancouver, where it may enter the trade routes of the Pacific, or of the Atlantic via the Panama Canal." The total cost of the elevator was reported to be approximately one million dollars.⁴⁷

36 National Archives of Canada, RG 80, Vol. 26, File t-14-148, letter of 15 October 1914, C.D. Howe to Charles Birkett.

37 "The Canadian Government's Fireproof Elevator at Saskatoon, Sask.," in Charles S. Clark, ed., *Plans of Grain Elevators*, 4th ed. (Chicago: Grain Dealers Journal, 1918), XLIV-XLV.

38 National Archives of Canada, RG 80, Vol. 11, File t-14-75, letter of 14 April 1913, C. Birkett, Secretary of the Board of Grain Commissioners, to F.C.T. O'Hara, Department of Trade and Commerce.

39 National Archives of Canada, RG 80, Vol. 11, File t-14-75, letter of 2 June 1913, W. D. Staples to Dr. R. Magill.

40 National Archives of Canada, RG 80, Vol. 11, File t-14-75, 23 January 1914, report by C.D. Howe.

41 "Dominion Government Building Expenditures," Book Edition of *The Morning Albertan*, Calgary, 1914, 32. The cost was estimated as \$2,000,000. Glenbow Alberta Institute.

42 National Archives of Canada, RG 80, Vol. 11, File t-14-75, letter of 4 April 1914, Howe to Birkett, and tender notice signed 11 April 1914 by F.C.T. O'Hara, Deputy Minister, Department of Trade and Commerce.

43 National Archives of Canada, RG 80, Vol. 11, File t-14-75, letter of 1 June 1914, Howe to Birkett; Howe recommended a financial statement of the firm and its previous experience be checked first. Their bid totalled \$788,900. The firm also had a Detroit address.

44 *Ibid.* The contractors were anxious to retrieve their \$40,000 deposit with the Department of Trade and Commerce.

45 National Archives of Canada, RG 80, Vol. 20, File t-14-112, letter of 1 March 1914, F.C.T. O'Hara, Deputy Minister, Department of Trade and Commerce, to C. Hamilton Wickes, H. M. Trade Commissioner: "The Engineer of the Board of Grain Commissioners at Fort William is now preparing plans for an elevator at Calgary...."

46 National Archives of Canada, RG 80, Vol. 26, File t-14-148, letter of 21 April 1914, F.C.T. O'Hara, Deputy Minister of Trade and Commerce, to Charles Birkett, Secretary of the Board of Grain Commissioners in Fort William. The idea for painting the Saskatoon elevator was O'Hara's. Sir George Foster, Minister of Trade and Commerce, suggested the painting be done on all the Government elevators. Letter of 4 May 1914, C.D. Howe to Birkett: "...it will not be possible to paint these signs before the storage tanks are completed, as it is necessary to allow the concrete to dry out and then to paint the entire structure with a water proof coating before this lettering can be put on."

47 "Dominion Government Elevator," *Calgary: The City of Calgary Year Book*, comp. S. Arnold Wark (Calgary, 1919), 78. Glenbow Alberta Institute.



Figure 16. Dominion Government Elevator, Saskatoon, with addition to storage annex built in 1931. (Saskatchewan Archives Board, R-B2393)

A similar account appeared in the *City of Calgary Municipal Manual* for 1916, but the total cost was given as approximately three million dollars.⁴⁸

Of all the Board elevators, it was Calgary's which achieved an international reputation. A photograph of the elevator acquired by Walter Gropius was passed on to Le Corbusier, who published it in his famous *Vers une architecture*.⁴⁹ Le Corbusier's book was translated into numerous languages and widely circulated, and the Calgary elevator became famous.⁵⁰ The acquisition of the Calgary photograph by Gropius can be termed an historical accident; had Gropius received a photograph of the Moose Jaw or Saskatoon elevators, the fame of Calgary's elevator might have been vastly different, particularly since the elevators at Moose Jaw and Saskatoon were much larger in size. Today, historians still repeat Le Corbusier's comments about elevators, and, like Le Corbusier, treat these industrial structures as anonymous creations.

Ironically, while the Calgary elevator achieved an international reputation thanks to Le Corbusier's book, it was the Saskatoon elevator which the Board extensively publicized in the years that these elevators were being constructed. Photographs and plans of the Saskatoon elevator appeared in the widely-circulated *Grain Dealers Journal* and in numerous government publications. In the former, the text mentioned the elevators at Moose Jaw and Calgary, with Moose Jaw indicated as "identical" and Calgary "similar" to the elevator at Saskatoon (figure 16).⁵¹

CALGARY'S ELEVATOR AND THE OTHERS CONSTRUCTED BY the Board of Grain Commissioners were important for a number of reasons. These Dominion Government Elevators were the first examples of slip-form reinforced concrete construction on the Prairies. The use of the slip-form method of reinforced concrete was still new in Canada, although Barnett-McQueen was one of the pioneers in its use. The design of the Board terminals was up-to-date in its arrangement of separating the workhouse from the annex. Secondly, these Prairie elevators instituted a whole new type of elevator, the transfer elevator, into the Canadian grain trade; previously all large-scale grain terminals were located on water. The Board elevators also offered farmers an alternative to using the railroad or private terminals. These elevators were a compromise by the Board to the demands of farmers for government control of all the elevators in the country. And the Board, by choosing the design of Barnett-McQueen, and repeating it from location to location, demonstrated an awareness of practical economics and state-of-the-art construction methods. The supervising engineer, C.D. Howe, learned the elevator business and met the grain dealers and government officials which benefitted his own engineering company which he established in 1916 at Port Arthur and operated until 1935. In 1935, Howe became the Member of Parliament for Port Arthur and sold his engineering firm, with his name; the C.D. Howe Company with numerous branch offices is still in business today. And the Board of Grain Commissioners with their inland terminals changed the methods of shipping and storing grain on the Canadian Prairies by offering farmers an alternative to the previous system.⁵² Also, it was the Board of Grain Commissioners that planned for Vancouver and "Hudson's Bay" to become alternate grain-shipping ports for the export of Canada's grain. Thus, the Board in the years between 1912 and 1916 was responsible for radical changes in Canadian elevator construction and grain handling, storage, and shipping.

48 "Dominion Government Elevator," *Municipal Manual: City of Calgary 1916*, comp. City Clerk (Calgary: Albertan Job Print, 1916), 59. Glenbow Alberta Institute.

49 Boddy, *Modern Architecture*, 56. Walter Gropius, "Die Entwicklung Moderner Industrie-baukunst," *Die Kunst in Industrie und Handel (Jahrbuch Des Deutschen Werkbundes, 1913)* (Jena: Eugen Diederichs, 1913), 17-23, illustrations unpagged; Gropius did not use the Calgary elevator in his article because it was not yet constructed.

50 Boddy, *Modern Architecture*, 56-57.

51 "The Canadian Government's Fireproof Elevator at Saskatoon, Sask.," *Plans of Grain Elevators*, XLIV.

52 The Dominion Government Elevators at Port Arthur, Saskatoon, Moose Jaw, and Calgary are now owned by various private grain companies.

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