CROWN MILLS
(Centennial Mills)
1362 NW Naito Parkway
Portland
Multnomah County
Oregon

HAER No. OR-184

WRITTEN HISTORICAL AND DESCRIPTIVE DATA
PHOTOGRAPHS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
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Location: The Crown Mill complex is located at 1362 NW Naito Parkway, in Portland, Multnomah, County, Oregon. The 4.75-acre parcel abuts the western bank of the Willamette River and the property also includes the pier-supported docks, part of the original use, that project over the river. The site slopes from west to east, toward the river, being a large rectangular parcel identified on Multnomah County lot R141440, shown on Assessors Plat 1N1E34BB as tax lot 100, consisting of lots 25 through 37 and the southern 15'-7" of lot 38 in Block 218 of Couch's Addition to the City of Portland. The total length of the property is 665'-7" along the eastern side of NW Naito Parkway (formerly NW Front Avenue) and approximately 300' deep, including that portion of the buildings and wharves that extend over the Willamette River. The Crown Mills site has been alternatively described as being on NW Naito and at the base N.W. 9th Street, which intersects Naito near the SW corner of the site.

The project is located in the USGS Portland Quadrangle, Universal Transverse Mercator Coordinates:

Lat 45.533865°
Lon -122.679901°

Present Owner: The Crown Mills complex (today known as the Centennial Mill) is owned by the Portland Development Commission (PDC), the urban renewal and economic development agency of the City of Portland. PDC is headed by an executive director who reports to a five-member board of commissioners who are appointed by the mayor of Portland and confirmed by the Portland City Council. PDC acquired the Crown Mills complex from ADM Milling Company in 2000 with the stated objective of redevelopment by enhancing the waterfront with public open space to facilitate connectivity.

Present Use: The site has been unused and vacant since the PDC purchase in 2000. Most of Warehouse E was substantially remodeled and upgraded for use by the Portland Mounted Police Unit (MPU) in 2001 and a roofed paddock was built on the former parking area to the south. The MPU remains the only occupancy in any portion of the mill, with the rest of the structures entirely vacant. Due to extreme deterioration and the requirements of the City of Portland Building Department and Fire Marshall, especially in those portions supported by piers over the Willamette River, all built elements except Warehouse E (the MPU area), the Feed Mill and the Flour mill were demolished in 2015-2016.

Significance: Crown Mills, a large scale flour mill, was operated by the Balfour, Guthrie and Company from its construction in 1910 through 1949, when it was sold to the Centennial Milling Company. The mill played an important role in the development history of the Pacific Northwest wheat trade. Balfour Guthrie, a Scottish-based shipping concern, was a significant player in the history of wheat and milling, as well as in the history of the development of the Port of Portland as an international shipping point. Balfour Guthrie built Crown Mills in 1910 to

support its own wheat export trade and then enlarged and improved the facility over the next the four decades.

Project Information**:** This report was prepared by George Kramer, M.S., HP, Senior Historic Preservation Consultant, Heritage Research Associates, Inc., Eugene, Oregon, under contract to the Portland Development Commission. Lynda Wannamaker, Wannamaker Consulting, served as the Project Manager, in association with Irene Bowers, Portland Development Commission.

PART I. HISTORICAL INFORMATION

A. PHYSICAL HISTORY:

Date of Construction: The earliest components of Crown Mills, including the Seed Mill, were completed in 1910 with serial additions including elevators, warehouses, and related facilities to expand capacity throughout the first five decades of the twentieth century. Centennial Mills (former Crown Mills) last operated in the late 1990s. Subsequent modifications, entirely related to the conversion of former warehouse space for use by the Portland Police Bureau's mounted unit, occurred in 2000-2001.

Architect/Engineer: The first phase of construction of the Crown Mills, including the Flour Mill, Grain Elevator A, and Warehouse A as developed by Balfour & Guthrie, was designed by Leland S. Rosener, a consulting engineer based in San Francisco, California. Rosener, born 10-March-1872 in San Francisco, was the son of California pioneers. Educated at the University of California, Berkeley, he graduated in 1899 with a B.S. in Mechanics. After working in the Alaskan gold fields, where he designed and built mining equipment, Rosener returned to San Francisco and established a consulting engineering firm under his own name. Prolific and versatile, Rosener's work included design for a wide variety of industrial plants as well as wharves, docks, coal barges, gold dredges, electrical and marine engineering and more. Near the end of his near-fifty years of practice, he did classified work for the Atomic Energy Commission and worked on projects for the Navy at both Hunter's Point and Moffat Field.[1] Rosener was also responsible for the design of Grain Elevator B at Crown Mills, built in 1925. Leland Rosener died in California, on 24-April-1963.

Building on Rosener's design, a series of prominent Portland-based architectural firms were responsible for the various additions to the mill. The firm of Whitehouse and Foulihoux was responsible for the second major phase of construction at Crown Mills, drawing the plans for the Blending Bins that were constructed in 1916. Morris Whitehouse (1878-1944), a Portland native, graduated from MIT in 1905 and returned to Portland in 1907 to establish the first in a series of architectural partnerships. The Whitehouse and Foulihoux partnership began in 1909 as Lazarus, Whitehouse and Foulihoux and then continued after Lazarus left until 1919 when Jacques Andre

[1] American Society of Civil Engineers. *Rosener, Leland Sylan: ASCE Life Member (1878-1963).* www.cedb.asce.org (visited 13-August-2015).

Fouilhoux entered the military. "The firm was highly successful and carried out many important commissions in Portland, including Jefferson High School (1910), Lincoln High School (1911), the Multnomah Athletic Club (1911), the University Club, Platt Building, Waverly Country Club and the 705 Davis Apartments (all in 1913)."[2] Following the dissolution of the firm, Morris Whitehouse continued to work for Crown Mills independently. He designed Warehouse D, built in two sections between 1919-1920.

In 1921 the Portland architectural firm of Strong and MacNaughton designed the western portion of Warehouse C at Crown Mills. Ernest Boyd "E.B." MacNaughton, was an architect in Portland for over twenty years but is today most remembered for his second career, as a banker and civic leader. Educated at MIT, in 1903 he first partnered with Edgar Lazarus (later to partner with Whitehouse) but in 1906 opened his own office, hiring Ellis Lawrence (another MIT graduate) as his chief designer the following year.[3] MacNaughton's "architectural" partnership with Robert H. Strong was apparently short-lived and appears to have morphed into the Strong, MacNaughton Trust Company, a real estate and financial institution that endured until 1932.[4] E. B. MacNaughton became the president of the First National Bank of Portland in 1932 and would also serve as the president of Reed College and the Oregonian Publishing Company over a long and influential career. MacNaughton died in 1960.[5]

Beginning in 1928 and continuing through 1941, the last phase of major construction at Crown Mills was designed and built by L. H. Hoffman. This included the construction of Grain Elevator C, the addition of the mezzanine level in Warehouse B, the eastern portion of Warehouse E, most of Warehouse C, and other work. Lee Hawley Hoffman, president and founder of the Hoffman Construction Company, was born in Portland in 1884 and graduated with a degree in architecture from Harvard University. He joined the firm of Whitehouse and Honeyman in 1906 and then continued with Whitehouse and Fouilhoux until 1917.[6] After leaving architecture, Hoffman may have moved into contracting with his father, a prominent Portland-area builder. In 1922 he established the Hoffman Construction Company, which quickly grew into the one of the largest contracting firms in the western United States. Lee H. Hoffman died in August 1959.[7] The Hoffman

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[2] Ritz, Richard Ellison. *Architects of Oregon*. Portland, OR: Lair Hill Publishing, 2002:421.

[3] Ellis Fuller Lawrence (1879-1946) is of note as the founding dean of the School of Architecture and Allied Arts at the University of Oregon, in Eugene, which is housed in Lawrence Hall, named in his honor. Among hundreds of residential and commercial commissions over a long and prolific career, Lawrence was responsible for the plan of the U of O Campus Quadrangle and most of its buildings prior to World War Two.

[4] See, for example, *The Heppner Herald*, 1-January-1924, 4:4, or *Oregonian*, 30-September-1922, 6:6. Robert Henderson Strong (1880-1951) born in Portland into a notable pioneer family, was a former member of the Port of Portland Commission and held numerous other civic roles but does not appear to have been educated, trained or licensed as an architect (Capitol Publishing, *Who's Who in Oregon* 1936-1937, Portland, OR, 1936:529; *Oregonian* 5-May-1951, 9:4-5).

[5] Ritz, op cit., 2002:265-266.

[6] Capitol Publishing, op cit. 1936:264.

[7] *Oregonian*, 9-August-1959, 32:3-4.

Construction Company continues in business in 2015 and is one of the largest general contractors in the world, with approximately $2 billion in annual volume.[8]

Builder/Contractor/Suppliers: Only two contractors are known to have been associated with the original 1910 construction of Crown Mills. The Cowlitz Bridge Company, of Portland, was responsible for the construction of the wharf. The firm is also known to have built docks for the Oregon Round Lumber Company and the Globe Grain & Milling Company, in Portland, and a breakwater in Astoria in 1910.[9] The general contractor is assumed to have been James Stewart & Company, of New York, solely based upon an article regarding that firm's legal claim against Balfour Guthrie over disputed charges. "The complaint recites that the construction company entered into a contract July 25, 1910 to supply labor and materials necessary to construct the new flouring plant at Ninth and Quimby streets, and was to receive $48,500."[10] James Stewart & Company, founded in 1865, was considered one of North America's most accomplished and long-standing contractors, remaining in business until 1953. Stewart's clients included the Pennsylvania Railroad, Standard Oil, US Steel, General Electric and other major industrial leaders, with projects nationwide.[11] In Portland, the Stewart firm was responsible for the construction of the Selling Building, at 6th & Alder (1910).[12]

The milling equipment installed at Crown Mill in 1910 and used virtually the entire time the mill was in operation was manufactured by the Nordyke and Marmon Company, of Indianapolis, Indiana.[13] Founded in 1851 by Ellis Nordyke, a prominent millwright, the business operated under several names prior to 1866 when Daniel W. Marmon joined the firm which was then renamed Nordyke, Marmon & Company. "By this time it had become one of the most prominent concerns in its field."[14] Nordyke & Marmon, which advertised as "America's Leading Mill Builders," published a five-hundred-page catalog in 1910, the year that Crown Mill was constructed, and claimed that its products enjoyed a worldwide reputation for quality, with installations throughout the United States, Canada, and Mexico, plus Central and South America. "They could furnish complete machinery equipment for flour mills…They made roller mills, bolting machines, packers, blending machinery…and numerous special machines. Much of their equipment is still used in present-day mills, especially the N & M roller mills."[15]

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[8] www.hoffmancorp.com, visited 14-August-2015.
[9] See *Oregonian*, 6-Feburary-1910, 11:2, 13-Feburary-1910 Sec. 4, 15:3 and 31-July-1910, 5:4.
[10] *Oregonian*, 7-November-1911, 9:2.
[11] See James Stewart Construction Collection, National Building Museum. (http://www.nbm.org/exhibitions-collections/collections/stewart-construction.html, visited 4-Nov-2015).
[12] *Oregonian*, 25-December-1910, Section 4, 10:4.
[13] Some reports, based on employee oral interviews, credit the original mill equipment to have been designed and manufactured by the Simon Company, of England and then replaced with Nordyke & Marmon built machinery after a 1912 fire. This does not appear to be accurate, as reported in 1911 more than a year prior to that fire (*The American Miller*, 1-July-1911, Vol. 39, No. 2).
[14] Nordyke & Marmon Company. *Price List 1020: Flour and Cereal Mill Machinery*. Indianapolis, IN: Nordyke & Marmon Company, 1910A: i.
[15] Hopkins, Hugh. "A Brief History of the Nordyke & Marmon Company." *Gas Engine Magazine*, January/February 1983. (www.gasenginemagazine.com, visited 20-August-2015).

Howard Marmon, one of Daniel Marmon's sons, became the company's chief engineer in 1905. He was a graduate of the University of California at Berkeley and was referred to as a mechanical genius. In 1904 Howard Marmon built an automobile for his own use as something of a lark and was quickly swamped with requests to build more. He and his brother Walter began the commercial manufacture of automobiles under the Marmon & Nordyke Company umbrella. "The Marmon" quickly developed a reputation for reliability, with cutting edge designs that included the first V-6 and V-8 engines. Marmon introduced the rear-view mirror and made the first extensive use of aluminum in auto manufacturing. Ray Harroun, driving a Marmon Wasp, won the first Indianapolis 500 auto race in 1911. The Nordyke & Marmon Company was acquired by Allis-Chalmers in 1926. The Marmon Auto Company, which continued under family ownership after the sale of the mill company, struggled during the Great Depression and despite several re-organizations Marmon ceased production in 1933.[16]

Original plans and construction: Construction of a new flour mill to be erected by Balfour, Guthrie & Company at an estimated cost of $250,000 was first announced in March 1910. The site was to be the "Centennial Dock" property, occupying 400 feet on the west side of river, near Union Station.[17] "The wharf on which the mill and elevator will stand will be 300 feet long and 100 feet deep. The mill will be a striking object from the river, five stories high, which will make it the loftiest structure in that part of the city."[18]

> Announcement was made this morning by Balfour, Guthrie & Co., that its new mill in Portland had been named the "Crown Mills." The plant is now in operation but will not start to make flour until Monday, when a start will be made on export business.[19]

The six-story Flour Mill is a large bearing masonry building of poured-in-place steel reinforced concrete. It was completed in 1910 and along with Warehouse A (to the south) and Grain Elevator A (to the east) form the original construction at the mill. Over the next three decades, additional structures were built, including the Feed Mill and additional elevators, warehouses and blending bins, to create a complex, multi-component project that essentially covered the majority of the property.

B. HISTORICAL CONTEXT:

1. OREGON WHEAT PRODUCTION

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[16] *Nordyke and Marmon Company: The Marmon Motor Car Company*. www.maxinkuckee.history.passtracker.com, visited 20-August-2015.

[17] Although the property, owned by Balfour, Guthrie & Company since the 1870s, was known as the "Centennial Dock," there is no known connection between that fact and the eventual renaming of the Crown Mill as the Centennial Mill in 1948 after its purchase by the Centennial Flour Mills Company, of Tacoma, WA.

[18] *Oregonian*, 19-March-1910, 9:1.

[19] *Oregon Daily Journal*, 1-Jun-1911, 18:5.

Euro-Americans working for the Hudson Bay Company began the cultivation of wheat in the Oregon Territory in 1825, and there were reports of sufficient quantities for potential export as early as 1836.[20] Initially wheat was mostly grown in the Willamette Valley, especially in the Marion County area around Gervais and French Prairie, but soon southern Oregon and elsewhere were also in production as milled wheat became one of the state's earliest agricultural exports. In 1842 farmers in the Willamette Valley produced more than 31,000 bushels of wheat, and that total rose to almost 200,000 bushels in 1850.[21] Oregon wheat was a major source of foodstuffs for the booming gold rush economy of California. "By the 1860s, the Pacific slope was undergoing a transformation into a major staple-producing area, with the development of large-scale grain farming tied to an evolving world commodity trade."[22]

Direct shipments of Oregon wheat to England began in 1869, joining a pre-existing, if sporadic, direct trade with China, Australia, and New York. Direct international trade from Portland signaled a break in the Northwest's reliance upon San Francisco and served as a marker in the evolution of Oregon's business climate.[23] Wheat production, both in the Willamette Valley and by the 1870s in the broad Columbia Plateau regions of eastern Oregon and Washington, quickly became a major element in the Oregon economy.

> The Willamette Valley was then providing the oil for Oregon's wheels of commerce by growing wheat. But by 1870, the valley was too crowded, too conservative, for the restless spirits…. So the settlement of eastern Oregon grew rapidly from 1870 on. Many came, again in covered wagons, but this time the wheat rolled from west to east.[24]

Initially wheat production in eastern Oregon was somewhat hampered by the monopoly on Columbia River shipping and the difficult portages around the rivers' falls. High freight costs restricted access between upriver farmers and downriver milling operations, limiting the number of farmers that chose to turn to wheat for their livelihood. "Hitherto transportation charges consequent upon the many handlings at different portages have not left much margin of profit to the producer."[25] As transport issues along the Columbia River corridor improved, wheat would come to dominate eastern Oregon agriculture. "The upland country of the Great Columbia Plain is a 'natural' wheat region."[26] Export

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[20] Charles H. Carey. *A General History of Oregon Prior to 1881*. Portland, OR: Metropolitan Press, 1935: II-361-62. See also Joseph Gaston. *A Centennial History of Oregon 1811-1911*. Chicago, IL: The S. J. Clarke Publishing Company, 1912, I-539.

[21] William G. Robbins. *Landscapes of Promise: The Oregon Story 1800-1940*. Seattle, WA: University of Washington Press, 1997:72, 100.

[22] Morton Rothstein. "West Coast Farmers and the Tyranny of Distance: Agriculture on the Fringes of the World Market," Agricultural History, Vol. 49, No. 1, Agriculture in the Development of the Far West: A Symposium (Jan., 1975), pp. 272-280.

[23] Robbins, op cit, 1997:99-100.

[24] Kirby Brumfield. *This Was Wheat Farming*. Seattle, WA: Superior Publishing Company, 1968:2.

[25] *Harpers New Monthly Magazine*. The Columbia River., Volume 66, No. 191 (December 1882), p. 4.

[26] Robbins, op cit, 1997:147.

companies, most importantly in terms of Crown Mills, included international firms like Balfour, Guthrie & Company (Balfour Guthrie) that began to develop sources of supply in Eastern Oregon and Washington, establishing complex networks of grain elevators and warehouses throughout the Columbia River basin to assure grain to the large mills in Portland and elsewhere. Farmers in eastern Oregon and Washington were supported through a system of loans, crop insurance, and other programs that served to lock them into a particular system operated by one of the large international houses, such as Balfour Guthrie, assuring the latter a stable source of supply.

> Balfour Guthrie quickly found that it could be of real service [to wheat farmers] by supplying grain sacks, fire insurance, crop financing and other such key services.[27]

During planting season, Balfour Guthrie provided seed and financing to its farmer partners, insurance against crop damage, and even the bags needed for harvest. Barges filled with Balfour Guthrie wheat left Balfour Guthrie elevators and warehouses along the river and traveled downstream toward Portland be milled. After processing, flour was bagged for shipment to west coast and foreign markets and was often transported on Balfour Guthrie owned or leased freighters, maintaining company control almost literally from planting onward.

After 1883, when the Union Pacific rail line connected the wheat fields of eastern Oregon and southeastern Washington to Portland, rail transport also allowed transport of wheat and other cereal grains along the Columbia River, with new mills developed alongside railroad lines for ease of access. The wheat market was a huge part of the Oregon and Washington economy. "Grain and grain products accounted for more than two-thirds of the value of domestic exports from the Pacific ports between 1871 and 1895."[28]

Balfour, Guthrie & Company was an American venture of the Scottish-based Balfour, Williamson and Company, Ltd., a major international shipping firm, that had multiple investments with a worldwide portfolio that built upon their early entrance into exports from South America.[29] After almost four years of planning, Balfour, Guthrie & Company was established in San Francisco, California in June 1869 as the firm's American branch, marking a major expansion for the Liverpool-based concern. The operation and management of Balfour Guthrie, the American branch, was delegated to three young Scotsmen who had long worked in the Liverpool office. Two, Robert Balfour (no relation to the senior partner) and Alexander Guthrie, relocated to California to manage local operations while a third, Robert Foreman, was to remain in England to manage the American firm's sales.

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[27] Allen, Sidney P. *Balfour & Guthrie: A First Century of Commerce, 1869-1969*. San Francisco, CA: Balfour, Guthrie & Co., 1969:10.
[28] Morton Rothstein. "A British Firm on the American West Coast, 1869-1914." *The Business History Review*, Vol. 37, No. 4 (Winter 1963), p.395.
[29] Balfour Williamson & Co. was founded in Liverpool in 1851 by Alexander Balfour and Stephen Williamson, later joined by David Duncan.

Balfour Guthrie quickly gained success importing British industrial goods, including cement and lumber, to the western United States and then returning vessels filled with Californian wheat. "Early dealings also involved imports of rough goods from England and coal from Australia, but the wheat trade absorbed the firm's greatest interest.[30] By 1873 Balfour Guthrie was among the principal wheat shippers in the western United States, operating a fleet of its own vessels and contracting for additional freighters during the season as needed.

Balfour Guthrie expanded its US operations in 1878, when it opened an office in Portland, seeking opportunities in the rapidly growing wheat, lumber, and salmon trade of Pacific Northwest.[31] The branch was placed under the direction of Walter J. Burns, a relative of Stephen Williamson, senior partner in the Liverpool office. Well-funded, with access to European markets and capital, Balfour Guthrie & Company and other European trading and banking firms like it, played an important if often overlooked role in the economic development of the western United States after the Civil War. "The success of Balfour, Guthrie and Company in mobilizing British and American capital for productive investment contributed importantly to the economic development of the Pacific-coast region of the United States."[32] In 1887 Balfour Guthrie continued its expansion in the Pacific Northwest, opening a branch office in Tacoma, Washington. In 1889 they set up a subsidiary, the Northern Wharf and Warehouse Company that developed wharf and storage facilities in Portland, at the head of a supply chain of sixty warehouses throughout the wheat regions of eastern Oregon and Washington.[33] "Balfour Guthrie & Company built more than seventy warehouses on the one hundred and seventy lots it owned on Portland's waterfront."[34]

By the late-19th century Balfour Guthrie was capable of transferring goods between its Seattle, Portland and San Francisco docks on the West Coast, as well as shipping materials around the world. For example, *The Perthshire*, loaded by Balfour & Guthrie in Astoria with more than 22,000 cwt[35] of "Walla Walla wheat" valued at $36,000, sailed to Queenstown, England in 1879. She was reported as the first vessel to be wholly loaded at Astoria.[36]

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[30] Rothstein, p. 395.
[31] Rothstein, p.392.
[32] Op cit., p.399.
[33] After the Panic of 1893, Balfour Guthrie continued to expand its West Coast presence, opening branch offices in Seattle in 1883 and in Los Angeles in 1895 (Rothstein, 1963:410). See SERA Architects and Ann Fulton, *Cultural and Historical Analysis: Centennial Mills.* Prepared for Portland Development Commission, Portland, OR, October 2001:1.
[34] E. Kimbark MacColl. The Growth of a City. (Portland, OR: The Georgian Press, 1979), 325.
[35] "CWT" is the standard abbreviation for "hundredweight," or 100 pounds of grain in both the British Imperial and US Customary System. A CWT in British Imperial would actually weight 112 pounds (USC). All weights here, based on printed reports, are assumed to reflect US Customary.
[36] *The Willamette Farmer* (Salem, OR), 19-September-1879, 5:3. According to www.measuringworth.com, the relative value of an 1879 commodity value of $36,000 would be about $900,000 in 2016 dollars.

> The demand for bread from foreign nations makes America at the present time the granary of the civilized world. The remarkable wheat-growing qualities of the soil of this Columbia region make the production of wheat [natural]…and the broad ocean at our doors brings hither shipping from all countries to transport our products.[37]

As the character of California agriculture changed in the late-19th century, with reductions in wheat acreage, Balfour Guthrie recalibrated its wheat investments to focus on the Pacific Northwest.[38] In the years immediately after the turn of the 20th century, Balfour & Guthrie were regularly chartering English, French, and German-owned ships to augment their own freighters out of Portland.

In the decades surrounding the turn of the 20th century the comings and goings of the "Wheat Fleet," the numerous ocean-going sailing ships that carried northwest wheat, were a noted event. The wharfs and docks along the Willamette River were crowded with masts, as wooden sailing ships filled the harbor, awaiting cargo for the eastern United States, Asia, Europe and South America. While Portland exported lumber and other goods, wheat was the primary commodity.

> The grain fleet from Europe is arriving at Portland. The warehouses are crowded with wheat, and the fleet of vessels coming to carry it away is larger than ever known at Portland.[39]

Throughout the last-quarter of the nineteenth century, the port of Portland boasted an increasing foreign trade, which grew to be valued at nearly $10,000,000 during the boom year of 1903. That year marked the first time in the city's history where export to Asia exceeded that to Europe. "This was in large measure due to the remarkable increase in the Oriental flour trade, which was more than twice as large as any previous year."[40] At its peak, more than 100 grain ships would arrive in Portland during the months following harvest.[41] Portland's total wheat exports in 1903, including goods sent to San Francisco, California was more than 5,500,000 million bushels.[42]

2. FLOUR MILLS AND MILLING TECHNOLOGY

Milling, the act of transforming wheat into flour, is often counted as man's oldest industrial process. Oregon's first reported flour or "grist" mill was built by the Hudson

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[37] *The Willamette Farmer*, 4-Feburary-1881, 17:3.
[38] Rothstein, *A British Firm on the American West Coast*, 1869-1914, p. 403. Balfour Guthrie remained active in California, purchasing huge tracts of land in the Santa Clara region and elsewhere that focused on canned fruit, canned fish and dried fruits, among other products (see also www.vasonabranch.com/packing_houses, visited 13-Nov-2015).
[39] *The Hood River Glacier* (Hood River, OR), 24-October-1891, 1:4.
[40] *Oregonian*, 1-January-1904, 33:1.
[41] Paul, Rodman W. "The Wheat Trade Between California and the United Kingdom," in *The Mississippi Valley Historical Review*, Vol. 45, No. 3 (December 1958), pp. 394.
[42] A U.S. bushel of wheat, as specifically differentiated from other grains, at 13.5% moisture, is defined by weight, equally sixty pounds, meaning Portland's 1903 wheat exports represented about 320 million pounds.

Bay Company at Fort Vancouver in the 1820s, and by 1835 more than 700 bushels of wheat were being grown in what would become Oregon "…full and plump, making good flour."[43] The first commercial flour mill in Oregon was established at Oregon City in1843, sixteen years before statehood, by John McLoughlin, the former Hudson Bay Chief Factor who is often referred to as the "Father of Oregon."

As Euro-American settlement spread in the years prior to statehood, flour mills were built throughout much of Oregon and many cities, especially in the western valleys, soon boasted a mill that provided for its own needs in an era of poor roads and difficult transport. As wheat production increased so did the size of the mills and Oregon began to export flour, initially to California and then later to foreign markets. "A milling industry of some consequence began to develop soon after the Civil War, largely at interior points, and its main outlet was the Oriental trade."[44] With improved transportation, particularly after the arrival of the railroad, smaller local mills were displaced by ever larger, more centrally placed facilities, especially those at dockside along the Willamette River in Portland.

Flour mills before the 1700s relied on technology that had not changed significantly for centuries. Waterpower provided the motive force to rotate two disk-shaped Buhr or millstones, often imported from France, that were mounted in horizontal orientation atop of one another to grind wheat into flour.[45] "The top stone turned, while the bottom stone remained stationary and grain was fed in between them. Deep grooves cut into the stone allowed grain to exit between the grinding surfaces."[46]

The so-called "automatic" mill, a major advance, was developed in the late 18th century and is usually credited to Oliver Evans, a skilled wheelwright and inventor. Evans wrote *The Young Mill-Wright and Miller's Guide* in 1795, describing the automated movement of wheat using a system of conveyer belts, hoppers, and screws through a series of refining processes that allowed nearly unattended and increased production in flour milling. Evans' ideas about mill automation would change the milling industry.

> A pair of Brandywine millers once came to inspect Evans' devices and found the mill working clean and in perfect order with no one in the building. Though they were greatly impressed…they were bewildered by the clatter of strange machinery.[47]

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[43] Brumfield, 1968:20. See also Scott, Harvey W., *History of the Oregon Country* (compiled by Leslie M. Scott). Cambridge, MA: The Riverside Press, 1924, III:61.
[44] Herman Steen. *Flour Milling in America*. Minneapolis, MN: T. S. Denison & Company, Inc., 1963:375.
[45] The modern milling process is designed to separate the *endosperm*, the easily digestible central portion of the kernel, from the *bran* coats, the huskier outer shell, and the *germ*, the reproductive portion of the kernel. Milling processes are designed to maximize the endosperm, a percentage of which is always lost during the separation and grinding process. Even today, refined flour will still contain small elements of bran and germ.
[46] Nebraska Wheat Board. *Wheat: From Field to Flour*. Lincoln, NE: Nebraska Wheat Board, 2009:25.
[47] Storck, John and Walter Dorwin Teague. *Flour for Man's Bread: A History of Milling*. Minneapolis, MN: University of Minnesota Press, 1952:161.

One of Evans' many innovations was the realization that if he used waterpower to *elevate* grain to the top of the mill and then channeled it through a series of steps as it descended downward, through the milling process, simple gravity would move material, significantly reduce the amount of manual labor required and increase the speed of the operation. "Evans made gravity the miller's friend instead of his enemy."[48] "Driven by waterpower, [Evans'] mill operated continuously through the use of five bulk material handling devices including a hopper-boy, bucket elevators, conveyor belts, Archimedean screws and descenders, reducing the number of men need to operate the equipment from four to one."[49]

While Evan's innovations meant the movement of grain through the mill had been greatly improved, the basic milling process itself, the grinding of the wheat kernel and then cleaning and sifting grain, remained essentially the same. It would require several other 19th century inventions to transform milling and create the modern milling process—the air purifier and the roller mill. Building on improved automation, the creation of the purifier and the roller mill resulted in what would be known as *New Process* milling.[50]

> In the United States, during the decades after 1860, flour milling completely altered its character. It became a thoroughly mechanized, large-scale, industry, drawing ever more varied wheats from ever more distant sources, submitting them to a cleaning and reduction program whose broad outlines were thoroughly standardized, producing flours and feeds of remarkable purity and uniformity, and disposing of a constantly increasing volume of production in ever expanding markets.[51]

Simplistically there are three major steps in producing flour from grain. After removing the husk, and any residual dirt from the bulk grain, the first step is the breaking or crushing the whole grain kernel. The product of this process is termed "middlings," a mixture of the various broken-down component parts of the kernel (endosperm, germ, and bran). The next step is the "reduction" of the middlings to separate out the bran and germ and produce flour from the endosperm. The final step is "cleaning" the flour to further remove any residual bran and germ.

Modern mills include multiple intervening steps such as additional cleaning and purification, and sometimes bleaching, with the goal of creating purer, or in the case of bleaching, whiter flour. Within these basic steps the modern milling process allows for complex, multi-stepped, customized (even patented) systems to process wheat grains to create the desired product (whole wheat, bleached white flour or other projects, largely dependent upon the source of wheat supply) and so flour mills are custom designed in specific ways to maximize their operation. *Blended grains*, special combinations of varying wheat strains, are obtained by mixing different wheats and create patented flour products of particular qualities. Patent flours can be created for specific uses or appearance, from bread to noodles, to all-purpose flours, and more. The grain and the

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[48] Ibid, 166.
[49] "Oliver Evans Built the First Automated Flour Mill," at www.historyofinformation.com, visited 13-Nov-2015.
[50] Sometimes facilities using the "new process" method were simply called "Roller Mills."
[51] Ibid, 196.

product of a particular mill somewhat determines its design and the layout of the milling "unit," the single vertical processing path that grain follows through the mill.

2(A) Air Purification

The first major innovation that led to the modern milling process was the development and perfection of *air purification*. The air purifier was an enhancement of the traditional sieve or sifter, themselves improvements on traditional winnowing, where loose bran and chaff would be blown away in the wind, or by fanning, to separate the "wheat from the chaff." The use of directed air currents over middlings to separate the chaff began in Hungary and, while useful, filled the mill with wheat dust, since the concept of an exhaust or collector system had not yet been developed. While directed air currents increased productivity, the wheat dust proved highly combustible, initially creating a series of "mysterious" explosions that destroyed mills and often killed mill workers.

The issues of air purification were solved with the invention of the "sieve purifier," a closed box with a conveyer system first designed by Nicholas and Edmund N. La Croix and then improved upon by George T. Smith, who modified the La Croix design by adding a traveling brush beneath the bolting cloths (the conveyors) that automatically cleaned the bolts and kept them from clogging. The air purifier as perfected included multiple sieve layers within the closed box system that allowed flour from one level to sift through to the next. Controlled and directed jets of air lifted lighter middlings into a series of pockets or chambers inside the purifier where they were collected and could be inspected and removed. Smith went into production on his improved air purification design in 1876.

> The purifier became the principal factor in New Process milling…. Its first effect was to product a superior flour, even from our previously unpopular hard spring wheat.[52]

Mills that installed air purifiers in the 1880s were called New Process mills, reflecting the changed technology they employed and intended to convey the impression of an improved product to customers. But these mills still relied upon mill-stones, as had mills for centuries. While air purification improved quality, the remaining mechanics of milling flour still remained unchanged.

2(B) Roller Mills

By the third quarter of the nineteenth century buhr or millstones, set in pairs horizontally, had provided the primary method of grinding grain for hundreds of years. In New Process mills multiple milling lines and millstones of different type or coarseness might operate in series, but the basic mechanics of the milling process was the same, which limited efficiency. "Millstones had another disadvantage in mass production…the cost of frequent dressing was excessive, especially in view of the stones' low productivity."[53] In the 1870s early versions of *roller mills* were first used successfully in Europe, where strategies to redesign the milling process had been under way for over 200 years. As

[52] Storck and Teague, 1952:219.
[53] Storck and Teague, 1952:242.

finally perfected in the 1880s, roller mills, horizontal steel rollers, usually grooved/ridged longitudinally (along the axis) were set in pairs where each roller ran in the opposite direction from its mate and used in series to successively produce finer and finer passes, allowing the milling of grain into the component middlings, bran/germ and endosperm as the wheat moved through the process.

By varying the design of the steel rollers, the size and design of the grooves and teeth of the two opposing faces, the space between the roller grooves, and the speed at which they rotated, millers could control the quality of flour output to a degree never before possible. The roller mill process, whereby grain passed through a series of rollers with varied qualities and yielding ever-finer and more consistent products, came to be known as *gradual reduction*, referring to the incremental, roller by roller, process. Coupled with air purification, rollers completed the technology of New Process milling and completely changed the industry by producing a more consistent, higher quality product at the same time that improved efficiency and capacity. "The superiority of the modern methods of milling lies largely in the exactness with which the various products of the wheat can be sorted."[54]

> Once the feasibility of roller milling was demonstrated, adoption of the process was rapid. No all millstone mill of any importance was built after 1880, and rolls were substituted for buhrs on at least the first or second breaks in practically all the milling plants of more than grist plant classification throughout the nation.[55]

Through the end of the nineteenth century, the technology behind roller mills was considered so advanced and understood as a source of higher quality products, that the term often appeared in a company's very name as a way to promote the quality of its products. [56]

3. CROWN MILLS[57]

Balfour, Guthrie & Company, which had a long record of shipping grain from Portland throughout the world, only entered the milling business as a mechanism to assure their own supply after the Hammond Mill in Seattle, which had previously milled "… a

[54] Hunt, Thomas F. *The Cereals in America*. New York & London, Orange Judd Company/Kegan Paul, Trench. Trubner Co., 1910:114.
[55] Steen, 1963:47. "Breaks" refers to individual steps in the gradual reduction process, which was systematized over time to successively "break" down or mill Spring and Winter wheat.
[56] See, for example the Diamond Roller Mill, which advertised "Flour of the Best Quality Always on Hand," in The Dalles (*Dalles Daily Chronicle*, 27-June-1893, 1:1) or the Portland Roller Mills, located in Albina, which was among Portland's early manufacturing ventures (see *The West Shore*, 1-January-1885, 15:1).
[57] Throughout the original development period the project is referred to both as Crown Mill and Crown Mills although printed materials produced by the company prior to the 1928 construction of the Feed Mill called it "Crown Mills."

considerable portion of the flour which they sold to Manila," was sold to an organization with ties to a competitor.[58] Following the sale of the Hammond mill, the Portland office noted that alternative wheat outlets and flour supplies were difficult to obtain. Balfour Guthrie, with considerable investment in wheat fields and export, had sufficient capacity to develop their own mill. The company's Portland office communicated its plan to San Francisco.

> We have concluded, therefore, wrote the Portland Office, that the time is ripe for us to take a hand in the milling business in the north. We would propose to start in a small way, our present idea being to utilize our river front property at Portland for a site. Portland, they pointed out, was directly tributary to our country warehouse interests…[59]

In December 1909 Balfour, Guthrie and Company had obtained the right to manufacture "Crown Flour," from the Stockton Milling Company, in Stockton, California, a company in which they held a minority interest and use of that blend and name was assigned to the new Portland milling venture.[60]

Design work for Portland's Crown Mill occurred during January and February and in March 1910 the company publicly announced its plans to build a "Great Flour Mill" on the Willamette in downtown Portland. As noted by the local office, the site was to be the company's Centennial Dock,

> The Centennial Dock property, on the west side of the river, a short distance from the Albina ferry, will be the site of the plant. The company has 400 feet of river frontage there and the situation will give them excellent shipping facilities by rail and water.[61]

The design of the plant complete, construction was rushed forward with the expectation that the mill would be ready for operation by fall. Total cost was estimated at $250,000. The new Crown Mill was just one of a series of new flouring mills built on Portland's waterfront during this period; the Portland Flouring Mills had only recently completed a new mill at Albina, across the river, which was expected to open in Spring 1910 and plans for another mill, for the Pacific Milling and Warehouse Company, was announced in the same *Oregonian* article as Crown Mill.[62] News of Crown Mills' construction was of statewide interest, with articles printed in many regional papers, especially in Eastern Oregon, where Balfour Guthrie was a major part of the economy. Typical was a notice in the *Heppner Gazette*, published under the headline "Big Mill for Portland."

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[58] Hunt, Wallis. *Heirs of Great Adventure: The History of Balfour, Williamson and Company, Ltd., 1901-1951*. Norwich, England: Jarrold and Sons, Ltd., for Balfour, Williamson and Company Limited, 1960:79.
[59] Ibid.
[60] Balfour Guthrie would purchase the assets of the pioneer Stockton mill in 1910 and take over the business, run in tandem with the new Portland operation (*Oregonian*, 3-June-1910, 2:2).
[61] *Oregonian*, 19-March-1901, 9:1.
[62] Ibid.

> Portland will have another great flour mill soon. Balfour Guthrie & Co., wheat and flour exporters, have completed plans for erecting a big mill…to be ready for operation during the coming fall…. It will be operated by electric motors and will be one of the most modern flouring milling plants in the country. Its daily capacity will be about 1000 barrels.[63]

Construction of the new Crown Mill was substantially completed by spring 1911 and equipment was installed for production to begin in June. "First of the wheat to be ground in the new mill of Balfour, Guthrie & Company may go forward on the steamer *Strathlyon* of the Portland & Asiatic Steamship Company's fleet, in June."[64] The mill was originally operated with a 750-barrel daily capacity but was designed on the "unit plan" with idea that additional lines would be completed to double its capacity to 1500 barrels for the 1912-1913 milling season.

> John Grant, a practical miller with extensive experience both on this coast and in the East, will have charge of the mill. The selling end of the business will be conducted at the local offices of Balfour Guthrie & Company.[65]

Barely a year after its completion Crown Mills was severely damaged in a major fire that "gutted" the upper three floors of the building, causing damage estimated at $100,000. "The flames originated on the fifth floor, apparently from a short circuit in the electrical machinery."[66] Fire crews, including the fire boat George H. Williams, were unable to get water to the upper floors, where equipment was located, but were able to save the lower portion of the building. The warehouses, with stored flour and stock, were protected by fire doors and undamaged. Covered by insurance, Balfour Guthrie immediately announced plans to rebuild and stated that work would be continued at the mill even as the repairs were underway.[67]

Fire was always a major concern in mills, due to the potential explosiveness of flour dust, and Crown Mill was originally built with an internal fire sprinkler system. The sprinklers failed to protect the upper floors in the June 1912 fire due to low water pressure that limited flow to the upper floor area.[68] As a result, Crown Mills added a wood-stave water tower that was built on the roof of the Flour Mill at the eastern wall, to provide gravity fed water to augment the water line and compensate for the city fire department's inability to get water to the upper floors. This wood-stave tank was probably built right

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[63] *Heppner Gazette*, 31-March-1910, 1:2.
[64] *Oregonian*, 18-May-1911, 20:4.
[65] *The American Miller*, 1-July-1911, 1:1. Grant remained in charge of Crown Mills for more than decade, until his death, when he was struck and killed by a freight car on Front Street, while walking to lunch (*Oregonian*, 21-Jan-1922, 11:4).
[66] *Oregonian*, 7-June-1912, 1:5.
[67] *Oregon Journal*, 7-June-1912, 9:5-6.
[68] Low water pressure in Portland was a constant problem until the 1930s and the completion of the large reservoirs in the city's Bull Run watershed. Prior to that the City required buildings over four stories to maintain an on-site water supply and both tanks at Crown Mill were likely built to satisfy that requirement (Obern, personal community with the author, April 2016).

after the fire, but it was certainly in place by 1918, as was the large illuminated roof top sign that spelled out "CROWN FLOUR in 10-foot tall individual letters on a steel latticework framework. (see Figure F4).[69] The wood-stave tank remained at least through 1925 (see Figure F5) and then was replaced with a more modern design, probably in 1928, in connection with the construction of the Feed Mill. The new water tank was of steel, supported by a steel framework, and was built at the west end of the Flour Mill. The roof top sign was retained and was augmented by a huge painted wall graphic on the west-facing wall of Elevator C. The steel water tank on top of the Flour Mill was drained and bypassed about 1960, when the city water system was improved and capable of developing sufficient water pressure to protect the upper floors of the mill.

By the end of World War, I, Crown was employing between 110 and 120 workers and working three units, or lines, around the clock when it could be assured of shipping for export.[70] With the war's end, Crown made major investments in expanding its operations in Portland, including expanding the wharf and building additional warehouse space. Both the upper and lower docks were expanded by more than 100 feet in length, allowing more vessels to be loaded at the same time. An article by Franklin O. Schroder, published in the *Portland Telegram* under a large headline that proclaimed "Crown Mills One of the Finest Plants on Pacific Coast" provides a detailed discussion of Crown's operation at the time and a comment upon its scale.

> It handles every day in the neighborhood of 12,000 bushels of wheat, or at 25 bushels per acre, as much as could raise on a 480-acre wheat field. It therefore takes all the wheat grown on 150,000 acres to keep this mill supplied [for] one year.[71]

Expansion continued through the 1920s, when Crown Mill was granted a permit to construct a pile foundation for a new grain elevator.[72] This construction was estimated at $250,000. A new elevator "…of 6000 ton capacity would be added to the milling equipment of the company at Front and Pettygrove streets [where] the company already has one elevator with a capacity of 4000 tons."[73] In 1921 Crown Mill absorbed the Golden Rod Milling Company, a subsidiary of Balfour Guthrie's that manufactured cereals and animal feeds, with the idea that combining the concerns would result in economic benefit.[74] In 1928 Crown announced plans to build a Feed Mill and new warehouse at its Crown plant at a cost of $50,000.

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[69] A dry valve that controlled water to Warehouse A, next to the Flour Mill, was cast with the date "1915" indicating it had been in operation for over a century when the warehouse was removed. The valve was saved for potential interpretive use.

[70] *Oregonian*, 23-February-1919, 16:3.

[71] *The Portland Telegram*, 6-March-1920, 12:1.

[72] Portland Docks Commission Minutes, Vol. 5, Page 301, May 1925.

[73] *Oregonian*, 12-April-1925, 18:1. Crown also announced plans to build a 10000-ton elevator at its operation on the east side of the river, at Irving Street, apparently a storage facility (see also *Oregonian*, 27-August-1926, 6:5).

[74] Hunt, Heirs of Great Adventure, p. 132.

> The building is to be constructed at the foot of Pettygrove street, adjacent to the Crown flour mill of Balfour Guthrie & Company. It will be five stories high and of 50 by 83-foot ground dimensions. Adjoining it will be a two-story and basement warehouse 45 by 54 feet in dimensions. Steel and concrete will be used.[75]

A major modification to Crown Mill complex occurred during WWI. Original head miller John Grant had steadfastly resisted bleaching flour. *Choice Recipes*, a small recipe booklet prepared by "Mrs. L. A. Humphreys" was released in at least three versions, one printed prior to WWI which advised the reader that "this is the 'pure food age.'" Mrs. Humphreys assured the reader that "Crown Flour is absolutely pure and wholesome because it is made under excellent sanitary conditions and because no artificial bleaching process is used to white the flour." The second edition of *Choice Recipes* went even further, noting "Crown Mills consider the bleaching of flour an unnecessary procedure and recommend the use of unbleached flour in order to get the full flavor and natural color in the finished loaf or cake."[76] Ultimately, however, the mill bowed to consumer demand, over the objections of John Grant, and the mill added a bleach plant to meet the requirements of a major customer "[Grant] was opposed to bleaching flour but Franz Bakery insisted on having bleached flour which forced us to install a bleaching system."[77]

During the mid-1920s, Crown Mill, "…the brightest star in Balfour, Guthrie's firmament," suffered its first financial loss, finishing 1925 in the red. "But they soon revived."[78] After investing in the Crown property in 1928, building the new Feed Mill and making other improvements, including an additional grain elevator, Balfour Guthrie faced a series of financial challenges during the Great Depression. Crown, one of the firm's most valuable real assets, provided much needed collateral but as their situation deepened, the company's parent firm in England tried in vain to sell Crown to cover other losses.

> Both Balfour, Guthrie and Balfour, Williamson did all they could to find a buyer for Crown Mills, the …corporations most valuable asset, which had kept out of serious trouble since the slump began.[79]

As the investment houses continued to struggle with liquidity issues during the deepening of the Depression, Crown Mills remained one of the chief assets. Repeated attempts to sell Crown Mills, however, failed. "Crown Mills results had been wonderfully steady, but the general state of stock markets and the misfortunes of other mills in the Pacific North West were deterrents to investors."[80] Instead, a private investor came forward and

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[75] *Oregonian*, 13-May-1929, 4:2.
[76] Crown Mills (Humphrey), *Choice Recipes*. (Portland, OR: Crown Mills), c1918.
[77] *Notes of Dugald MacGregor II*, as found in Anne Fulton MS, OHS Collection. Franz Bakery, founded in Portland in 1906 and still in operation, is now under the fourth generation of family leadership (www.franzbakery.com, visited 5-November-2015).
[78] Hunt, Heirs of Great Adventure, p. 164.
[79] Ibid., p.198.
[80] Ibid. p. 207.

the entire debt of Balfour Guthrie was extinguished by sale to a newly formed subsidiary of Balfour Williamson (the London parent company) to be called Crown Flour Mills Limited, which was offered for sale on the London stock market in September 1935.[81]

In 1943, after selling other assets, Balfour Williamson repurchased the stock of Crown Flour Mills Limited, and paid off all outstanding debts and Crown Mills was returned to the management of Balfour Guthrie. Still seeking liquidity because of other ventures, Balfour Williamson sold a one-half interest in Crown Mills in January 1947. Then, in 1948, they received a bid for the property from Centennial Flouring Mills, of Tacoma, operators of one of the largest mills in the Pacific Northwest. A January 1947 fire completely destroyed Centennial's Tacoma mill and received coverage both nationally and even internationally, for its impact on the industry.[82]

> There was a case, on business as well as sentimental grounds, for rejecting the bid and retaining the management and half the capital of the mill, which was deservedly one of the best known on the Pacific Coast. It had proved highly profitable recently. The year to 30th June 1946 had been the second best in its history; the next year's net profits more than doubled the previous record established in 1919. But Centennial would probably rebuild if they could not buy. If Balfour, Guthrie and their co-owners did not sell to them, they might once again be faced with the problem of excess milling capacity in the area and competition from a completely modern plant.[83]

Ownership of Crown Mills was transferred to Centennial Flouring Mills on June 30, 1948. The company continued to operate the mill, changing its name to Centennial Mills in 1955. That year the mill employed 150 workers at the mill, with thirty salesmen and thirty-five office and executive staff.[84] The mill's equipment was mostly original and had been operating almost continuously for more than four decades. "From 1911 to 1961, the plant's milling process and equipment remained essentially the same."[85] United Pacific Corporation purchased the mill in 1960 and enlarged and modernized the operation, replacing much of the original equipment in order to remain competitive.[86] Centennial hired Miag Corporation, of Germany, to design the upgrades to both the Flour and Feed Mills and that work was completed in 1962.[87] United Pacific merged with Van Waters & Rogers, Inc., in 1966 and by 1974 they formed Univar Corporation, which continued to

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[81] Throughout this period, Balfour Guthrie in California was shedding its assets, including large amounts of land held in both California and Oregon by Balfour Properties, and the liquidation of the Balfour Guthrie Trust Company, and various other concerns (Hunt, p. 215).

[82] See, for example, *The Lethbridge Herald*, of Alberta, Canada, which ran a story on the fire 30-January-1947(2:2),

[83] Hunt, p. 241. US newspapers outside of the Pacific Northwest that carried the AP report and photo of the story include the *Ogden (UT) Standard-Examiner*, the *Waukesha (WI) Daily Freeman*, the *Amarillo (TX) Daily News* the *Louisville (KY) Courier-Journal*, the York, PA *Gazette and Daily*, among many others.

[84] *Crown Mills, 1955*. Unpublished Manuscript, in Ann Fulton Collection, OHS.

[85] Portland Development Commission. *Centennial Mills History*. N.D., (c2005).

[86] SERA Architects and Ann Fulton. *Cultural and Historical Analysis: Centennial Mill*. Prepared for Portland Development Commission, Portland, OR, October 2001, p1.5

[87] Ibid., 2001:3.3.

operate Crown Mill. A final ownership transfer, to ADM Milling Company, a subsidiary of Archer-Daniels Midland Company, occurred in 1981.[88] ADM ceased all milling operations prior to 2000 and the property was subsequently purchased by the Portland Development Commission.

4. CROWN MILL IN OPERATION

Grain Delivery

Crown Mill was built at the head of a supply chain and transportation network that extended hundreds of miles eastward, to the acres and acres of grain fields in eastern Washington and Oregon. The focus of the Balfour & Guthrie wheat growing and shipping system, the mill was built specifically to process grain for their existing overseas markets. Sited on long-owned company property, the Centennial Dock, the mill relied on rail freight to deliver grain from inland growers, despite a near monopolistic rate structure. Sacked grain was unloaded from railcars on the spur that lined the mills entire west elevation and another spur on the north elevation taken into the mill for processing. Later, in the mid-1920s, as part of the expansion that included construction of the Feed Mill and Grain Elevators B and C, new bulk handling equipment was installed, allowing Crown Mills to process grain more efficiently, with wheat "unloading pits" constructed next to the railroad siding.[89] Bulk handling of grain remained the standard for the remainder of the mill's operation. The railroad spurs were abandoned in the mid 1960's and grain delivery was shifted principally to trucks to a loading dock located on the south side of the building complex.

Grain Processing and Sales

Crown Mill was "…an automatic, all-roller, gradual reduction method…" flour mill, relying upon the latest available technologies when it went into operation in 1910.[90] Accounts of the original Flour Mill construction document that the milling equipment itself was purchased from Nordyke & Marmon, of Indianapolis, Indiana, one of the leading manufacturers of flour and cereal machinery in the world. While not documented, it is likely that Nordyke & Marmon (N&M) worked closely with Leland S. Rosener, the engineer hired by Balfour & Guthrie to design the project, to layout and develop the mill's operation. Available plans show equipment in the Flour Mill that is visually similar to N&M products and, in some cases, plans include N&M product numbers for identification.

The best narrative that describes the scale and impact of the Crown Mill operation, as well as the path of grain through the Flour Mill during the early years of the Crown Mill operation was written by Franklin O. Schroder, a correspondent for the *Portland Telegram,* that was published as part of a story printed under a full-page headline "Crown

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[88] *Oregonian*, 26-February-1981, D6:3.
[89] Ibid., 2001:2.2.
[90] Op Cit., 2001:1.1.

Mills One of the Finest Plants on the Pacific Coast" in March 1920, quoted here at length.[91]

> The mill has a daily capacity of 1700 barrels…. It takes about a half a pound of flour to make a loaf of bread so that the output of this mill alone would give a loaf a day to more than 1,000,000 people, or to more than all the inhabitants of Portland, Seattle and Tacoma combined.
>
> Starting your trip through the mill you would first be taken to the top floor where the wheat is taken by conveyors and it goes through the different processes. The first processes are those of cleaning the wheat. The grain is passed through machines which take out every bit of straw and chaff and remove all foreign and unclean matter. The grains are scoured and cleaned again and again before passing through the roller mill where it is slightly crushed and the flour is removed.
>
> From there it goes to the bolters and passes over a series of sieves through which the flour falls. The bran and shorts are separated from the flour and deposited in separate bins and the poor starchy flour is separated from the choicest part of the kernel, and after this separating process the milled product passes through separate spouts to the packers, where it is sacked and ready to be loaded on to the cars and sent to the consumer.[92]

At first, grain arrived at the mill in sacks direct from the grower by barge and was offloaded by hand, opened, and emptied into the automatic conveyor system that carried it to the top of the elevator for storage. Grain Elevators, the large vertical wood-cribbed storage bins, were used to store unprocessed grain prior to milling and allowed the chief miller at Crown to control quality, by separating different quality grain for processing. "A bucket elevator carried the grain from the bottom to the top of the grain elevator, where it was weighed."[93]

Blending bins allowed grains from different sources to be blended for specialized use. Grain to be processed was deposited onto the conveyor via a series of chutes and other methods. Automatic conveyors, including belt conveyor rollers, steel helical conveyors (also called auger conveyors) moved grain horizontally or at shallow angles through the mill. Belt conveyors consisted of an endless loop of stitched canvas or leather belts and traveled across a series of "trough carriers," essentially idler wheels that both supported the bottom and included rollers mounted at an upward angle to slightly fold the belt into a trough. Specialized belt conveyor supports allowed the supply line to turn corners, to dump grain, to reverse belt orientation (to turn the belt over), or perform other functions as required by the operation.

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[91] Franklin Otto Schroder (1892-1977) began his career in newspapers at the age of 14 and was the owner and publisher of a small paper in La Mesa Springs, California by the time he was twenty. After pursuing correspondent work around the country, including his stint at the *Portland Telegram* (at age 28), he returned to California and other pursuits before becoming the co-owner of the *Simi Valley News-Advertiser* (*Valley News)* (Van Nuys, CA), 7-January-1977, 38:1-2).

[92] *Portland Telegram*, 6-March-1920, 12:1-6.

[93] Roger Farren interview, as quoted in SERA & Fulton, 2001:3.1.

Helical or auger conveyors consisted of a caged helical shaft or auger, mounted inside a steel trough or wooden box sized to the auger (which could be ordered from Nordyke & Marmon in sizes ranging from three to sixteen inches in diameter) that allowed dry grain to be moved. Augers came in sections with standard lengths of eight, ten and twelve feet, and could be assembled in series as needed with pillow blocks added for support between sections. The steel shafted auger terminated in a "driving end," also called a grudgeon, which attached to a drive wheel, usually connected to the internal belt-drive systems.

Elevator buckets, consisting of small cups or buckets made of steel or tin that were bolt-mounted to the outside of an endless loop canvas belt, moved grain vertically by being driven through a "boot," a hopper of grain where each cup scooped up a small amount of grain and then ran over a series of idler wheels vertically through the mill to the elevator "head," where it was emptied and depositing its contents as it turned over and dumped prior to returning to the point of origin. Boots and heads could be made of multiple materials, including cast iron, galvanized sheet metal, and wood, all of which were offered for sale in the Nordyke & Marmon catalog.[94]

Processing grain began with the separator, which began the cleaning process to remove any dirt, and begin the reduction process. Grain was analyzed in the mill laboratory and then sorted according to its protein content and quality as needed. Elevator operators could mix grains from different sources to obtain the mixture desired and then that blended grain could be stored in the elevators as well. Bucket elevators transported grain to the upper floor of the mill, where it was "tempered." "They tempered the wheat for a specific time by adding moisture to toughen the bran and mellow the endosperm." [95] Once tempered the grain went through the roller mills, called the "first break" in the kernel. The broken grain was then further reduced by sieves or sifters, a series of screens that sifted the flour and allowed finer flour to be separated from coarser elements like bran, germ, and shorts, which were selected out and sent to separate bins while the fine flour elements continued through the main process. At Crown, Nordyke & Marmon sifters made of wood, with boxed screens, remained in use from 1910 (or 1912, after the fire) until the end of operation. Flour was purified, likely added after the original construction, using directed air pressure to remove any remaining bran and then reground, through another bank of roller mills, and again sifted to create the highest grade of flour.

All the mill conveyor and processing equipment, indeed almost all the equipment in the mill, was powered by two large 300hp and 350hp Westinghouse electric-powered motors located on the main floor. From the main floor two large drive belts extended up to a mezzanine level mechanical room that contained long drive belts. Drive belts, typically leather or canvas, ran over a complex series of wheels, axles, belt-tighteners, and other drive-related devices to assure smooth and constant operation and provide power to the

[94] Nordyke & Marmon's *Price List No. 1020*, published ca. 1910, is hardbound, over 550 pages long and contains finely detailed line-art illustrations of the entire range of company products, including in addition to flour and cereal mill machinery, more than 200 pages of specialized designs for "elevating, conveying, and power transmitting appliances" as needed in the operation of a modern mill.
[95] SERA and Fulton, 2001:3.2.

wide variety of processing and conveyance equipment that extended in a system to the upper floors.

Changes in the market and increased demand resulted in Crown Mills expansion, beginning with the construction of a second grain elevator in 1925 and then a third elevator and the Feed Mill in 1928-29.

> In milling we get only about 72 pounds of flour for every 100 pounds of wheat. The remaining 28 pounds consists of the hull and the germ of the wheat kernel…. these by-products made an excellent base for animal feeds.[96]

As the process of flour milling became more scientific, the role of the laboratory at Crown grew in importance. Crown had established a lab as part of the original construction. In addition to testing grain for quality and content, by World War Two the lab was responsible for enriching the flour. "The flour that goes to the troops is enriched with B1, B2 Niacin and iron."[97] Issue of wartime also required the mill to develop new, water-proof, packaging, allowing flour to be floated to shore where docks didn't exist or survive the high humidity of submarine use. "The new bags are made of four plies of paper and an asphaltic membrane…to keep water out."[98]

The Feed Mill operated in much the same manner as the Flour Mill but did so with the goal of producing a less refined product for animal feed. "By the early 1930s the company sold approximately fourteen different types of mill feed, including feed for chickens, turkeys, dairy cows, beef cattle, hogs, sheep, goats, rabbits, foxes, minks and dogs."[99]

By 1954 the mill feed division of Crown Mill was responsible for nearly forty percent of the plant's income.[100] Changes in ownership, however, allowed mill feed to be shipped to Centennial's Wenatchee, Washington plant and resulted in the end of animal feed production in September 1959. "The decision to discontinue the Portland feed division was reached in order that greater effort could be directed to the company's principal interest, flour milling."[101] This change allowed Centennial to reconfigure the Feed Mill and install new equipment to convert it for operation as a Starch Mill, also called the gluten or wheat gluten starch plant. Starch mills use a wet process to separate and concentrate the gluten in the grain, creating a versatile product that can be used not only for breadmaking or foodstuffs, but as an additive in a variety of industrial process that include papermaking, forest products, paint, and chemical manufacture. It's a complex process that marked a major change in the operation of Centennial Mills. "If anyone

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[96] *Crown Mills, 1955*. Unidentified Manuscript, Ann Fulton MS Collection, OHS.
[97] *Oregon Journal*, 24-October-1941, 2nd Section, 1:1
[98] Ibid.
[99] R. L. Polk & Company. *Portland City Directory 1938*. Portland, OR: R. L. Polk & Company, 1938:29.
[100] Crown Mills, 1955.
[101] *Oregonian*, 12-September-1959, 40:1.

thinks flour milling is difficult, he should try wheat starch and gluten processing!"[102] The Starch Mill at Centennial Mills went into operation in 1966 and continued to form a major component of the operation until late 1975 when it was closed due to a decline in product demand.[103]

Shipping Finished Product

Finished product took advantage of the mill's location on the Willamette River. Portland's Commission on Public Docks, established in 1910, was the result of a decades-long effort to dredge the river and transform it into a deep-water port, allowing ever larger freighters access for worldwide exports. Initial grain sack loading occurred on the wharf that had two levels to enable ships to be loaded at either high or low water. Improvements to automated bulk loading in late 1930 allowed Crown to fill cargo ships at the rate of 150 tons per hour. "Bulk grain capacity [is] approximately 633,000 bushels; sacked grain on the pier, 333,000 bushels [with] trackage accommodation for eight cars."[104] While rail and truck transport grew in importance over the life of Crown Mill, river-based shipment remained an important element in the operation throughout almost all of its existence as well.

> …[T]he company loaded the largest shipment of flour in the company's history and to export product worldwide. The *MV Othon* sailed on December 24, 1968 with 26,034,800 pounds of flour for Ceylon…. the last ship left the mill's docks in 1982.[105]

Originally most of the processed flour at Crown Mill was wholesale bagged (sacked) and shipped out via ocean-going vessels to distant ports. However, by the early 1920s increased interest in bulk shipping flour (i.e., not bagged) began and this would eventually become the industry standard.[106]

Some flour was sold for local consumption and packaged under the "Crown" brand. By 1920 a full line of products included Best Patent Unbleached Flour, Wheat Flakes, Pancake Flour, Rolled Oats, Whole Wheat Flour, Graham Flour, and others were being advertised by the company throughout Oregon. Crown products were delivered to area bakeries and others, first by horse-drawn carts and then, perhaps as early as 1915 and certainly by 1920, by a fleet of company-owned delivery trucks. The truck loading area, along North Front (NW Naito Parkway) shared space with a rail spur, as that method of transport complimented the water-borne deliveries on the waterfront. Later, as Crown

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[102] Sudgen, David. *Wheat Starch and Gluten Manufacturing*. (www.world-grain.com., visited 29-April-2016).
[103] *Seattle Times*, 4-March-1970, B10:3. See also *Oregonian,* 5-Janaruy-1976, D9:6-8. Centennial has also built a new, presumably more efficient, starch mill at its Spokane operation.
[104] Portland Commission on Public Docks. *Twenty-Ninth Annual Report, Year Ending November 30, 1939*. (Portland, OR: Portland Commission on Public Docks), 1939:46.
[105] Op Cit., 2001:2.4.
[106] *Oregonian*, 16-September-1922, 14:3. This article reports that "much of the local output goes without sacks," when shipped to Europe while flour to China and Japan was still shipped in sacks, due to the preference of that market. See also *Oregonian,* 12-April-1922, 18:1.

Mill expanded its local sales, flour produced at the mill was delivered to markets in addition to wholesalers and restaurants.

To boost sales, Crown produced a series of "Choice Recipe" pamphlets authored by Mrs. L. A. Humphreys, "the celebrated food specialist of the Northwest," to promote Crown "Best Patent" Unbleached Flour.[107] Humphreys traveled throughout western Oregon, to Salem, Eugene, Medford, Bend, Klamath Falls, and elsewhere putting on cooking demonstrations and offering baking and cooking classes as the head of the "Crown Mills Home Economics Department." These promotions continued throughout the 1920s and 1930s. Typical was the Register Cooking School, held in Eugene, Oregon in March 929.[108] "Mrs. Humphreys always uses Crown Unbleached Flour and Crown Cake Flour!"[109]

[107] Humphreys would also be referred to as a "well-known cooking expert," a "famous dietitian," and a "nationally known cooking expert" in the printed promotions for her various presentations.
[108] In the 1930s Mrs. Leanna A. Humphreys (1881-1963) was frequently assisted in cooking demonstrations by her daughter, Miss Claudine Humphreys, and occasionally joined by Mrs. E. L. Herrell, of Roseburg, another daughter. Humphreys died in Eugene (*Oregon Statesman*, 12-December-1963, 33:5).
[109] *Morning Register* (Eugene, OR), 2-March-1929, 11:6-8. Humphreys was something of a celebrity endorser, with advertisements that announced her exclusive use of Westinghouse Electric Ranges, General Electric's "All Steel Electric Refrigerator" and other cooking-related products (see *Medford Mail Tribune*, 3-May-1931, 11:1-3).

PART II. ARCHITECTURAL INFORMATION

A. General Statement:

Architectural Character:
Crown Mills is a multi-component industrial development that occupies the majority of the site on the east side of Northwest Naito Parkway, on the west shore of the Willamette River, north of downtown Portland, Oregon. Buildings are of mixed materials including wood, concrete, stucco and metal and of varying sizes and heights depending on original use, creating a complex industrial character.

Crown Mill consisted of eleven separate structures, including the Flour Mill, Feed Mill, Grain Elevators A, B and C, Warehouses A B, C, D and E, a separate additional warehouse and a blending bin, as well as surrounding wharfs over the Willamette River, loading docks and the large linear platform that faced west along a rail siding. In 2015-2016 due to serious deterioration, all structures including the wharf except the Flour Mill, Feed Mill and Warehouse E (converted for use by the Portland Mounted Patrol) were removed.

Condition of Fabric:
The Crown Mill facilities have not been used for their original purposes since 1999. Multiple buildings were in severely deteriorated condition and were removed as dangerous by the owner at the direction of the City of Portland. Warehouse E, rehabilitated for use by the Portland Mounted Patrol in 2001, is in good condition and remains occupied, temporarily serving as office space during the demolition process. The Flour Mill, built of bearing masonry exterior walls with wooden interior floor and partitions, suffers from severe water damage with large failing sections of the gable roof allowing damage and vegetative grown throughout. Large areas of all floors are rotten and marked as dangerous, limiting access. Most milling equipment was removed following a public auction in 2001 although some equipment proved too cumbersome and remains. The Feed Mill, also of concrete with mixed wood-framed and hollow clay tile interior partitions has mixed wood and concrete floor levels. It too has severe water damage and issues related to vacancy and vandalism. Before the removal of the warehouse and elevator buildings in 2015-2016, portions of the remaining milling equipment, signage, and other artifacts were salvaged for potential interpretative use in connection with the anticipated future rehabilitation of the Flour and Feed mills.

B. Description of Structures:
The Crown Mill complex consists of multiple structures that all loosely fit into three basic types; Mills, Elevators, and Warehouses. Although physically contiguous, most of the buildings are or were independent structurally. In order of construction, the major buildings at the site are as follows.

1. **FLOUR MILL**: Designed by Leland Rosener and completed in 1910, the Flour Mill is a seven-story building with a full basement located at the NW of the site. The building is 53’-3” wide and 108’-10” wide.

The Flour Mill, with its character-defining roof-top steel water tank, the key structure in the operation, is appropriately the most visually prominent building within the Crown Mill complex. Oriented with its narrow, 53'-3" wide front facing NW Naito Parkway, the basement and grade floor level of the mill opened directly onto the covered loading dock parallel to the rail tracks along the west property line. Starting from a concrete floor on fill, the poured-in-place concrete walls rise six floors to a shallow wood-framed gable roof with two parallel interior column runs that divide the building roughly into four equal bays. Concrete beams in the first floor and basement support the upper floors, built of timber beams and columns. Columns are 10x10" with floor beams of 10x16" timbers. The second floor level, which originally supported the heavy roller mills themselves, is built on 10x18" timber floor beams. The first floor joists are of reinforced concrete of mixed dimensions, 14x36" on the outer bays and 14x27" in the center, all rising from massive poured concrete footings to carry the heavy industrial load.

Regularly spaced windows on the west- and south-facing elevations (above the adjacent structures) are of two-over-two wood frame sash, the majority of which remain from original construction. Multiple window openings have been infilled with concrete block or other masonry, the result of changes in operation over the past century. Interior floors have wood planks (with wood panels in places) supported by large timber beams. Operating equipment was largely removed following closure of the mill in 2000.

Powered by large electric motors located on the main floor, belt-driven equipment elevated grain to the sixth floor level of the mill where steel distribution pipes directed raw grain into the equipment for initial processing, being scrubbed and cleaned to remove dirt and debris. From the top floor to the basement level, the Flour Mill equipment was laid out as follows (see Figure 6270, Section B-B.jpg):

Floor 6	Level 7:	Dusters
Floor 5	Level 6:	Sifters and Reels
Floor 4	Level 5:	Reels and Purifiers
Floor 3	Level 4:	Aspirators and Dusters
Floor 2	Level 3:	Rollers
Mezzanine	Level 2:	Line Shafting (Drive equipment)
Floor 1	Level 1:	Weighing and Sacking Electric Drive Motors
Basement	Level 0:	(Flour in sacks)

Grain was separated and graded using a series of gyrating wood-framed sieve boxes that were suspended from the floor joists above and supported by multiple wooden rods. Sieve trays of various sizes could be stacked within each of the four chambers and then the oscillating motion of the unit used gravity to reduce the grains and sent product through a series of galvanized pipes mounted in the floor to the next processing stage below. Linen connectors allowed the unit to move freely, while still containing the grain. Multiple feed pipes from above allowed different grains to be blended or mixed.

Additional sorting and sifting, along with roller milling to ever finer grain, continued as gravity fed the grains down through the mill levels to the ground floor. The main floor held the large electric-powered motors that ran the mill, along with the wide leather drive

belts that transferred power to the various machines on upper floors. Operation was controlled from the third floor where a "control room" was built at the center of the building.

2. **GRAIN ELEVATOR A**: Designed by Leland Rosener and completed in 1910, Grain Elevator A was located toward the river, east of the Flour Mill. With a stated capacity of 125,000 bushels, it had sixty-five (13 by 5) full-height vertical bins. Overall footprint of the five-story tall structure was 30'-0" wide and 95'-9" long. Exposed portions of Grain Elevator A were clad with corrugated metal to protect its stacked wood construction from the elements.

   Grain elevators contain significant forces, and during the late 19th and early 20th centuries the most economical method of construction was milled, stacked, 2" by 6" boards nailed together in horizontal courses and rising multiple stories to create tall, narrow (usually six feet square or so) shafts that could be used to store varied grains. This sort of construction is called "cribbed" construction and was among the most common forms of elevator design due to its inherent stability. Interior "webs" were created by through tenon-like stacking on alternate courses to create strong vertical bins.

   Elevators would receive grain from the farmer via ship or barge (later train), and it was then dumped into a grain "pit" at the bottom moved horizontally at the basement level by an automatic belt conveyor system then lifted up vertically 6 floors by grain buckets to the top of the building then transferred to horizontal belt conveyor system to the headhouse. The "headhouse" was located at the top floor, in the case of Grain Elevator A within the gable roof structure, and pivoting wooden chutes, fed by conveyor, directed dry grain into the storage bins as needed. Small ports opened onto the shaft, which typically was covered with a wooden trap-type door that provided access for cleaning (with steel bar ladder rungs embedded into the wood).

3. **WAREHOUSE A**: Designed by Leland Rosener and completed in 1910, Warehouse A was located immediately south of the Flour Mill. Built of timber-frame, the building was one story tall with a full basement. Oriented to match the Flour Mill, with its narrow elevation facing what is now NW Naito Parkway, Warehouse A had a footprint 48'-7" wide and 108'-6" long.

   Grain warehouses, like any other industrial structure, were built to carry huge dead loads of stacked product, whether before or after processing. Typical construction of Warehouse A consisted of a thick concrete reinforced floor supported by large concrete reinforced beams and columns. Columns extended below the grade 6ft and were supported by driven wood piles. The roof structure was wood framed truss with the roof covered with rolled asphalt.

4. **BLENDING BINS**: Located immediately to the east of the Flour Mill, adjacent to Grain Elevator A, the Blending Bins were designed by Whitehouse and Foulihoux and completed in 1916. Essentially a machine, the building contained a series of ten-foot square bins fabricated from 2-inch thick stacked or cribbed wood. The overall footprint

was 14'-3" wide and 51'-4" and basically appeared as an extension of the Flour Mill or Grain Elevator A. According to plans prepared in 1939, four six-inch double screw conveyors (vertical hopper belts), operated by 2-hp gear motors and roller chain drives, moved grain from the basement level to the top of the building where it could be directed into the appropriate storage bin. At the basement level two nine-inch screw conveyors (augers) moved grain laterally, driven by a 10-hp electric motor through a 15-bbl feeder hopper and four Nordyke and Marmon-brand Feeder Mixers. A series of Nordyke and Marmon friction clutch "Flour Packers" were located on the first floor level,

5. **WAREHOUSE B**: This large two-story tall timber-framed industrial structure is located facing the Willamette River and partially wraps around Grain Elevator A and the Blending Bins, north of the Feed Mill. Portions of this building, including a two-level wharf on pilings, were probably constructed in the early 1920s or earlier and then remodeled in 1940 by L. H. Hoffman, who added a mezzanine level to increase storage capacity in 1928. Side wall construction on the south, abutting warehouse C, was mixed, of poured-in-place concrete with pilasters and structural clay tile and concrete columns. Interior construction in Warehouse B, like the other warehouses, was of heavy timber columns and beams with a wood plank floor for dead loads. The roof, covered with rolled asphalt, is of a clipped truss design that, in combination with the adjacent structures, forms a series of modest "m" forms, with angled edges. The lower floor level of Warehouse B was of concrete the western portion on fill the eastern was a wharf. The two-level wharf, supported on an under grid of concrete columns that were supported by wood pilings over the river, allowed for docking during both high- and low-water periods on the river. This ell-shaped building had a maximum width of about 100'-7" along the river channel and a maximum depth, from the rear wall of Warehouse A to the river, of about 190 feet.

6. **WAREHOUSE D**: The eastern two-thirds of this two level heavy timber-framed and piling-supported wharf located at the northeastern corner of the property was designed by M. H. Whitehouse and completed in 1919. The western third, also designed by Whitehouse, was completed in 1920. The overall footprint was approximately 100'-0" wide and 160'-0" deep, the western portion on fill and the eastern portion located over the rive on pilings. The roof was a clipped truss design, matched to that of Warehouse B. Large interior wood columns and beams support the upper plank wood flooring while the lower level flooring is concrete. The exterior wall, on the north, was of laminated (stacked) wood covered with corrugated metal as a weather envelope.

7. **GRAIN ELEVATOR B**: Designed by L. E. Rosener and completed in 1925, this second elevator at Crown Mill was built of stacked 2x6 wood with through tenons to create eighty (8x10) multiple full-height vertical bins. Construction of this elevator resulted from changes in grain shipment, with bulk grain deliveries replacing the earlier bagged shipments. "As a consequence at the present a concern which is handling large quantities of grain must either have bulk storage facilities or make use of those at public docks."[110] Elevator B stood approximately six stories high and had a stated capacity of 200,000 bushels. Overall footprint was 50'-6" deep and 85'-6" wide, located immediately west of Warehouse D. L. H. Hoffman put a new foundation on Grain

[110] *Oregonian*, 12-April-1925, 18:1.

Elevator B in 1940. The exposed exterior walls, on the north façade and above Warehouse D, to the east, were clad with corrugated metal to protect the structure.

According to plans signed by "C. C. H." and dated in March 1923, the design for what is assumed to have been Grain Elevator B included a six story "Work House," located at the south, containing separating and cleaning equipment to process the grain as it was moved vertically into storage bins.

8. **WAREHOUSE E**: Occupying the southwestern portion of the Crown Mill complex, Warehouse E is a single-story bearing concrete building with a basement level. The western portion was designed by Strong and McNaughton and completed in 1921, including the loading platform lining what is now NW Naito Parkway. The rear, eastern, portion was designed by L. H. Hoffman and completed in 1928. Crown Mill offices were located on the main floor and the mezzanine floor housed a cafeteria and worker changing room. Hoffman also designed the loading platform at the south elevation, which was built in 1940. The overall footprint of Warehouse E is 175'-0" wide, and 108'-7" deep. Construction is of bearing concrete walls with concrete floors on the lower level and laminated wood flooring, wood support columns above. The roof structure is of wood truss.

   In 2001, after the original flour mill use ended and the property was purchased by the Portland Development Commission, Warehouse E was remodeled for use by the Portland Mounted Patrol, the horse unit of the Portland Police Department. Portions of the space were converted to office use while the main floor level was used, essentially, as a barn/horse stable and training facility.

9. **FEED MILL** (aka "Starch Plant"): Four stories tall with a basement, this poured-in-place concrete structure was designed by L. H. Hoffman and completed in 1928. Located east of and attached to Warehouse E (as expanded), the Feed Mill is 50'-3" wide and 82'-11" deep.

   Built concurrently with the Grain Elevator C and Warehouse, the Feed or Starch mill marked a major expansion of the Crown Mill products to include animal feed. "It is the first mill of its kind to be constructed in Portland in years."[111] The gable roof structure is located near the center of the Crown Mill site. Large multi-paned industrial sash windows light all four exterior elevations on those floors above the adjacent warehouse structures. The steel framework for the original "Crown Mills" sign that was located on the ridge of the roof remains, although the letters have long been removed. A portion of the building was converted to a starch plant in 1960's to include large vats for processing and manufacturing starch.

   The interior of the Feed Mill consists of a series of perimeter wooden floor levels located around a central open atrium that rises from the ground floor to the roof. Grain entered the mill at the top level, pulled from adjacent storage bins (elevators) and was separated and screened by four cyclones before entering the large vertical bins and the screening

[111] *Oregonian*, 13-May-1928, 4-2-5.

plant. Operation was controlled from the ground floor level, where a "control room" was built at the center south side of the building.

10. **GRAIN ELEVATOR C**: Designed by L. H. Hoffman and completed in 1929, this 80'-10" deep by 76'-8" wide stacked 2x6 wood structure stood at the NE corner of the property, facing what is now NW Naito Parkway. Capacity of the fifty-six (7 by 8) full-height vertical bins was stated at 300,000 bushels, the largest elevator on the site. A small, unnamed, warehouse addition (two-stories and a basement, 22'-10" by 80'-10") was built to the south, between this structure and the Flour Mill, at the same time.

11. **WAREHOUSE C**: Also including a two-level wharf on pilings that extended into the river channel, the original construction of this heavy timber-framed warehouse is unclear but likely dates from the 1920s or earlier. It was remodeled and perhaps expanded from plans by L. H. Hoffman in 1940. The roof was a clipped truss design, matched to that of Warehouse B & D. Large interior concrete columns and supported the main concrete floor while the upper level is wood columns, wood truss covered with rolled asphaltic roof. A portion of the wharf is wood plank floor overlain with asphaltic concrete. The exterior wall, to the south, was concrete with a painted sign.

C. Known Modifications and Additions:

Documentation on the history of the mill is somewhat limited although it is assumed that minor changes to equipment and operations occurred throughout the ninety years of plant operation, especially following the sale of the mill from the original Balfour-Guthrie ownership to Centennial Flouring Mills in 1948. Known modifications or minor additions to the mill (exclusive of the construction of new buildings) are listed in chronological order.

1912 $100,000 fire damages to the upper three floors of the Flour Mill, started by an electrical spark (*Oregonian*, 7-Jun-1912, 1:5).

1917 Permit to "alter a six story brick transformer house" at a cost of $800 (*Oregonian*, 9-Nov-1917, 24:6).

1918 Granted permit to erect a "…mill for the grinding of barley flour…with the understanding that there be adequate precautions against fire." This project does not appear to have been realized (*Oregon Daily Journal*, 15-March-1918, 14:4).

c1920 Installed bleaching equipment, to satisfy Franz Bakery requirements (MacGregor Oral History, Fulton Manuscript Collection, OHS "Franz Bakery insisted on having bleached flour, which forced us to install a bleaching system during World War I"). This appears to have occurred after the end of the war, as a March 1920 article on the mill reports "As bleaching for artificial coloring of flour is said to impair its healthfulness, no such thing as a bleaching machine is to be found in the Crown mills." (*Portland Telegram*, 6-March-1920, 12:1-6). The bleach plant may not have been added until the 1930s, but that can be determined with further research.

1925 Portland Docks Commission, Resolution No. 915, granted Crown Mills authority to construct a pile foundation 50 feet by 86 feet at their mill "…for the purpose of

erecting grains bins thereon." This likely refers to what would become Grain Elevator B, which is of those basic dimensions.[112]

1929 Crown appeared before the Portland Docks Commission for permission to construct a concrete loading dock, assumed to relate to the dock lining NW Naito Street (*Oregonian*, 23-May-1929, 14:1).

1930 The Docks Commission granted permission to construct "…gallery and shipping-out tower and a steel sprinkler tank at the Crown Mill. The gallery and shipping-tower are being installed to load bulk grain aboard vessels" (*Oregonian*, 25-September-1930, 20:1).

1933 Permit was granted to build a penthouse on the Crown Mill dock for the installation of a "shaker screen" (*Oregonian*, 15-March-1933, 12:5).

1962 Milling equipment was modernized and updated for the first time since 1910, including the installation of new systems. As part of this conversion, the former Feed Mill was converted to operation as a "Wheat Starch Mill," (see *Oregonian*, 5-January-1975, 9:6-8).

1965 100 feet of the dock and associated warehouse lining the Willamette River were "reduced to splinters" when a grain-leaden ship attempting to turn around crashed into the mill. The ship, the *Aegean Mariner*, was loaded with grain from the Peavy Company mill, across the channel and was being pulled by a tugboat when it crashed into the dock. Damage to the building was estimated at $100,000 (*Oregonian*, 14-April-1965, 6:4-6).

1975 Starch Mill (former Feed Mill) ends operation (*Oregonian*, 5-January-1975, 9:6-8).

[112] Portland Commission on Public Docks, Volume 5, p. 301(1925).

PART III. SOURCES OF INFORMATION

A. **Architectural Drawings**: A selection of plans of various buildings at the Crown Mill site are in the collection of the Portland Development Commission as the result of their purchase of the property in 2000. These are incomplete and generally date from 1920 additions or later. These drawings provided information on the construction and flour operation during the period of mill use. Current conditions were documented by KPFF Consulting Engineers of Portland, under contract to the Portland Development Commission, and provided information on structure and scale of the project as it existed prior to the removal of hazardous structures between 2015 and 2016.

B. **Early Views**: Limited historic photographs of the mill, almost all exterior or aerial images, included views of the property over the course of the operation. These were located from a variety of sources, most notably the Oregon Historical Society and City of Portland Archives, both in Portland, Oregon. Other views as were published in local newspapers, industry trade publications and *Choice Recipes*, a series of small pamphlets produced by Crown Mills in the 1920s, were also located.

C. **Archival Sources**: Information on the history of Balfour, Williamson, Balfour & Guthrie and the impact of British investment in the Pacific Northwest during the 19th and 20th centuries relied upon published sources commissioned by the Balfour Williamson Company and various articles prepared by economic historians and published in academic journals. Documentation on the development of the Crown Mill site, though sparse, was located in the records of the Portland Public Docks Commission, maintained by the City of Portland Archive, located on the Portland State University campus. One of the first works to look specifically at the history of the Crown/Centennial Mill complex was prepared under contract by SERA Architects in association with historian Ann Fulton, whose manuscript collection at the Oregon Historical Society contained a wealth of material including unpublished manuscripts and interview notes with former Centennial employees not otherwise available. Newspaper accounts of the mill's construction and operation were researched both at the Multnomah County Public Library in Portland, and the Knight Library at the University of Oregon in Eugene, with reliance upon several on-line search engines, most notably Historic Oregon Newspapers (www.oregonnews.uoregon.edu), Newspapers.com (www.newspapers.com) and Genealogy Bank (www.genealogy.com).

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Thomas, Ashley D. The Past, Present and Future of Grain Elevators in Delaware County, Indiana: A Study of the History, Present Conditions and Potential Rehabilitation Uses of Country Grain Elevators. Submitted in Partial Fulfillment of Master's Degree in Historic Preservation, Ball State University, April 2009.

E. **Likely Sources Not Yet Investigated**: Information relating to Centennial Milling Company may be located in Washington State but was not researched for this project. Materials related to the Port and shipping industry that may provide information on the role of the "Wheat Fleet" in Portland are likely found in the collection of the Oregon Maritime Museum (www.oregonmaritimemuseum.org), which among its other collections retains the Lawrence Barber Papers, donated by the longtime Maritime Correspondent for the *Oregonian* newspaper.

F. Supplemental Material

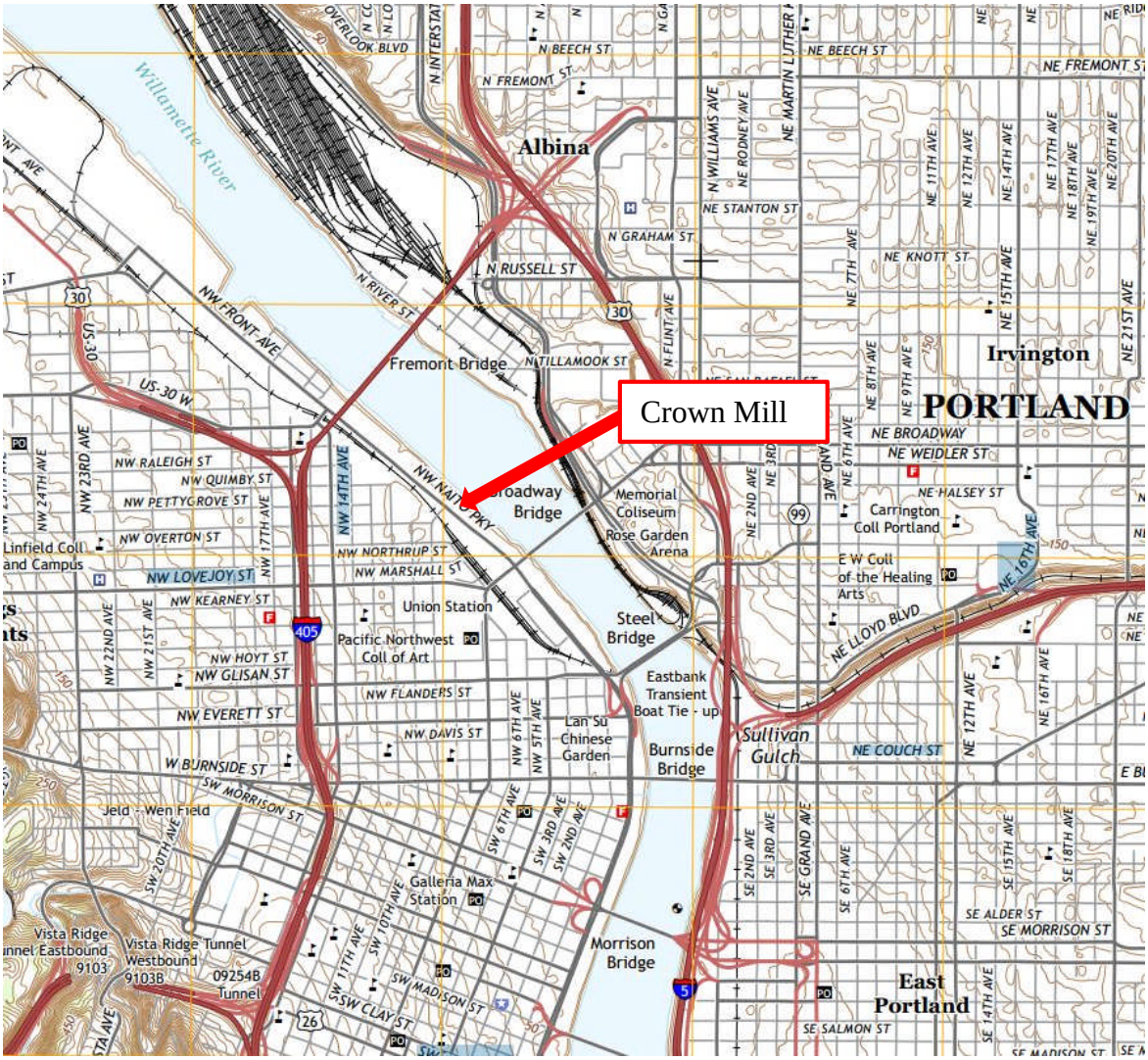


Figure F1: Crown (Centennial) Mill, 1362 NW Naito Parkway, Portland, Multnomah County, OR (Source: USGS Portland 7.5. Quadrangle, 2014).

Figure F3: HISTORIC VIEW, Crown Mill, circa 1910 (Source: *American Miller Magazine*, July 1, 1911).

Figure F4: HISTORIC VIEW, "Crown Mills – The Home of Crown Flour" circa 1918 (Source: *Chosen Recipes*, Crown Mills, Author Collection).

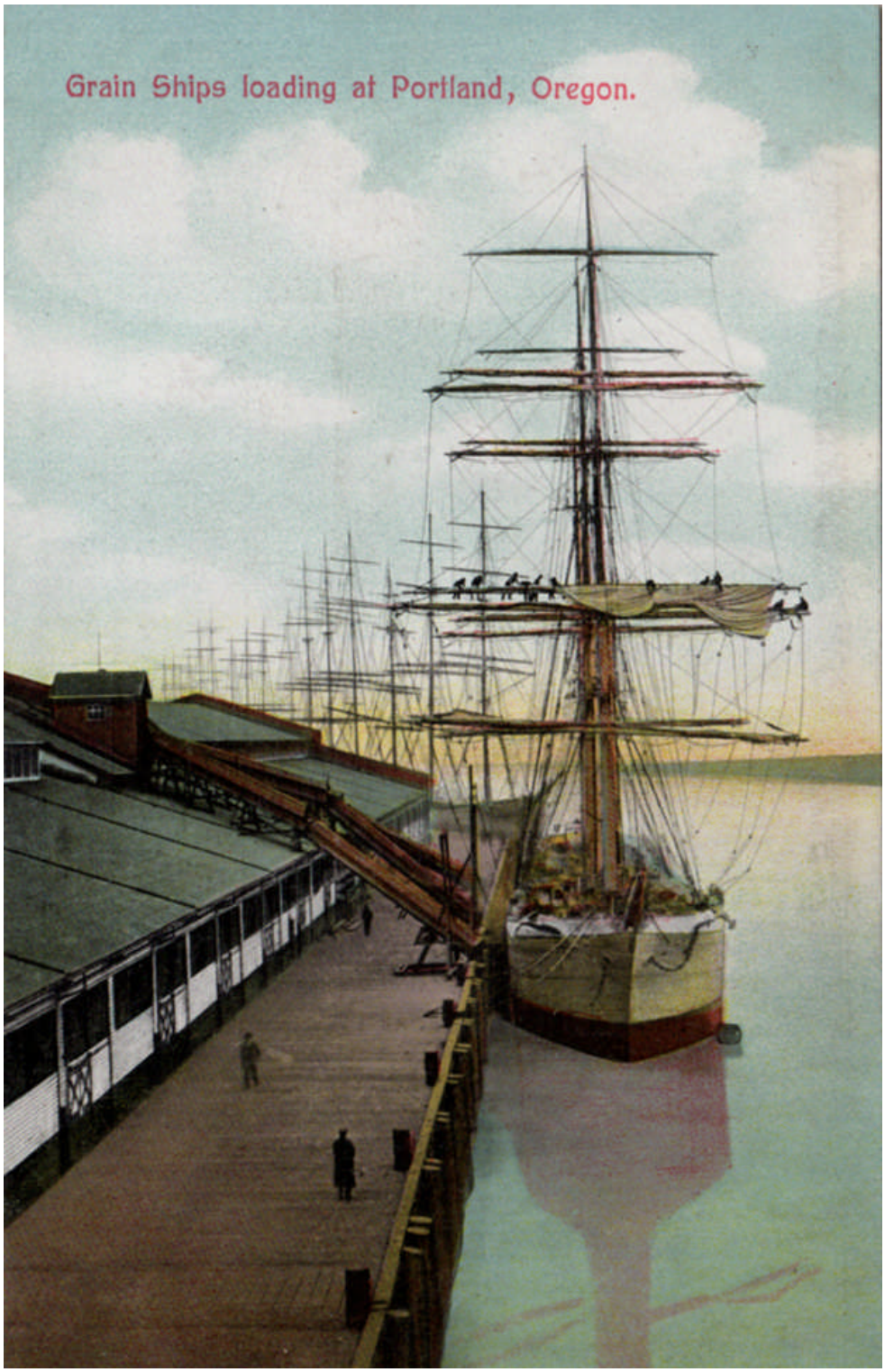


Figure F4: HISTORIC VIEW, Typical Wharf View, “Grain Ships Loading at Portland, Oregon” circa 1915 Source: Postcard Image, Author Collection).

Figure F5: HISTORIC VIEW, "Crown Mills and New Grain Elevator (Grain Elevator B) at Crown Mills, October 25, 1925, (Source: Oregon Historical Society, Image No. 024521).

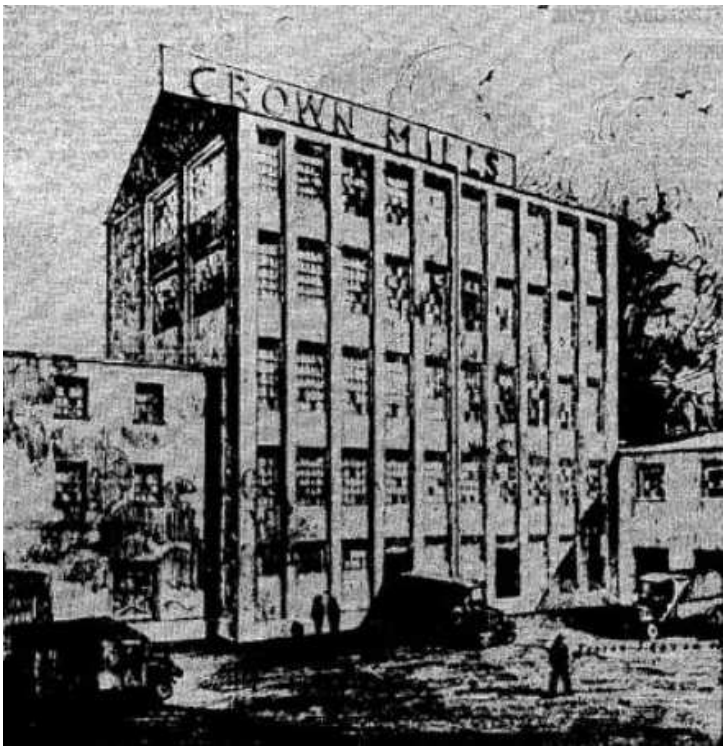
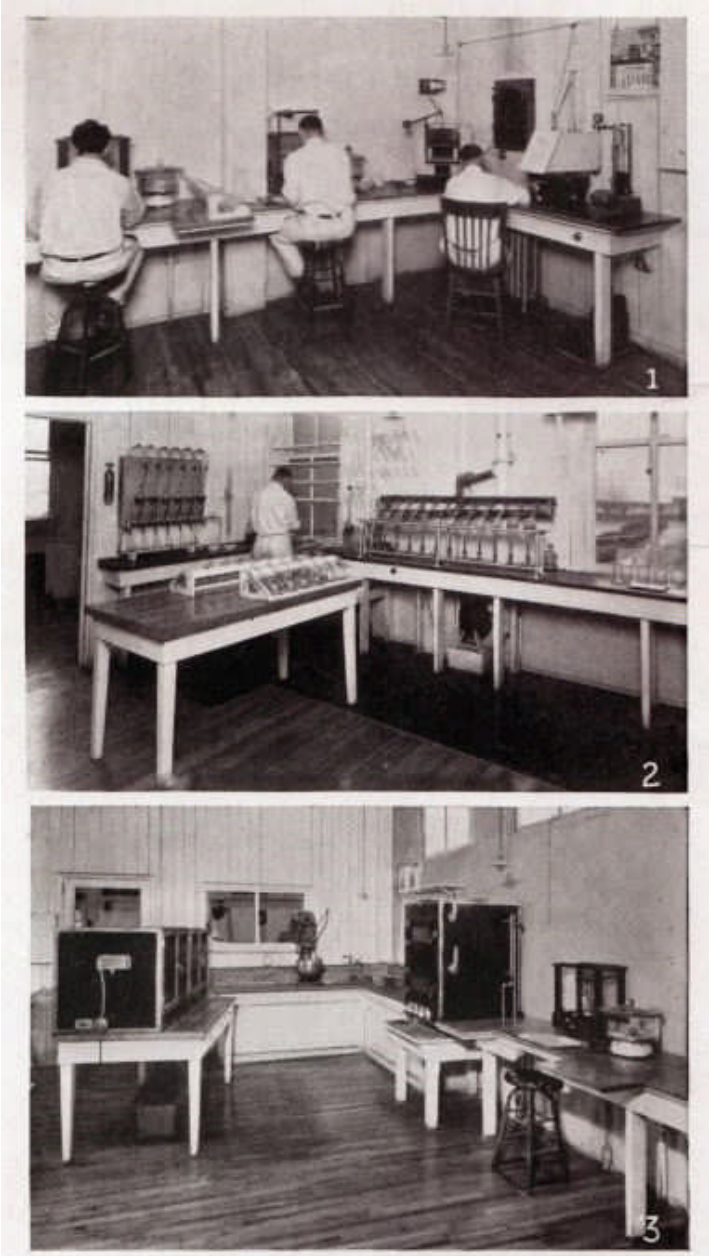


Figure F6: HISTORIC VIEW, Architect's Rendering, "Crown Feed Mill to Rise this Summer" (*Oregonian*, 13-May-1928, 4:2-5).

Figure F7: HISTORIC VIEW, "Crown Mills – The Home of Crown Flour" circa 1930 (Source: *Chosen Recipes*, Crown Mills, Author Collection).



1. Section of laboratory where raw materials are tested. The best flour can only be made from clean wheat. The wheat from which Crown Flour is made is scientifically washed and cleaned before being milled.
2. Section of laboratory where wheat is tested for protein content. Crown Flour is as perfect as the best wheat, modern machinery and expert milling knowledge can make it.
3. Section of laboratory where baking tests are made to insure uniformity of every sack of Crown Flour. The "Crown" trademark is a mark of excellence.

Figure F8: HISTORIC VIEW, Crown Mills Laboratory Views, circa 1930 (Source: *Chosen* Recipes, Crown Mills, Author Collection).

Figure F9: HISTORIC VIEW, Crown Mills, April 7, 1933 (Source: Oregon Historical Society Image No. 018628).

Figure F10: HISTORIC AERIAL VIEW, Crown Mills, circa 1935, Public Works Administration Photograph (Source: City of Portland Archives, Image A2005-005.1395.2).

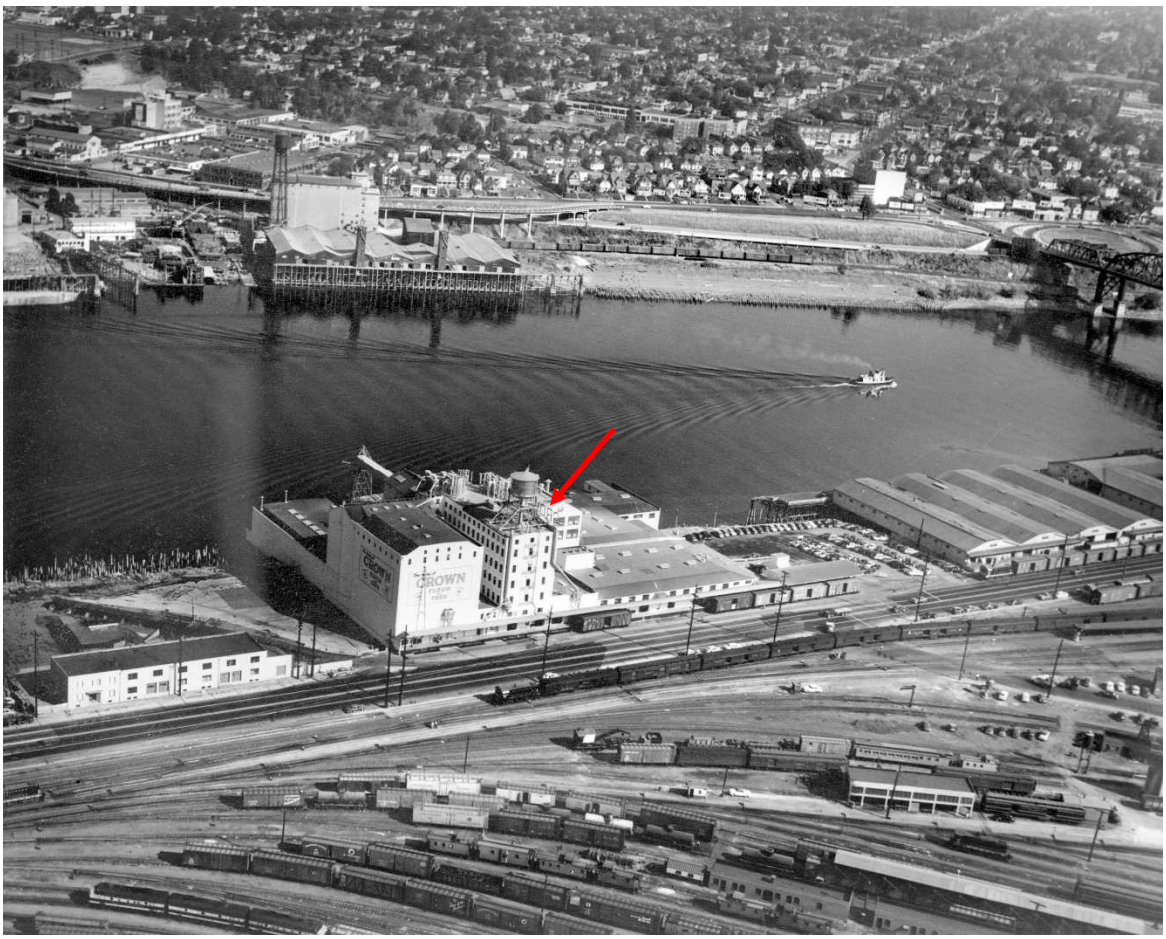


Figure F11: HISTORIC AERIAL VIEW, Crown Mills, circa 1950 (Source: Oregon Historical Society Image No. 022498

Figure F12: HISTORIC VIEW, Centennial Mill, Dock Damage, 1965, Crown Mills, April 7, 1933 (Source: Oregon Historical Society Image No. 018628).

F. Supplemental Material (cont.)

Figure F13: Color Digital Image (John Toso, for PDC, April 2015).

Figure F14: Color Digital Image (John Toso, for PDC, April 2015).

Figure F15: Color Digital Image (John Toso, for PDC, April 2015).

Figure F16: Color Digital Image (John Toso, for PDC, April 2015).

Figure F17: Color Digital Image (John Toso, for PDC, April 2015).

Figure F18: Color Digital Image (John Toso, for PDC, April 2015).

Figure F19: Color Digital Image (John Toso, for PDC, April 2015).

Figure F20: Color Digital Image (John Toso, for PDC, April 2015).

Figure F21: Color Digital Image (John Toso, for PDC, April 2015).

Figure F22: Color Digital Image (John Toso, for PDC, April 2015).

Figure F23: Color Digital Image (John Toso, for PDC, April 2015).

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Figure F25: Color Digital Image (John Toso, for PDC, April 2015).

Figure F26: Color Digital Image (John Toso, for PDC, April 2015).

Figure F27: Color Digital Image (John Toso, for PDC, April 2015).

Figure F28: Color Digital Image (John Toso, for PDC, April 2015).

Figure F29: Color Digital Image (John Toso, for PDC, April 2015).

Figure F30: Color Digital Image (John Toso, for PDC, April 2015).

Figure F31: Color Digital Image (John Toso, for PDC, April 2015).

Figure F32: Color Digital Image (John Toso, for PDC, April 2015).

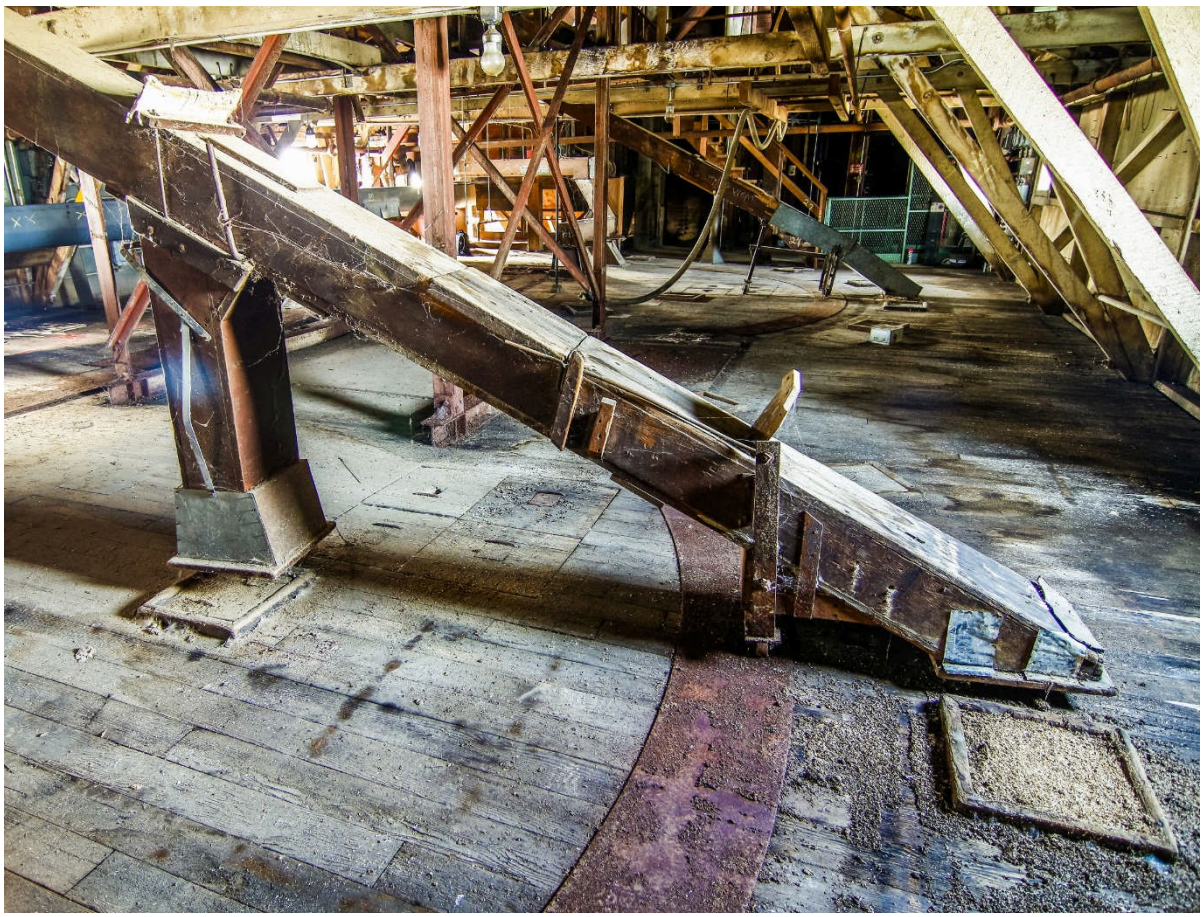

Figure F33: Color Digital Image (John Toso, for PDC, April 2015).

Figure F34: Color Digital Image (John Toso, for PDC, April 2015).

Figure F35: Color Digital Image (John Toso, for PDC, April 2015).

F. Supplemental Material (cont.)

Blueprints and Plans Included as Field Notes

1. 1910 B&G Flour Mill, E-W Sections (Leland S. Rosener, Consulting Engineer)
2. 1910 B&G Flour Mill, N-S Section (Leland S. Rosener, Consulting Engineer)
3. 1910 B&G Flour Mill, Conveyor from Warehouse to Dock (Leland S. Rosener, Consulting Engineer
4. 1910 Elevator Longitudinal Section (Attributed to Leland S. Rosener)
5. 1910 Elevator Flour Mill & Cleaning House End Section, with Equipment (Attributed to Leland S. Rosener)
6. 1910 Flour Mill Longitudinal Section (Attributed to Leland S. Rosener)
7. 1910 Elevator Transverse Section (Attributed to Leland S. Rosener)
8. 1923 Grain Elevation Sections (Signed “C.C.H.”)
9. 1939 Crown Mills Site Plan at Lower Level (L. H. Hoffman, revised 1941)
10. 1939 Crown Mills Site Plan at Upper Level (L. H. Hoffman, revised 1941)
11. 1939 Crown Mill South-West Elevation (Signed “C. C. H”)
12. 1939 Crown Mill Feed Mill Diagram (Signed “C. C. H”)
13. 1939 Crown Mills Site Property Map (L. H. Hoffman, revised 1941)
14. 1949 Crown Mills (Centennial) Site Map and Sections (W. D. Johnson)

PART IV. PROJECT INFORMATION

This historical narrative report was prepared in March 2016 by George Kramer, M.S., Senior Preservation Specialist, Heritage Research Associates, Inc., Eugene, Oregon, under contract to the Portland Development Commission. Fieldwork and archival investigation was done between June 2015 and December 2015 and resulted from a signed Memorandum of Agreement between the Portland Development and the Oregon State Historic Preservation Office due to an Adverse Finding for the removal of multiple structures at the Crown Mill site. Project photographs of the buildings to be removed were taken in April 2015 prior to the start of demolition by John Toso, A Frame in Time, Ashland, Oregon, under contract to Heritage Research Associates. HAER 4x5 Black and White photography of the Flour Mill and Feed Mill were taken by John Wimberly in March 2016.

Kathryn Toepel, PhD, provided project management and oversight for Heritage Research Associates, working with Lynda Wannamaker of Wannamaker Consulting, Portland. Dave Obern, contract project manager, and Irene Bowers, Portland Development Commission, provided valuable assistance and project oversight. Christopher Page, Portland District, United States Army Corps of Engineers, as well as Ian Johnson and Jason Allen, of the Oregon State Historic Preservation Office, provided valuable assistance in the completion of this project.

HISTORIC AMERIAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. OR-184
HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

View photos

CROWN MILLS
(Centennial Mills)
1362 NW Naito Parkway
Portland
Multnomah County
Oregon

HAER No. OR-184

Photographer: John Wimberley, for the Portland Development Commission April 2016

OR-184-1 FLOUR MILL, EXTERIOR VIEW, LOOKING NW FROM NAITO PARKWAY

OR-184-2 FLOUR MILL, SIXTH FLOOR, GRAIN DISTRIBUTION PIPING, LOOKING EAST

OR-184-3 FLOUR MILL, FIFTH FLOOR, CEILING MOUNTED SIFTER, LOOKING EAST

OR-184-4 FLOUR MILL, FIFTH FLOOR, CEILING MOUNTED SIFTER, DISTRIBUTION PIPING, LOOKING WEST

OR-184-5 FLOUR MILL, FIFTH FLOOR FLOUR BIN, LOOKING SOUTHWEST

OR-184-6 FLOUR MILL, FOURTH FLOOR, AIR PURIFIER AND RELATED EQUIPMENT, LOOKING EAST

OR-184-7 FLOUR MILL, FOURTH FLOOR, MAN-LIFT, LOOKING NORTHWEST

OR-184-8 FLOUR MILL, THIRD FLOOR, FLOUR CLEANING EQUIPMENT

OR-184-9 FLOUR MILL, THIRD FLOOR, FLOUR CLEANING EQUIPMENT

OR-184-10 FLOUR MILL, SECOND FLOOR, ROLLER MILLING EQUIPMENT

OR-184-11 FLOOR MILL, SECOND FLOOR, ROLLER MILLING EQUIPMENT

OR-184-12 FLOUR MILL, SECOND FLOOR, CENTENNIAL MILL CONTROL PANEL AND PLANT DIAGRAM

OR-184-13 FEED MILL, EXTERIOR VIEW, LOOKING NORTH FROM FORMER WAREHOUSE C SITE

HISTORIC AMERIAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. OR-184

OR-184-14 FEED MILL, EXTERIOR VIEW, LOOKING EAST FORM FORMER WAREHOUSE A SITE, WAREHOUSE E IN FOREGROUND

OR-184-15 FEED MILL, FIFTH FLOOR, LOOKING NORTHEAST

OR-184-16 FEED MILL, FIFTH FLOOR, GENERAL VIEW, LOOKING WEST

OR-184-17 FEED MILL, FOURTH FLOOR, FREIGHT ELEVATOR

OR-184-18 FEED MILL, FOURTH FLOOR, GRAIN CLEANING EQUIPMENT

OR-184-19 FEED MILL, THIRD FLOOR, CENTRAL ATRIUM, GENERAL VIEW, LOOKING EAST

OR-184-20 FEED MILL, SECOND FLOOR, FLOUR BINS

OR-184-21 FEED MILL, FIRST FLOOR, FLOUR BINS

OR-184-22 FEED MILL, FIRST FLOOR, CONTROL ROOM, LOOKING SOUTHEAST