

# **Statement of Heritage Significance**

## **Fourth Avenue (“Thunderbird”) Viaduct Moose Jaw**



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*Cover Photo:* Fourth Avenue (“Thunderbird”) Viaduct, Moose Jaw, looking towards the north (R. Herrington; September 27, 2007)

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#### **STATEMENT OF SIGNIFICANCE**

The Fourth Avenue (“Thunderbird”) Viaduct, located in Moose Jaw, crosses the CPR Main Line and Thunder Creek and connects Manitoba Street on the north side with 4<sup>th</sup> Avenue S.W. in South Hill. The bridge, which was opened in December, 1929, is a continuous concrete structure on concrete columns and abutments.

#### **HERITAGE VALUE**

The heritage value of the bridge lies in its status as a prominent feature of Moose Jaw’s urban landscape and an important community landmark. The Fourth Avenue Viaduct provides a vital link over the CPR rail yards and Thunder Creek between Moose Jaw’s downtown district and the South Hill communities. Except for replacement of the steel through truss over the CPR main line, the structure remains largely unchanged since its completion in late 1929.

The heritage value of the structure also resides in its engineering technology. Designed by renowned American engineer, C.A.P. Turner (1869-1955), Moose Jaw’s Fourth Avenue Viaduct was an early Western Canada example of Turner’s patented reinforced concrete flat-slab floor construction system applied to bridge construction. Despite a series of patent infringement law suits which started in 1911, Turner successfully transformed construction practices and engineering conceptions about reinforced concrete floors.

The heritage value of the bridge also resides in its *art moderne* architecture. This style, which became popular in the 1920s and 1930s, was a reaction to the more formal classical revival styles. The distinguishing features included simple, clean and streamlined shapes, with geometrical or stylized ornaments which often were influenced by Far and Middle Eastern design, and Greek or Roman themes. Typical motifs included stylized foliage, animals and sun rays. The opening of Tutankhamen’s tomb in 1922 might have influenced the design of the Fourth Avenue Viaduct. The specific design elements that reflect Egyptian culture include terra cotta lamp standards with multi-coloured lotus flower caps, and coloured bollards. In addition, the column heads that support the road surface are coloured in an interesting papyrus style. Semi-glazed terra cotta medallions in bas-relief, depicting faces of Indian chiefs and moose heads, are incorporated at the base of each lamp standard. The Fourth Avenue Viaduct is architecturally similar to the Albert Memorial Bridge in Regina, which was completed in 1930 and also built by the same engineering partnership.

## **CHARACTER-DEFINING ELEMENTS**

The heritage value of Moose Jaw's Fourth Avenue Viaduct resides in the following character-defining elements:

- those elements which speak to its status as a landmark in the community, including its form and massing and its location on its original site;
- those elements that reflect the property's engineering technology, such as being an early Western Canada example of C.A.P. Turner's patented reinforced concrete flat-slab floor construction system applied to bridge construction;
- those elements that reflect the property's architecture, including the terra cotta lamp standards with multi-coloured lotus flower caps, bollards, coloured papyrus-style column heads, and semi-glazed terra cotta medallions in bas-relief, depicting faces of Indian chiefs and moose heads.

## **DETAILED BACKGROUND TO THE STATEMENT OF SIGNIFANCE**

### **A. Historical Significance**

The Fourth Avenue Viaduct, and its predecessors, provided a vital link over the CPR rail yards and Thunder Creek between Moose Jaw's downtown and the burgeoning South Hill communities. At this time there were only two other north-south links: the Second Avenue Subway and the Ninth Avenue crossing.

The first bridge linking Moose Jaw's North and South Hill and spanning the CPR Main Line and Thunder Creek was a long wooden pedestrian structure. Moose Jaw and the CPR signed an Agreement on August 7, 1909 to replace this wooden structure with an impressive new pedestrian and traffic 'viaduct'. Construction work started in late 1909. The new viaduct was carried on piles for 915 feet to the south side of the wide valley. The flooring was comprised of creosoted blocks.<sup>1</sup> Three concrete piers carried a 200-foot long Pratt steel truss structure over the CPR main tracks near the north side of the valley. A second Agreement was signed on June 8, 1910 between the CPR and city officials to establish responsibility for future maintenance costs.<sup>2</sup> This cost-sharing arrangement would create difficulties for the city in the years ahead.

When it became apparent by the late 1920s that the old 1910 wooden structure would need to be replaced, City Council members were undecided about whether to build another wooden structure or replace the old bridge with one made of concrete. Those opposed to concrete suggested that the valley's alkali soils would adversely affect the concrete and significantly shorten the bridge's life. At the Council meeting on July 2, 1929 a resolution was approved that "plans and specifications for the bridge as submitted by [engineer] C.A.P. Turner [of Minneapolis] be approved by the Council conditional on the tenders not exceeding \$200 000."<sup>3</sup>

An alternative bridge design was submitted by contractor P.W. Graham and Sons for an earth-fill structure. Although the cost was lower than Turner's proposal, the city advised Graham that "it is the intention of the Council to construct a concrete viaduct."<sup>4</sup>

The present (1929) bridge was financed by some of the proceeds of the sale of Moose Jaw's power plant to the National Light and Power Company.<sup>5</sup>

Tenders for construction of the concrete viaduct were opened on July 17, 1929.<sup>6</sup> Seven bids were submitted with quotes ranging from \$125 000 to \$270 000. The bids were from: P.W. Graham and Sons; John Gunn and Company, Winnipeg; Bird, Woodall and Simpson; J. McDiarmid and Company Ltd., Winnipeg; McCaw and MacDonald, Winnipeg; Carter-Halls-Aldinger Company, Winnipeg; and Foley Brothers, Winnipeg.<sup>7</sup> The contract was awarded to McCaw and MacDonald, subject to approval by the burgesses. The contractor had stipulated that he would complete the contract by November 15, 1929.

When notified about winning the contract, McCaw and MacDonald expressed concern to Council about the delay in starting the work until a bylaw had been voted on. The contractor had assumed that work would start immediately to avoid pouring concrete during cold months. If the work was delayed, this would entail additional construction costs either due to the need to keep the concrete from freezing during the curing process or else completing the work in the following spring. The earliest that a vote by burgesses could be taken was August 12, 1929. This would delay the project a full month. Although the City solicitor was not present and could not offer a legal opinion, the Council passed a resolution that the contractor could start work on the bridge at once. If burgesses subsequently did not approve the bylaw to issue debentures to the sum of \$175 000, the contractor would be compensated for his work to date. A second motion awarding the contract to McCaw and MacDonald also was approved.<sup>8</sup> The contractor indicated that this seemed acceptable but would consult with his legal advisors in Winnipeg.

McCaw subsequently advised Moose Jaw officials that the firm would be withdrawing its bid since it had been advised legally that it would be awkward to start construction before approval by the burgesses.<sup>9</sup> Council met again in a special session on July 31, 1929 to discuss whether the city should call for new tenders, with bids to close on August 15 but no decision was taken. The Council also met on August 1, 1929 to consider the withdrawal of McCaw and MacDonald. Since withdrawing its bid, McCaw and MacDonald had been in contact with C. A. P. Turner and stated that they were willing to proceed with their contract under certain conditions: they wanted to purchase crushed rock from the city at a reduced price, and also requested that “the city should, through its electrical department, undertake the installation of the lighting system on the bridge relieving the Winnipeg firm of that portion of the specifications.”<sup>10</sup> For this they would complete the contract at the original price. The Councillors subsequently passed a motion that McCaw and MacDonald’s original contract withdrawal be accepted. A motion that new tenders be called was defeated, presumably on the basis that the existing wooden bridge presented an emergency situation and the city could be held legally accountable for any delays in starting construction. Thus, the city awarded the contract to the second lowest bidder, Carter-Halls-Aldinger. The same conditions given to McCaw and MacDonald were imposed on the new contractor: work should start immediately and be completed within four months; and if the bylaw is not passed, the contractor would be awarded compensation based on the work completed to that date.

The city later decided to return the good-faith cheque deposited by McCaw and MacDonald during the initial tendering process.<sup>11</sup>

The 1910 wooden structure was closed to traffic before burgesses could vote on the bylaw. Polling took place on August 14, 1929 with overwhelming support for a concrete structure, although only twenty percent of eligible voters actually voted.<sup>12</sup> By this date work on the demolition of the old wooden structure was proceeding rapidly and the contractor would soon be starting the new construction.<sup>13</sup>

Although it was envisioned that buses would be used initially, the Moose Jaw Street Railway Company was contracted to lay street car tracks across the bridge in case a decision was made at a later date to revert to street cars.<sup>14</sup>

The new concrete viaduct experienced controversy almost before construction had even started. Allegations of a cover-up were made at the Council meeting on September 9, 1929 when it was revealed that the new plans were ten to fifteen feet shorter than the total span required to cross the valley. Apparently an error had been made in referring to the plans on file for the original wooden structure. It appeared that Council had tried to cover this up by setting up an additional contract with the contractor, Carter-Halls-Aldinger. The consulting engineer, Claude Turner, perhaps understandably, downplayed this error when he met with City Council on September 19.

The official opening of the viaduct took place on the afternoon of December 19, 1929 when Moose Jaw Mayor James Pascoe severed a ribbon which had been stretched across the south side of the structure. A motorcade subsequently traversed the bridge from south to north. A formal banquet was held that evening at the Grant Hall Hotel. Among the 150 prominent people in attendance were: Hon. J.F. Bryant, provincial Minister of Public Works; Hon. J.A. Merkley, Minister of Railways, Labour and Industry; Hon. A.C. Stewart, Minister of Highways; and, J. Gordon Ross, MP for Moose Jaw. Also present were the bridge engineer, C.A.P. Turner, all three principals of the Regina associate engineering firm of Puntin, O'Leary and Coxall, and J. Carter of Carter-Halls-Aldinger.<sup>15</sup> Turner remarked at the banquet that "Moose Jaw has received as much for her money in the newly-opened bridge as has been given any bridge I know of in all my experience."<sup>16</sup> Alderman R.F. Jackson noted that "Moose Jaw could be looked upon as the western pioneer of a new type of concrete construction which combined beauty with utility."<sup>17</sup>

In 1952 the Moose Jaw City Council struck a committee to "bring in recommendations for naming certain bridges in the city."<sup>18</sup> The committee considered naming the bridges after prominent early settlers in the district, but picking names proved difficult. As an alternative, it was suggested that the bridges recognize the Indian cultures of the past by naming them after Indian tribes believed to be once native to the Moose Jaw area. It was recommended that the Fourth Avenue Viaduct be named the "Thunderbird Viaduct".<sup>19</sup> It was noted that the Thunderbird is a significant symbol of Indian culture and it was possible that Thunder Creek, which the Viaduct spans, is derived from this word. It was further suggested by the Committee that a prominent sign be erected at the approaches to this bridge. It is interesting that, at a Council meeting in September 1953, the members could not recall the names of all of the five Moose Jaw bridges!<sup>20</sup> Most present Moose Jaw residents refer to this crossing as the Fourth Avenue Bridge; it is likely that most have never heard this called the Thunderbird Viaduct.

## **B. Engineering Significance**

The Fourth Avenue Viaduct was designed by Minneapolis consulting engineer, Dr. Claude Allan Porter Turner, who also had an office in Winnipeg. The associate engineer

was Colonel Frederick J. O’Leary, a professional engineer with the Regina architectural and engineering firm of Puntin, O’Leary and Coxall.

Turner was born in Lincoln, Rhode Island in 1869 and died on January 10, 1955.<sup>21</sup> He patented a reinforced concrete flat-slab floor construction system<sup>22</sup> that became standard construction practice in hundreds of buildings and bridges throughout North America<sup>23</sup> and in many other countries although his “mushroom-head” system of reinforcing was controversial at the time and many prominent engineers of the day were convinced that the design was flawed. The use of spirally wound, longitudinally reinforced ribs with higher grade concrete results in higher strength, greater rigidity and higher load carrying capacity, than would result from more traditional construction methods. Structural dimensions can, therefore, be smaller with a corresponding decrease in dead weight.<sup>24</sup>

The economic advantages of the Turner system included minimal formwork, reduced floor-framing depths, and simplified finishing. For example, the surviving architectural drawings for the Whitmore Warehouse in Regina specifically note that the Turner system resulted in a gain in storage height of 14 inches by omitting the traditional beam system.

The long viaduct was completed in 1929 in the surprisingly short period of only four months. In promoting his patented design in a 1934 book,<sup>25</sup> Turner stated that “flat plate concrete floors for replacing timber viaducts has inherent advantages in that the old timber work may be utilized to support the concrete while hardening and the replacement, as was the case at Moose Jaw, may cost far less than creosoted timber with an asphalt roadway surface, and wood sidewalks with a plank hand rail.” He illustrates this contention with two photographs: one taken on September 6 which shows the timber structure, and one taken on October 11 which has more than a thousand feet replaced with concrete work. This statement suggests that the old structure acted as falsework but the photographs do not show this detail.

Despite a series of patent infringement law suits which started in 1911, Turner’s legacy was no less than the “transformation of construction practices and engineering conceptions on reinforced concrete floors.”<sup>26</sup> Its completion was claimed to “mark a new era in viaduct concrete construction in the West and was a source of civic pride.”<sup>27</sup>

The bridge is 1546 feet in length with the east approach adding another 431 feet. The main concrete bridge is comprised of 36 spans. The old 145-foot steel Pratt through-truss located over the tracks towards the north end of the structure was constructed by the CPR in 1910 to bridge their main line. The CPR also was responsible for maintaining the 55-foot steel girder span immediately to the north.

By the early 1980s CP Rail’s steel through truss portion of the bridge was showing signs of serious corrosion. CP Rail replaced a broken steel member in December 1983 and by 1986, the steel truss had deteriorated to the point of requiring traffic load restrictions. After a structural assessment was completed for CP Rail by Dominion Bridge,<sup>28</sup> CP Rail made the decision to replace the old steel span. The city’s Municipal Heritage Advisory Committee investigated moving the steel bridge to a site such as the river valley park if a

cost-sharing scheme could be worked out between CP Rail and the Wakamow Valley Authority.<sup>29</sup> In the summer of 1987 CP Rail decided to replace the steel truss section with a concrete section in sympathy with the rest of the structure.<sup>30</sup> The fate of the steel through truss is not known.

The bridge was closed for renovation and maintenance from June 1988 until November 28, 1989. Delays were experienced in getting the bridge completed because the City and CPR couldn't agree on how to rebuild the bridge. The National Transportation Agency had to resolve the cost-sharing arrangement between the two parties.

### **C. Architectural Significance**

The Fourth Avenue Viaduct is an example of the *art moderne* style of architecture. This style, which became popular in the 1920s and 1930s, was a reaction to the more formal classical revival styles. The distinguishing features included simple, clean and streamlined shapes, with geometrical or stylized ornaments which often were influenced by Far and Middle Eastern design, and Greek or Roman themes. Typical motifs included stylized foliage, animals and sun rays. The opening of Tutankhamen's tomb in 1922 might have influenced Claude Turner's design of the Fourth Avenue Viaduct. The specific design elements that reflect Egyptian culture include terra cotta lamp standards with multi-coloured lotus flower caps, and coloured bollards. In addition, the column heads that support the road surface are coloured in an interesting papyrus style. Semi-glazed terra cotta medallions in bas-relief, depicting faces of Indian chiefs and moose heads, are incorporated at the base of each lamp standard. The Fourth Avenue Viaduct is architecturally similar to the Albert Memorial Bridge in Regina, which was completed in 1930 and also built by the same engineering partnership.

The Fourth Avenue Viaduct is structurally very similar to the Albert Memorial Bridge in Regina, which was also built by the partnership of Turner and O'Leary and completed in 1930.<sup>31</sup> The Egyptian motifs and semi-glazed terra cotta medallions and lamp standards that are incorporated into both bridges apparently were the work of the same designer. Literature from Turner suggests that these were designed by the Turner Steel Company of Minneapolis: "We are prepared to quote on the terra cotta designs and guarantee their permanence under all ranges of temperature. This permanence is secured by the special filling adopted by Engineer Turner which prevents the filling from cracking the terra cotta by reason of the wide difference in the coefficient of expansion of the terra cotta and ordinary concrete. The test of some years in which the terra cotta has been subjected to range of temperature from 100 above to 55 degrees below zero constitutes the background of this guarantee."<sup>32</sup> It has been suggested more recently<sup>33</sup> that Joseph Lee-Grayson was the designer of the pillars and ornaments. Lee-Grayson was Saskatchewan's "provincial artist" at the time.<sup>34</sup>

One might wonder if Turner used his terra cotta designs on any other structures.

The decoration continues to the "ceramic light standards and beneath each, a medallion in bas-relief depicting faces of Indian chiefs and moose heads."<sup>35</sup> While no records exist to

confirm why two Indians were chosen, it is reputed that the terra cotta medallions at the base of each of the bridge's light standards depict images of Bear Ghost and Mike Oka. Research to date suggests that Bear Ghost was a medicine man with Sioux and Assiniboine ancestry and might have been a member of the Moose Jaw band of Sioux, the remnants of Sitting Bull's followers who camped at Moose Jaw until 1913. Mike Oka might have been a member of the Many Tumors branch of the Blood Indians, a division of the Blackfoot Confederacy, of southern Alberta. His connection to the Moose Jaw area is unknown. Perhaps all that can be concluded with certainty is that, to the artist, they represented "the first people of the western plains who, for countless generations, hunted and lived near the Thunder Creek Valley."<sup>36</sup>

By 1986 most of the faces on the medallions had been chipped. In many places the concrete was cracked, exposing steel reinforcing-bar support. The lamp standards had been restored by 1986 but the Moose Jaw heritage community was not happy with this from an aesthetic and heritage point of view. The city committed to "restore the terra cotta lamp standards, decorative medallions and bolliars [sic; bollards] that add to the beauty and historic value of the structure."<sup>37</sup> The city also updated the lights to modern light capabilities.

Shortly after the old CPR steel through truss bridge section was replaced by a concrete section in 1989, the city contracted with local sculptors Wendy Parsons and Zach Dietrich to cast eight new glazed, 18-inch terra cotta medallions to match the originals.<sup>38</sup> These were placed on both sides of the four new lamp standards to create an appearance which emulated the original 1929 structure. Parsons photographed the original medallions and drew them to scale. With the help of a Regina sculptor, and through trial-and-error, she successfully imitated an early glazing technique known as 'oatmeal glaze'.

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<sup>1</sup> *Moose Jaw Times-Herald*, January 13, 1971, "Historically Speaking" by Leith Knight, p.13.

<sup>2</sup> Copies of these Agreements are held by the Moose Jaw Archives.

<sup>3</sup> *Moose Jaw Evening Times*, July 3, 1929, p.1.

<sup>4</sup> *Moose Jaw Evening Times*, July 3, 1929, p.1.

<sup>5</sup> *Moose Jaw Times-Herald*, February 9, 1949, p.7.

<sup>6</sup> It is a bit surprising to this author that tenders would have been called for and submitted only two weeks after Council made the decision to build a concrete structure.

<sup>7</sup> *Moose Jaw Evening Times*, July 18, 1929, p.7.

<sup>8</sup> *Moose Jaw Evening Times*, July 18, 1929, p.7.

<sup>9</sup> *Moose Jaw Evening Times*, August 1, 1929, p.1.

<sup>10</sup> *Moose Jaw Evening Times*, August 2, 1929, p.7.

<sup>11</sup> *Moose Jaw Evening Times*, August 13, 1929, p.7.

<sup>12</sup> *Moose Jaw Times-Herald*, Then and Now column by Harold Davies: "New Bridge Plan Starts Controversy", 1964 (on file at Moose Jaw Archives but exact date not recorded).

<sup>13</sup> *Moose Jaw Evening Times*, August 15, 1929, p.7.

<sup>14</sup> *Moose Jaw Times-Herald*, Then and Now column by Harold Davies: "New Bridge Plan Starts Controversy", 1964 (on file at Moose Jaw Archives but exact date not recorded).

<sup>15</sup> *Moose Jaw Evening Times*, December 20, 1929, p.9.

<sup>16</sup> *Moose Jaw Evening Times*, December 20, 1929, p.9.

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- <sup>17</sup> *Moose Jaw Evening Times*, August 20, 1929, p.13.
- <sup>18</sup> *Moose Jaw Times-Herald*, December 16, 1952, p.9.
- <sup>19</sup> The other bridges over the Moose Jaw River include: *Sioux Bridge* at River Park Drive (formerly Wellington White Bridge; 1913); *Cree Bridge* at Main St. South (1909; formerly known as Slater's Bridge but now abandoned); *Assiniboine Bridge* adjacent to the "Riome" property (apparently this was a 'humpback' bridge in River Park that was demolished by the early 1960s); *Blackfeet Bridge* at River Park Drive (near Dr.Parkin's former home in the River park area; damaged by high water and replaced in about 2000).
- <sup>20</sup> *Moose Jaw Times-Herald*, October 4, 1963, p.4
- <sup>21</sup> *Who was Who in America*, Vol. iii, 1951-1950, p.865.
- <sup>22</sup> Turner's first flat-slab building, the Johnson-Bovey Building in Minneapolis, was constructed in 1906 and is still in use. The five-storey Darke Block (now the Cornwall Professional Building), which was designed by Darling and Pearson and constructed in 1907, is believed to be the first building in Regina to employ this new construction technology.
- <sup>23</sup> For a list of one hundred buildings of over a thousand built using this system between 1906 and 1913, see: Henry T. Eddy, *The Theory of the Flexure of Rectangular Flat Plates applied to Reinforced Concrete Floor Slabs*, 1913, Rogers and Company, Minneapolis, pp.105-106.
- <sup>24</sup> Turner, C.A.P., 1934, *Elasticity: Structure and Strength of Materials in Engineering Construction*, Minneapolis, p.355.
- <sup>25</sup> Turner, C.A.P., 1934, *Elasticity: Structure and Strength of Materials in Engineering Construction*, Minneapolis, p.351.
- <sup>26</sup> D.A. Gasparini, "Contributions of C.A.P. Turner to Development of Reinforced Concrete Flat Slabs 1905-1909", *J. Structural Engineering*, October 2002, Vol. 128 (10), 1243-1252, p.1250.
- <sup>27</sup> *Regina Leader-Post*, May 28, 1986, p.B14.
- <sup>28</sup> *Regina Leader-Post*, May 28, 1986, p.B14.
- <sup>29</sup> *Moose Jaw Times-Herald*, February 10, 1987.
- <sup>30</sup> *Regina Leader-Post*, March 10, 1987, p.A4.
- <sup>31</sup> *Western Canada Contractor and Builder*, Vol. 27, No. 8, Aug. 1930, p.12. Carter-Halls-Aldinger were the contractors.
- <sup>32</sup> Turner, C.A.P., 1934, *Elasticity: Structure and Strength of Materials in Engineering Construction*, Minneapolis, coloured insert showing a photo of the Albert Street Bridge and terra cotta balusters.
- <sup>33</sup> *Regina's Secret Spaces: Love and Lore of Local Geography*, edited by Lorne Beug, Anne Campbell and Jeannie Mah, 2006, Canadian Plains Research Centre, p.21.
- <sup>34</sup> Personal Communication, Timothy Long, Head Curator, Mackenzie Art Gallery, Regina.
- <sup>35</sup> *Regina Leader-Post*, May 28, 1986, B14.
- <sup>36</sup> *Moose Jaw Times-Herald*, March 31, 1978.
- <sup>37</sup> *Regina Leader-Post*, March 10, 1987, p.A4.
- <sup>38</sup> *Moose Jaw Times-Herald*, September 4, 1992.