

## 4a Railway Gauges in Ontario

### History of the Railway Gauge

Much has been written, but in summary, the best speculation is that what became the “standard” or “Stephenson” gauge of 4 ft 8½ inches (1,435 mm) was adopted from early Northumberland UK horse tramways that transported “coals to Newcastle”. George Stephenson (1781-1848), a self-taught civil and mechanical engineer who did his apprenticeship around the Northumberland collieries, is widely acknowledged as being “the father” of the railways, although he may be more accurately described as the enabler who made steam locomotion a practical reality.

No one knows how the Northumberland tramways came to adopt the 4 ft 8½ inch gauge, although it may be a practical result of a wagon width determined more or less by the breadth of a wagon harness hitched to a well-built pit pony. As George Stephenson, partnering with his son Robert (1803-1859), went into the locomotive manufacturing business as Robert Stephenson & Co., this gauge was adopted for production. As there was an immediate robust export business to all parts of the world (often accompanied by British engineering expertise), the “off the assembly line” product was shipped to that gauge, with its consequent general adoption by the purchaser.

This did not however result in the immediate global adoption of the “Standard” gauge – far from it, even today only just over 50 per cent of world railway mileage is on the standard gauge (Wikipedia). The rest is more or less divided into a 5 ft something or a 3 ft something gauge group.

This pattern started to emerge very soon after the advent of the railways. The extremes at either end of the gauge spectrum were Isambard Kingdom Brunel’s 7 ft ¼ inch (2,140 mm) gauge of the UK Great Western (God’s Wonderful) Railway that was phased out by 1892, and the 2 ft gauge railways such as appeared in Maine USA, and with the Wales UK quarry railways. There was also the US 6 ft (1,829 mm) Erie Railroad, until its conversion to the standard gauge in 1880.

The underlying pros and cons of a narrower gauge versus a broader gauge are that with a narrower gauge, the advantages are lower costs of land acquisition and construction; and with a broader gauge, higher speeds, better stability and of course larger load capacity. The disadvantages are of course inversely applicable – lower speeds, bumpier rides and limited load capacity for the narrower gauges; and higher costs of land acquisition, construction and maintenance for the broader gauges.

A median standard gauge balances these pros and cons, and in the absence of other considerations – such as a narrower gauge for mountainous terrain – makes it a more economically-balanced consideration. In some cases non-standard gauges were chosen for political, commercial or strategic reasons, the last being to impede rather than to promote the smooth and economic flow of people and goods. Each “break in gauge” poses a barrier, operationally and economically.

### Basic Gauge Description Terminology

Standard Gauge – also referred to as the “Stephenson” gauge, ranging from 4’8” to 4’9”, but most usually 4’8½”.

The Broad or Provincial Gauge – specifically the 5’6” gauge required in the Province of Canada in 1851 for eligibility for government debt guarantee

Broad gauge(s) – any gauge wider than the Standard or Stephenson Gauge.

Narrow gauge(s) – any gauge narrower than the Standard or Stephenson Gauge.

Notes:

1. Somewhat confusingly, in Canada the original Provincial or Broad Gauge railways commonly referred to the Standard Gauge as the “Narrow Gauge”, not to be confused with the usual definition of “narrow gauge”.
2. The commonly understood measurement of the gauge is the distance between the inner edges of the two rails.

### **The Rise and Fall (1851 to 1872) of the Broad Gauge in the Province of Canada**

Railway development trailed behind that in the UK because of political and financial uncertainties, but some early railways such as the Champlain & St. Lawrence and the Montreal & Lachine Railroads were being built to the Standard Gauge, but railway development remained minimal in the 1830s and 40s until the passing of the Railway Guarantee Act in 1849. That Act guaranteed the loan interest on the construction of railways not less than 75 miles in length. This beneficial legislation triggered Canada's railway building boom.

Unfortunately, in 1851 the Province of Canada enacted further, inter alia, to create a Board of Railway Commissioners, one of whose duties was to administer the 1849 loan interest guarantee. The Board required that to obtain the loan interest guarantee benefit, any railway had to build to the 5ft 6in gauge, which came to be known as the "Provincial" or "Broad" Gauge. According to S.S. Worthen, in his treatise [Referred to the Committee](#), this decision was 9-1 in favour of the 5ft 6in gauge, despite the fact that in committee, the 4ft 8½in gauge was supported by 6 of the 10 members. This treatise suggests that the decision may have been influenced by the fact that the construction of the Atlantic-St. Lawrence and St. Lawrence-Atlantic Railroads (Portland Me to Montreal) was already underway on the 5ft 6in gauge - these two lines being the starting point for the Grand Trunk's bold plan to create a transportation artery into the mid-USA. G.R. Stevens in *Canadian National Railways - Sixty Years of Trial and Error* supports this conclusion, and also pointed out that Portland's mercantile interests espoused the 5' 6" gauge to exclude competition to its traffic to Boston through the selection of a gauge other than the Standard Gauge. A.W. Currie, in his seminal work *The Grand Trunk Railway of Canada*, also fingers the influence of Portland's mercantile interests as the reason for the GTR's acquiescence to the Provincial Gauge that was in effect forced on it in any event by the Board of Railway Commissioners' decree. (The reason for the selection of 5ft 6in itself remains unclear, but may have been motivated by the possible acquisition of available locomotives that happened to be of that gauge.)

This short-sighted decision proved to have enormous long-term adverse repercussions and consequences for railway development in Canada in general. It was an immediate imposition on railways in Canada seeking to interconnect with U.S. roads, as the U.S. railways bordering on southwestern Ontario (with the notable exception of the Erie Railroad with its 6ft gauge that was not converted to Standard Gauge until 1880) had already adopted the 4ft 8½in gauge, which was rapidly becoming universal in Europe and in the northern United States. During the 1860s, the increasing competitive pressure on the Great Western and the Grand Trunk Railways to interchange with the Standard Gauge American roads proved to be the reason for the Provincial Gauge's eventual demise, when those two roads started to secure amendments to their charters to remove the gauge clauses around 1870; and as a consequence all of the other Canadian roads that had been obliged to opt for the Provincial Gauge and in turn interchanged with the GWR and the GTR, were obliged to follow suit.

All early Canadian railways that had initially adopted any gauge other than the Standard "Stephenson" Gauge, which included all of the railways that had adopted the Provincial Gauge as a result of the Guarantee Act, were faced with the major financial consequences of having to re-gauge to the Standard Gauge, or simply went out of independent existence. In all cases (except for the Cobourg & Peterborough Railroad, which became defunct for other reasons) the necessity of conversion led (other than for the Grand Trunk Railway itself) to their absorption into larger railway systems by the end of the 19th century.

In the 1870s any new roads were being built to the Standard Gauge (with the exception of two Ontario 3ft 6in narrow-gauge lines), but by then the crippling damage to the emerging Canadian railway system had been done.

US Border-to-Border Transshipment across Upper Canada

An emerging business opportunity for railways operating in southwestern Ontario was the realization by US commerce of the faster shipping between New York and Michigan States to be had by taking advantage of the shorter distance through Canada between Niagara Falls/Buffalo and Port Huron/Detroit. This border-to-border traffic demand was initially satisfied by means of unloading from the US railroad cars onto Provincial Gauge cars and vice-versa at the other end, an obviously expensive, time-consuming and cumbersome solution.

### **The Great Western Railway (GWR)**

The GWR had been reconstituted from its original 1834 London & Gore Railroad charter for the express purpose of providing the border-to-border traffic link sought by adjacent US roads in New York and Michigan States. The US railroads bordering on southwestern Ontario had already adopted the 4ft 8½in Standard Gauge (with the notable exception of the Erie Railroad with a 6ft gauge that was not converted to the Standard Gauge until 1880).

The GWR was undoubtedly the most severely-affected road by the Provincial Gauge. It eventually met the transshipment challenge as of 1867 with the capital-cost-intensive laying of a third (inside) rail along its main line to accommodate direct through movement of US Standard Gauge cars. Ironically, that proved to be the tipping point for the Provincial Gauge's nearing demise. The GWR started to convert to the Standard Gauge in 1870. The enormous cost of the laying of the third rail and the eventual conversion from the Provincial to the Standard Gauge were major contributing causes to the GWR's failure in 1882.

### **The Grand Trunk Railway (GTR) and the Buffalo & Lake Huron Railway (B&LH)**

The GTR on the other hand was traversing southwestern Ontario as an international road from Portland, Maine across what was then Upper Canada to Chicago, Illinois, and its route lay via Toronto, Stratford and Point Edward (Sarnia) across to Port Huron in Michigan. What the GTR lacked was a connection to pick up this lucrative traffic at the New York State end. Enter the B&LH.

The B&LH began its existence as an intended portage railway (promoted by Buffalo commercial interests) between Lake Huron at Goderich and Lake Erie at Fort Erie/Buffalo. It was first chartered as the Brantford & Buffalo Joint Stock Railroad Company in 1851. Built to the Provincial Gauge, it was opened from Fort Erie to Brantford at the end of 1853 as the Buffalo, Brantford & Goderich Railway (BB&G), and to a junction with the Great Western at Paris in 1854. (On the US side, there was a rail link between Black Rock and Buffalo, with a ferry across the Niagara River.)

At that point the BB&G was out of money, and the debts continued to pile up in 1855. The Canada Company then intervened, as the railway's prospective failure would have an adverse effect on the development of the Huron Tract. So in 1856 the Buffalo & Lake Huron Railway (B&LH), with backbone UK financial support, was incorporated to take over the BB&G. The railway was completed to Stratford in 1856, and despite the financial crash of 1857, to its ultimate destination at Goderich in 1858.

By 1861, the road needed a substantial capital infusion for much-needed improvements in order to stay in business, and was also considering acquisition of the Hamilton & Port Dover Railway, to give it access to Lake Ontario and to an intermediate harbour on Lake Erie. This proposal fell through, presumably because the B&LH was by then close to bankruptcy. It offered to lease itself to the Great Western Railway, but this proposal was rejected unanimously by the Great Western's London, England board of directors. So it was that the B&LH came into the orbit of the other major competitor in southwestern Ontario, the Grand Trunk Railway. The Grand Trunk also had a plan to capture this transit traffic more effectively by laying an inside rail to its Provincial Gauge track between Stratford and Sarnia, with the strategically-placed B&LH with the already-existing line between Fort Erie and Stratford to provide the corresponding third rail between Fort Erie and Stratford.

Unfortunately, although this plan was also very much to the benefit of the B&LH, it could not come up with the capital, and thus in 1864 entered into a joint management agreement with the Grand Trunk to bring the plan about. Even then, the B&LH could not pull its financial weight, and after some infighting, bickering and acrimony, in accordance with an agreement ratified in 1870, the Grand Trunk acquired the B&LH under a perpetual lease [i.e., outright] effective July 1, 1869. The issue of the laying of a third Standard Gauge rail (which never came about for the B&LH and the GTR) contributed to the early demise (1864) of the Buffalo & Lake Huron as an independent road because of its need to ally itself with a senior partner on account of its chronic financial distress.

Thus the Grand Trunk, which was also in continual financial turmoil, settled for a less-than-successful solution with movable (telescopic) axles, and then with interchangeable bogie trucks (two-axle wheel assemblies). Those substitute solutions lasted until the sections between Fort Erie and Stratford, and be-

tween Stratford and Sarnia, were converted to the Standard Gauge in 1872\* ; as part of the GTR's general conversion of its entire system from the Provincial to the Standard Gauge in those years\*\*. The enormous cost of all this reverberated as a contributing factor to the eventual failure of the GTR in the early 20th century.

\*The GTR line between London, St. Mary's and Stratford was briefly dual gauge to allow Provincial Gauge locomotives to be moved to Stratford for conversion or scrapping.

\*\*The section of the Buffalo & Lake Huron Railway between Stratford and Goderich was converted to the Standard Gauge in 1873)

**Two other major pioneer railways on the Broad Gauge in Upper Canada:**

The Northern Railway of Canada

The NRC was first incorporated in 1849 as the Toronto, Simcoe & Lake Huron Union Railroad, and was renamed the next year as the Ontario, Simcoe & Huron Union Railroad. The road was built to the Provincial Gauge and opened to Machell's Corners (now Aurora) on May 16, 1853, and Allandale by late 1853. At that time the location of the northern terminus had not yet been decided upon, but was subsequently confirmed in early 1853 by a survey expedition to a place to be subsequently named Collingwood. In 1858 the road was formally reconstituted as the Northern Railway of Canada. Finances remained tight despite the general prosperity of the road, and it did not convert to the Standard Gauge until July 1881. It subsequently reached North Bay and became part of the Grand Trunk Railway in 1889.

The Northern Railway of Canada, for whom the Grand Trunk was a major interchange railway, did not begin conversion until 1879, and did not complete it until 1881. Conversion was forced on the Northern by necessity on account of its merger with the Standard Gauge Hamilton & North Western (see below). The reason for the delay was undoubtedly the financial necessity of postponing the cost of conversion for as long as possible, combined with the fact that the railways interchanging with the Grand Trunk Railway in Toronto were not as pressured competitively as the trans-Ontario roads competing for American transshipment business.

The Midland Railway of Canada

The genesis of the eventual Midland Railway was the Provincial Gauge Port Hope, Lindsay & Beaverton Railway (PHL&B). It was originally chartered in 1846 as the Peterborough & Port Hope Railway (P&PH), but re-incorporated in 1854 as the PHL&B with a new focus on Lake Simcoe and Georgian Bay. Construction reached Lindsay in late 1857, and terminated there for the time being. The PHL&B became the Midland Railway of Canada in 1869 to reflect its amended goal to reach Georgian Bay. Still on the Provincial Gauge, the railway reached Beaverton in 1871, and Port Hope's expanded ambitions were consummated with extension to Orillia in 1873, Waubashene in 1875 and on to the lucrative grain traffic at Midland in 1879. Its gauge was changed to the Standard Gauge in 1874.

**Table of Canadian Railways on the Broad Gauge (Upper Canada [Ontario] Railways in BOLD):**

Railway	Year(s) Sections Built	Year(s) changed to 4' 8½"
<b>Grand Trunk Railway</b>	<b>1847-1864</b>	<b>1872-1874</b>
<b>Great Western Railway</b>	<b>1853-1870</b>	<b>1870-1873</b>
<b>Northern Railway of Canada</b>	<b>1853-1875</b>	<b>1881</b>
European & North American Ry	1857-1860	1875
Nova Scotia Railway	1855-1867	1875

New Brunswick & Canada Ry	1857-1871	1878
Intercolonial Ry of Canada	1868-1875	1874-1875
<b>Midland Railway of Canada</b>	<b>1857-1873</b>	<b>1874</b>
<b>Brockville &amp; Ottawa (CC) Ry</b>	<b>1859-1876</b>	<b>1880</b>
<b>Buffalo &amp; Lake Huron Ry</b>	<b>1856-1858</b>	<b>1872-1873</b>
<b>London &amp; Port Stanley Ry</b>	<b>1856</b>	<b>1872</b>
<b>Cobourg &amp; Peterborough Ry</b>	<b>1854</b>	<b>Abandoned c1860</b>
<b>Welland Railway</b>	<b>1859</b>	<b>c1875</b>
Carillon & Grenville Railway	1854	Abandoned 1916
<b>Erie &amp; Ontario Railway</b>	<b>1854</b>	<b>c1875</b>
Windsor & Annapolis Railway	1869	1875
Saint John & Maine Railway	1869	1877
Fredericton Railway	1869	1877

### **The Narrow Gauge Phenomenon in Ontario**

The railway construction climate that encouraged the narrow gauge option in Ontario was in major part the railway financing mechanism that shuttered down in the aftermath of the Crimean War that ended in 1856, and remained more or less closed during the American Civil War that ended in 1865 (bearing in mind that much, if not almost all, of the financing came from British financial houses).

During that period there was stagnation in further railway construction, a decline in government political will for financing support, with the result that there was increasing reliance on municipal bonuses, call them downloads, local levies, incentives or bribes, to finance local railways. The euphemistically described "bonus" was essentially a debentured municipal lump sum subscription to have a railway come through its territory. It was paid for the most part with a grudging acknowledgment that a railway was needed – in some cases there were threats by the railway to bypass if the commitment was not forthcoming, but many municipalities were smart enough to figure out that their location was strategically placed to the direction of the railway and were able to hold out for the best terms, including no payment until completion. That was an important negotiating point because it was not uncommon for a first section of railway to be built using funds obtained from bonuses in the second section – sort of an early pyramid scheme. Just the same, these "bonuses" constituted a huge long term liability for fledgling municipalities with, for the most part, modest tax bases.

The "mover and shaker" of the narrow gauge promotion was one George Laidlaw, a Scot who immigrated in 1855 to become a wheat buyer for "little brown jug" Gooderham & Worts, the prominent Toronto distiller (whose plant has been commemorated today as the Distillery District). He espoused a 3'6" narrow gauge as rebellion against the monopoly and perceived financial excesses of the Grand Trunk Railway; and closer to home, as an effort to break the stranglehold that Toronto's Northern Railway to Collingwood exercised over the price of cordwood, the key industrial, commercial and residential fuel of the day.

Laidlaw argued passionately (and correctly) that the narrow gauge choice offered significant savings in construction and operating costs, arguments that resonated in the cash-strapped decade of the 1860s

and resulted in the incorporation in 1868 of the Toronto & Nipissing Railway to the north-east; and its equally narrow gauge sister, the Toronto, Grey & Bruce Railway that was to strike out in a northwesterly direction from Toronto to Owen Sound to service railway-hungry Grey and Bruce Counties. The issue of the Toronto cordwood monopoly aside, the immediate incentive for the promotion of both of these railways was that their sponsoring distillery needed grain to make its whiskey.

For the Toronto & Nipissing Railway, there was an additional specific object: There was already talk of the planned transcontinental railway, and entrepreneurs were quick to catch the enormous economic implication of such a plan – Toronto's Northern Railway of Canada and Hamilton's North Western Railway were already eyeing the prospect for a connection to that vision. Thus the naming of the Toronto & Nipissing Railway was no random stab at a lake somewhere up in the north – it was a strategic strike towards the ultimate connection.

For the Toronto, Grey & Bruce Railway, it was to reach a port on Georgian Bay (at Owen Sound) to offer competition to Toronto's Northern Railway of Canada to Collingwood that was disinclined to build branches to service the emerging lucrative farmlands of Grey and Bruce Counties.

George Laidlaw was the driving force behind four railways in all (The Toronto & Nipissing Railway [T&N], the Toronto, Grey & Bruce Railway [TG&B], the Credit Valley Railway and the Victoria Railway). Of these four, the T&N and the TG&B were chartered (in 1868) while the 5'6" Broad Gauge was still a condition for the Province of Canada financing guarantee, and both were built to the 3'6" narrow gauge. (the other two were built to the Standard Gauge.)

Both railways were an immediate success, hauling prodigious amounts of grain and lumber into the big city, and with impressive passenger traffic receipts besides. Within a few years, however, the inherent limited capacity of a narrow gauge operation became apparent, interchange with the Grand Trunk Railway (GTR) in Toronto became an issue, and both railways began to struggle to meet traffic demands. At the same time the light rails began to wear out and the accumulating costs of maintenance and renewal began to hover over their balance sheets.

By the early 1880s, this brave experiment was over. The Midland Railway (itself soon to be leased to the Grand Trunk) bought out the T&N in 1881 and assumed the cost of gauge conversion by 1883. By 1880 the financial situation of the TG&B was equally dire, and control of the railway was handed over to the Grand Trunk in 1882 in exchange for the enormous cost (\$800,000 [over \$19 million today]) of re-gauging and re-fitting the line. The GTR did not however obtain a controlling interest, as it was financially stretched itself in its frantic bid to keep the CPR out of Ontario. In 1884, the GTR had to sell its TG&B stock, which was snapped up by the Ontario & Quebec Railway, the CPR's unobtrusive cat's paw bid to enter the lucrative Ontario market.

As with the Provincial Gauge, the obvious and overarching drawback of a break in gauge was the cost of transshipment of goods, and the inability to interchange freight cars as business required flow between adjoining railways. This proved to be a painful lesson for Canada and Canada's early railways. As already noted, the eventual costs of conversion to the Standard Gauge unquestionably had a huge impact on subsequent railway development in Canada.

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