REVISED EDITION

REPORT

OF THE

National Transcontinental Railway

Investigating Commission

VOL. II

EXHIBITS

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY THE KING'S PRINTER TO HIS MOST EXCELLENT MAJESTY
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THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY

General Instructions

From the Chief Engineer to the Staff, Explorations and Preliminary Surveys, Location and Construction.

ORGANIZATION.

The organization of the Engineering Department is as follows:—

1. Chief Engineer, reporting to the Commissioners.

2. Assistant Chief Engineer, reporting to the Chief Engineer, and in his absence acting in his place.

3. District Engineer, reporting to the Chief Engineer, with jurisdiction over the parties in his District.

4. Assistant District Engineer, in charge of a number of parties, reporting to the District Engineer.

5. Divi ion Engineers, reporting to the District Engineer, and on construction in charge of a number of residencies.

6. Engineers in charge of parties on Exploration, Preliminary and Location Surveys, reporting to Assistant District and District Engineer.

7. Resident Engineer, in charge of a residency on construction, reporting to the Division or District Engineer.

8. Engineers entrusted with special duties, such as buildings, water service, bridges, etc., reporting to the District Engineer or Chief Engineer as may be instructed.

9. The Districts to be designated as A, B, C, D, E, F; the party will be numbered 1, 2, 3, etc., and the proper naming will give in every case the letter of the District and the number of the party.

DISTRICT ENGINEER.

10. The District Engineer is in full charge of all the parties in his District; he is responsible for the faithful execution of all instructions, general or special, which may be given from time to time, as well as for the proper maintenance of discipline in the parties. He will see that the Engineers in charge of parties are properly instructed, that they are competent men, and that they faithfully perform the duties entrusted to them; he will instruct the Commissariat Officer from time to time as to the stores required and will make all requisitions for supplies so as to give ample time for purchasing and delivering same; he will certify to all accounts, pay rolls, etc., and send them in to the Chief Engineer on the first ot every month; he will report to the Chief Engineer monthly, and oftener when opportunity offers, on all matters of interest affecting the work in his District. **Duties**

It will be his duty to know the general character of the country through which the line is being run and to see that ample exploration is made in advance of the preliminary lines. **Explorations**

District Engineers will send fortnightly to the Chief Engineer, from the reports received by him from his Engineers, as called for in Section 12, a full report of all the work done in his District. **Reports**

On the first of every month, he will summarize to date all matters bearing upon his operations, giving progress being made, and such other matters as are of interest and value affecting the work.

He will forward to the Chief Engineer, duly approved, pay-rolls, expense accounts and bills.

He will take a blue print copy of the plans and profiles received and forward to the Chief Engineer's office the original tracings.

ASSISTANT DISTRICT ENGINEERS.

Duties

11. The Assistant District Engineer has in his charge the number of parties allotted to him by his District Engineer; he will make his headquarters as near the centre of his operations as practicable, and will at all times keep in close touch with all parties under his direction; it will be his duty to guide and direct the Engineers in charge of parties, to see that they are competent and that the work is being efficiently done; he will visit the parties frequently and will remain with them for such lengths of time as will enable him to reach just conclusions; he will report by mail to his District Engineer on every available opportunity, but in every case on the first of every month, on the operations of the preceding month.

ENGINEERS IN CHARGE OF PARTY.

Size of Party

12. The party in a bush country will usually consist of a transitman, levelman, topographer, field draughtsman, rodman, two chainmen, picketman, four axemen, five packers and a cook. The Engineers in charge will be responsible for the

Competency

honesty, sobriety, industry and "competency" of the men under their charge, and they must give "personal attention" to see that transitmen, levelmen and others understand their work and are conscientious in its performance; they must give special attention to see that instruments are kept in adjustment; that all possible checks upon the accuracy of the work are used, and that note books are neatly and accurately kept; that the plans and profile are plotted up every day;

Supplies

that the party is well supplied with instruments, tents, stationery, provisions, and that all the tools and outfit for the proper and vigorous prosecution of the work are on hand in good order.

Cooking, Etc.

They must see that their camps are neat and orderly, and that the cook uses provisions economically, and cooks the food neatly and cleanly.

Engineers in charge of survey parties will make a report fortnightly to their District Engineer, to the extent of their operations during the preceding two weeks; sending in tracings of plans and profiles, prepared in accordance with the sample sheets Plate "C" and "D".

On the first of every month he will summarize the work done to date, by filling out the blank spaces in form 21; together with any special matter of interest or information. He will send in his pay-rolls, expense accounts and all bills for service or materials in quadruplicate. He will certify to the correctness of the pay-rolls and the bills will be certified to on the following forms:—

Stamp A" "I hereby certify the above personal expense account to be correct and to have been incurred by me on the business of the Trans-Continental Railway."

Stamp B" "I certify the above goods have been received."

Stamp C" "I hereby certify the above board bill to be correct and to have been incurred on the business of the Commissioners of the Trans-Continental Railway, and that the prices charged are fair and just."

Stamp D" "I certify that the service described in the above account has been performed, and that the price charged is fair and just."

Stamp E" "I hereby certify that the goods mentioned in the above account have been received, and that the prices charged are fair and just."

Stamp "A" is to be used in certifying to personal expense accounts when the regular form stamp is not available. **Stamp A"**

Stamp "B" is to be used in certifying to the receipt of supplies, etc. **Stamp B"**

Stamp "C" is to be used in certifying to board bills. **Stamp C"**

Stamp "D" is to be used in certifying to accounts for work performed, such as teaming, etc. **Stamp D"**

Stamp "E" is to be used in certifying to accounts for supplies purchased by the Engineer in charge. **Stamp E"**

13. Whenever the Engineer in charge of a party finds it neeessary to leave the party, or in the event of sickness, he shall at once notify the Assistant District Engineer, who will appoint a person to temporary take charge of such party, and in case he fails to do so, or during the interval of such appointment, the Transitman shall take charge. **Engineer in Charge Ill or Absent**

TRANSITMAN—DUTIES.

14. The Transitman on beginning his work will first enter in his field book, the letter of the District, the number of the party, the name of the Engineer in charge, his own name and the date on which the work began; each page shall be separately dated and initialed; he shall make full note as he proceeds of the character of the country, soil, rocks, lakes, creeks, timber, gravel pits, etc., on each side of the line. All the field notes must be clearly entered in pencil on the spot; no additional notes should be entered with the original notes after the day on which the latter are written; field notes must not be inked in or altered in any way—copies may be made in ink. All plans and profiles must be plotted so that the end nearest Winnipeg shall be at the left hand of the paper and the end nearest to Moncton shall be at the right hand of the paper, regardless of the local sinuosities of the line. **Field Book Entries — What to Note — How entered — Plotting Plan Profile Direction of line**

Horizontal scale shall be 400 to an inch. Vertical scale shall be 20 feet to an inch. Ten miles to the sheet. **Scales of Maps and Profiles**

The transit instrument is to be used on all lines, when the progress of the party will not be retarded thereby; in an open country it is the quicker instrument; in thick bush on preliminary lines use the compass or pickets, taking the angles with the box sextant or by compass bearings, or both. Observe for latitude and azimuth, noting the magnetic variation of the compass—check your azimuth frequently so as to insure a close check on your traverse. Measure your deflection angles carefully, noting whether right or left check by doubling the angle; at the same time note the magnetic bearings, taking all possible checks to insure accuracy. **Instrumental Work — Observation for Azimuth Latitude**

Tie your line to all townships and subdivision lines whenever crossed, give the station number and plus, intersection angle, distance to nearest post; when the line runs through a village, town or city, take enough measurements and angles to correct the survey with the map of the place, send a copy of such map to the Chief Engineer's Office; note carefully all property lines and locate all buildings that are near to the line. **Survey Tie**

Test your chain with the 50 foot steel standard supplied. See that it is kept of the correct length; the chaining must be correctly done and a stake driven at the end of each hundred feet, and the number of chains from the starting point of the party marked thereon. The initial stake to be marked with the letter of the district and the number of the party. **Chaining**

At every apex a large stake shall be driven, having its proper distance and the deflection angle written thereon. The line is to be sufficiently cleared to enable levels to be taken. **Apex, how Marked**

The chaining will be noted regularly in the field book from the bottom of the page upward; each hundred foot stake as driven noted on a separate line; the **Notes, how Entered**

space on each side of the column for distance being used for such note and sketches in the right and left of the line as may be necessary in order to give the fullest possible information of the country.

What to Note Note every stream and river crossed, its size, direction, depth of water, nature of bottom, flood marks, probable maximum volume, and whenever possible the depth to solid foundation; give full particulars of banks.

LEVELLERS' DUTIES

15. The Leveller will open his book by entering on the first page thereof the letter of his District and the number of his party, the name of the Engineer in charge and his own name with date of commencement, each morning he will date his notes and sign with his initials.

Rodman He will be careful to fully instruct his rodman as to the duties of his position.

Field Notes All field notes must be clearly and distinctly made in pencil on the spot, no additional notes should be entered with the original notes after the day on which the latter are written; field notes should not be inked or changed in any way; copies of them may be made in ink and reduced levels entered in ink. Great care must be taken to preserve the original field notes from obliteration.

In making entries be particular to describe the locality, line, etc., so that any other Engineer can easily find the place and understand the whole at a glance.

Bench Marks on Preliminary Bench marks should be regularly established about every 1,500 feet, and the elevation above datum written thereon thus, viz.: the elevation, letter of the District, and number the party. Each bench mark must be fully described in the column of remarks. When two parties meet both shall check on the same bench mark, noting difference in elevation.

B. M. 1220.3 DISTRICT "A" PARTY 3.

On Location On location the bench marks should be about every 1,000 feet and always at the two ends of heavy cuttings, tunnels, deep fills, bridges, viaducts, etc.; positions should be selected so that they will not be destroyed in the clearing of the railway lands or be interfered with by the works. They should be numbered consecutively in each party and their numbers and elevations above datum distinctly and permanently marked thereon with blue paint, and on timber with a "scribe." When the line does not pass through timbered land, and other suitable objects cannot be readily found for bench marks, substantial posts must be sunk in the ground at least five feet, and be well packed to insure them against being raised by the frost.

What to Note Note every stream and river crossed, its size, direction, level of surface of water, difference between high and low water, if practicable depth of the water and any peculiarities it may seem to possess. Note character and constituents of materials along the line for classification purposes.

Accuracy of Work Every care must be taken to insure accuracy. Check back on B.M's. when necessary or possible; particular care will be exacted to insure accurate reductions; teach your rodman to check reductions; read your rod to hundredths at every turning point and all B.M's.; on ordinary stations at intermediates on the line, to the nearest tenth; check the levels at the end of each day's work by adding back sights and foresights and ascertaining the differences; any doubtful sections must be re-levelled. Six hundred feet each way should be considered the maximum distance to read the rod.

Cross Section Before fixing the final location cross sections of all side hill work will be made, and before beginning work of grading cross sections at least at every 100 feet station whether in excavation or embankment, and also at a sufficient number of intermediate points, wherever a change in the ground takes place, so as to insure a perfectly accurate record of the various inequalities of the original surface. These cross sections will extend on each side of the centre line and at right angles thereto

a sufficient distance to include all side ditches. The levels on these cross sections shall be taken in the same manner as those on the line, always commencing at a bench mark, using the same datum and checking on a B. M. at the end of the work. The actual rod reading and distance out right or left, as the case may be, as observed in the field shall be entered in the cross section field book, Form No. 8. *The customary cross section notes according to American practice, which are the result of a calculation, will not be allowed.*

Extent of Cross Section

What to Set Down

In all cross sections a level should be taken over the edge of the roadbed to facilitate the computation of earthwork. In excavations in earth the width at formation will be 22 feet, in rock 20 feet, in embankments 16 feet and under, in height the formation width will be 16 feet, beyond that height the formation width of embankment will be 18 feet. The side slopes in earth will be 1½ horizontal to 1 vertical, in rock excavations the side slope will be ¼ horizontal to 1 vertical. Rock embankments 1 horizontal to 1 vertical (see C ause 5 Specifications). Hence in earth excavations, the levels should be taken 11 feet north and south of the centre line; in rock excavations 10 feet, in embankments 16 feet and under, 8 feet north and routh of the centre line; over 16 feet high, 9 feet, levels should also be taken at the precise point of the slope stake and the exact horizontal distance out from the centre line recorded.

Level Sections Required

Width

Slopes

When off-take drains are required, a longitudinal section of them must be made in the same manner as for the centre line of the railway, and if necessary, cross sections also.

Off-take Drains

All profiles will be plotted on Plate A standard transparent profile paper, 400 feet to an inch horizontal, 20 feet to an inch vertical, *and must contain all the information called for by the sample sheet "Plate C."* Stencils will be supplied for the purpose of saving time in lettering. That end of the line nearest Winnipeg shall be at the left hand of the paper, and the end nearest Moncton at the right hand, regardless of the local sinuosities of the line; ten miles to a sheet should be the rule.

Plotting of Profile

TOPOGRAPHER'S DUTIES.

16. The Topographer will open his book by entering the letter of the District, the number of the party, the name of the Engineer in charge, his own name and the date.

He will carry an Abney or other type hand level, a fifty feet tape line, a pocket compass, a rod 5 feet long to sight from, a levelling rod graduated to tenths, and should generally have two men to assist in clearing out brush, make measurements, etc. He should always have with him the reduced levels of the stations so that all work will be on the same datum. He must determine the contour lines in even multiple of 10 feet, locating the position of the round figure contours, in general contour lines should be taken at 10 feet vertical intervals; he will carefully fix opposite the stake the true position of the contour line and will sketch in the connection between stakes; for example, assume that the reduced level at station 12 was found to be 976.2, the elevation of contour line 980 will be at 3.8 feet higher, etc. Note the distance to this point, 10 feet higher the next contour will be found, etc., etc.

Instrument

He will enter in his book in pencil on the ground all the artificial features met with on the line, being particularly careful to secure intersection plus and the angle the line makes with all farm lines, township lines or other boundaries, the names of the owner and occupant of any land so crossed, proximity of buildings, cross fences, etc., being careful to tie the line to village or town surveys, township and county lines, measuring to the nearest post, marking lots, concessions, ranges or other local subdivisions in use. All the natural features are to be sketched, as streams, shores, margins of swamps, forests, ravine ridges and bluffs, taking

What to Note

care to have them correctly intersect the artificial features. It is desirable to know not only the locality of a hill or slope, but also its shape, steepness and height; sketch contour lines, do not use hatchings.

How Entered in Book

The centre line of the Topographer's book is a straight line and for the purpose of the sketch, the centre line of the survey may be considered a straight line also. Slight deflections in the course of the preliminary line may be ignored in the sketch, but if a large angle occurs it is better to terminate the sketch with the course and begin again, leaving a few blank lines between the two sketches. Fix the distance from centre line stake both by levels and measurements. Each day's work must be plotted on the evening of that day.

General

The Topographer should have a knowledge of geology and should be able to name the materials he finds, such as limestone, slate, shale, granite, gneiss, trap, clay, cemented gravel, gravelly loam, etc., etc. He should also designate in order of occurrence the several trees, such as pine, spruce, etc.

He should have an eye for the main essentials to enable him to only select the important things.

The width of the belt of country examined necessarily depends on the character of the country through which the line is being run. The reconnoissance line should have determined in a general way where the preliminary is to be run, which should be as near to a practicable railway line as possible; hence the width of the belt should be governed accordingly, the object being to secure such a representation of the surface of the ground as will enable the best possible line to be located on the ground under examination. It will be obvious, therefore, that when the preliminary line is made up of long straight lines with light angles and is within reasonably close distance of the grade line that less topography will be required. If on the contrary, the preliminary is made up of a series of short lines with great and small angles a wide area of topography should be taken in order that a careful study may eliminate curvature. On a side hill it is advisable to cover the whole slope; in a valley it is advisable to include the whole valley. The meandering of a river or creek should be carefully taken, boundaries of lakes, etc.

Note specially the presence of springs on side hills.

FIELD DRAUGHTSMEN.

17. The Field Draughtsman will plot up with care the plans and profiles each day as the notes are received by him. In plotting maps he will do so by latitude and departure. Show north point, giving astronomic courses of all lines, and marking on the map the magnetic variation. He will plot all contours with care, making every fifth line heavier than the others. He will mark on the lines the elevations in feet, referring to the datum by name. The left hand side of the paper will show that portion of the line nearest to Winnipeg. The same care will be taken to plot up profiles; the grade lines on profile will, however, be fixed by the Engineer in charge of the party, The map and profile must contain all the information called for in the sample sheets, Plates C and D.

Stencil to be Used

Reports to District Engineer

To Keep Work up Tight

Use the stencils provided for title and lettering to save time. Tracings of maps to be sent to the District Engineer on the first of the month. Profiles to be prepared on tracing profile paper and sent in along with the plan of the line. The Field Draughtsman must keep his work up tight to the field work, particularly on location work. The projected location should be made by the Engineer in charge.

PRELIMINARY LINES.

18. When the country along the projected route has been sufficiently explored to enable a choice to be made, preliminary lines will be run. The first preliminary

will be run as rapidly as possible; use either the transit or compass or a picket line for the alignment. Do not waste time backing up; this line is to develop the country; use offsets freely where required; cover as much ground as possible; be absolutely sure of your levelling, checking with care to avoid errors. The Topographer should make wide excursions so as to secure all the information possible. **First Preliminary**

The second preliminary should be run with more care, seeking to place it as closely as possible to a reasonable line for the railway. In crooked, difficult places, it will be necessary to stake out approximately the curves required. Topography in such places must be carefully and accurately taken. Enough information should be secured to permit of a projected location on the map. Take out the quantities on this projected location and compare different lines on the basis of total cost. **Second Preliminary**

Run enough preliminary lines to be absolutely sure that you have exhausted the possibilities of the country under examination.

LOCATION.

19. Once the preliminary lines are all completed and sufficient coutours have been taken to enable a projected location to be worked out on the map, fit the first location to the ground shown on such projected location; run in the curves with care; in thick bush it is not necessary to run in spiral curves; cross section all side hills and rough places; take out the quantities accurately, and secure all needful information to enable an accurate estimate of cost to be made. Full and careful studies of all large bridges, viaducts, etc., should be made. **First Location**

The second location will be made by utilising all the information secured. The working profile will have on it the results of the first location, additional contours required, additional cross sections, etc. Study the line in detail station by station, paying particular attention to sections of heavy work, bridge and viaduct crossings, having due regard at all times to lines of total cost. It is advisable to change the personnel of the Engineer in revision work. A third location may be found desirable in certain cases; indeed, before considering the final location as settled, it is necessary to know that no better line is to be had in the country. **Second Location**

The preliminary locations do not demand that the stakes, reference hubs, etc., should be set with that degree of permanence which the final staking out requires; for obvious reasons it is preferable to wait until the right of way is cleared before such final staking out. All Bench Marks will be carefully checked, errors eliminated, curves will be staked out, all easement curves staked out, errors in chainage eliminated, etc. **Final Staking Out**

DIRECTION OF LINE.

20. For the purpose of measuring and record, the line of railway will be considered as running westerly.

PLOTTING.

21. All plans and profiles will be plotted so the westerly end will be at the left hand of the paper.

CROSS SECTION PLOTTING.

22. All cross sections will be plotted so that the measurement north of the centre line will be at the right hand, those south of the centre line at the left hand.

DATUM.

23. The same general datum should be carried throughout the whole line, preferably the mean sea level. As this may be found to be impracticable, each District Engineer wi'l be required to see that a uniform datum is adopted for the several Divisions of his District. When the levels meet at the end of the Districts the exact difference will be ascertained and noted. District B has special facilities to secure the mean level at Quebec, so that all other Districts may be readily reduced to the mean sea level.

REFERENCE HUBS.

24. Reference hubs should be placed at the beginning and end of each curve and on tangent at every twenty stations. In placing reference hubs, it is well to fix the point by intersection lines rather than measurement. The hubs should preferably be set at an angle of 45° with the line at even distance of say 100 feet from the centre stake. When a line is near a river or lake or other obstruction, prohibiting the above described method, it is advisable to set off a line at right angles and two other lines making angles of 45° with the line and drive two or more hubs on each line at stated distance of 50, 75, etc., feet from the centre stake. The reference hub should be 3″ diameter and 12″ long, and should be driven level with the ground, the exact centre being marked with a nail or tack. The stake alongside should be marked with the station and plus, and such other marks as will indentify the point. For example: R. H., 100′ left, Sta. 106+25, B. C. 4° left.

TABLE OF BENCH MARKS AND REFERENCE HUBS.

25. Table of bench marks and reference hubs describing exactly their position, and in case of the former, giving the number and elevation above the datum of the District, must be made out and copies filed in the District Engineer's office. The position, number and elevation of bench marks should also be entered on the working profile, at their proper station and plus.

CURVATURE.

26. The maximum curve on a level shall not exceed 6° (Rad. 955′). This curve should be used sparingly and only when the topographical conditions prohibit an easier radius. At depots or stopping places curves exceeding 3° Radius 1910°) should not be used. Curves less than 300 feet long are objectionable, and should not be used. Reversed curves must not be used under any circumstance; at least 600 feet between transition curves must be had. Broken back curves must not be used. The minimum tangent between curves in the same direction shall be 600 feet clear of the transition curves.

COMPENSATION.

27. All curves will be compensated in accordance with the following rules: If at a stopping place, depot, etc., compensate 0.10′ per degree in the index of the curve; at other portions of the line compensate 0.04′ per degree in the index of the curve.

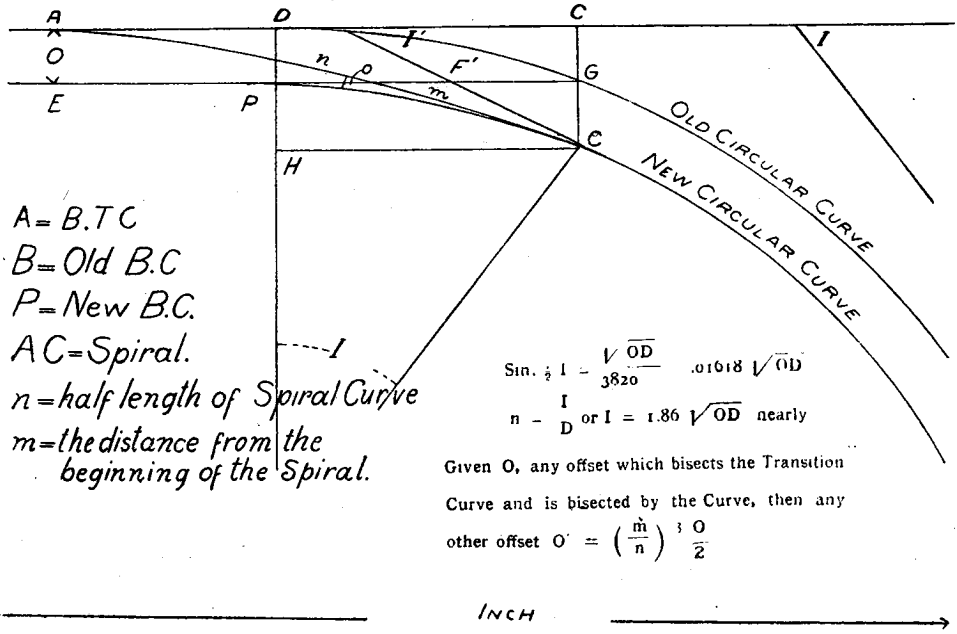
TRANSITION CURVE.

28. All curves of one degree and over will be spiralled at both ends by putting in an adjusted curve in accordance with the table and explanation which follows:

The cubic parabola as developed by the late A. M. Wellington, will be used in connecting tangents to all circular curves 1° and over. In staking out the transition curve, you will follow the rules below.

(a) Calculate for an ordinary circular curve as usual and run the tangents to the "B.C." and "E.C." as usual. (b) Make an offset at the "B.C." towards the centre of the curve (value of O); this is the distance the circular curve is moved inwards (note the distance within the limits of the table should be as great as possible); (note also that the length of the transition curve is a function of it), and that it should always be long enough to run out the super-elevation called for in the table (see Section) 62 (c) Calculate the distance the curve "B.C." should be moved backwards by formula Tan. $\frac{1}{2}$ Intersection angle x O. (d) Run in the main circular curve as usual from the off-set "B.C." (e) From the tangent and curve as thus run in, make the off-sets shown in the tables for the given value of "O". These are the same IN from the tangent OUT from the curve at the same distance from the "B.C." and "E.C." of the transition curve. At the old "B.C." the transition curve bisects the off-set "O" and is bisected by it. The off-sets are calculated for every 30 feet, one rail length, up to a distance of 240 feet. (f) To record the curve put in new "B.C." off-set at old "B.C." giving Station and plus as usual, "4.5 R. or 4.5 L.," as the case may be. (g) The plotting can be done as usual and the new curves drawn in parallel with the old one showing the spiral at each end thereof. (h) The description for Right of Way calls for a given width each side of the centre line. In describing land where spiral curves are used, it will be sufficient to say: Thence by a tangent bearing "N"-"W", (as the case may be,) from Station....to Station....a distance of.. feet. Thence along a curve to the right or left, as the case may be, of....degrees, a distance of....feet; thence on a course of....along a tangent from Station.... to Station....a distance of....feet, there being an off-set at the beginning and ending of the ....degree curve at....feet for a transition curve to connect the circular curve and tangent. (i) The derivation of the functions of the spirals

DIAGRAM



will be understood by following the explanation and diagram given below. The tables which follow obviate the necessity for any calculations, the best judgment being exercised in selecting the value of "O" and thereby fixing the length of the spiral.

Again, N. = 1.868 $\sqrt{\frac{o}{D}}$ nearly.

Example for O′ at quarter points of the transition curve, O′—$(\frac{1}{2})^3 \frac{3}{2}$ O = 1/160 where O = 10 feet, O′ = 0.625 feet. At $\frac{1}{8}$ point of curve, quarter point of half-curve, the off-set will be $\frac{1}{8}$ of the off-set at the quarter point) .078; at the $\frac{3}{8}$ point ($\frac{3}{4}$ point of half curve) it will be 3^3 = 27 times this amount or 2.11 feet all for a total original off-set of ten feet opposite old "B.C."; half length of curve it will be five feet. In the Diagram, "D" is the old "B.C."; P is the new off-set "B.C." from which the circular curve is run (see rule "C" for position of point P.) The transition curve runs from A. to C. and is staked out on the ground from the off-sets given in the table.

Example: Given 120+42, Apex I = △ = 32° 20′, -6° curve. Therefore tangent of circular curve = 277 feet "B.C." = 117+65 "E.C." = 123+03.8. The super-elevation of the outer rail for the curve will be taken at four inches, to reach this elevation smoothly requires an approximate distance of at least 240 feet. Hence half length of transition curve should not be less than 120 feet. The nearest distance in the table is 130 feet, giving an off-set O of 3 feet. The new "B.C." (Point P., Rule C.), (tan. $\frac{1}{2}$ 1 x o) = 117+65–0.87 = 117+64.13. The new "E.C." will be 123+03.8+0.87 = 123+04.67. The "B.T.C." will be 116+34.13, the point of junction of transition curve with circular curve "P.J.C." = 118+94.13 The circular curve will run from this point to 121+74.67 where the spiral at the end of the curve starts the "E.T.C." is at Station 124+34.67.

The only stakes requiring attention during location are those at 117, off-set IN 0.15; 118 off-set OUT 0.49. Station 122 off-set OUT .018, 123+00 OUT 1.16; 124 IN 0.18 at the old "B.C." and "E.C." the spiral bisects the off-set, the hub will, therefore, be 1.5 feet in from the old "B.C."

TABLE.

Table of off-sets in from tangent out from curves for various values in Central off-set "O".

Off-sets in Feet.....		0.5	1.0	2.0	3.0	4.0
Half Length of Transition Curve.....		130′	186′	262	.....	.....
1° Curve.	30′	.002	.003	.001	.....	.....
	60′	.024	.016	.01	.....	.....
	90′	.082	.054	.036	.....	.....
	120′	0.192	.028	.085	.....	.....
	150′	.....	0.25	0.17	.....	.....
	180′	.....	0.43	0.20	.....	.....
	210′	.....	.....	0.51	.....	.....
	240′	.....	.....	.75	.....	.....
Half Length of Transition Curve.....		93	130′	186	227	262
2° Curve.	30′	.008	.006	.004	.003	.002
	60′	.065	.048	.032	.026	.020
	90′	.....	.164	.108	.081	.071
	120′	.....	.384	.256	.192	.190
	150′	.....	.....	.50	.375	.33
	180′	.....	.....	.80	.74	.58
	210′	.....	.....	.....	1.17	1.02
	240′	.....	.....	.....	.....	1.51

Table of off-sets in from tangent out from curves for various values of Central off-set "O."

Off-sets in feet.....		0.5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	
Half Length of Transition Curve.....		74	107	152	186	214	238	262	.....	.....	.....
	30′	.016	.01	.007	.006	.005	.004	.004	.....	.....	.....
3° Curve	60′	.13	.087	.054	.048	.043	.039	.03	.....	.....	.....
	90′	.....	.296	.185	.162	.148	.127	.10	.....	.....	.....
	120′	.....	.....	.51	.384	.351	.312	.26	.....	.....	.....
	150′	.....	.....	.....	.75	.68	.62	.50	.....	.....	.....
	180′	.....	.....	.....	1.29	1.18	1.05	.86	.....	.....	.....
	210′	.....	.....	.....	.....	1.88	1.70	1.54	.....	.....	.....
	240′	.....	.....	.....	.....	.....	.....	2.26	.....	.....	.....
Half Length of Transition Curve.....		65	93	130	160	186	206	227	245	262	.....
	30′	.02	.016	.012	.009	.008	.007	.006	.006	.005	.....
	60′	.....	.13	.097	.079	.064	.06	.053	.048	.04	.....
4° Curve	90′	.....	.....	.328	.263	.216	.198	.162	.163	.14	.....
	120′	.....	.....	.779	.633	.512	.487	.384	.386	.34	.....
	150′	.....	.....	.....	1.20	1.0	.93	.86	.79	.66	.....
	180′	.....	.....	.....	.....	1.73	1.65	1.48	1.36	1.15	.....
	210′	.....	.....	.....	.....	.....	.....	2.34	2.15	2.05	.....
	240′	.....	.....	.....	.....	.....	.....	.....	....	3.01	.....
Off-sets in Feet.....		0.5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0
Half Length of Transition Curve.....		58	82	117	143	166	186	203	219	234	249
5° Curve	30′	.03	.02	.01	.01	.01	.01	.009	.009	.008	.007
	60′	.....	.19	.12	.11	.08	.08	.08	.07	.07	.06
	90′	.....	.....	.45	.37	.31	.27	.25	0.24	.22	.20
	120′	.....	.....	.....	.89	.74	.64	.61	.58	.53	.49
	150′	.....	.....	.....	.....	.....	1.25	1.17	1.10	1.05	.99
	180′	.....	.....	.....	.....	.....	2.26	2.04	1.93	1.83	1.70
	210′	.....	.....	.....	.....	.....	.....	.....	3.0	2.82	2.70
	240′	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Half Length of Transition Curve.....		52	74	96	130	152	169	186	201	212	227
6° Curve	30′	.04	.30	.03	.018	.014	.013	.012	.009	.009	.008
	60′	.....	.26	.24	.15	.108	.10	.096	.095	.094	.08
	90′	.....	.....	.....	.49	.37	.37	.32	.29	.28	.27
6° Curve	120′	.....	.....	.....	1.16	1.02	.89	.77	.71	.68	.64
	150′	.....	.....	.....	.....	.....	1.70	1.50	1.41	1.35	1.29
	180′	.....	.....	.....	.....	.....	.....	2.65	2.46	.234	2.22
	210′	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.50
	240′	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

The maximum grade rising eastwardly on a tangent will be 0.40% =21.1 feet per mile; rising westerly the maximum grade will be 0.60% =31.68 feet per mile. The maximum grade is to be used sparingly and only for the purpose of avoiding heavy work. *The best grade to be had in the country must be secured in every case.* On curves the rate of grade will be reduced in accordance with the rules for curve compensation.

LEVEL AT STATIONS.

29. Every effort will be required to secure a level track at stations and for 2,000 feet each side, particularly at terminal points, water stations, etc. Under no circumstances will a water tank or station be placed in a sag.

VERTICAL CURVES.

30. It is important that all changes in grade be made by a vertical curve of such length as will allow the longest train to pass from one rate of grade to another without the cars piling up against each other. With modern equipment,

the rate should not be greater that 0.1 feet per station, and this rate should be used in sags, on summits a greater rate of change may be used, but not to exceed 0.3 feet per station.

BRIDGES.

31. The following data will he required for every important bridge:

1st. Profile of crossing on a scale of 20 feet horizontal.

10 feet vertical per inch.

(a) High water mark (extreme flood height).

(b) Low water mark.

(c) Bottom of river or stream, giving nature of same.

(d) Depth to rock, if any, nature of material, etc., the information must be carefully and fully taken. Suitable boring and sounding appliances will be provided when required for this work. A thorough survey must be made and careful records of same taken.

(e) Alignment near the bridge site and the grade of same, if any; when possible a bridge should be level.

2nd. (a) Plan of the river on scale of 100 feet to the inch, with contour lines at 10 feet; vertical intervals for a considerable distance each side of the proposed crossing, the distance to be proportionate to the importance of the bridge. Indicate nature of material composing banks, bottom, etc.; for large important bridges the traverse should run a mile each way from the bridge site.

(a) Length of span suggested, proposed location of piers.

(b) Clearance required above high water mark.

(c) Shore protection required, if any.

3rd. Is it a navigable river, if so, what clear height is required to accommodate the traffic?

4th. Is the stream subject to freshets? Give velocity of current at high water. At low water. Is it subject to scour?

5th. What is the best way to reach the bridge site? Give nearest distance from railway station, or if only can be reached when the rails are laid on the railway.

6th How far must sand, of quality required, be hauled?

7th. How far must stone of suitable quality be hauled:

For (a) masonry? (b) cement?

State fully kind of stone, size and position of quarry, proximity of gravel, etc.

WATER SUPPLY.

32. The importance of an abundance supply of pure soft water cannot be over-estimated. Hence, location Engineers will be particular to note available sources. Softness should be tested with soap. Scale forming material by boiling. Try to find a supply of suitable quality, that will flow by gravity to water tanks In doubtful cases send a sample securely packed to the Chief Engineer's office.

COMPUTATION OF EARTH WORK.

33 For comparing preliminary lines table of level sections may be used; in comparing location lines, accurate computation of earth work should be made, using Crandall's tables, or plotting up cross section note and computing from same.

COMPUTING OVERHAUL.

34 Overhaul will be computed in accordance with the method shown in the sample profile Plate C, and the explanations which follow.

PLOTTING AND COMPUTING OF HAUL.

The contract provides that the limit of free haul is to be 500 feet, and that all materials shall be paid for at schedule price per cubic yard per 100 feet overhaul. See Plate "C" for diagram of overhaul—cuts being shown in red, fills in blue.

For purpose of illustrating the method, take the cutting from station 139 to 145 and + 20; the quantities in each station and summation of same right and left are as shown in the following table:

Station.	Cu. Yd.	Summation from right.	Summation from left.
139	....	0	8696
140	272	272	8424
141	692	964	7732
142	1253	2217	6479
143	2464	4681	4015
144	2768	7449	1247
145	1229	8678	18
+20	18	8696	0

As the fill from Station 145 + 20 to the bridge must all come from the cut to the east, there is no object in plotting it otherwise than from the right to the left. Call each Division on the profile paper 100 cubic yards and plot over each Station the amounts shown opposite right and left. The curves joining the several points will cross each other and a perpendicular line from the intersection point will be centre of mass of the cut or the fill, as the case may be. Next, take a pair of dividers and set them to a distance of 500 feet on the profile scale. Find where the curves between the fill and cut are at this distance, draw a horizontal line, all below it comes within the 500 feet free haul. Next, take 600 feet in the divisers, join the points with a horizontal line; the distance between the 500 feet line and this latter line will give the number of cubic yards hauled 600 feet.

A further study of the cutting at Stations 117 to 121 plus 30, and the fill from 121 plus 30 to 130, will bring out clearly the extent of the haul, etc. In the above illustration as worked out, there still remains in the cutting, after the fill to the bridge is completed, 1,807 cubic yards, which will have to be hauled to the right, and upon inspection it will be readily seen that it all comes within the free haul limit.

Note the required shrinkage so as to provide sufficient material to make the embankment; note the borrow required to complete the embankment; also, if any waste, the disposition of same. Classification can also be noted on this diagram.

Show by arrows the direction the material was moved, and the name of the contractor, the date he began and completed his work, etc.

WATER POWER.

35. Locating Engineers will take pains to secure all information possible as to the water powers along the line of the railway or within reasonable distance thereof.

The data required to be the flow of the river, in cubic feet per second, the time of the year, the stage of the river, whether normal or otherwise; the head in feet, nature of bottom and banks, kind of dam required, with height of same; nature of river bottom; in general, such information as will enable an intelligent estimate to be made of the value of the power and the cost of de eloping it.

PEAT BEDS.

36. The presence of large peat beds along the line is to be noted; give the approximate area and depth, send in to the Chief Engineer's office samples of material.

GRAVEL PITS AND QUARRIES.

37. Particular attention is requested to the securing of good gravel pits and quarries, from time to time report on the quantity and quality of the material found along the line of the survey.

EQUATING VALUES.

38. Tables will be supplied from the office of the Chief Engineer giving equating values, viz.: Value of degree of curvature, foot of distance (for minor savings in length), foot of rise and fall, train mile cost, cost of pusher grade, locomotive to use for calculations, etc. Price to apply to units, etc.

DISCHARGE TICKET.

39. All men in the service of the Commission have signed contracts for definite periods of employment, subject to satisfactory service. In discharging a man, always give him a discharge ticket, Form No. 7, which is printed in triplicate. Be careful to fill out the reason for such discharge and to make everything clear and plain.

TRANSFER OF MEN.

40. Should it be necessary to transfer a man from one party to another, he should be given a discharge ticket for the time due him. As reason for discharge enter transferred to party No.... On reaching the party to which the person is transferred, the Engineer in charge will allow him time for travelling by the shortest and quickest route and his reasonable travelling expenses while en route.

RECEIPTS TO BE TAKEN.

41. Receipts in triplicate for all expenditure must be taken from the person to whom the money is paid.

ACCOUNTS TO BE CERTIFIED.

42. Whenever a service is rendered or materials are supplied to any party, the Engineer in charge of such party will secure accounts in triplicate from the person supplying such materials or rendering the service, and will stamp the accounts in triplicate with the proper stamp supplied for the purpose, and will promptly certify to the same and send them in with his monthly report to the District Engineer, who will approve same and forward to the Chief Engineer for approval.

PAY ROLLS.

43. All pay rolls are to be made out in triplicate on the first of every month, marking up against any particular person the deduction, if any and showing the balance due. Forwarding such roll duly certified to the District Engineer, who will approve same and forward them to the Chief Engineer for his approval, and to be accompanied by the deduction sheet, Form 59.

OUTFIT.

44. Camp outfit, supplies, etc., will be supplied to each party as per following list. For all parties where the outfit, etc., cannot be moved by wagon, a list for parties in settled country, where camp may be moved by wagon or sleigh, will be supplied on application.

CAMP OUTFIT FOR 18 MEN—BUSH CAMP.

2 Baking Reflectors.
3 Bake Dishes for same.
2 Frying Pans.
Nest of 6 Cook Pails, 14 qts. to 1 gal.
6 Graniteware Meat Dishes.
2 large Tea or Coffee Pots.
2 large Dish Pans.
2 Dippers, 1 qt.
2 doz. Soup Plates, graniteware.
2 doz. large Plates, graniteware.
2 doz. Tea Basins.
2 doz. Knives, iron handled.
2 doz. Forks, iron handled.
2 doz. Soup Spoons.
2 doz. Tea Spoons.
4 large Gravy Spoons.
2 large Meat Forks.
3 Butcher Knives.
6 yards Towelling, rough.
2 doz. Common Towels.
3 Pepper Dusters.
6 Wash Basins, graniteware.
1 Grindstone, with iron handle (1½ x 12 in.).
1 doz. Chopping Axes (not over 3 lbs.).
1 doz. Axe Handles.
4 Zinc Pails.
2 Bake Kettles (14 in. to 16 in. x 4 in. high, tight lid).
1 Long Handled Shovel.
3 Boys' Axes.
2 Brush Hooks.
1 doz. Small Whetstones.
1 Meat Saw.
6 heavy Wire Pot Hooks.
1 Clock (alarm).
5 yards Oilcloth (table).
1 Drawing Knife.
1 Spokeshave.
1 Jack Plane, with extra chisel.
2 Scribes.
1 Gross 1¼-in. Screws.
200 feet ⅜-in. Cotton Rope.
3 balls Twine (coarse).
1¾-in. Auger.
1 1-in. Auger.
1 Screw Driver.
1 pair Wire Cutting Pliers.

1 small bundle Copper Wire (200 feet).
6 tin Candlesticks.
Fishing Tackle (trolling and pole lines).
1 Letter Book and Portable Press.
1 Hand Hammer.
1 bundle Stove Pipe Wire (45 feet).

---

3 Bell Tents, 14′ diam., 3′ wall and sod-cloth, 10 oz.
1 House Tent, 10 x 16, 5, 5′ wall and sod-cloth, 10 oz.
1 House Tent, 12 x 18, 4′ wall, and sod-cloth, 10 oz.
1 Shelter Tent, 9 x 9, 10 oz. duck.
18 Canvas covers, 6 x 8, 8 oz. duck.
3 Canvas covers, 8 x 12, 10 oz. duck.
1 Boiler Plate Cook Stove (to be selected).
5 Sheet Iron Heating Stoves.
2 Levelling Rods.
1 Stationery Box.
20 pairs Snow-Shoes (for winter work).
12 Toboggans (for winter work).

SESSIONAL PAPER No. 123

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY

Food Supplies per man per Month and for Parties of Eighteen and Twenty-four Men.

Articles	Amount per Man	Amount per 18 Men	Amount per 24 Men
Apples (evap.)	1¾ lbs.	31 lbs.	42 lbs.
Apricots	1¼ "	22 "	30 "
Alspice	½ oz.	9 oz.	¾ "
Bacon	15 lbs.	270 lbs.	360 "
Beans	8 "	145 "	195 "
Butter	4¾ "	85 "	115 "
Biscuits	6 "	110 "	145 "
Baking Powder	¼ "	4½ "	6 "
Beef (corned)	8 "	145 "	195 "
Barley	½ "	9 "	12 "
Beef (extract)	½ "	9 "	12 "
Corn Meal	1½ "	27 "	36 "
Coffee	1 "	18 "	24 "
Corn Starch	1 "	18 "	24 "
Candles	2 "	36 "	48 "
Currants	1 "	18 "	24 "
Codfish	1½ "	27 "	36 "
Cheese	1¾ "	31 "	42 "
Cream (condensed)	1½ cans = 1½ "	27 cans = 27 "	36 cans = 36 "
Corn (canned	¾ " = ¾ "	13 cans = 13 "	18 " = 18 "
Essence (lemon	1/9 bottle = 2/9 oz.	2 bottles = 4 oz.	3 bottles = 5⅓ oz.
Essence (vanilla)	1/9 " = 2/9 "	2 " = 4 "	3 " = 5⅓ "
Essence (ginger)	1/9 " = 2/9 "	2 " = 4 "	3 " = 5⅓ "
lour	37½ lbs.	675 lbs.	900 lbs.
Ginger	½ oz.	9 oz.	¾ "
Ham	10 "	180 lbs.	240 "
Hops	1/18 "	1 "	1½ "
Jam	1½ "	27 "	36 "
Lime Juice	½ pt.	9 pts.	1½ ga.
Lard	2 lbs.	36 lbs.	48 lbs.
Molasses	3 pts.	7 gals.	9 gals.
Milk	2 cans = 2 lbs.	36 cans = 36 lbs.	48 cans = 48 lbs.
Matches	2/9 bxs.	4 bxs.	5⅓ bxs.
Macaroni	¼ lbs.	4½ lbs.	6 lbs.
Mustard	2 oz.	2¼ "	3 "
Marmalade	½ lbs.	9 "	12 "
Nutmegs	¼ oz.	4½ oz.	6 oz.
Oatmeal	5 lbs.	90 lbs.	120 lbs.
Onions	2 "	36 "	48 "
Pork	13 "	216 "	290 "
Peas	3 "	54 "	72 "
Prunes	2 "	36 "	48 "
Potatoes (dessicated)	2 lbs.	36 lbs.	48 lbs.
Pepper	1¾ oz.	2 "	2⅝ "
Pickles	¾ pt.	1¾ gals	2¼ gals
Peaches (dried)	2 lbs.	36 lbs.	48 lbs.
Rice	1¾ "	31 "	42 "
Raisins	1 "	18 "	24 "
Sugar (white)	10 "	180 "	240 "
Syrup	1 pt.	2¼ gals	3 gals
Salt	1½ lbs.	27 lbs.	36 lbs.
Soap (washing)	1½ "	27 "	36 "
Soap (toilet)	1 cake	18 cake	24 cks.
Soda	1/16 lbs.	1⅛ lbs.	1½ lbs.
Soup (condensed)	½ "	9 "	12 "
Tea	2 "	36 "	48 "
Tomatoes	1 can = 2½ "	18 cans = 45 "	24 cans = 60 "
Tobacco (chewing)	¾ "	13 "	18 "
Tobacco (smoking)	1½ "	27 "	36 "
Tapioca	½ "	9 "	12 "
Vinegar	½ pt.	9 pts.	1½ gals
Vegetables (compr'd)	½ lbs.	9 lbs.	12 lbs.
Worcester Sauce	½ bottle = ¼ pt.	9 bottles = 4½ pts.	12 bottles = 6 pts.
Yeast	½ bx.	9 bxs.	12 bxs

The following named articles may be selected by the District Engineer in quantities varying from the above list but retaining the same relative amount of meat and vegetable food as given in the list:—

Bacon, Pork, Corned Beef, Ham, Peas, Rice, Oatmeat, Cornmeal, Buckwheat Flour, Condensed Soup, assorted Jam and Marmalade.

If District Engineers find from further experience that too liberal an allowance of any article is shown on this list, they should reduce their orders accordingly and advise Headquarters. Greater proportions than shown on list should not be ordered without special authority.

Assistant Chief Engineer's Office,
Ottawa, Dec. 19th, 1905.

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY

MEDICINE CHEST CONTAINING MEDICAL EQUIPMENT FOR ENGINEERS IN CHARGE OF PARTIES.

One tin box with lock, key and strap, of neat size, to contain the following:
Bandages, gauze, 2″ wide, 6 yards long, ½ doz.
Bandages, gauze, 3″ wide, 6 yards long, ½ doz.
Carbolized wool in ¼ lb. packages, 1 lb.
Carbolized lint, in ¼ lb. packages 1 lb.

Housewife made of canvas and tied with a tape; the inside of the housewife to have straps to hold the following:

A. Scissors, straight, with antiseptic lock; length 5″.
B. Bistoury, curved, sharp and scalpel with plain spring.
C. Needles, surgeons, in antiseptic oil, six only,
D. Catgut, No. 0, 1 and 2, in antiseptic oil, one bottle.
E. Silk, carbolized, No. 1, 2, and 3, each, one reel.
F. Pins, safety, size 1 ½, one doz.
" " common, three doz.

Field tourniquet, rubber tube with clasp.
Zinc ointment, ¼ lb. pot.
Blue ointment ¼ lb. pot.

Poroplastic felt, for splints, one piece the length of the tin containing box and ten inches wide.

Surgeons rubber adhesive plaster, 7″ wide and one yard long.

Tablets, Bi-chloride of mercury, antiseptic..25 labelled "POISON" and directions on bottle.

Aromatic spirits Ammonia, labelled with dosage 3 oz.

One tin pill box with cover, hinges and clasp, large enough to contain the following bottles, packed closely in compartments to prevent breakage. The inside cover of the pill box to have the directions for use of the remedies enclosed. These directions to be printed or typewritten.

No. 1. Rheumatic pill.....100
Sodium Solicylat.....gr. 7½
Vinum Colchi. min.....V
Sodium Bicarbonate.....gr. 2·
Oil of Wintergreen.....

No. II. Pill, lead and opium, for diarrhoea.....100
Acetate of lead.....gr. 2
Powdered opium.....gr. ½
No. III. Pill, sulphate of quinine...gr. 5.....100
No. IV. Pill, strychnia sulph...gr. 1/60.....100
No. V. Pill, morphia sulph...gr. ¼.....100
No. VI. Cough Tablets.....200
Ammon. carb.....gr. 1
Pulv. squills.....gr. ¾
Pulv. senegae.....gr. ¾
Tinct. camph. Co.....M. V.
Terpin hydrate.....gr. 1
No. VII. Cathartic No. 1.....100
Pil. Cath. Co.
No. VIII. Cathartic No. 2.....100
Calomel.....gr. 2½
Sodii bicarb.....gr. 2½
No. IX. Antifebrile tablet.....100
Phenacetine.....gr. V
Caffeine at.....gr. II
Antiseptic powder (Jeys) with plain tin shaker.....oz. I.
Perry Davis' Pain Killer.....½ doz.
Minard's Liniment.....½ doz.
Carbolic Acid Ointment.....¼ lb. box

Directions for the use of medicines in a pill box to be pasted on inside of tin cover also on a loose card in inside of box.

RHEUMATISM. Pain and swelling of joints with fever.
Use one pill of No. I every three or four hours. Keep warm. Wrap inflamed joint in wool. Bowels well moved by two pills of No. VIII.

DIARRHŒA. Take one or two pills of No. VII or VIII in four hours afterwards take one pill of No. II and repeat in four hours if diarrhœa persists.

CONSTIPATION. One or two pills of No. VII or VIII at night.

COUGH. One pill No. VI every three hours.

FEVER. One pill No. IX every four hours.

PAIN. One pill No. V. every four or six hours—not over four pills in twenty-four hours.

FAINTING and SUNSTROKE. Revive with ammonia. Give one pill No. IV. every three hours. If fever use No. IX.

DRESSING WOUNDS. Dissolve one-half of one antiseptic tablet in water, bathe wound, dust in antiseptic powder and apply lint and bandage.

TO STOP HEMORRHAGE. Wind tourniquet around limb above the joint higher up than the wound.

FOR LICE. Wash well with soap and water. Cover surfaces with blue ointment and change underclothes.

FRACTURES. Soak felt in hot water. Then cut to fit the limb.

Office of the Assistant Chief Engineer.
December 22nd, 1905.

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY

CONTENTS OF CACHE KEEPER'S CASE

One Pill Box containing:—
No. 1. Rheumatic pill.....100
Sodium Solicylat.....gr. 7½
Vinum Colchi, min.....V
Sodium Bicarbonate.....gr. 2½
Oil of Wintergreen.....Q.S.
No. II. Pill, lead and opium, for diarrhoea,.....100
Acetate of lead.....gr.2
Powered opium.....gr. ⅓
No. III. Pill, sulphate of quinine...gr. 5.....100
No. IV. Pill, strychnia sulph...gr. $\frac{1}{60}$.....100
No. V. Pill, morphia sulph...gr. ¼.....100
No. VI. Cough Tablets.....200
Ammon. carb.....gr. 1
Pulv. squills.....gr. ¾
Pulv. senegae.....gr. ¾
Tinct. Camph. Co.....M. V.
Terpin. hydrate.....gr. 1
No. VII. Cathartic No. 1.....100
Pil. Cath. Co.
No. VIII. Cathartic No. 2.....100
Calomel.....gr. 2½
Sodii bicarb.....gr. 2½
No. IX. Antifebrile tablet.....100
Phenacetine.....gr. 5
Caffeine At.....gr. 2
Absorbent cotton.....½ oz.
Bandages, gauze, 3″ wide, 6 yards long.....¼ doz.
Lint, absorbent.....1 oz.
Adhesive Plaster.....1 yd.
Carbolic Acid Ointment.....2 oz.
Office of the Assistant Chief Engineer.
December 22nd, 1905.
3 pads Letter Head Paper.
6 Penholders.
30 large Envelopes.
12 Pay-Roll Forms.
100 small Envelopes.
1 Requisition Book.
6 Scribbling Pads.
1 Diary, 1906.
4 HHHH Pencils.
1 Canadian Almanac.
12 HH Pencils.
12 Transit Books.
12 HB Pencils.
6 Level Books.
150 feet Tracing Profile Paper.
150 feet Tracing Paper.
10 yards Tracing Cloth.
30 feet Drawing Paper.

24 Thumb Tacks.
1 Stencil for rods.
½-pint mixed Carmine Red Paint.
1 pint White Paint.
1 pint Black Paint.
2 Account Books.
2 sticks India Ink, good quality, water colors (red and blue).
1 box Hub Tacks.
12 copies of Form 12.
1 sheet Blotting Paper.
2 lbs. Red Keel
6 blue Oil Chalks.
1 set Contract Forms.
24 Paper Fasteners.
1 package Pins.
3 Ink and Pencil Erasers.
3 Soft Rubber Erasers.
9 Rubber Tops for Pencils.
2 Aneroid Barometers.
1 Hand Level.
1 Compass.
2 set Squares.
1 Protractor.
1 Steel Straight Edge, 30″.
2 sets Rod Papers.
½-pint LePage's Glue.
1 pint bottle Sizing.
1 pint bottle Varnish.
1 100′ Brazed Link Chain.
3 Square Links.
2 50′ Chesterman Tapes, reading to 10ths.
3 Brushes for Paint, small and stencil use.

CONSTRUCTION.

45. Ten to twelve miles will usually be allotted to each Resident Engineer.

It will be the duty of the Resident Engineer immediately on reaching his residency to study carefully the specifications, contract and plans, so as to be prepared to decide promptly all questions that may arise within the scope of his authority, and in order to ensure this end, he will confer with his District Engineer on all points that seem to him to require explanation. He will inform himself fully of all the rules and matter contained in these instructions, and conform his work thereto in every particular. He will do all the instrumental work required on his residency in order that the contractor may rapidly and satisfactorily carry on the work in accordance with the plans, specifications and contract. He will make up monthly and final estimates of all work done in his residency in accordance with Form Nos. 4 and 5.

He will treat contractors with courtesy and will give them the aid necessary to expedite the work, and see that the conditions called for in the plans, specifications and contracts are complied with.

RESIDENT ENGINEER REPORTS.

46. The Resident Engineer will report to the Division Engineer, if there is one, otherwise to the District Engineer.

SUPPLIES.

47. The Resident Engineer will by requisition through his immediate superior, obtain the following supplies; and in future requisitions, maintain such list at all times while the work is under way:

2 pads Letter Heads.
12 No. 303 Pens.
6 No. 170 Pens.
24 Assorted Pens.
1 bottle Water-Proof (Higgins' Chin-Chin) Ink, black.
1 paper Pins.
50 large Envelopes.
100 small Envelopes.
1 bottle Writing Fluid.
1 bottle Copying Fluid.
1 stick Japanese Ink.
1 box Assorted Rubber Bands.
1 bottle Water-Proof (Higgins' Chin-Chin) Ink, blue.
1 bottle Water-Proof (Higgins' Chin-Chin) Ink, red.
Windsor & Newton's Colors—1 cake Blue.
1 cake Carmine.
1 cake Cobalt Blue.
1 cake Vermillion.
1 cake Chrome Yellow.
1 cake Venetian Red.
1 cake White.
1 cake Olive Green.
1 cake VanDyke Brown.
1 cake Chrome Orange.
1 cake Paynes' Gray.
1 cake Scarlet Lake.
1 cake Burnt Sienna.
1 box Paper Clips.
1 copy Instructions.
1 Levelling Rod.
2 Pickets.
2 3½-lb. Axes, with handles.
5 lbs. Red Keel.
6 Blue Oil Crayons.
1 pot, ½-pint, Red Paint, with brush.
1 copy Specification Contract.
5 yds. Plate A Profile Paper.
5 yds. Plate A Tracing Profile Paper.
5 yds. Tracing Cloth.
5 yds. Cross Section Paper, 10ths.
5 yds. Tracing Paper.
5 yds. Duplex Manilla Paper.
1 100 Roe Aluminum Plated Steel Band Chain.
2 50′ Chesterman Metallic Tapes, with 2 extra Fillers, divided feet and 10ths.
3 Sheets Blotting Paper.
2 Transit Books.
1 large Cross Section Book, office record.
6 3H Pencils.
3 Penholders.
12 Pay Rolls.

1 Portable Roll Copying Press.
1 lb. Tinned Tacks.
4 Level Books.
2 Cross Section Books.
3 6H Lead Pencils.
6 No. 3 Pencils.
24 Estimate Sheets.
12 Scratch Pads.

SIZE OF PARTY.

48. Resident Engineer will be allowed a rodman, tapeman and one extra axeman. If more help is required, owing to heavy work, he will ask the District Engineer to supply same.

NOTICES TO BE SENT.

49. The Resident Engineer on his arrival at his residency will promptly notify his Division and District Engineer and the Chief Engineer, stating his post office, telegraph and telephone address.

WORKING PROFILE.

50. The Resident Engineer will obtain from the District Engineer data from the location profile to make up a working profile on Plate A profile paper, similar in every way to the sample working profile herewith. This working profile will show in pencil the approximate quantities and contemplated overhaul.

BOOKS REQUIRED.

51. The resident Engineer will keep a transit book, level book, field and office cross section book, Form No. 8, bridge book, pile recorder's book, memorandum book, and office diary.

On the fly leaf of each book write the title, give the number of the residency, the letter of the District, name of the Engineer in charge and address thus:

"Bridge Book."
"Residency No. 6, District A."
"John Jones, Resident Engineer."
"Grand Falls, N.B."

Do not mark the cover, number the pages, date your entries, index your book, be sure and enter in the book all original measurements, do not transcribe notes from other sources, only original notes should appear. In the Transit Book should be entered all notes, reference hubs, land and other lines, etc., so as to have a complete record of the alignment and land boundaries, names of owners, occupants, etc. In the Level Book all centre line levels will be entered up, bench marks, etc.

In the Cross Section Book, Form No. 8, all original entries of all cross sections will be entered. All original notes must be set down in the book in the field. The customary way of entering cross section notes usually followed in American practice wherein the original observations are not entered, but instead the cut or fill, will not be allowed. Make your entries continuously, leaving enough blank pages to summarize everything in its proper place. Index each Section Station by Station, keeping the quantities in each mile separate. Never erase a line, if an error has been made draw lines across it and write the words "Cancelled erroneous"; if notes are continued on a succeeding page refer to it and on that page write the words "forward from page."

LENGTH OF SECTION.

52. Sections will usually be one mile in length. Give the name of the contractor on each section, note the beginning and ending stations of their work, with dates of such beginning and ending of work. Plot all the excavations on cross section paper, 10 feet to one inch; each day's cross section work to be plotted, and the quantities computed the same day the measurements are taken, with the area of the section inked in. On this plotted section as the excavation is made note accurately the character and classification of the materials found in the cut. See sample sheet Plate E; the cross section book should also contain the monthly estimate of grading, with the volume excavated each month. The cross section sheet should be colored with the proper color for the month showing the area excavated. So in like manner the progress profile should have the volume colored with the appropriate color.

BRIDGE BOOK.

53. In the standard bridge book the notes of bridges, culverts and other structures, as well as drainage and other special matter, should be entered. On the left hand page, all bills of timber, piling and quantities should be entered, and on the right hand page a sketch of the structure, showing a ravine section; full notes of pile driving as per form below shall be taken, also kind of material penetrated; in case of masonry or concrete culverts or other structures, sufficient dimensions must be shown to enable the quantities to be calculated; describe fully and carefully the exact kind of material the structure is founded upon. Give the quantities, classification and disposition of the excavated material. Particular care is required to insure absolutely safe foundations. No chance will be taken; in case of doubt consult the District Engineer. Under each structure enter the name of the contractor and the foreman in charge of the work, the date in which work started and ended. The Bridge Book, properly filled up, will be returned to the District Engineer as a final estimate on the completion of the works therein entered.

PILE AND TRESTLE BRIDGES.

54. In the construction of pile and trestle bridges, a competent Inspector will be supplied, whose duty it will be to watch the driving of piles at all times and to keep a record of all piles driven. The Inspector shall require piles to be driven such depth as will make them secure against being washed out by scour, and in accordance with the clause of the specifications relative to pile-driving. See Section of Specifications 145.

The record of all pile and trestle bridges shall be kept in a book ruled and headed as per sample herewith. For convenience in designating any particular stick of timber, he will call the first bent nearest to Moncton, Panel A; the second bent and span, Panel B, etc. Piles, posts, stringers, guard rails, will be numbered from left to right (i. e, south to north) and the bridge ties will be numbered in the same direction as the letters of the panels. The position of the bridge will be designated by the station and plus of its beginning and end—and the number of the same. In accordance with the above plan, it is easy to understand the location of a timber, as pile B3—Stringer A3 or bridge tie 38, as the case may be. The record kept by the Inspector must show the depth to which each pile is driven, the depth by the last five blows of the hammer and the depth by the last blow. The form of this record to be as below.

Bridge No. 10 } Weight of hammer, 3,000 lbs. Steam hoist, quick actions,
Stations 160+60 } or as the case may be.

PANEL A.

Pile Wing	Deep.	Last 5 Blows.	Last 3 Blows.	Fall of Hammer.
1	8 ft.	2 ft.	3 in.	28 ft.
2	9 ft.	2½ ft.	5 in.	28 ft.
1	14 ft.	1 ft. 3 in.	½ in.	30 ft.
2	14½ ft.	2 ft. 0 in.	1½ in.	29 ft.
3	13 ft.	1 ft. 6 in.	1 in.	30 ft.
4	15 ft.	2 ft. 0 in.	2 in.	30 ft

PANEL B.

PANEL C.

REMARKS.

The soil at this bridge is sandy at a depth of about 13 feet, below grade the piles strike a hard stratum of material with which piles cannot be driven more than 2 or 3 feet.

I had the depth to hard material also tested with water jet.

55. This record book of the Inspector will be turned over to the Bridge Engineer, who will then make up a complete record for each bridge in form as shown below, in which (a) represents the height of pile from the surface of the ground to the top of cap timber, and (b) represents the length of the pile below the surface of the ground. Following the record of the piles there must be a complete bill of piles and other material used in the construction of the bridge, and a memorandum of any facts of interest or importance connected with the situation of the bridge or its surroundings. In this record and in their proper place, all timber culverts and cattle guards must be entered, with description, dimensions and bill of material; also, all truss bridges, with location, description, and dimensions and bill of material in the floor system.

Bridge No. 10. Station 160 + 60.

PILE.

Panel. A	1 a=6½ ft. b—14′	2 a=7′ b—14½	3 a=8½′ b—13′	4 a=9′ b—15′
B				
Wing Pile				

BILL OF PILES USED.

159 16
78
20
40

REMARKS.

This is a pile bridge. The piles are driven in sandy soil, striking a stratum of hard pan at a depth of 20 feet, below the Cap timber.

BILL OF MATERIAL.

Pcs.	Size.
Stringers	8″ x 16″ x 26′
Caps	12″ x 12″ x 14′
Guard Rails	8″ x 9″ x 16′
Sway Braces	3″ x 10″ x 20′
Retaining plank	—600′ B.M.
Packing bolts.	
G. R. Braces	
Drift Bolts	
Spools	
Washers	

FORCE RETURNS.

56. The Resident Engineer will secure force returns from the contractor once a week; this return shall be taken personally by some person in the employment of the Commissioners, and must be verified with the contractor's time book. It will show the number of men employed each day, the number of teams, hoisting engines, derricks, etc., all classified as called for in Form 54.

Under remarks note any special information. At the end of each month summarize the force returns giving daily average and total days' work, average wages paid for men and teams, all the information called for in Form No. 55. Send one copy to the District Engineer's office and one copy to the Chief Engineer, Ottawa, Ontario.

Under remarks briefly state the progress of the work in each mile, the location of pile driver, steam shovel, etc., and station at end of track, etc.

MONTHLY PAY ROLLS.

57. On the first day of every month all pay rolls are to be made out, with deductions, if any, in triplicate, on Form No. 143.

Personal expenses statements are to be made out on Form No. 22, in triplicate. **Expense Account**

All bills are to be rendered in triplicate, to which certificate of receipt of goods or service, as the case may be, shall be attached. **Bill**

Approximate monthly estimates in triplicate will be prepared on Form Nos. 4 and 5. **Estimate**

Progress profile will be made up in accordance with sample sheet. **Progress Profile**

All to be certified to and signed by the Engineer in charge and forwarded by first mail to the District Engineer who will approve same and forward to the Chief Engineer.

CHECK ALIGNMENT.

58. The Resident Engineer on taking charge of his residency will as quickly as possible check all curves, spirals, tangents, run check levels over the residency, reporting at once to the District Engineer any errors found. He will reference all B.C., E.C. or other points, B.M's etc.

LOCATION STATIONS TO BE PRESERVED.

59. The final location stations are to be maintained throughout the work, and all records must conform to them. Should errors or discrepancies be found note the amount, long or short, giving its correct length, but preserve the station number. The track chaining must also agree with the location stations.

MILE POSTS.

60. The station for each mile post will be given the Resident Engineer, and the beginning and ending of mile thus shown must be maintained throughout the work in all records. All material excavated from cuts, borrow pits, ditches, etc., must be estimated on the mile where such material was excavated. The cost of every item of work on each mile must be kept separate, so that if material is hauled from one mile to another it must be so designated in the book, showing such mileage cost. In case a borrow pit is opened on one mile and the material goes to another, such excavation will be charged against the mile where the earth is placed in the embankment.

PROGRESS PROFILE—HOW COLORED.

61. A progress profile is to be used as a monthly progress report of work done, and will be prepared on Plate A profile paper, in every respect similar to the sample sheet Plate E, and will be forwarded as stated in Section 58. It will be returned to the Resident Engineer each month in time for him to post up for the month. Show in colors for the given month, as below, the excavations moved and embankment placed. Show the index of these colors under the title in the profile. For January, Cobalt blue; February, vermillion; March, chrome yellow; April, Venetian red; May, white; June, olive green; July, Vandyke brown; August, Antwerp blue; September, chrome yellow; October, Payne's grey; November, scarlet lake; December, burnt Sienna.

Show on the profile the direction the excavation is being hauled by arrows and by plotted haul. Note above each structure in ink, the date work started

and ended, at what bridge the pile driver is working, end of track, etc; give the contractor's name, and such other data as will plainly indicate the progress of the work.

SUPER-ELEVATION OF OUTER RAIL ON CURVES.

62. As all curves 1° and over will have their ends eased off with transition spiral curves, the tangents will be level. The super-elevation will be put in on the spiral gradually increasing with the increased radius of the spiral, the whole amount of the super-elevation called for in the table below to be put in on the circular portion of the curve.

TABLE OF THE SUPER-ELEVATIONS OF THE OUTER RAIL ON CURVES.

Degree of Curve.	Amount of Super-Elevation of Outer Rail.	Distance to Run Out.
0°—30′	¾″	45 feet
1°—00′	1, †	60 "
1°—30′	1¼″	75 "
2°—00′	1½″	90 "
2°—30′	1⅞″	112½ "
3°—00′	2¼″	135 "
3°—30′	2⅝″	157½ "
4°—00′	3, ″	180 "
4°—30′	3⅜″	202½ "
5°—00′	3¾″	225 "
5°—30′	4⅛″	247½ "
6°—00′	4½″	270 "

STAKING OUT WORK.

63. As soon as possible the cross sections should be finished up. Plot each cross section and calculate its area the same day. All work must be staked out, ditches, creek diversions, right of way, berms, etc.; set stakes for all excavations and embankments to sub-grade, as shown on the grade line of the profile. Stake out bridge ends as shown on masonry plans, et Use good strong stakes, well driven; mark the proper station and plus on the side from the roadbed and the cut or fill on the back; mark the centre stake likewise. Cross section curves at least every fifty feet, unless the surface is practically level.

DITCHES.

64. Catchwater or surface ditches shall be staked out and be excavated at the same time as the cuts are opened; they should be neatly cut, placing the material in the embankment if required to make the fill, otherwise on the lower side in a uniform manner. Ditches should not be less than eighteen (18″) inches deep and two (2′) feet wide at the bottom, with side slope of 1½ horizontal to 1 vertical, and should be at least ten feet away from the edge of a cut. Secure a good grade to allow the water to run away freely. Keep the outlet away from the toe of the embankment so as not to endanger same. All ditches must be left clean by the contractors.

DANGEROUS TREES.

65. The Resident Engineer will specially mark all leaning trees that are liable to fall across the telegraph line, or that may fall across the right of way, standing outside thereof, and will see that they are cut down and removed as called for in the specifications, Clause 7.

LARGE BLASTS.

66. Under Clause 13 of the specifications large blasts are restricted. On hill side work the tendency of such large blasts is to throw material to waste. If it is required in an adjoining bank, the contractor must supply free of cost for every cubic yard so wasted and one-half cubic yards of other suitable material for the bank.

PUBLIC AND FARM ROADS.

67. The Resident Engineer shall take particular care to insure that, at all public and farm road crossings at all times, a safe crossing is in good order; that the contractor takes all reasonable precaution to protect the public from injury due to his operations, and will hold the contractor to a strict account in this particular matter.

CLEARING.

68. The specifications must be closely observed; dead or leaning trees within the limits called for in the specifications must be cut down and removed, the right of way must be left clear. *Great care must be taken in burning brush to see that all the Provincial Fire Regulations are observed*, and every precaution must be insisted upon to insure the protection of the forest from fires. **Fire in Bush**

GRUBBING.

69. See that all grubbing is burned up and that the specifications are strictly adhered to. Grubbing will not be estimated in cuttings over four feet in depth (see Clause 11 of specifications).

CENTRES.

70. Resident Engineers will give centres in all cuttings from time to time to ensure the contractor excavating to the required lines and slopes, and will see that the slopes are left clean and true. Projecting or dangerous rocks on slopes must be removed. Slides of rock loose or solid must be carefully guarded against. **Projecting Rocks Slide**

BACKFILLING ROCK CUTS.

71. Backfilling in rock cuts must not be done until the required excavation one foot below grade is finished. The material used shall be broken stone, or coarse, clean gravel.

EMBANKMENTS.

72. Embankments are to be built of the full width and slope called for in the specifications. In setting out formation width, make proper allowance for subsidence as called for under Section 39 of the specifications. Embankments up to 16 feet in height will be 16 feet wide at formation level, beyond this height 18 feet wide, side slope for earth 1½ to 1, for rock 1 to 1.

BORROW PITS.

73. Borrow pits will be staked out when and where required; they must be left clean and neat with slopes of 1½ horizontal to 1 vertical, and must not be excavated closer to right of way lines than three feet and not closer to the toe of embankments than the distance called for under Section 30 of the specifications. Where possible they should always be left so that they will drain through the nearest opening.

FINISHING STAKES.

74. Resident Engineers will set accurately, square strong stakes at each station, marking the toe of the embankment, correct as to finished levels and line, and will see that the embankments are graded so that when full settlement takes place they will conform to such stakes, and that the cuttings are excavated cleanly and neatly to the full lines.

STATION GROUNDS.

75. Resident Engineers will secure plans of station grounds and will not allow any borrowing to be done within the limits of the site. Tracks and buildings, drains, etc., will be accurately located and staked as shown on the plan.

TRACK CENTRES.

76. Track centres will be accurately set. Stations on tangents to be every 100 feet, on curves every 50 feet. Mark the beginning of the adjusted curves centres at 30 feet intervals on same, also the ending of the spiral; rails must be laid with broken joints; in passing around curves shorter rails will be provided in order that the centre of one joint shall, as near as may, be opposite the centre of the opposite rail. Rails should not be cut. Track must be fully spiked as it is laid and the spikes must be set vertical, and driven home so closely as to hold the rail firmly to the tie, but not so hard as to break the head of the spike. The tracks must be gauged as spikes are driven at "joints," "centres", and "quarters", and no excuse will be taken for inaccurate gauging. On straight lines track will be gauged to 4 feet 8½ inches. On curves, in accordance with the following, viz:

1°, curve = 4 ft. 8⅝ in,; 2°, 4 ft. 8⅝ in,; 3°, 4 ft. 8¾ in.; 4°, 4 ft. 8¾ in.; 5°, 4 ft. 8¾ in.; 6°, 4 ft, 8⅞ in.; 7°, 4 ft. 8⅞ in.; 8°, 4 ft. 8⅞ in.; 9°, 4 ft. 9 in.; 10°, 4 ft. 9 in.

The joints must be firmly secured in place by the full number of bolts well drawn up, and special attention should be paid to the adjustment of any nut lock device which may be used.

Ballast Grades

Ballast grades will be set and the top of the rails must conform to the level called for by them. Particular care is demanded in packing the ties; the tamping must be thorough, the tie thoroughly supported throughout, the space between the ties packed full and the shoulder at the end of the tie as called for in specifications, and cross sections of same. The slopes to be neatly and exactly laid to that called for. Particular care will be taken to set the ballast grade stakes on curves to give the proper super-elevation called for, the inner rail being kept to the true grade. On spiral curves the super-elevation will be gradual and proportionate to that on the circular curve, the tangents being level.

SWITCHES.

77. Special attention should be given to the laying out of switches, turnouts and frogs. The frogs, of angles of 6° 22′ and those of 9° known as number 9 and number 6½, only will be used.

All turnout curves are considered as beginning at the fixed end of the slide rail, and all Engineers must make their calculations for determining the position of head-block and point of frog on this basis. Sidings at different distances from the main track will be located, in the absence of special instructions, according to the following table, the turnouts being from straight lines.

TABLE SHOWING ALIGNMENT OF SIDINGS.

Distance from Siding to Main Track, Centre to Centre	Turnout Curve		Length of Tangent	Curve Returning Parallel with Main Track	
	Degree	Length		Degree	Length
12 ft.	7°, 30′	95.8 ft.	.....	7° 30′	95.8 ft.
13 ft.	7°, 30′	99.7 ft.	.....	7° 30′	99.7 ft.
14 ft.	7° 30′	103.4 ft.	.....	7° 30′	103.4 ft.
15 ft.	7°, 30′	107.1 ft.	.....	7° 30′	107.1 ft.
16 ft.	7°, 30′	110.7 ft.	.....	7° 30′	110.7 ft.
17 ft.	7°, 30′	114.1 ft.	.....	7° 30′	114.1 ft.
18 ft.	7°, 30′	117.4 ft.	.....	7° 30′	117.4 ft.
19 ft.	7°, 30′	120.0 ft.	1.13 ft.	7° 30′	120.0 ft.
20 ft.	7°, 30′	120.0 ft.	7.52 ft.	7° 30′	120.0 ft.
22 ft.	7°, 30′	120.0 ft.	20.31 ft.	7° 30′	120.0 ft.
24 ft.	7°, 30′	120.0 ft.	33.09 ft.	7° 30′	120.0 ft.
26 ft.	7°, 30′	120.0 ft.	45.88 ft.	7° 30′	120.0 ft.
28 ft.	7°, 30′	120.0 ft.	58.66 ft.	7° 30′	120.0 ft.
30 ft.	7°, 30′	120.0 ft.	71.45 ft.	7° 30′	120.0 ft.
40 ft.	7°, 30′	120.0 ft.	135.38 ft.	7° 30′	120.0 ft.
50 ft.	7°, 30′	120.0 ft.	199.30 ft.	7° 30′	120.0 ft.
60 ft.	7°, 30′	120.0 ft.	263.23 ft.	7° 30′	120.0 ft.

The ends of switch ties must be laid off to a line parallel with the nearest rail. Guard rails opposite frogs shall be cut twelve feet long and bent to a standard pattern upon formers. The gauge of track of all turnout leads shall be 4′, 8⅝″, and this width must extend from the fixed end of the slide rails to the heel of the frog.

BUILDINGS.

78. The location of all buildings will be decided in the office of the Chief Engineer, and the Bridge and Building Engineer will receive instructions in regard to location. Special care must be taken in the laying out and construction of foundations, and a full record must be kept of the dimensions of all masonry built. The following rules will govern the location of all buildings and platforms, as to their distance from tracks, viz.: The tops of all platforms adjacent to the main track should be 12 inches above the top of the rail (conforming to the grade of the track) and the nearest edge of the platform 2 feet 9 inches from the gauge side of the rail. The tops of all freight platforms on side tracks for general use should be 3 feet 8 inches above the top of rail on side track (conforming to grade of track), and the edge of platform 3 feet 3 inches from the gauge side of the nearest rail. No building should be located nearer than 7 feet in the clear from the centre of the main track.

No building should be nearer than 6 feet from the centre of any side track, which is used for meeting and passing trains, or for general purposes.

All buildings or other structures, erected by corporations or other parties, and all stone, ties or timber piles for Company use, should not be located nearer than 6 feet from the nearest rail.

PERMANENT STAKES.

79. Resident Engineers will plant permanent stakes at the B. C. and E. C. of every curve and at the point of commencement of spiral curves, when the track laying and ballasting is completed; for this purpose they will requisition their District Engineer for suitable monuments.

PERMANENT BENCH MARKS.

80. Place permanent bench marks reduced to true sea-level datum.

DIARY.

81. The Resident Engineer will keep a daily record of all instructions given to contractors; he will enter the date on which work under each contractor began and ended; the date of beginning and completion of all openings and important piece of work; also notes classifying material, the manner in which the contractor handles his work and such other notes as will enable a complete accurate classification to be made; the date of any special notices or instructions served upon contractors; every item bearing upon the work should be entered daily. Record in your diary all storms, such as extraordinary high winds, heavy rainfalls, low temperatures, excessive snowfalls, etc.

LIMIT OF HAUL.

82. It must be understood that all excavation is to be hauled to the limit; no borrowing will be permitted, unless the overhaul price exceeds the earth work price. When it is necessary to waste, the material should be used to widen embankments within the limit of the free haul, waste to be uniformly and evenly distributed. No waste will be placed on the sides of cuts nor overhaul paid on waste unless first approved by the District Engineer.

The contractor should be told where the excavation is to be hauled, to avoid waste and borrow.

MONTHLY ESTIMATES.

83. The Resident Engineer will prepare on Form No. 4 approximate monthly estimates of all the work done and materials delivered on the work section by section, using a separate sheet for each section. And on Form No. 5 a summary estimate of all the work done on all the sections under one contractor. This estimate must show the total amount of work done from the beginning of the work to the end of the month for which the estimate is made, entering earth works to the nearest 100 cubic yards, timber to the nearest 1 000 feet, masonry to the nearest cubic yard, etc. Fill all the blanks, or note no work done where such is the case.

The amount due for the current month should be shown in red figures.

Note in remarks column anything affecting result, such as material hauled from an adjoining mile. Should the mile post come in the centre of a structure group the two sections together, but in general each section should be shown complete by itself.

EXTRA WORK.

84. The contract provides that all claims for extra work or material must be presented to the Chief Engineer for allowance at the close of each month in which it was done, otherwise the Commissioners are not required to allow or pay for same. Resident Engineers will write to the District Engineer for the Chief Engineer's approval for the contemplated work, noting the estimated cost. This approval will be promptly returned to the Resident Engineer and he will attach same to the contractor's bill and return both with the monthly estimate, adhering strictly to the contract that no bills will be allowed that are rendered later than the month in which the work was done. The Resident Engineer will report fully upon the proposed extra work, the reasons for same, and in general give such full information as will enable the Chief Engineer to reach a just conclusion.

CHANGES IN GRADE OR ALIGNMENT.

85. Resident Engineers will not be allowed to make changes in grades or alignment, but will promptly call their District Engineer's attention to any possible change they consider beneficial. Rates of grade fixed on the location profile will govern and must be adhered to. Vertical curves will be carefully graded to elevation called for. Easement curves will be staked as per table and according to the directions given for same.

FINAL PROFILE.

86. A final profile must be made as per sample Plate C, on a continuous roll of Plate A profile paper, 400 feet to an inch horizontal, 20 feet to an inch vertical. Leave 18 inches blank space at each end. Place a neat title at each end of the roll as shown in sample sheet. On the outside edge at both ends of the profile write "Final Profile Residency No....., District....., National Trans-Continental Railway, Eastern Division. Miles ..... to ....., Station..... to ..... On this final profile follow the general style of Plate C. Plot overhaul as shown. Give the stations and plus of the Moncton end of stringer on pile and girders and other bridges, centre of all pipes and other culverts, plus of all roads and cattle guards, names of rivers, brooks, cities, towns, villages and stations, length of sidings with plus of switch stand, semaphores, alignment, position of water tank and stand pipe, bench marks and clearing, width of right of way, fencing for each fence, gate and farm crossings; note quality and description of ballast; summarize the entire residency mile by mile, giving totals of all classifications and quantities.

FINAL ESTIMATES.

87. Quantities for final estimates are to be made up promptly and completed as fast as the work is finished. Particular care is required to secure accurate computation, and frequent checks will be made to insure accuracy. A copy of Crandall's table will be supplied and should be used in checking quantities. All final estimates will be made up in ink, that for all grading, clearing and grubbing in the standard field cross section book and be fully entered in the office cross section book in ink, fully explaining by notes, the classification and disposition of all quantities. These notes must be full and sufficient to enable the making from them of a summary, which summary will be the original of what is to appear on the final estimate sheet. Clearing and grubbing must be shown on a page by itself, and the station numbers given between which clearing and grubbing is estimated, with width of area, also the name of the contractor, the total being

placed in the summary. The notes for all excavations quantities, not entered in the cross section book, are to be referred to by notation, giving the book and page upon which they appear, such as foundation pits or other excavations, the notes of which belong to the bridge book. A total summary must be made showing each mile on a separate line for the entire residency at the end of the book, which must be signed as correct. All cross sections must be inked in, showing fully the classification lines and the total classification for each cut.

The final estimate in detail for all bridge substructures, box and other culverts, pipe drains and other structures pertaining to the case of drainage is to be returned in the bridge book, as instructed in Section 54. Such book must show quantities, classifications and disposition of all the material handled, and the notes necessary to check the quantities, together with the name of the contractor. The estimate will be made out in triplicate, be signed as correct, and forwarded to the District Engineer, who will check same, approve and forward to the Chief Engineer.

ESTIMATES NOT TO BE GIVEN TO CONTRACTOR.

88. It must be distinctiy understood that the Resident Engineer is not to give any estimates to the contractors. All such information must come direct from the Chief Engineer.

RESIDENT ENGINEER REPORTS.

89. The Resident Engineer will report fortnightly to his District Engineer, giving a concise summary of the condition of all the work in his residency.

DISTRICT ENGINEER REPORTS.

90. The District Engineer will send in to the Chief Engineer once a month, or oftener when opportunity offers, and there is matter of interest, full reports of all the work in his District.

ACCOUNTING.

CLASSIFICATION OF CONSTRUCTION EXPENSES.

ENGINEERING.

91. To this account should be charged all salaries and expenses of Engineers, Assistants, and Axemen; teams for transportation of Engineers and men to and from work, or upon trips of inspection of line of work, or incidental thereto; Engineer's instruments, rods, chains, axes, hatchets, tape lines, keel or marking chalk, stakes, profile and drawing paper, tracing linen or paper, cross section paper, transit and level books, cross section or topographical books, India ink and colors, drawing boards, stools, map cases, paper racks stationery for office or field, fuel, lights and camp equipage, and other analogous items.

Proportion of Engineers' expenses when engaged on special work should be charged to same.

RIGHT-OF-WAY AND STATION GROUNDS.

92. To this account should be charged the cost of land acquired for roadbed (of necessary width conformably to depth and slopes of excavations and embankments), station and terminal grounds; also the cost of land purchased for ingress or egress to or from station grounds; salaries and expenses of counsel, right-of-way Agent, and of Engineers and assistants when especially engaged upon such matters; stakes used to denote right-of-way limits; expenses of Appraisals, or of Juries, Commissioners or Arbitrators in condemnation cases; cost of removal of buildings when upon right-of-way, station or terminal grounds, but not included in property purchased; stationery supplied Right-of-Way Agent, Engineers, and assistants, engineers' instruments, etc., when used for such purposes; commissions paid outside parties for purchase of properties for these purposes; cost of plats, abstracts, notarial fees, recording deeds, etc.

Note particularly account No. 3, "Real Estate," as regards the cost of property purchased but not required for the operation of the road.

REAL ESTATE.

93. To this account should be charged the cost of all land purchased by the railway company in excess of that actually required for roadbed, station or terminal grounds, or other specific purpose, including all expenses incurred in connection with such purpose as enumerated in account No. 2, "Right-of-Way and Station Grounds." A portion of the cost of land purchased outside right-of-way for borrow pits or waste banks should be charged to this account.

NOTE—The amount to be charged to real estate should be an estimate of the saleable value of said borrow pits or waste banks after completion of the road.

GRADING.

94. To this account should be charged the cost of grading roadbed, whether excavations or embankments; clearing and grubbing; dressing slopes of cuts and

fills; reconstructing pikes or roads; ditching roadbeds; berm ditches; cost of material taken from borrow pits, haul if allowed; amounts paid for privilege of making waste banks outside of Company's right-of-way or station grounds; ditches for waterways not specially required by right-of-way agreement, in which case cost would be properly chargeable to account No. 2, "Right-of-Way and Station Grounds." This account includes retaining walls and other masonry or riprap for the protection of embankments, cuts, and slopes; cribbing or bulkheading built to protect the tracks or embankments along the seashore or banks of lakes and streams, including the cost of any cribs, breakwaters, wing dams, or other devices constructed to change the direction of the current of a stream to prevent the washing of the bank; also freight on material and transportation and subsistence of grading gangs.

TUNNELS.

95. To this account should be charged the cost of tunneling including such timber as may be used for centreing, packing, etc.; cost of stone, brick, cement, sand, lime, salt, piles, timber, spikes, nails, braces, concrete, etc., used in the construction or lining of the same; cost of labor preparing or securing the same, transportation, scaffolding, cofferdams, and pneumatic caissons; cost of soundings, and machinery, pumps, engines, etc.: used for such work. This account does not include grading or surfacing the roadbed, or cost of the track through the tunnel.

BRIDGES, TRESTLES AND CULVERTS.

96. To this account should be charged the cost of all bridges and trestles erected to carry tracks over streams, ravines, streets, or other railways, and culverts, both substructure and superstructure, including transportation. This account should include abutments, piers, supports, draw and pier protection; machinery to operate drawbridges; masonry ends and wing walls for culverts; cost of inspection of bridge material, either at shop or site of structure; cost of tests; cost of wing dams, cribs, or ice-breakers for the purpose of regulating the current of a stream or breaking up ice jams before reaching a bridge; also labor and material used in painting structure.

In case "false work" is furnished by the railway company for erection of bridge superstructure, the cost of same should be charged to this account, and when removed, the value of the material removed should be credited to this account and charged to the account benefitted.

TIES.

97. To this account should be charged the cost of all cross, switch, bridge, and other ties laid in the main track or tracks, sidings, spurs, gravel, and repair tracks; in tunnels, depots, shop, and other yards, shops and other buildings, etc.; on turntables, wharves, piers, track scales, inclines, bridges, trestles and culverts; to and from coal chutes, coal pockets, fuel, and water stations, etc.; also the cost of transportation, inspection, loading, unloading, and any process of preservation.

RAILS.

98. To this account should be charged the cost of rails laid in the main track or tracks, sidings, spurs, gravel, and repair tracks, in tunnels, depots, shops and other yards, shops, and other buildings, etc.; on turntables, wharves, piers, track

scales, inclines, bridges, trestles, and culverts; to and from coal chutes, coal pockets, fuel and water stations, etc.; also the cost of transportation, inspection, loading, and unloading.

TRACK FASTENINGS.

99. To this account should be charged the cost of spikes used for laying rails, and of fish and tie plates, splice or angle bars, chairs, rail braces, bolts, nuts, nut locks or washers used in connection with same; also the cost of transportation, inspection, loading, and unloading.

FROGS AND SWITCHES.

100. To this account should be charged the cost of all frogs, switches, and switch material, including switch stands (throw or lever), frog guard rails, crossing frogs, and timber, bolts, etc., used in foundations or base for same, and the cost of transportation.

BALLAST.

101. To this account should be charged the cost of all ballast, whether of broken stone, slag, gravel, or other material especially provided for this purpose; also the expense of loading, hauling, unloading alongside of track, and transportation.

TRACK LAYING AND SURFACING.

102. To this account should be charged the cost of distributing, laying, spacing, and lining ties; cost of laying, spiking, and jointing rails, surfacing and lining track; including the adjustment of rail to proper elevation, and labor of placing frogs and switches; cost of track tools, including shovels, picks, track jacks, crowbars, levers, spiking mauls, gauges, and wrenches; cost of putting in ballast; service of engines, cars, and crews distributing track material, and transportation.

FENCING RIGHT-OF-WAY.

103. To this account should be charged the cost of all material and labor used in constructing board, wire, rail, hedge, stone, or other fences along the right-of-way or limits of roadbed, and transportation; but no charge should be made to this account for fences constructed around stock yards, fuel stations, station grounds, shops, and on other properties outside of right-of-way, which should be charged to their appropriate accounts. The cost of permanent or portable fences for protection of tracks from snow should not be charged to this account, but to account No. 28, "Miscellaneous Structures."

CROSSINGS, CATTLE GUARDS AND SIGNS.

104. To this account should be charged the cost of all labor and material used in constructing farm, country-road, or street crossings at grade, overhead bridges, cattle guards, and wing fences to same, and all track signs, crossing gates, and watchhouses at crossings, and transportation.

INTERLOCKING OR SIGNAL APPARATUS.

105. To this account should be charged the cost of interlocking or signal apparatus complete, when built by contract. If built by the railway company,

the cost of labor and material, including all levers, racks, wires, pulleys, semaphores, semaphore signals, ground signals, posts, materials in box troughs, and other fixtures, tower, foundation for same, and all other work necessary to complete it, and transportation.

TELEGRAPH LINES.

106. To this account should be charged the cost of newly constructed telegraph and telephone lines, including poles, wires, billets, insulators, instruments, and all other materials used, also labor employed in the construction work, cost of all tools used, and transportation.

STATION BUILDINGS AND FIXTURES.

107. To this account should be charged the cost of all material and labor expended on all station buildings, including cost of transportation, platforms, sidewalks, excavation, foundation, drainage, water, gas, and sewer pipes and connections, steam heating apparatus, stoves, electric light and power fixtures, including wiring for same, grading and putting ground in order after building has been finished; electric bells, elevators, and all other material, furniture, or fixtures used to complete the building; wells for water supply or stations; also salaries and expenses of Engineers and Architects.

NOTE.—The account should include the cost of similar buildings on docks, wharves, and piers, when used for station purposes.

SHOPS, ROUNDHOUSES AND TURNTABLES.

108. To this account should be charged the cost of all buildings to be used as shops (including transfer tables), or roundhouses (including cinder and drop pits), and turntables; plants for heating the buildings; platforms, sidewalks, and outhouses in connection therewith; oil houses, sand houses, storehouses for company's material, scrap bins, etc. This account should include amounts paid when erected by contract; labor and material when built by company, preparing grounds before and clearing up same after construction, foundations, painting, excavation for and lining of turntable pit, and of cinder or drop pits inside or outside of roundhouses; foundation for turntable, loading, unloading, and placing turntable in position, levers and stops for handling turntable; sewerage system, connection with water supply system, shop wells; architects' fees for drawing plans, supervision of construction by Engineering Department or others; transportation and all incidental expenses. This account does not include the cost of tracks laid in connection with these buildings.

SHOP MACHINERY AND TOOLS.

109. To this account should be charged the cost of all new machinery and additional tools placed in any of the shops or roundhouses, including foundation for same; transportation, loading, unloading, and placing machinery in position. It must not include any machinery or tools purchased to take the place of those that have been worn out or destroyed.

WATER STATIONS.

110. To this account should be charged the cost of material and labor expended in the construction of water stations for the purpose of supplying locomotives with water, including cost of windmills, pumps, boilers, pumphouses, tanks,

tubs, tank foundations, track tanks, or troughs, engines and all fixtures and pipes, standpipes or penstocks and connections; wells, dams, and reservoirs or cisterns; transportation; also engineering expenses, and tools used in the work. This account must not include waterworks, wells, etc., exclusively for supply of stations, hotels, tenements, or section houses, which should be charged to the appropriate account.

FUEL STATIONS.

111. To this account should be charged amounts paid under contract for, or the cost of all labor and material expended in, the construction of coal platforms, coal sheds, coal pocket chutes, woodsheds, and racks, and all machinery or appliances necessary to equip them for service. This account includes inclines at fuel stations (except the cost of track laid thereon), tipple cars, buckets, cranes for handling same, elevating machinery, gasoline or other engines for operating same, dumping machinery, all appliances for weighing coal in pockets and opening coal pockets, transportation, architects' fees, engineering, etc.

GRAIN ELEVATORS.

112. To this account should be charged the cost of ground on which elevator is located, cost of foundations, elevator building, conveyors, fixtures, machinery complete; and all material, labor, transportation, and other charges incidental to construction. This account does not include the cost of small storage elevators at way stations, which are considered to be station buildings.

STORAGE WAREHOUSES.

113. To this account should be charged the cost of ground on which storage warehouses are located, and cost of buildings, machinery, etc., complete, when built by contract; if built by the railway company, the cost of ground, material, machinery, fixtures, and labor, transportation, and all other expenditures incident to construction.

The buildings herein referred to are not the ordinary freight warehouses or stations where freight is received for shipment, etc., but warehouses in which merchandise is stored, and which the railway company or others operate as warehouses.

DOCKS AND WHARVES.

114. To this account should be charged the entire cost of docks, wharves, ferry or other landings, and inclines to transfer steamers, including grounds and riparian rights, dredging of slips, piling, filling cribs, pile protection, building cofferdams, pumping or bailing water, masonry walls or filling, etc., transportation, and all expenses incurred in the construction of these structures, except the cost of tracks and buildings thereon.

ELECTRIC LIGHT PLANTS.

115. To this account should be charged the cost of all labor and materials, including cost of transportation, used to put in operation either arc or incandescent light plants, such as dynamos, engines for running dynamos, wire constituting lines, glass globes, carbon or arc lights, carbonized filament for incandescent lights, poles, hangers for lights, insulators, and every expense incidental to the erection of the plant. When it is necessary to erect a building for an electric light plant, the entire cost of the same, including ground, should be charged to this account.

ELECTRIC MOTIVE POWER PLANTS.

116. To this account should be charged the cost of ground on which electric-power stations are located, and the cost of erection of power and car sheds, including all expenditures for labor and material, stationary engines, boilers, and machinery, pumps, condensers, foundations, and settings for steam plants; generators, foundations, and settings, switchboard, and lighting apparatus for electric plants; current conductors, including poles, wires, and labor for overhead work, third rails, fastenings for same and labor laying same, with cost of inspecting, loading, and unloading; feed wires, track-bonding, and grade crossing cut-outs; and all other expenditures connected with the installation of plants intended to generate and distribute electricity for motive power, including transportation.

GASMAKING PLANTS.

117. To this account should be charged the cost of all labor and material, including cost of transportation, used to put into operation a gas-making plant complete. The cost of ground on which the plant is located should also be charged to this account.

MISCELLANEOUS STRUCTURES.

118. To this account should be charged the cost of structures of every character, including cost of material, labor, transportation, and all incidental expenses connected therewith, which are permanent or a betterment to the property and enter into the cost of road, and which are not otherwise herein particularly referred to, and or which no account has been provided; the object being to designate one general classification, to which may be charged the cost of all minor superstructures, and in this way avoid increasing the number of general accounts.

LEGAL EXPENSES.

119. To this account should be charged the amount of all attorneys' salaries, fees, and expenses, and all other incidental legal expenses incurred during the process of construction of a road, except when the expense can be charged directly to the account for which it is incurred.

INTEREST AND DISCOUNT.

120. To this account should be charged discount on securities sold; interest on loans effected, and on notes issued for construction purposes or overdue payments to contractors or other creditors, and discount, interest, and exchange on other commercial paper issued for a similar purpose. Premium realized from sale of bonds, stock, or other securities should be credited to this account. Discount or premium realized from sale of bonds, stock, or other securities for a specific work should be applied to such work.

GENERAL EXPENSES.

121. To this account should be charged organization expenses, and expenses incurred in the disposal of securities; salaries and expenses of general officers of a road under construction, clerks in general offices engaged on construction accounts or work, stationery, and office expenses; also all items of a special and incidental nature which can not be properly located under any other account.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 2

Table of values for equating distance rise and fall and curvature.

(See Page 15 of Report)

Drawing No. 59.

THE NATIONAL TRANS-CONTINENTAL RAILWAY.

Table of Values for Equating Distance, Rise & Fall, and Curvature, &c.

Class	Value per Train Mile	Value per foot per Daily Train per Annum	Capitalized Value per foot per Daily Train per Annum	Capitalized Value per Mile per Daily Train per Annum	Saving effected per Daily Train per Annum per Mile of Shortening	Justifiable Expenditure per mile of saving in distance for 12 Daily Trains per Annum	Justifiable Expenditure per mile of saving in distance for 20 Daily Trains per Annum	*Distance.* Capitalized Values per Mile to nearest $100 and interest 4%. *One* daily train each way equals *two* daily trains.
	$ c	$ c	$ c	$ c	$ c	$ c	$ c	
A.....	0 30	0 02	0 50	2,600 00	104 00	31,200 00	52,000 00	Distances so short as not to affect Track or Train Wages; aggregating less than 2 Miles.
B.....	0 50	0 03.4	0 85	4,500 00	180 00	54,000 00	90,000 00	Distances affecting Train Wages, but not so great as to affect the number of Stations or Sidings—From 2 to 5 miles.
C.....	0 60	0 04	1 00	5,300 00	212 00	63,600 00	106,000 00	Distances so great as to affect number of Stations and Sidings required—From 5 to 75 miles.
D.....	1 00	0 07	1 75	9,200 00	368 00	110,400 00	184,000 00	Distances so great as to affect number of Engine Districts—Over 75 Miles.

Class	Value per Foot Rise & Fall per Daily Train per Annum	Capitalized Value per Foot Rise & Fall per Daily Train per Annum	Justifiable Expenditure per ft. of saving in Rise & Fall for 12 Daily Trains per Annum	Justifiable Expenditure per ft. of saving in Rise & Fall for 20 Daily Trains per Annum	*Rise and Fall—All Trains.* Freight Train Velocity Limits—30 Maximum—10 Minimum, Miles per hour.
	$ c	$ c	$ c	$ c	
A Minor Grades.....	0 12	3 00	36 00	60 00	All Rise & Fall up to 30 ft.
B Minor Grades.....	0 48	12 00	144 00	240 00	Where grades require shutting off Steam, but not application of Brakes, in descending.
Ruling "	0 88	22 00	264 00	440 00	This class includes all Rise & Fall of over 30 feet on grades less than 0·6% and between 30 ft. and 100 ft. on 0·6% grade and steeper grades of small drop not covered under Class C.
C Minor Grades.....	1 00	25 00	300 00	500 00	Where grades require the application of Brakes and shutting off Steam descending.
Ruling "	1 40	35 00	420 00	700 00	This class includes all Rise & Fall of over 100 Feet on grades of 0·6% and a proportionate fall on steeper grades.

NOTE:—1 degree of Curvature means 1 degree of Central Angle regardless of radius of Curve. It is assumed that expense due to Curvature is in proportion to total Central Angle.

Curvature—All Trains.

The Elimination of 1 degree of Curvature will save 16 cents per Daily Train per Annum (including passenger and freight trains); equal to Capitalized Value of $4.00 per Degree.

Justifiable Expenditure per degree of saving in curvature for 12 daily trains, $48; and for 20 daily trains, $80.

If a curve is in a particularly dangerous place which necessitates a Watchman or other additional expense the value of its elimination must be considered separately.

Assumed Costs per Freight Train Mile, Engine Mile, &c.

Train Mile $1.00, Engine Mile $0.35, both assisting and returning light; if assisting both ways with no light running $0.40.

Minimum cost for Assistant Engine when not at Divisional Point or used for Yard Work $18.00 per day or $6,600 per annum.

Light running $0.25 per Engine Mile, Switching $0.30 per Engine Mile, Doubling Grades $0.90 per Engine Mile straight distance, or $0.45 per additional Engine Mile.

Level Crossings of other Railways::—

Justifiable Expenditure to save one normal level crossing, $40,000

NOTE:—For calculating Justifiable Expenditure per Mile, 10 Daily Trains each way (equal to 20 Daily Trains) will be assumed between Moncton and Quebec, and between Winnipeg and Junction of Branch to North Bay.

Between other points 12 Daily Trains will be assumed.

Justifiable Expenditure per mile takes into consideration maintenance of Rails, Ties, Ballast, &c.

D. MACPHERSON, *Asst. Chief Engineer.*

OTTAWA, August, 1905.

Approved HUGH D. LUMSDEN, *Chief Engineer,*

AUGUST, 30th, 1905.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 3

Correspondence in connection with volume of traffic to be expected on the Railway.

(See Page 16 of Report)

OTTAWA, July 24th, 1905.

MR. H. A. WOODS, *Assistant Chief Engineer,*
Grand Trunk Pacific Railway Co.,
Montreal, Canada.

DEAR SIR:—

I am preparing instructions for our Locating Engineers as to the equating value of distance, curvature, rise and fall, and shall be glad if you will kindly let me know the number of daily trains each way, which you have assumed for purposes of calculation on main line of the G. T. P.

Yours very truly,
D. MACPHERSON,
Asst. Chief Engineer.

MONTREAL, QUE., July 26th.

MR. D. MACPHERSON,
Asst. Chief Engineer, Trans-Continental Railway,
Ottawa, Ont.

DEAR SIR:—

Replying to yours of July 24th, stating that you are preparing instructions for your Locating Engineers as to the equating value of distance, curvature, rise and fall, and asking the number of daily trains, each way, we have assumed for purpose of calculation on the main line. I beg to say that for our Prairie Division we have assumed ten trains, each way, daily. I think this is not in excess of what we shall require on that Division, and the Lake Superior Branch.

Yours truly,
(Sgd) H. A. WOODS,
Asst. Chief Engineer.

OTTAWA, Aug. 3rd, 1905.

MR. H. A. WOODS, *Ass't. Chief Engineer,*
Grand Trunk Pacific Railway,
Montreal, P. Q.

DEAR SIR:—

I would beg leave to thank you for your letter of the 26th July stating that you have assumed ten daily trains each way on your Prairie Division. Would you kindly let me know how many trains you have assumed for the Mountain Division, and how many you think would be reasonable for the main line of the Eastern Division. It seemed to me that ten daily trains each way was too large an assumption for our end of the line as a good deal of traffic will go via Lake Superior, and this large number of trains makes the capitalized value per mile of track very large. Assuming $1.17 as the train mile unit cost, then for distances short enough not to affect train wages the additional cost per train mile would be 37½ cents, which capitalized at 5%, would give $2,745 as the value per mile per daily train per annum, amounting to $54,900 per mile on a ten train basis. For distances requiring extra side tracks this last value would amount to $101,376.

Yours very truly,
D. MACPHERSON,
Asst. Chief Engineer.

MONTREAL, QUE., Aug. 7th 1905

MR. D. MACPHERSON,
Asst. Chief Engineer, Trans-Continental Ry.,
Ottawa, Ont.

DEAR SIR:—

Yours of Aug. 3rd, requesting information as to the number of trains we have assumed for comparison of alternate lines on our Mountain Division, received on return to office.

Replying to same, I have to say that, as yet, we have not progressed far enough with our surveys on this Division to give definite instructions to our Engineers. There are so many obstacles, in the way of grades and curvature, on this part of the line, which may make comparison of alternate lines unnecessary. However, I may say that where conditions are such as to admit of comparison, it will probably be on the basis of eight daily trains each way. In this connection, I may say that we expect, within a few years, our westbound business will exceed our eastbound business, west of Edmonton, and possibly for some considerable distance east of that point.

I agree with you that the ten daily trains, each way, on the Trans-Continental, east of the Junction of our Lake Superior Branch, is too large an assumption for that part of the Line. I should consider six daily trains each way, sufficient for comparison.

For your information I may say further, that we assume the unit cost per train as $1.35, which is reported cost on the Canadian Pacific Railway, and that we capitalize on a basis of 4%, instead of 5%. I am not sure that the Government will pay above 3½. The difference between the capitalization at 5% and 3½ makes quite a radical difference, as you will note.

I expect to be in Ottawa within a day or two, and shall take pleasure in calling at your office, and going into this matter a little more in detail, if you so desire.

Yours very truly,
(Sgd.) H. A. WOODS,
Asst. Chief Engineer

OTTAWA, August 9th 1905.

S. R. POULIN, ESQ.,
District Engineer,
North Bay, Ont.

DEAR SIR:—

I am preparing a table of equating values for distance, curvature and rise and fall, for the purpose of giving our Locating Engineers a basis on which to compare different lines, and I shall be glad if you will kindly let me have your opinion, based on your knowledge of the country and of existing lines, as to what would be a fair number of daily freight trains per annum, each way, to assume as the probable maximum number over your district. Ten daily trains each way have been suggested, but it seems to me too large, and I shall be glad to have your views or any suggestions that will be useful in this connection.

Yours very truly,
D. MACPHERSON,
Asst. Chief Engineer.

SESSIONAL PAPER No. 123

NORTH BAY, August 11th 1905.

MR. D. MACPHERSON,
Asst. Chief Engineer,
Ottawa.

DEAR SIR:—

In answer to yours as to what would be a fair number of daily freight trains per annum(?) over my District, I think that 7 or 8 at the most would be a fair average. My reasons for saying so is: that the C. P. R. here at North Bay, after twenty years of operation have only that number in the busy time, and that the number of cars on their trains do not average over 33 cars, that is from 28 to 42 cars according to the motive power, while over our line with the grades and curvatures contemplated, 8 trains each way would give nearly double the amount of cars, that the C P.R. are moving past North Bay, and the freight passing North Bay is not only from the West but probably one-third or one-half comes from the Soo Line and the settlements between here and Chapleau and Sault St. Marie. Of course it can be taken for granted that there will be large settlements also along the new line and that local traffic will emanate from local points. Still if the G. T. P. build their projected line from North Bay in a westerly direction to tap the main line, it would probably take all over the Ontario traffic going and coming from the west, and would in proportion reduce the number of trains over my district, so that I think that 8 trains, probably 400 or 450 cars each way is a good average for the next 25 or 30 years, unless the wheat should find its outlet over the said line.

Yours truly,
S. R. POULIN, *Dist. Eng'r.*

OTTAWA, August 15th, 1905.

H. D. LUMSDEN, ESQ., *Chief Engineer*,
Trans-Continental Railway,
Ottawa, Ont.

DEAR SIR:—

Tables should be issued as soon as possible to Locating Engineers giving Equating Values for Distance, Curvature and Rise and Fall, in order that they may have definite values for comparing different routes. The basis for all these calculations is the assumed number of daily trains and cost per train mile.

Some calculations were made in the interim report based on ten daily trains each way, or a total of twenty daily trains, but it appears to me that this is entirely too high, and that probably the number should not be the same for all Districts, as the traffic between Winnipeg and Junction of Fort William Branch would be heavier than on any other part of the line.

As an illustration of my argument that twenty trains is too high; assume (which is C. P. R. basis of calculation) that total cost per train mile is $1.00, then for additional lengths of line great enough to necessitate extra sidings, the cost for each additional train mile would be about $0.60. In twenty daily trains this equals 365 x 20 x 60 = $4,380.00, which would be the annual extra cost of adding one mile of track under these conditions. Capitalize this at 4% and it amounts to $109,500.00. In other words, if you assume twenty daily trains you can afford to spend $109,500.00 for every mile you can shorten the line, in the distances long enough to lessen the number of sidings. It does not appear to me that we would be justified in spending that amount, and I should be glad if you will kindly advise

me the number of daily trains each way which should be used as a basis of calculation on each district, and I will then prepare the necessary table for District Engineers.

I enclose you copies of correspondence with the Assistant Chief Engineer of the Grand Trunk Pacific and our District Engineers, on the subject.

Yours very truly,

D. MACPHERSON.

August 18th, '05

D. MACPHERSON, ESQ.,
Assistant Chief Engineer.

Dear Sir,

In reply to yours of the 15th. inst., in regard to preparation of tables to be issued to Locating Engineers, giving equating values for distance, curvature and rise and fall, for comparison of routes, I think you might assume six daily trains per day each way,

Yours truly,

H. D. LUMSDEN.

OTTAWA, August 29th 1905.

H. D. LUMSDEN, ESQ.,
Chief Engineer,
Ottawa, Ont.

Dear Sir:—

Herewith tracing of Table of Values for Equating Distances, Curvature and Rise and Fall. If you approve, will you kindly sign same, so that I may have copies sent out to the District Engineers.

Yours very truly,

D. MACPHERSON.

Enclos.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 4

Mr. Collingwood Schreiber's Estimate.

(See Page 17 of Report)

Grand Trunk Pacific Railway, 1903.

I estimate the cost of construction of the Grand Trunk Pacific Railway as a road of an ordinary character such as has been built in Canada with maximum grades of 1% or 52.80 per mile, being less than the maximum grades upon the Intercolonial Railway, the maximum grades on which road are as follows:—

Bedford	grade	1.80% or 95.00	feet per mile.
Folleigh	"	1.22% or 64.42	"
Metis	"	1.22% or 64.42	"

Estimated Cost of the Grand Trunk Pacific Railway.

Moncton to South Approach to Quebec Bridge.....	$	25,000 per mile
Quebec to Winnipeg.....		28,000 "
Prairie Section.....		17,500 "
Mountain Section.....		67,000 "
Terminals at Pacific Coast.....		3,000,000

COLLINGWOOD SCHREIBER.

OTTAWA, 12th July, 1903.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 5

Copy of Letter from Mr. W. S. Fielding, giving Estimate of Cost.
(See Page 17 of Report)

MINISTER OF FINANCE.

OTTAWA, May 11th, 1904.

DEAR MR. EMMERSON,

Last summer, while I was Acting Minister of Railways, and when the Grand Trunk Pacific scheme came up, I asked Mr. Schreiber's opinion as to the probable cost of constructing the Eastern Division (Government portion) of the road. Mr. Schreiber gave me the information, although not in the form of a written report, and I used it in the House, mentioning his name as my authority. His opinion was that a road could be constructed from Quebec to Moncton for $25,000 per mile, and from Quebec to Winnipeg for $28,000 per mile.

These estimates were made for a road of an ordinary character, such as is constructed elsewhere. In order to make a sufficiently liberal allowance for a road of better character, I added 25%, making the estimate $31,250 per mile from Quebec to Moncton, and $35,000 per mile from Quebec to Winnipeg. I have not spoken to Mr. Schreiber on the matter of late, but from other experienced railway men I have received assurances that my estimate was a most liberal one and that the road could probably be constructed well within these figures.

As above stated, I did not obtain a written report from Mr. Schreiber. I think it might be convenient to have a report from him. May I suggest that you discuss the matter with him and, if there is no objection, ask him to make a short memorandum, putting in writing the information which he gave me last summer.

Yours faithfully,

(Sgd.) W. S. FIELDING.

The Honourable H. R. EMMERSON,
Minister of Rys. and Canals,
OTTAWA, ONT.

OTTAWA, 17th May, 1904.

SIR,

In compliance with your request that I should put in writing the information orally given to me by Mr. Fielding last summer, while he was Acting Minister of this Department, in respect of the estimated cost of constructing the Eastern Division, between Moncton and Winnipeg, of the proposed Grand Trunk Pacific Railway, I would state as follows: premising that the character of the railway I had in view was a substantially built railway, with maximum grades of less severity, and curves of greater radius than those on the Intercolonial Railway.

As to the section between Moncton and the South approach to the bridge now in course of construction over the river St. Lawrence at Quebec, I advised

Mr. Fielding that from my personal knowledge of the general configuration of the country and from information gathered from the written reports of various Engineers who have traversed the district, I have arrived at the conclusion that the cost of construction should not exceed $25,000 per mile.

As to the section between Quebec and Winnipeg, I considered this section on the assumption that the line would probably follow the height of land from a point some distance from Quebec to a point North of Sudbury, and thence to Winnipeg, passing North of Lake Nepigon, I availed myself of the information contained in various engineers' reports on surveys made of the country lying between the neighbourhood of Sudbury and Winnipeg, and the conclusion I reached was that the cost of construction need not exceed $28,000 per mile, and I so informed Mr. Fielding.

I would say that I am still of opinion that a road of the standard above indicated can be constructed at these figures.

I have the honour to be, sir,
Your obedient servant,

(Sgd.) COLLINGWOOD SCHREIBER,
Chief Engineer.

The Honourable H. R. EMMERSON,
Minister of Rys. and Canals,
Ottawa.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 6

Estimate of Cost Prepared by Mr. Lumsden, June 23rd, 1908.

(See Page 17 of Report)

NATIONAL TRANSCONTINENTAL RAILWAY

Statement shewing number of Miles contracted for and Miles unlet to date, with Cost per Mile of Completed Main Line (including Sidings, &c.) and percentages of total work done on each Contract to 1st June, 1908.

June 23rd, 1908.

Mileage from Moncton		LOCATION	Miles let	Percentage of work done on original contracts to Feb. 29, '08.	Estimated cost per mile of completed main line
From Mile	To Mile				
		Number of miles under contract is 1227.93 as follows:—			$ c
0·00	50·00	Moncton to near Chipman	50·00	16·84	41,995 00
50·00	58·55	At Chipman	8·55	8·67	83,570 00
58·55	97·60	Chipman to I.C.R. Crossing	39·05	Nil	32,573 00
97·60	164·00	I. C. R. Crossing to Mile 164	66·40	Nil	45,341 00
164·00	195·80	Mile 164 to Grand Falls	31·80	Nil	110,172 00
195·80	256·68	Grand Falls to New Brunswick Boundary	60·88	25·11	51,130 00
256·68	309·74	N. B. Boundary to 150 miles east of Quebec Bridge	53·06	Nil	65,771 00
309·74	459·74	From Quebec Bridge, 150 Miles eastward	148·89	31·19	65,370 00
		Quebec Bridge link (not included in estim'te)	1·11		
459·74	509·74	Quebec Bridge, westerly	50·00	49·39	104,589 00
509·74	609·74	50 miles west Quebec Bridge to 150 miles west	100·00	65·49	
609·74	654·74	150 miles west Quebec Bridge to near Weymontachene	45·00	8·48	
654·74	656·07	To be included in this contract	1·33		
877·75	1027·75	Near Harricanaw River to Junction with T. & N. O. Ry.	150·00	1.0	46,842 00
1027·75	1127·75	Junction T. & N. O. Ry. for 100 miles west	100·00	Nil	59,425 00
1334·35	1409·35	From 19½ miles west of Mud River easterly 75 miles	75·00	Nil	46,454 00
1557·80	1804·66	Lake Superior Junction to west bank Red River (includes Red River Bridge and double track from Crossing of Dundee Branch)	246·86	61·52	85,003 00
		Total	1227·93		
		Number of miles yet to be contracted for is 576·73 as follows:—	Miles Unlet		
656·07	877·75	Weymontachene to near Harricanaw River	221·68		58,058 00
1127·75	1171·85	From 100 miles west of Junc. T. & N. O. Ry. to west end District "D"	44·10		62,524 00
1171·85	1334·35	From west end of District "D" westerly	162·50		37,000 00
1409·35	1429·76	From 19½ miles west of Mud River to west end of District "E"	20·41		33,480 00
1429·76	1557·80	From west end of District "E" to Lake Superior Junction	128·04		55,943 00
		Total	$576·73		
		Average cost per mile=$63,427. For 1803·55 miles=Total, $114,393,765			

This estimate is based on quantities as estimated by District Engineers and contract prices, so far as contracts have been let, remaining prices estimated by Chief Engineer.

Distances are those of actual survey, and the average cost given is per mile of completed Main Line Track, and includes, in addition to the road bed, ties, rails and fastenings, trackage of sidings and yards (326 miles) section houses, stations, engine houses, &c., cost of surveys, right of way and bridges, and also includes 10% for Engineering and contingencies.

The following items are not included in estimate:—

St. Lawrence River Bridge, Quebec; Terminals in City of Quebec or line thereto; Terminals in City of Winnipeg, or large machine shops in that vicinity; but $90,000 included for ordinary Divisional Point at Moncton.

HUGH D. LUMSDEN,
Chief Engineer.

Ottawa, June 23rd, 1908.

(455)

J. R. G.
A. M. & S.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 7

Statement Prepared by Investigating Commission showing Cost up to September 30th, 1911.

(See Page 17 of Report)

NATIONAL TRANSCONTINENTAL RAILWAY.

Statement—Showing cost of work done up to September 30th, 1911. DISTRICT "A"—LENGTH 256.61 MILES.

Extending from Moncton westerly to boundary between the Provinces of New Brunswick and Quebec.

Contract No.	County	Length of Contract	Grading	Tracks and Tracklaying	Bridges and Culverts	Buildings	Right of Way	Engineering	General Expenses	Total
1	Westmorland.....	50. mi.	$1,729,500	$429,000	264,900$	$9,000	$50,000	$204,700	$86,500	$2,841,600
2	Queens Sunbury.....	8. "	411,000	85,300	227,600	8,900	8,000	32,700	13,800	787,300
3	York.....	39.6 "	770,200	390,900	173,600	58,600	15,400	159,600	67,500	1,635,800
4	Carleton.....	66.4 "	2,234,100	734,500	293,900	16,100	24,000	274,300	115,900	3,692,800
5	Victoria.....	31.7 "	2,287,200	261,800	1,568,500	18,400	19,000	131,000	55,300	4,341,200
6	Madawaska.....	60.91 "	1,662,800	567,500	537,800	44,300	306,000	248,000	103,800	3,470,200
	TOTALS.....	256.61 "	$9,094,800	$2,537,000	$3,066,300	$155,300	$422,400	$1,050,300	$442,800	$16,678,900

Total Cost—District "A" to Sept. 30th, 1911—$16,768,900.00, or $65,300,00 per mile of Main Line.

NATIONAL TRANSCONTINENTAL RAILWAY.

Statement—Showing cost of work done up to September 30th, 1911.

DISTRICT "B".—LENGTH 584.01 MILES.

Extending from the New Brunswick Boundary to the River St. Lawrence opposite Quebec and from the City of Quebec, westerly, 374 miles all in the Province of Quebec, passing thro' the Counties of Temiscouta, Kamouraska, L'Islet, Montmagny, Bellechasse, Dorchester and Levis on the south side of the St. Lawrence River and Quebec, Portneuf and Champlain, North of the St. Lawrence River.

Contract No.	Counties	Length of Contract	Grading	Tracks and Tracklaying	Bridges and Culverts	Buildings	Right of Way	Engineering	General Expenses	Total
7	Temiscouata, Kamouraska, L'Islet, Montmagny, Bellechasse, Dorchester, Levis	53.84	$2,126,700	$426,400	$450,300		$65,600	$183,400	$76,300	$3,328,700
8		150.00	4,976,500	1,214,500	1,108,500		243,800	511,000	212,100	8,266,400
9A		5.37	359,300	32,600	14,400		173,900	14,200	5,800	600,200
9	Quebec	50.00	1,605,900	447,900	1,255,800	$500	367,100	170,300	70,700	3,918,200
10		100.00	7,966,800	827,100	1,968,400	37,600	27,700	340,700	141,400	11,309,700
11	Portneuf	46.40	2,746,600	368,200	548,100	12,600	12,800	158,100	65,200	3,907,600
12	Champlain	107.00	3,159,500	716,000	543,500	10,000	29,600	364,500	151,300	4,974,400
13		71 40		523,900			20,100	243,200	100,600	887,800
	TOTALS	584.01	$22,937,300	$4,556,600	$5,889,000	$60,700	$940,600	$1,985,400	$823,400	$37,193,000

Total Cost—District "B" to Sept. 30th, 1911—$37,193,000.00.

Or $63,600.00 per miles of Main Line.

NATIONAL TRANSCONTINENTAL RAILWAY.

Statement Showing cost of work done up to September 30th, 1911. DISTRICT "C.D."—LENGTH 398.02 MILES

Extending from 122 miles East of the Boundary between the Prov. of Quebec and Ontario, in a westerly direction thro' the County of Champlain in the Prov. of Quebec and thence thro' the Districts of Abbitibi and Algoma in the Prov. of Ontario to a point about 204 miles West of the Town of Cochrane.

Contract No.		Length of Contract	Grading	Tracks and Tracklaying	Bridges and Culverts	Buildings	Right of Way	Engineering	General Expenses	Total
13		43.56					$800.	$260,300	$58,000	$319,100
14c		78.00	$1,688,800	$598,100	$557,400	$3,100	800.	477,600	104,000	3,409,800
14d		72.00	1,937,400	586,200	717,900	61,500	800.	440,800	96,000	3,840,600
15		100.00	2,751,500	829,200	1,185,600	30,400	800.	612,300	133,300	5,543,100
16		104.46	1,696,600	793,300	346,700	1,300	900.	639,500	139,200	3,617,500
	TOTALS.....	398.02	$8,074,300	$2,806,800	$2,787,600	$96,300	$4,100.	$2,430,500	$530,500	$16,730,100

Total Cost—District "C.D" to Sept. 30th, 1911. $16,730,000.00, or $42,000.00 per mile of Main Line.

NATIONAL TRANSCONTINENTAL RAILWAY.

Statement—Showing cost of work done up to September 30th, 1911

DISTRICT "E"—LENGTH 195.19 MILES.

Extending from a point in the District of Algoma, Province of Ontario 204 miles west of the Town of Cochrane westerly 195.19 miles to a point in the District of Thunder Bay Northwest of Lake Nipigon.

Contract No.	District	Length of Contract	Grading	Tracks and Tracklaying	Bridges and Culverts	Buildings	Right of Way	Engineering	General Expenses	Total
17	Algoma.....	100.00	$688,100	$30,400		$2,100		$356,200	$113,200	$1,190,000
18		75.59	1,542,400	22,800	$321,300	1,600		267,100	84,900	2,240,100
19	Thunder Bay.....	19.60	423,700	6,000	2,100	400		69,800	22,200	524,200
	TOTALS.....	195.19	$2,654,200	$59,200	$323,400	$4,100		693,100	$220,300	$3,954,300

Total Cost—District "E" to Sept. 30th, 1911.—$3,954,300.00. Or $20,200.00 per mile of Main Line.

NATIONAL TRANSCONTINENTAL RAILWAY.

Statement—Showing cost of work done up to September 30th 1911 DISTRICT "E"—LENGTH 376.62 MILES.

Extending from a point in the District of Thumder Bay, Province of Ontario, Northwest of Lake Nipigon thro' 285 miles of Western Ontario and thro' 91 miles of the Province of Manitoba to the City of Winnipeg.

Contract No.	District	Length of Contract	Grading	Tracks and Tracklaying	Bridges and Culverts	Buildings	Right of Way	Engineering	General Expenses	Total
19	Thunder Bay	105.45	$3,890,700	$728,000	$153,700	$3,000	$15,800	$602,300	$172,900	$5,566,400
20		12.70	434,400	104,300	188,500	5,500	1,900	72,300	20,800	827,700
20A		11.55	890,500	271,000	255,700	202,800	1,700	65,600	18,800	1,706,100
21		246.92	16,630,100	2,880,700	1,455,900	269,400	696,900	1,413,900	406,000	23,752,900
Buildings at Transcona including Machinery						1,658,869				
The Red River Bridge.					661,631					
			$21,845,700	$3,984,000	$2,715,431	$2,139,569	$716,300	$2,154,100	618,500$	$34,173,600

Total Cost—District "F" to Sept. 30th, 1911.—$34,173,600.00, or $90,700.00 per Mile of Main Line.

NATIONAL TRANSCONTINENTAL RAILWAY.

Statement showing cost of work done up to September, 30th 1911.

SUMMARY.

District	Province	Length	Grading	Tracks and Track Laying	Bridges and Culverts	Buildings	Right of Way	Engineering	General Expenses	Total
"A"	NewBrunswick	256.61	$ 9,094,800	$ 2,537,000	$ 3,066,300	$ 155,300	$ 422,400	$1,050,300	$ 442,800	$ 16,768,900
"B"	Quebec	584.01	22,937,300	4,556,600	5,889,000	60,700	940,600	1,985,400	823,400	37,193,000
"C" & "D'	Ontario	398.02	8,074,300	2,806,800	2,787,600	96,300	4,100	2,430,500	530,500	16,730,100
"E"	Ontario	195.19	2,654,200	59,200	323,400	4,100		693,100	220,300	3,954,300
"F"	Ontario and Manitoba	376.62	21,845,700	3,984,000	2,715,431	2,139,569	716,300	2,154,100	618,500	34,173,600
Purchase from	of Surveys G. T. P.							352,190		352,190
Totals	– – –	1810.15	$64,606,300	$13,943,600	$14,781,731	$2,455,969	$2,083,400	$8,665,590	$2,635,500	$109,172,090

N. T. R.

INVESTIGATING COMMISSION

Exhibit 8

GORDON GRANT'S ESTIMATE.

(See Page 18 of Report)

NATIONAL TRANSCONTINENTAL RAILWAY—EASTERN DIVISION.

Statement showing work done to Dec. 31st, 1912, and estimate of cost of completion.

ITEMS	Value of work done to Dec. 31st, 1912	Value of work required to complete	Total estimate of cost of work
GRADING (See note of detail of items)	$ 88,785,710.	$18,380,290.	$107,166,000.
RIGHT OF WAY AND EXPENSES	2,362,585.	579,415.	2,942,000.
RAILS AND FASTENINGS (See note)	12,404,573.	525,427.	12,930,000.
BUILDINGS (See note)	2,056,808.	2,625,192.	4,682,000.
STEEL SUPERSTRUCTURE BRIDGES Including flooring	4,996,127.	1,057,873.	6,054,000.
SURVEYS AND EXPENSES	2,943,000.	nil	2,943,000.
TRANSPORT (See note)	1,250,132.	39,868.	1,290,000.
ENGINEERING	4,206,489.	1,400,511.	5,607,000.
SUNDRY ITEMS (See note)	2,093,123.	374,877.	2,468,000.
SPRINGFIELD SHOPS. Locomotive Shops (See note)	2,731,958.	205,042.	2,937,000.
Car Shops (See note)	617,108.	683,892.	1,301,000.
PROPOSED CAR FERRY AT QUEBEC	nil	650,000.	650,000.
TERMINALS AT QUEBEC. (See note)	917,006.	6,362,994.	7,280,000.
RENTAL OF JOINT TERMINALS AT WINNIPEG	157,500.	210,000.	367,500.
HEADQUARTERS SALARIES AND EXPENSES	1,607,133.	592,867.	2,200,000.
PROPORTION OF INTEREST ON EXPENDITURE FOR CONSTRUCTION OF WINNIPEG TERMINALS	90,611.	399,689.	490,300.
TOTALS	$127,219,863.	$34,087,937.	$161,307,800.

NOTE:—

GRADING includes:—Clearing; excavation; culverts; sub-structure of bridges; tracklaying; ballasting; ties; signals; interlocking appliances; telegraph lines; fencing; water supply; track scales temporary trestles; extra work; pump houses and pumps; and ties purchased by commission on contracts numbers 9, 10 and 21.

RAILS AND FASTENINGS includes:—Frogs; switches and diamond crossings.

BUILDINGS includes:—Stations; section and tool houses; divisional point buildings.

TRANSPORT:—This item was formerly included (in statements) with "Surveys and Expenses."

SUNDRY ITEMS:—Formerly combined under heading "Engineering and Expenses" and included instruments; supplies; camp outfits; general expenses; freight and express; furniture; legal Expenses; medical service, etc., etc.

SPRINGFIELD SHOPS.—*Locomotive Shops:*—Item includes plant and equipment; water supply; sewerage system; and lighting.

Car Shops:—Item includes plant and equipment.

QUEBEC TERMINALS:—Includes line from Quebec Bridge to Quebec City; right of way; terminal facilities; and Quebec shops.

GORDON GRANT,
Chief Engineer.

Ottawa, Ont., April 18th, 1913.

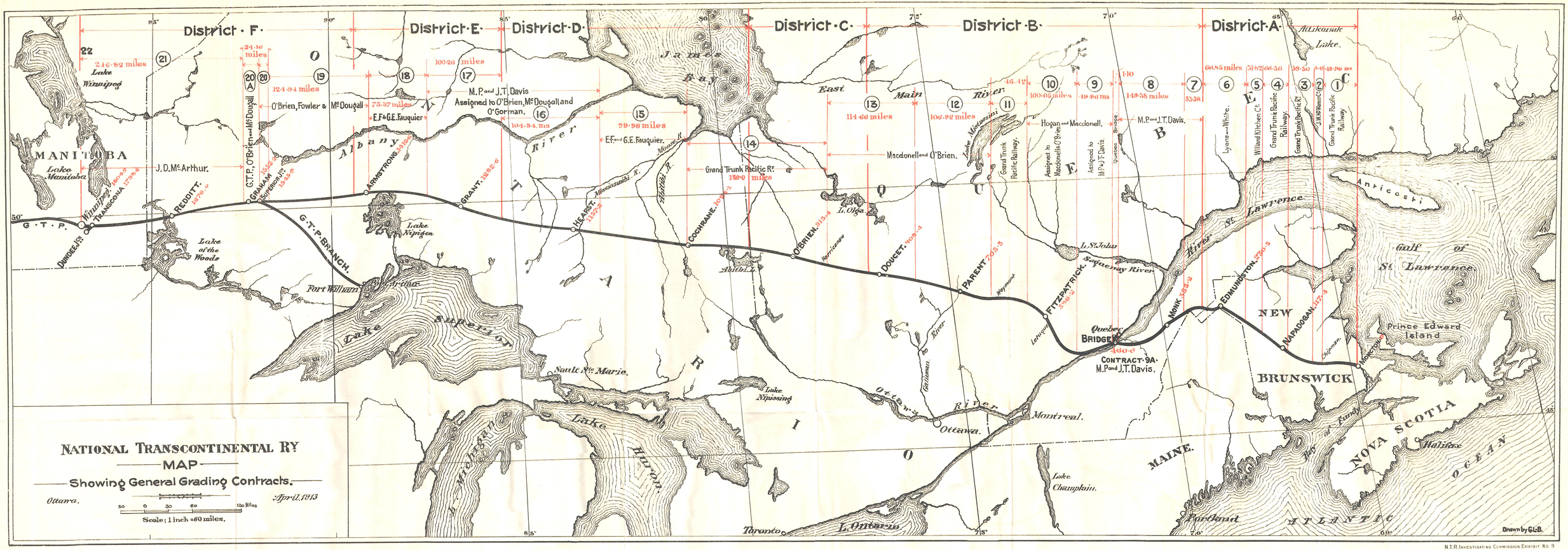
N. T. R.

INVESTIGATING COMMISSION

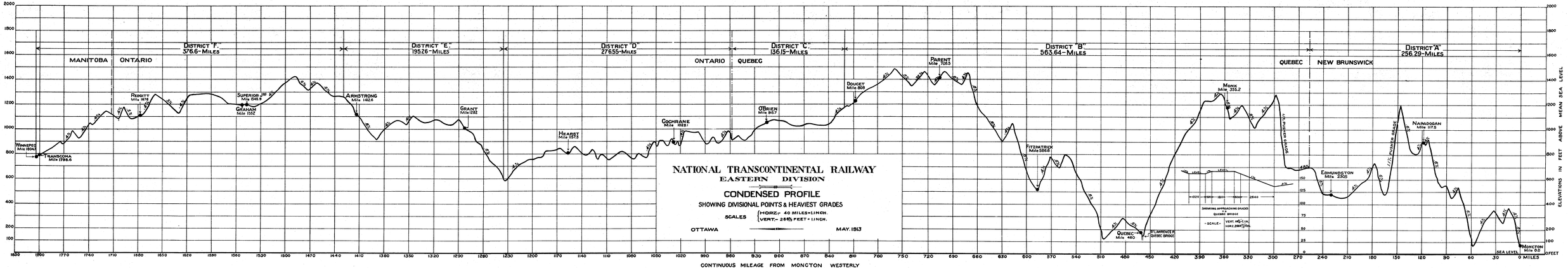
Exhibit 9

Map showing Contracts, also Profile of the Railway.

(See Page 19 of Report)



N.T.R. Investigating Commission Exhibit No. 9


MANITOBA
ONTARIO
ONTARIO
QUEBEC
QUEBEC
NEW BRUNSWICK
DISTRICT "F"
376.6-MILES
DISTRICT "E"
195.26-MILES
DISTRICT "D"
276.55-MILES
DISTRICT "C"
136.15-MILES
DISTRICT "B"
563.64-MILES
DISTRICT "A"
256.29-MILES
WINNIPEG
Mile 1804.3
TRANSCONA
Mile 1798.6
REGUITT
Mile 1678
SUPERIOR JCT.
Mile 1545.9
GRAHAM
Mile 1552
ARMSTRONG
Mile 1482.6
GRANT
Mile 1282
HEARST
Mile 1073
COCHRANE
Mile 1028.1
O'BRIEN
Mile 957
DOUCET
Mile 805
PARENT
Mile 705.5
FITZPATRICK
Mile 506.8
QUEBEC
Mile 440
ST. LAWRENCE RIVER QUEBEC BRIDGE
MONK
Mile 355.2
EDMUNDSTON
Mile 230.5
NARADOGAN
Mile 117.5
MONCTON
Mile 0.0
SEA LEVEL
0 MILES
0 FEET
NATIONAL TRANSCONTINENTAL RAILWAY
EASTERN DIVISION
CONDENSED PROFILE
SHOWING DIVISIONAL POINTS & HEAVIEST GRADES
SCALES { HORZ.- 40 MILES=1 INCH.
VERT.- 2640 FEET=1 INCH.
OTTAWA
MAY. 1913
SHOWING APPROACHING GRADES TO QUEBEC BRIDGE
SCALE:- VERT. 40'=1 IN.; HORZ. 2640'=1 IN.
CONTINUOUS MILEAGE FROM MONCTON WESTERLY
ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

N. T. R.

INVESTIGATING COMMISSION

Exhibit 10

Copy of General Specifications and Form of Tender and Contract.
(See Page 19 of Report)

(4532) Form 159. HM.—22-2-09

THE NATIONAL TRANSCONTINENTAL RAILWAY

EASTERN DIVISION

General Specifications

AND

Form of Tender and Contract

1909

General Offices:
THE NATIONAL TRANSCONTINENTAL RAILWAY
Corry Building, Ottawa

DISTRICT

FORM OF TENDER.

To

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY,
OTTAWA.

GENTLEMEN:—

(I or we) the undersigned do hereby offer to the Commissioners to furnish all and every kind of labour, tools, machinery, implements and other plant, services and materials whatsoever necessary for the due execution and completion of, and to fully execute and complete in the most thorough, workmanlike and substantial manner on or before the

in accordance with the specifications hereto annexed and the plans, profiles and drawings prepared and to be prepared for the purposes of the work, and upon the terms and conditions set out in the printed form of contract furnished by the said Commissioners and also attached hereto, and in every respect to the satisfaction and approval of the Chief Engineer of the Commissioners, all the work of the different kinds hereinafter mentioned, set out or referred to in the said specifications, so far as the same are applicable to the classes of work hereby tendered for, and required in the construction of the following section of the Transcontinental Railway, viz:—

District Commissioners — From a point designated on the plans of the said

that is to say, clearing, close cutting, grubbing, grading, cross logging, ditching, stream and road diversions, truss, pile and trestle bridging, masonry and concrete culverts, cast iron and other pipe culverts, drains of various kinds, piers, abutments, road crossings, bridge masonry, retaining walls, embankment protection, paving, riprap, ties, cattle guards, telegraph line, track laying, surfacing, ballasting, water service, turntables and substructures, engine houses, section houses, fences, gates and all the works below sub-grade or formation level, in fact all work necessary when the bridge superstructures are in place to complete ready for operation a single track railway, with side tracks, switches, yards, terminal yards, depot grounds, spurs and other necessary and appurtenant tracks, at and for the prices set opposite the different items in the following schedule:—

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
1	Clearing, including close cutting	acre			
2	Trees cut down outside right of way	each			
3	Grubbing	acre			
4	Solid rock	c. yd.			
5	Loose rock and other materials (sec. 35 spec.)	"			
6	Common excavation	"			
7	Excavation in foundations, no coffer dams	"			
8	Excavation of foundation within coffer dams	"			
9	Overhaul all materials per c. yd. per 100 ft. over 500 ft. haul	"		0 01	
10	Piles delivered as per engineer's bill	lin. ft.			
11	Pile driving	"			
12	Sheet piling per M. ft. b.m.				
13	Wakefield type "				
14	Cross-logging, 1 ft. deep with 18-in. brushwork	acre			
15	Pole drains	lin. ft.			
16	French stone drains	"			
17	Paving in culverts (not laid in cement)	c. yd.			
18	Crib filling with stone	"			
19	Hand laid rip-rap	"			
20	Pierre Perdu rip-rap	"			
21	Piling out reserved stone from rock cuttings	"			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
22	Round logs in cribs	lin. ft.			
23	Cedar mud sills, per M. ft. b.m.				
24	Framed trestles per M. ft. b.m. except stringers				
25	Caps, walings and braces for pile trestles, per M. ft. b.m.				
26	Sawn ties and guard rails for bridges per M. ft. b.m.				
27	Stringers per M. ft. b.m.				
28	Cedar timber in culverts, 8-in. x 12-in., 10 in. x 12-in., and 12-in. x 12-in., per M. ft. b.m.				
29	Plank in highway and private road crossings per M. ft. b.m.				
30	Timber, best quality, for culverts, per M. ft. b.m.				
(*a*)	Timber in coffer dams or ordinary foundations	M. ft. B.M.			
(*b*)	Timber in caissons	"			
	Vitrified pipe culverts—				
33	15-in. diameter	lin. ft.			
34	18-in. diameter	"			
	Reinforced concrete pipe—				
36	14-in. diameter	"			
38	18-in. diameter	"			
40	24-in. diameter	"			
41	30-in. diameter	"			
42	36-in. diameter	"			
44	48-in. diameter	"			
46	60-in. diameter	"			
47	4-in. agricultural under tile drains	"			
	Cast iron pipe culverts—				
49	18-in. diameter	"			
51	24-in. diameter	"			
52	30-in. diameter	"			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
53	36-in. diameter	lin. ft.			
55	48-in. diameter	"			
57	60-in. diameter	"			
58	Concrete facing mixture 1-2, 2½-in. thick, including forms	c. yd.			
59	Concrete 1-2-4 coping course 6-in. thick, including forms	"			
60	Concrete 1-3-5, including forms	"			
61	Concrete 1-3-6, including forms	"			
61a	Concrete 1-2-5, including forms and centres	"			
62	Concrete 1-3-5 in arch culverts, including forms and centres	"			
63	Concrete 1-3-6 in arch culverts, including forms and centres	"			
64	Concrete 1-3-6 in box culverts including forms	"			
65	Concrete 1-4-8 ordinary foundations including forms	"			
66	Concrete 1-4-8 walls of building including forms	"			
67	First-class masonry	"			
68	Second-class masonry	"			
69	Third-class masonry	"			
70	Dry masonry	"			
71	Masonry in arch ring, including centering	"			
72	Track-laying in main line with ordinary frogs, switches, and sidings, including light surfacing 'A'	mile			
73	Track-laying in yards at terminals	"			
74	Train hauled surfacing 'B' no overhaul allowed	c. yd.			
(c)	Train hauled filling, including temporary trestle	c. yd.			
(d)	Overhaul on train hauled filling per cubic yard per mile over five (5) miles			0 01	
(e)	Removal of moss per cu. yd., no overhaul allowed				
75	Ballasting, no overhaul allowed	c. yd.			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
76	Ties, first-class	each			
77	Ties, second-class	"			
78	Ties for switches, sawn to dimensions per M. ft. b.m.				
79	Public road signs	each			
80	Mile posts, whistle posts, and road signs	"			
81	Semaphores at stations, complete	"			
82	Interlocking appliances, complete, eight levers including all connections, signals, etc	"			
83	Each additional lever	"			
84	Fencing	rod			
85	Gates	each			
86	Tunnels, rock sections (unlined)	lin. ft.			
87	Tunnels, lined	"			
88	Tunnels, concrete lining	c. yd.			
89	Tunnels, masonry lining	"			
90	Drainage tunnels, 4 c. yds. per ft	lin. ft.			
91	Telegraph line	mile			
92	Water tanks, 50,000 galls. complete, including foundations	each			
93	Turntables, including everything except foundations	"			
94	Track scales, including everything except foundations	"			
95	Tunnel shafts	c. yd.			
96	Iron in drift bolts	lbs.			
97	Iron in screw bolts	"			
98	Forged or cut spikes	"			
99	Cast-iron washers and separators	lbs.			
100	Cattle-guards (3 sections)	3 sections			
101	Cast-iron pile shoes	each			
102	Cast-iron water pipes of any dia. from 4" to 10" per ton of 2,000 lbs				
103	Steel imbedded in concrete	lbs.			

It shall be understood that the Commissioners are to furnish to the Contractor all the rails and fastenings, tie plates, track bolts and spikes, either on board cars at the nearest accessible point by rail or at steamboat landing, or at a point along the line of road to be constructed, as may be directed by the Chief Engineer. All other materials required for the said construction shall be supplied by the Contractor at the schedule price for same. Not more than one-fifth of the total number of ties supplied by the Contractor shall be second-class.

It shall also be understood that the construction of steel bridges, depots, shops, warehouses, freights and fuel sheds does not form a part of this contract and is not included in the work tendered for.

The Contractor at his own cost provides all wagon roads to reach and carry on the work.

The Contractor will be required to handle all material at his own expense including the unloading and loading of cars and all material must be unloaded from cars within three days after its arrival, unless special authority to the contrary is given by the Engineer. Any violation of this rule will subject the Contractor to the usual demurrage.

Accompanying this tender is an accepted cheque on the

Bank for the sum of

dollars, as required by the

advertisement annexed hereto.

And we do hereby declare and agree that in case of refusal or failure to execute the said contract with the Commissioners, and also to furnish the approved security required, to an amount not exceeding one third of the estimated total consideration of the contract, for the faithful performance of the said contract, within ten days after the acceptance of this tender the said cheque shall be forfeited to the said Commissioners as liquidated damages for such refusal or failure, and that all contract rights acquired by the acceptance of this tender shall be forfeited.

The full names and residence of all persons interested in this tender as principals are as follows:—

The undersigned further agree to conform in all respects to the terms and conditions of this tender.

Dated at the day of 190

WITNESS	ACTUAL SIGNATURES OF PARTIES TENDERING	OCCUPATION	RESIDENCE

INDEX TO SUBJECTS

CONTRACT

(RAILWAY CONSTRUCTION).

THIS AGREEMENT made (in triplicate) the

day of 190

BETWEEN:

(hereinafter called the "Contractor") OF THE FIRST PART;
AND THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY (hereinafter called "the Commissioners") OF THE SECOND PART;

WITNESSETH as follows:—

GENERAL COVENANT.

In consideration of the covenants and agreements hereinafter contained and to be performed by the Commissioners and of the prices hereinafter mentioned, the Contractor hereby COVENANTS AND AGREES with the Commissioners as follows:

MEANING OF WORD "WORK."

1. In this agreement the word "work" or "works" shall, unless the context requires a different meaning, mean the whole of the work and materials, matters and things required to be done, furnished and performed by the Contractor under this contract.

ENGINEER, CHIEF ENGINEER, DEFINED.

2. The words "Engineer" or "Chief Engineer" when used in this agreement or in the specifications hereunto annexed, shall mean the Chief Engineer of the Commissioners, for the time being, acting as such either directly or through the Assistant Chief Engineer, District Engineer, Division Engineer, Resident Engineer or Inspector, having immediate charge of a portion of the works limited by the particular duties entrusted to him. All instructions and directions or certificates given, or decisions made, by anyone acting under the authority of the Chief Engineer shall be subject to his approval and may be cancelled, altered, modified and changed as he may see fit. In all cases where the Contractor or the Commissioners are satisfied with the decision of the Engineer or Inspector in immediate charge of the work, an appeal to the Chief Engineer may be made.

CONSTRUCTION OF CLAUSES AS COVENANTS.

3. Whenever in this agreement it is stipulated that anything shall be done or performed by either of the parties hereto, it shall have the same effect and be construed as if the said party had entered into a covenant with the other party to do or perform the same, and as if any such covenant on the part of the Contractor had been expressly made not only on his own behalf, but also on behalf of his executors, administrators and assigns, and that any such covenant on the part of the Commissioners had been expressly made on behalf of themselves and their successors. Whenever this agreement is entered into by more than one party as parties of the first part, the word "Contractor" shall be read "Contractors" and all pronouns in this Contract or in the specifications hereunto annexed referring to the Contractor shall be read as plural, and whenever a corporation is the party of the First Part, the said pronouns shall be read accordingly.

PERFORMANCE BY CONTRACTOR.

4. The Contractor shall, at his own expense, furnish all and every kind of labour, tools, machinery, implements, and other plant, services and materials whatsoever necessary for the due execution and completion of, and shall fully construct, perform, execute and complete in the most thorough, workmanlike and substantial manner in every respect, to the satisfaction and approval of the Chief Engineer, in the manner and upon the terms and conditions herein specified and according to the specifications annexed hereto, which, for the purpose of identification, have been signed by the Contractor and the Commissioners, and form part of this agreement, and to the plans, profiles and drawings in the office of the Chief Engineer, and to any further plans or drawings in addition thereto which the Chief Engineer may find necessary to provide from time to time for the full and complete performance of the work; and shall, on or before the

finally complete and deliver to the Commissioners all the works of the different kinds hereinafter mentioned, set out or referred to in the said specifications hereto annexed in so far as the same are applicable to the classes of work hereby contracted for and shown on the said plans, profiles nad drawings prepared, and those to be prepared, for the purpose of the work required in the construction of that portion of the Eastern Division of the Transcontinental Railway being

District

that is to say, the clearing, close-cutting, grubbing, grading, cross-logging, ditching, stream and road diversions, truss, pile and trestle bridging, masonry and concrete culverts, cast iron and other pipe culverts, drains of various kinds, piers, abutments, road crossings, bridge masonry, retaining walls, embankment protection, paving, riprap, ties, cattle guards, telegraph line, tracklaying, surfacing, ballasting, water service, turntables and sub-structures, engine houses, section houses, fences, gates, and all the works below sub-grade or formation level, in fact all work necessary, when the bridge superstructures are in place, to complete ready for operation a single track railway with side tracks, switches, yards, terminal yards, depot grounds, spurs, and other necessary and appurtenant tracks; but it shall be understood that the Commissioners are to furnish to the Contractor all the rails and fastenings, tie plates, track bolts and spikes, either on board cars at the nearest accessible point by rail or at steamboat landing, or at a point along the line of road to be constructed, as may be directed by the Chief Engineer; however, steel bridges,

depots, shops, warehouses, freight and fuel sheds do not form part of the present contract. It is also agreed that not more than one-fifth of the total number of ties supplied by the Contractor shall be second-class.

TIME OF THE ESSENCE OF THE CONTRACT.

5. Time shall be of the essence of this contract.

In default of the Contractor completing the work by the date mentioned in clause 4, the Contractor shall, if required by the Commissioners, pay to the Commissioners by way of liquidated damages the sum of

for each calendar month which may elapse after the date mentioned before the work shall be so completed and delivered; it being understood that the Commissioners shall be the sole judges of what constitutes default on the part of the Contractor.

MANNER OF PERFORMANCE.

6. All of the said works shall be constructed of the best materials of their several kinds, and finished in the best and most workmanlike manner, in the manner required by and in strict conformity with the said specifications and the drawings relating thereto and the working or detail drawings which may, from time to time, be furnished (which said specifications and drawings and the working or detail drawings to be hereafter furnished are hereby declared to be part of this Contract), and to the complete satisfaction of the Chief Engineer.

SEVERAL CLAUSES OF CONTRACT TO BE READ TOGETHER.

7. The several parts of this Contract shall be taken together, to explain each other, and to make the whole consistent; and if it be found that anything has been omitted or misstated, which is necessary for the proper performance and completion of any part of the work herein mentioned and described, the Contractor will, at his own expense, execute the same as though it had been inserted and properly described, and the correction of any such error or omission shall not be deemed to be an addition or deviation from the works hereby contracted for.

COMMENCEMENT AND PROSECUTION OF WORK.

8. The said work shall be commenced immediately after the execution of this Agreement and shall be proceeded with continuously and diligently, and under the personal supervisiou of the Contractor, until completed. The work shall be carried on and prosecuted in all its several parts in such a manner and at such points and places as the Engineer shall from time to time direct and to his satisfaction, but always according to the provisions of this agreement, and, if no direction is given, then in a careful, prompt and workmanlike manner, according to this Agreement. The Contractor shall make and keep open for use in safe condition, all crossings and approaches wherever the line of railway traverses any public or private road, and shall alter and amend such roads, crossings and approaches whenever required by the Engineer in charge of the work, during the construction of the line.

AGREEMENT NOT TO BE ASSIGNED.

9. This Agreement shall not be assigned without the consent of the Commissioners, nor shall the said work or any part thereof be subcontracted, without the written consent of the Commissioners to every such assignment or subcontract.

CONTROL OF THE WORK BY ENGINEER.

10. The Contractor shall in all things conform to and comply with the instructions of the Engineer. All work and material shall be subject to the approval of the Engineer, and any work or material which, in the opinion of the Engineer, is not of the character, quality, dimensions or design required by the plans or specifications, or which is in the judgment of the Engineer otherwise in any manner defective, imperfect, or insufficient, shall be replaced or remedied when pointed out to the Contractor by the Engineer, and shall be made good and sufficient by the Contractor, at his own expense, and to the satisfaction of the Engineer, who shall have the power and whose duty it shall be, to have any defective work or material taken out and rebuilt, or replaced at the expense of the Contractor. Any omission by the Engineer to disapprove of or reject any insufficient or imperfect work at the time of any estimate shall not be deemed an acceptance of such work or material.

CHANGES AND EXTRA WORK.

11. The Engineer shall be at liberty at any time, either before the commencement or during the construction of the works or any portion thereof, to order any extra work to be done, and to make any change or alteration which he may deem expedient in the alignment or grade of the railway, or in the dimensions, nature, location, or position of the works, or of any part or parts thereof, or in any other thing connected with the works, whether or not, such changes increase or diminish the work to be done, or the cost of doing the same, and the Contractor shall immediately comply with all written requisitions of the Engineer in that behalf, but the Contractor shall not make any change in or addition to, or omission, or deviation from the works, and shall not be entitled to any payment for any change, addition or deviation, or any extra work, unless such changes, addition, omission, deviation, or extra work, shall have been first directed in writing by the Engineer, and notified to the Contractor in writing, and the price to be paid for such extra work shall be previously fixed by the Engineer by agreement with the Contractor, or in default of such agreement, shall be as provided by Section 35.

CLAUSES OF CONTRACT TO APPLY TO CHANGES AND EXTRA WORK.

12. All the clauses of this contract shall apply to any changes, additions, omissions, deviations, or extra work, in like manner, and to the same extent as to the works contracted for, and no changes, additions, deviations, omissions or extra work shall annul or invalidate this Contract.

NO CLAIM FOR LOSS OF PROFITS.

13. If any change or deviation in, or omission from the works be made by which the amount of work to be done shall be decreased, no compensation shall be claimable by the Contractor for any loss of anticipated profits in respect therefor.

CLAIMS FOR EXTRA WORK TO BE PRESENTED AT END OF MONTH.

14. All claims for extra or additional payment must be presented to the Engineer for allowance at the end of the month in which the work or material in respect of which the same is claimed shall have been done or furnished, and shall, if allowed by the Engineer, be included in the estimate for that month, otherwise all claims therefor shall be deemed to be absolutely waived by the Contractor and the Commissioners shall not be required to make such or any payment for or in

respect of such work or material, unless, in the judgment of the Commissioners under the circumstances of the case, it is reasonable and proper to do so.

ENGINEER SOLE JUDGE.

15. The Engineer shall be the sole judge of work and material in respect of both quantity and quality, and his decision on all questions in dispute with regard to work or material shall be final, and no works or extra or additional works or changes shall be deemed to have been executed, nor shall the Contractor be entitled to payment for the same, unless the same shall have been executed to the satisfaction of the Engineer, as evidenced by his certificate in writing, which certificate shall be a condition precedent to the right of the Contractor to be paid therefor.

PRICES IN SCHEDULE TO INCLUDE ALL THINGS NECESSARY FOR EXECUTION AND COMPLETION OF WORK.

16. The prices to be paid for the different kinds of work set out or referred to in the list or schedule of prices are intended to and shall include not merely the particular kind of work or materials mentioned in the said list or Schedule but also all and every kind of work, labour, tools and plant, materials, articles and things whatsoever necessary for the full execution and completion ready for use of the respective portions of the works, to the satisfaction of the Engineer. And in case of dispute as to what work, labour, tools and plant, materials, articles and things, are or are not so included, the decision of the Engineer shall be final and conclusive.

FOREMAN.

17. A competent foreman shall be kept on the ground by the Conrtactor during all the working hours, to receive the orders of the Engineer, and should the person so appointed be deemed by the Engineer incompetent, or conduct himself improperly, he may be discharged by the Engineer, and another shall be at once appointed in his stead; such foreman shall be considered as the lawful representative of the Contractor, and shall have full power to carry out all requisitions and instructions of the Engineer.

MATERIAL OBJECTED TO MUST BE REMOVED.

18. In case any materials, or other things in the opinion of the Engineer, which are not in accordance with the several parts of this Contract or are not sufficiently sound or are otherwise unsuitable for the respective works, shall be used for or brought to the intended works, or any part thereof, or in case any work shall be improperly executed, the Engineer may require the Contractor to remove the same, and to provide proper material or other things, or to properly re-execute the work, as the case may be; and thereupon the Contractor shall and will immediately comply with the said requisition, and if twenty-four hours shall elapse and such requisition shall not have been complied with, the Engineer may cause such materials or other things, or such work, to be removed and, in any such case, the Contractor shall pay the Commissioners all such damages and expense as shall be incurred in the removal of such materials, or other things, or of such work, or the Commissioners may, in their discretion, retain and deduct such damages adn expenses from any amounts payable to the Contractor.

MACHINERY AND PLANT TO BE PROPERTY OF COMMISSIONERS DURING CONSTRUCTION.

19. All machinery and other plant, materials and things whatsoever provided by the Contractor for the works hereby contracted for, and not rejected under the provisions of the last preceding clause, shall from the time of their being so provided become, and, until the final completion of the said work, shall be the property of the Commissioners for the purpose of the said works, and the same shall on no account be taken away, or used or disposed of except for the purpose of the said works, without the consent in writing of the Engineer, and the Commissioners shall not be answerable for any loss or damage whatsoever which may happen to such machinery or other plant, materials or things, provided always that upon the completion of the works and upon payment by the Contractor of all such moneys, if any, as shall be due from him to the Commissioners, such of the said machinery and other plant, materials and things as shall not have been used and converted in the works and shall remain undisposed of, shall, upon demand, be delivered up to the Contractor.

POWER TO TAKE WORK OUT OF CONTRACTOR'S HANDS.

20. In case the Contractor shall make default or delay in diligently continuing to execute or advance the works to the satisfaction of the Engineer, and such default or delay shall continue for six days after notice in writing shall have been given by the Engineer to the Contractor requiring him to put an end to such default or delay, or in case the Contractor shall become insolvent, or make an assignment for the benefit of creditors, or neglect either personally or by a skilful and competent agent to superintend the works, then in any of such cases the Commissioners may take the work out of the hands of the Contractor and employ such means as they may see fit to complete the work, and the Contractor shall have no claim for any further payment in respect of the works performed, but shall nevertheless remain liable for all loss or damage which may be suffered by reason of the non-completion by him of the works; and all materials and things whatsoever, and all horses, machinery and other plant provided by him for the purposes of the works, shall remain and be considered as the property of the Commissioners for the purpose and according to the provisions and conditions contained in paragraph 22 hereof.

ABANDONMENT OF WORK BY CONTRACTOR.

21. If the work to be done under this Agreement shall be abandoned or be assigned by the Contractor without the consent of the Commissioners, or if the Contractor shall lose control of the work for any cause, excepting the acts of God or of the public enemy, or if at any time the Chief Engineer shall be of the opinion and shall so certify in writing to the Commissioners that the Contractor is wilfully and persistently violating any of the conditions or covenants of this Contract, or is not executing said Contract in good faith, the Commissioners may take the work out of the hands of the Contractor and may employ such means as they may see fit to complete the work, and all provisions of section 20 of the Agreement shall thereupon apply and the Commissioners shall have in regard to the said work all the powers therein provided.

POWER TO EMPLOY ADDITIONAL MEN, HORSES, ETC., AND PLANT.

22. If the Engineer shall at any time consider that the number of workmen, or horses, or the quantity of machinery, or other plant, or the quantity of proper

materials, respectively employed, provided or supplied by the Contractor on or for the said works, is insufficient for the advancement thereof towards completion within the limited time, or that the works are, or some part thereof is, not being carried on with due diligence, then and in every such case the Engineer may, by written notice to the Contractor, require him to employ or provide such additional workmen, horses, or machinery or such additional or other plant or materials as the Engineer may think necessary, and, in case the Contractor shall not thereupon within three days, or such other longer period as may be fixed by any such notice, in all respects comply with such requisition, then the Engineer may either on behalf of the Commissioners, or, if he sees fit, may as the agent of and on account of the Contractor, but in either case at the expense of the Contractor, provide and employ such additional workmen, horses, or machinery or such additional or other plant, or material or any portion thereof, respectively, as he may think proper, and may pay such additional workmen such wages, and for such additional horses, machinery or such additional or other plant and machinery respectively such prices as he may think proper, and all such wages and prices respectively shall thereupon at once be repaid by the Contractor, or the same may be retained and deducted out of any sum that may then or thereafter be or become due from the Commissioners to the Contractor, and the Commissioners may use in the execution or advancement of the said works not only the horses, machinery and other plant and other materials so in any case provided by anyone on their behalf, but also all such as may have been or may be provided by or on behalf of the said Contractor.

WORKS AT THE RISK OF CONTRACTOR UNTIL COMPLETION.

23. The Contractor shall be at the risk of, and shall bear, all loss or damage whatsoever, from whatsoever cause arising, which may occur to the works, or any of them, until the same shall be fully and finally completed and delivered up to and accepted by the Commissioners; and, if any such loss or damages shall occur before the final completion, delivery and acceptance, the Contractor shall immediately, at his own expense, repair, restore and re-execute the work so damaged.

DAMAGE GENERALLY.

24. The Contractor and his agents, labourers and all employed by him, or under his control, shall use due care that no person or property is injured or any rights infringed in the prosecution of the said works, and the Contractor shall be responsible for all damages claimable by any person or corporation whatsoever in respect of any injury to persons or property or in respect of any infringement of any right whatsoever, including damage by fire occasioned in his carrying on of the said works, or by any neglect or misfeasance or nonfeasance on his part or on the part of his servants or employees, and shall and will, at his own expense, make such temporary provisions as may be necessary for the protection of persons, or of lands, buildings, animals or other property, or to prevent the interruption of the traffic on any public or private road, or for the uninterrupted enjoyment of all rights of persons or corporations in and during the performance of the said works.

STOPPAGE OF WORK AND REDUCTION OF FORCE.

25. The Commissioners shall have the right to suspend operations from time to time at any particular point or points or upon the whole of the works, or to direct that the force employed on the works shall be diminished, and the Contractor, upon being requested in writing so to do by the Commissioners, shall stop the work or reduce the force, as the case may be, in accordance with such

written request, and the Contractor shall have no claim for damages by reason thereof. Such writing shall be signed by the Engineer and delivered to the Contractor, or to some person on the work representing the Contractor, at least ten days previous to such stoppage of work or reduction of force.

EXTENSION OF TIME IN CASE OF STOPPAGE OF WORK.

26. If there be any stoppage of the said work upon the written directions of the Commissioners or if its progress be materially delayed, from want of location, or staking of the line, or work of securing of the right of way, or by reason of any act or neglect of any of the Engineers or agents or employees of the Commissioners, the time herein specified for completing the said work shall be extended for a period of time equal to the time of such stoppage or delay, and the Contractor shall have no further or other claim therefor, or for or in respect of anything arising therefrom or caused thereby. The right of the Contractor to such extension shall be deemed to have been waived unless a claim therefor, stating the occasion and nature thereof, shall be made by him in writing, delivered to the Commissioners at the time of such stoppage or delay. At any time after operations have been suspended either in whole or in part, such operations may be again resumed and again suspended and resumed as the Commissioners may deem proper, and the Contractor, upon receiving written notice on behalf of the Commissioners that the suspended operations are to be resumed, shall at once resume the prosecution of the work under this contract and diligently carry on the same.

TOTAL SUSPENSION WITH THE CONSENT OF THE COMMISSIONERS.

27. In case of a total suspension of all work under this Agreement without any fault, default, collusion or procurement of the Contractor for a longer period than days, unless such suspension shall have been caused by the winter season or protracted rigor of weather, it shall be the duty of the engineer to make a final estimate of the work done according to the terms of this Agreement, and to make a return thereof to the Commissioners when the amount found by the Engineer to be then due for work done, together with all percentages retained up to that time, except as herein otherwise provided, shall be paid to the Contractor.

28. No delay within or beyond the period herein specified for completing the said work shall vitiate or void this Contract, or any part thereof, or the obligation hereby imposed upon the Contractor, or shall make void or in anywise impair or effect any current or other bond or security for the performance of this Contract, and all the Covenants and Agreements in this Contract and in the said Specifications contained shall apply to this Contract until the said work is finally completed and accepted, notwithsanding the fact that such work is not completed within the time specified herein for such completion.

CONTRACTORS TO PAY FOR LABOUR PROMPTLY.

29. The Contractor shall promptly pay for all labour, services and material in or about the construction of the work and all payments for such purpose shall be made by the Contractor at least as often as payments are made by the Commissioners to the Contractor, and in the event of failure by the Contractor at any time to do so, the Commissioners may retain from any moneys due or to become due to the Contractor such amount of money as the Chief Engineer may deem sufficient to make such payments. If the Engineer reports that there is reason to fear that any such payments will not be promptly made by the Contractor, the Commissioners may pay for such labour, services and material from

any date to any date and to any amount which may be payable and may charge the same to the Contractor, and the Contractor covenants with the Commissioners to repay at once all and every sum so paid. Before final settlement is made between the parties hereto for work done and materials furnished under this Contract, the Contractor shall and will produce and furnish evidence satisfactory to the Commissioners that the said work and any other property of the Commissioners upon which said work may have been constructed and all structures, are free and clear from all liens for labour, workmanship, materials or otherwise and that no claim then exists in respect of which a lien upon the said work or property of the Commissioners could or might attach. And the Contractor shall protect and hold harmless the Commissioners and all their porperty from any and all kinds of liens accruing from labour and services performed and material furnished or otherwise and any of the same in or about the said work.

DAMAGE BY FIRE.

30. Special precautions must be taken by the Contractor at his own expense to prevent fire; and the labourers in his employ shall be subject to the direction of the Engineer in the event of their aid being required by the Engineer to extinguish forest fires occurring in proximity of the right-of-way.

The Contractor shall conform to the fire regulations adopted by the Co m missioners and also to the laws and regulations respecting fires in the different Provinces wherein the work is being performed.

Any damage by fire that may occur to buildings or structures during construction, must be made good by the Contractor, who must keep such structures fully insured until the same have been completed and accepted by the Commissioners. The operation or occupation by the Commissioners of a portion of the work, before the completion of the whole, is not to be considered as an acceptance of the same by the Commissioners. The premiums for fire insurance shall be payable by the Contractor, and the policies are to be made payable to the Commissioners or in such form as they may direct, the loss being made payable as the interest of the Contractor and of the Commissioners respectively may appear and the policy or policies shall be deposited with the Chief Engineer of the Commissioners until the completion and acceptance of the work.

INTOXICATING LIQUORS.

31. The Contractor shall not bring nor permit to be brought anywhere on or near the said works any spirituous or intoxicating liquors, and if any foreman, labourer or other employee or sub-contractor in the opinion of the Engineer, be intemperate, disorderly, incompetent, wilfully negligent or dishonest in the performance of his duties, he shall, on the direction of the Engineer, be forthwith discharged and the Contractor shall not permit or employ to remain upon the work any person who shall have been discharged from the said work for any or all of the said causes.

32. Upon the completion of the work, the Contractor shall remove all temporary structures, fill up all holes and trenches, level all mounds or heaps of earth that may have been dug or built by him in the execution of the work or incident thereto and shall remove and clean away all surplus and waste materials or rubbish of whatever kind remaining on or about the works, and deposit such refuse material at such place as the Engineer may designate.

COMMISSIONERS COVENANT TO PAY.

33. In consideration of the faithful performance by the Contractor of all and singular the covenants and agreements herein contained, the Commissioners hereby covenant and agree with the Contractor that they will well and truly pay him on the full completion by him of all the work herein specified within the time specified and limited for the completion thereof to the satisfaction and subject to acceptance by their Chief Engineer and subject also as herein provided, the following sums and prices, namely:—

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
1	Clearing, including close cutting	acre			
2	Trees cut down outside right of way	each			
3	Grubbing	acre			
4	Solid rock	c. yd.			
5	Loose rock and other materials (sec. 35 spec.)	"			
6	Common excavation	"			
7	Excavation in foundations, no coffer dams	"			
8	Excavation of foundation within coffer dams	"			
9	Overhaul all materials per c. yd. per 100 ft. over 500 ft. haul	"		0 01	
10	Piles delivered as per engineer's bill	lin. ft.			
11	Pile driving	"			
12	Sheet piling per M. ft. b.m.				
13	Wakefield type "				
14	Cross-logging, 1 ft. deep with 18-in. brush-work	acre			
15	Pole drains	lin. ft.			
16	French stone drains	"			
17	Paving in culverts (not laid in cement)	c. yd.			
18	Crib filling with stone	"			
19	Hand laid rip-rap	"			
20	Pierre Perdu rip-rap	"			
21	Piling out reserved stone from rock cuttings	"			
22	Round logs in cribs	lin. ft.			
23	Cedar mud sills, per M. ft. b.m.				

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
24	Framed trestles per M. ft. b.m. except stringer				
25	Caps, walings and braces for pile trestles, per M. ft. b.m.				
26	Sawn ties and guard rails for bridges per M. ft. b.m.				
27	Stringers per M. ft. b.m.				
28	Cedar timber in culverts, 8-in. x 12-in., 10 in. x 12-in., and 12-in. x 12-in., per M. ft. b.m.				
29	Plank in highway and private road crossings per M. ft. b.m.				
30	Timber, best quality, for culverts, per M. ft. b.m.				
(a)	Timber in coffer dams or ordinary foundations.	M ft. B.M.			
(b)	Timber in caissons	"			
	Vitrified pipe culverts—				
33	15-in. diameter	lin. ft.			
34	18-in. diameter	"			
	Reinforced concrete pipe—				
38	18-in. diameter	"			
40	24-in. diameter	"			
41	30-in. diameter	"			
42	36-in. diameter	"			
44	48-in. diameter	"			
46	60-in. diameter	"			
47	4-in. agricultural under tile drain	"			
	Cast iron pipe culverts—				
49	18-in. diameter	"			
51	24-in. diameter	"			
52	30-in. diameter	"			
53	36-in. diameter	"			
55	48-in. diameter	"			
57	60-in. diameter	"			
58	Concrete facing mixture 1-2, 2½-in. thick, including forms	c. yd.			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
59	Concrete 1-2-4 coping course 6-in. thick, including forms	c. yd.			
60	Concrete 1-3-5, including forms	"			
61	Concrete 1-3-6, including forms	"			
61a	Concrete 1-2-5, including forms and centres	"			
62	Concrete 1-3-5 in arch culverts, including forms and centres	"			
63	Concrete 1-3-6 in arch culverts, including forms and centres	"			
64	Concrete 1-3-6 in box culverts including, forms	"			
65	Concrete 1-4-8 ordinary foundations including forms	"			
66	Concrete 1-4-8 walls of building including forms	"			
67	First-class masonry	"			
68	Second-class masonry	"			
69	Third-class masonry	"			
70	Dry masonry	"			
71	Masonry in arch ring, including centering	"			
72	Track-laying in main line with ordinary frogs, switches, and sidings, including light surfacing 'A'	mile			
73	Track-laying in yards at terminals	"			
74	Train hauled surfacing 'B' no overhaul allowed	c. yd.			
(c)	Train hauled filling, including temporary trestle	"			
(d)	Overhaul on train hauled filling per cubic yard per mile over five (5) miles			0 01	
(e)	Removal of moss per cu. yd., no overhaul allowed				
75	Ballasting, no overhaul allowed	c. yd.			
76	Ties, first-class	each			
77	Ties, second-class	"			
78	Ties for switches, sawn to dimensions per M. ft. b.m.				
79	Public road signs	each			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
80	Mile posts, whistle posts, and road signs	each			
81	Semaphores at stations, complete	"			
82	Interlocking appliances, complete, eight levers including all connections, signals, etc	"			
83	Each additional lever	"			
84	Fencing	rod			
85	Gates	each			
86	Tunnels, rock sections (unlined)	lin. ft.			
87	Tunnels, lined	"			
88	Tunnels, concrete lining	c. yd.			
89	Tunnels, masonry lining	"			
90	Drainage tunnels, 4 c. yds. per ft	lin. ft.			
91	Telegraph line	mile			
92	Water tanks, 50,000 galls. complete, including foundations	each			
93	Turntables, including everything except foundations	"			
94	Track scales, including everything except foundations	"			
94	Tracks cales, including everything except foundations	"			
95	Tunnel shafts	c. yd.			
96	Iron in drift bolts	lbs.			
97	Iron in screw bolts	"			
98	Forged or cut spikes	"			
99	Cast-iron washers and separators	lbs.			
100	Cattle-guards (3 sections)	3 sections			
101	Cast-iron pile shoes	each			
102	Cast-iron water pipes of any dia. from 4" to 10" per ton of 2,000 lbs				
103	Steel imbedded in concrete	lbs.			

34. Cash payments equal to about ninety per cent. of the value of the work done, approximately made up from returns of progress measurements and computed at the prices agreed upon, or determined under the provisions of this agreement, will be made to the Contractor monthly, on the written certificate of the Engineer that the work for, or on account of which, the certificate is granted has been duly executed to his satisfaction, and stating the value of such work computed as mentioned, and upon approval of such certificate by the Commissioners; and the said certificate and such approval thereof shall be a condition precedent to the right of the Contractor to be paid the said ninety per cent., or any part thereof. The remaining ten per cent. shall be retained until the final completion of the whole work to the satisfaction of the Chief Engineer for the time being having control over the work; and within two months after such completion the remaining ten per cent. will be paid; and the written certificate of the Engineer, certifying to the final completion of the said works to his satisfaction, shall be a condition precedent to the right of the contractor to receive or to be paid the said remaining ten per cent., or any part thereof; provided, however, that if and when it is shewn by the Contractor to the satisfaction of the Commissioners that the application of the said ten per cent. or any part thereof will enable or hasten the completion of the work, and that the same will be so applied; and if and when, in the opinion of the Commissioners, it appears that the deposit made by the Contractor as security for the performance of this Contract is ample security for the completion of the work, the said ten per cent. or any part thereof may be released by the Commissioners in such instalments as may from time to time be agreed upon. The Commissioners shall be at liberty from time to time to take over as completed any portion of the work certified to by the Engineer as having been completed, and the Contractor shall, thereupon, be entitled to payments in full for the work so completed in like manner, and subject to the same conditions, as if the said completed portion comprised the whole work to be done. The Commissioners shall be entitled from time to time to the use of any portion of the line of railway not theretofore accepted as completed under the terms thereof for the transportation of all steel superstructures or other materials, and no such use of any part of the said railway shall be deemed to be any acceptance or taking possession thereof.

PRICE FOR EXTRA WORK.

35. In addition to the foregoing contract price, the Commissioners will pay to the Contractor for extra work or for work done under written orders of the Engineer, not covered by this Agreement, but done in the proper execution of this Contract, and for which prices are not named herein, the actual cost of such work, with an additional ten per cent. on the cost of labour and material for the use of tools, Contractor's plant, superintendence and profit, but such actual cost shall not exceed the reasonable market value of such labour and material as the case may be.

36. Where, in the opinion of the Chief Engineer, the work done is not, having regard to the nature and character of the work remaining to be performed, of sufficient value to justify computation at the prices agreed upon and determined under the provisions of this agreement, it shall be competent for the Chief Engineer, in certifying the value of the work done for the purpose of such payment, to disregard the prices so agreed upon or determined, and to compute and certify its relative and proportionate value having regard to the nature and character of the work remaining to be performed; in which case the Contractor shall only be entitled to receive ninety per cent. of the value of the work done as stated in such certificate, and he shall not be paid the difference between ninety per cent of the value of the work done as so ascertaineed and certified, and ninety per cent of the value of such work according to the prices stipulated therefor under the provisions

of this Agreement, until such time as the Chief Engineer, by reason of the performance of additional work of greater relative value, shall certify that the Contractor is entitled to receive the same.

37. It is intended that every allowance to which the Contractor is fairly entitled will be enbraced in the Engineer's monthly certificates; but should the Contractor at any time have claims of any description which he considers are not included in the progress certificates, it will be necessary for him to make and repeat such claims in writing to the Engineer within thirty days after the date of the despatch to the Contractor of each and every certificate in which he alleges such claims to have been omitted.

38. The Contractor in presenting claims of the kind referred to in the last preceding paragraph must accompany them with satisfactory evidence of their accuracy, and the reason why he thinks they should be allowed. Unless such claims are thus made during the progress of the work, within thirty days, as in the preceding clause, and repeated, in writing every month, until finally adjusted or rejected, the Contractor shall have no claim upon the Commissioners in respect thereof.

39. The progress measurements and progress certificates shall not in any respect be taken as binding upon the Commissioners, or as final measurements or as fixing final amounts; they are to be subject to the revision of the Engineer in making up his final certificate, and they shall not in any respect be taken as an acceptance of the work or release of the Contractor from responsibility in respect thereof, but he shall at the conclusion of the works deliver over the same in good order, according to the true intent and meaning of this Agreement.

CONTRACTOR'S INFORMATION.

40. This Agreement is made and entered into by the Contractor for the consideration herein expressed, solely on his own knowledge, information and judgment of the character and topography of the country, its streams, water courses and rainfalls and subject to the same, and upon information derived from other sources than the Commissioners, its officers or agents, of and respecting the nature and formation of the property upon which the said work is to be done, or the character, quantities, or location of the material required to be removed or to be used in forming the roadbed for the said railway, and the Contractor does not rely upon the information given or statement or representation made to him in connection with the said contract by the Commissioners or any of its officers or agents. The Contractor further declares and agrees that the plans, maps and profiles of the said work, furnished by the Commissioners are given only for the purpose of general information.

41. The Contractor shall not have nor make any claim or demand against the Commissioners or file a petition of right for any damage which he may sustain by reason of any delay in the progress of the work, arising from the acts of any of the Commissioners' agents, and it is agreed that, in the event of any such delay, the Contractor shall have such further time for the completion of the works as may be fixed in that behalf by the Commissioners.

42. No action shall be brought against the Commissioners upon this Agreement, or for any breach of any covenants herein contained, or for any work done or claimed to be done or for damages arising out of or by reason of this Agreement, but the remedy of the Contractor shall only be by way of Petition of Right to His Majesty the King, and it is hereby agreed that all matters of difference arising between the parties hereto upon any matter connected with or arising out of this Agreement, the decision whereof is not hereby especially given to the Engineer, shall be referred to the Exchequer Court of Canada.

43. This Contract is hereby made subject to the express condition that no Member of the Senate or of the House of Commons of Canada shall be a party to or concerned or interested in any contract with the Commissioners for the construction of any part of the Eastern Division of the National Transcontinental Railway, or shall be a shareholder in any incorporated company having any such contract.

44. The Contractors will protect and will not remove or destroy, or permit to be removed or destroyed, the stakes, buoys and other marks placed on or about the said works by the Engineers of the works, and shall furnish the necessary assistance to correct or replace any stake or mark which through any cause may have been removed or destroyed.

45. Any notice or other communication mentioned in this Contract to be notified or given to the Contractor shall be deemed to be well and sufficiently notified or given if the same be left at the Contractor's office or mailed in any Post Office to the Contractor or Foreman, addressed to the address mentioned in this Contract, or to the Contractor's last known place of business.

46. The Contractor shall, in connection with the whole of the said work, as far as practicable, use only material, machinery, plant, supplies and rolling stock manufactured or produced in Canada, provided same can be obtained as cheaply and upon as good terms in Canada as elsewhere, having regard to quality and price.

47. All mechanics, labourers, or other persons who perform labour for the purposes of the construction of the works hereby contracted for shall be paid such wages as are generally accepted as current for competent workmen in the district in which the work is being performed, and, if there is no current rate in such district, then a fair and reasonable rate, and, in the event of a dispute arising as to what is the current or a fair and reasonable rate, it shall be determined by the Commissioners, whose decision shall be final.

48. This Agreement is subject to the regulations now in force or which may at any time hereafter be in force during the construction of the works hereby contracted for, made under the authority of the Department of Labour and which are or shall be applicable to such works.

49. All the works carried on under this Agreement shall be subject to the provisions of the Act respecting the Preservation of Health on Public Works and to all regulations made or to be hereafter made pursuant to the said Act, or by any other lawful authority, and applicable to such works, and to any regulations which may be adopted by the Commissioners in reference to sanitation or the preservation of health on public works.

50. The Contractor shall at his own expense make adequate arrangements for the medical and sanitary supervision of all his employees, and shall for that purpose employ the necessary duly qualified medical practitioners, furnish and provide all necessary medicines, surgical instruments, and hospital accommodation to the satisfaction of the Chief Engineer.

The duties of the medical staff shall include not only the attendance on sick or injured men, but the inspection of the sanitary arrangements of all camps, dwellings and works, at least once a month, or oftener, if, in the opinion of the Engineer, it is necessary.

In order to compensate the Contractor for such supervision he shall deduct from the wages of every man in his employment in the district or districts in which this contract is situated

per month, or a proportional rate for a less period.

It shall be optional on the part of the Commissioners, should they see fit to do so, to take over the medical and sanitary supervision of all men, camps, dwellings and works, and should they elect so to do the Contractor shall deduct from the wages of all employees as before stated the sum of

per month,

or a proportional rate for a less period, and shall furnish to the Commissioners at the end of each month a full and correct statement of all such deductions, and the Commissioners shall subtract the total amount of such deductions from the moneys due or to become due to the Contractor on account of estimates for that month.

51. The Contractor shall observe and comply with all regulations made by any lawful authority and with all regulations of the Commissioners and instructions from the Engineer of the said works, from time to time during the construction made or given with reference to the prevention and extinguishing of fires, and shall pay all wages and other outlay occasioned by such regulations and instructions.

52. It is distinctly declared that no implied contract of any kind whatsoever, by or on behalf of the Commissioners, shall arise or be implied from anything in this contract contained, or from any position or situation of the parties at any time, it being clearly understood and agreed that the express contracts, covenants and agreements herein contained and made by the Commissioners, are and shall be the only contracts, covenants and agreements upon which any rights against them are to be founded.

IN WITNESS WHEREOF the parties hereto have herewith caused these Presents to be signed and sealed on the day and year first above written.

SIGNED, SEALED AND DELIVERED,
by the Contractor in the
presence of:

Signature of Contractor.

SIGNED, SEALED AND DELIVERED,
by the Commissioners in the
presence of:

SESSIONAL PAPER No. 123

INDEX TO SUBJECTS

TO

GENERAL SPECIFICATIONS.

SESSIONAL PAPER No. 123

GENERAL SPECIFICATIONS

FOR THE CONSTRUCTION OF THE

NATIONAL TRANSCONTINENTAL RAILWAY

EASTERN DIVISION

General.

ALIGNMENT.

1. The centre of the roadbed shall conform in alignment to the centre stakes.

SUB-GRADE.

2. The grade line of the profile denotes sub-grade, and this term indicates the top of embankments or the bottom of excavations ready to receive the ballast.

CROSS SECTION.

3. The roadbed shall be formed to the section, slopes and dimensions shown upon the standard drawings, or to such modifications thereof as are required to meet special conditions, as may be from time to time directed.

WIDTH OF ROADBED.

4. When finished and properly settled the roadbed shall conform to the finishing stakes and shall be of the following dimensions at sub-grade, for single track, viz.:—

On embankments less than sixteen feet in height, the width shall be sixteen feet. On all other heights, the width shall be eighteen feet

Earth excavations, twenty-two feet at formation level.

Rock excavations, twenty feet wide at formation level.

SLOPES.

5. The slopes of embankments and excavations shall be of the following inclinations, as expressed in the ratio of the horizontal distance to the vertical rise:—

Embankments: Earth, one and one-half to one; rock, one to one.

Excavations: Earth, one and one-half to one; loose rock, one to one; solid rock, one quarter to one; unless otherwise ordered in writing by the Engineer.

Clearing and Grubbing.

CLEARING.

6. The whole, or as much of the right-of-way as the Engineer may direct, shall be entirely cleared of all trees, logs, brush and other perishable matter; all of which shall be burnt or otherwise disposed of as the Engineer may direct unless specially reserved to be made into ties, timber or cordwood. All merchantable timber, etc., cut on the right-of-way will belong to the Commissioners,

who may dispose of same as best seems fit. Unless directed in writing by the Engineer, trees and brush must not be thrown on adjacent lands, but must be disposed of on the right-of-way. Trees unavoidably falling outside right-of-way must be cut up, removed to right-of-way and disposed of.

All trees, stumps, undergrowth and brush within such clearing must be cut so that the tops of same shall not be over eighteen inches above surface of ground.

No allowance will be made for the cutting and removal of grain, grass, weeds or other annual plants on the right-of-way, the contract price of grading being assumed and understood to cover all such items.

DANGEROUS TREES.

7. All trees outside the limit of the right-of-way considered unsafe by the Engineer shall be cut down and disposed of as "other clearing," but no trees shall be cut down unless marked for cutting by the Engineer.

HOW PAID FOR.

8. Clearing shall be paid for by the acre where actually performed and dangerous trees cut outside the right-of-way at the specified rate per single tree.

CLOSE CUTTING.

9. On ground to be covered by embankments more than two feet and less than 5 feet high, all trees and stumps shall be cut off even with the surface of the ground and removed; the price paid for clearing covers close cutting.

GRUBBING.

10. In all excavations, including borrow pits, on all ground to be covered by embankments less than two feet high, and from all ditches, drains, new channels for water ways and other places when required, all stumps and large roots must be grubbed out and removed.

HOW PAID FOR.

11. Grubbing will be estimated and paid for by the acre, when actually performed in excavation less than four feet deep, under embankments less than two feet high, and on borrow pits, ditches drains, and new channels for water within the clearing limits, but no grubbing will be allowed on the slopes of any cutting where the depth at a distance of eleven feet on either side of the centre line exceeds four feet.

REMOVAL OF MOSS.

11A. Where the moss is over six inches deep on the ground to be covered by embankments less than two feet high, or any other places where, in the opinion of the Engineer, it is necessary to remove moss, it shall be removed and wasted. Such work shall only be done on the written instructions of the Engineers, and shall be paid for at a schedule rate per cubic yard measured in excavation.

Grading.

DEFINITION.

12. Under this head will be included excavations and embankments for the formation of the roadbed; all diversions of roads and streams; all borrow pits and ditches, foundation pits for trestles, culverts, buildings and structures, and all similar work connected with and incident to the construction of the roadbed.

LARGE BLASTS.

13. The use of powder or other explosives in large blasts is prohibited, unless on written authority of the Engineer. In the event of wasting of rock through any such blasting the Contractor shall, if the material is required in the vicinity for the making up of embankments, of which the Engineer shall be the judge, furnish at his own cost an equivalent amount of material for such embankment. One yard of rock in place being taken to equal 1½ yards of earth.

RESPONSIBILITY FOR DAMAGE.

14. All damage occasioned by blasting of rocks in the progress of the work, to any person, or any injury done by the Contractor, or those in his employ, to tracks, rolling stock, crops, fences, buildings or any property of the Commissioners, or of the adjoining land owners or occupants, shall be paid by the Contractor, or may be paid to the Commissioners and charged to the Contractor.

PUBLIC OR PRIVATE ROADS.

15. Whenever the line is intersected by public or private roads, the Contractor must keep open, at his own expense, convenient passing places. All dangerous places must be suitably protected by the customary warning signals, and fences when necessary.

REMOVAL OF ICE AND SNOW.

16. The Contractor shall, at his own cost, remove snow and ice from any portion of the work, whenever deemed necessary by the Engineer.

HAUL.

17. The limit of free haul will be 500 feet. For any haul exceeding 500 feet the Contractor shall be paid at one cent per cubic yard per 100 feet. The yardage overhauled will always be measured and estimated in excavation.

In all cases the work will be estimated so as to make the least cost; that is, if necessary, earth from excavations will be estimated as having been hauled regardless of the fact that the Contractor may have preferred to waste the material from the cuts and borrow the materials for the fills, but such waste and borrow must be subject to the approval of the Engineer in writing. This clause does not apply to material hauled over the rails owned by the Commissioners, or to any other train-hauled material.

Temporary Bridge or Haulway.

When the Engineer or the Commissioners so directs, material will be hauled over or beyond any bridge opening, and the Contractors shall construct such temporary bridge or haulway over or around such opening, and shall receive therefor actual cost of such bridge or haulway, including labor and material, plus (10%) per cent. This clause does not include the construction of roadways which are to be provided by the Contractor under section 244.

Excavations and Embankments.

FINISHING SLOPES.

18. Slopes of all excavations shall be cut true and straight, and all loose or projecting stones on the slopes must be removed.

EXCESS AND DEFICIENCIES OF MATERIAL.

19. Excess material in excavation shall be used to widen embankments within the limit of haul. No wasting will be permitted except on written authority of the Engineer. When the quantity of excavation is insufficient to make up embankments within the limit of haul, the deficiency shall be made up by widening the cuts as directed. No borrowing will be permitted until this manner of obtaining material has been exhausted.

RESERVATION OF MATERIAL AND PAYMENT THEREFOR.

20. Whenever gravel suitable for ballasting is found in a cutting, the Contractor shall, if required by the Engineer, cut a gullet through large enough to pass a train, the remainder of the material being reserved for top dressing or ballasting. The price stipulated in the schedule for common excavation shall cover the gulleting of gravel cuts, the remainder being treated as ballast. When stone suitable for special purposes is found in a cutting, it shall, if required by the Engineer, be reserved for such special purposes, and shall be piled near at hand so as to permit convenient loading on cars. The price paid for piling and reloading such reserve stone shall be the schedule price for same.

CATCH WATER DITCHES.

21. Catchwater ditches, as required, shall be made along the tops of excavations to prevent water flowing into the cut. The location and cross-section of such ditches shall be designated by the Engineer, and, if required, shall be excavated before the cuts are opened.

TILE DRAINS.

22. When required, four (4) inch tile drains shall be used; their location shall be as directed by the Engineer. The trenches for these tile drains must be excavated below frost line and to a true grade. The tile shall be laid with ends butted, and shall be covered with brush, grass, hay or straw, over which shall be laid gravel or other suitable material approved by the Engineer.

PROVISION FOR SETTLEMENT.

23. Whenever it is necessary to provide for the future settlement of the embankments, the height and width of the roadbed shall be increased, as directed.

PRECAUTIONS ON HILLSIDE GROUNDS.

24. When the embankment is to be placed on steep sidehill, the surface shall be deeply plowed, stepped or trenched. If built on wet or spongy ground likely to be affected by water, the Contractor shall remove all unsuitable material, and, if required, shall underdrain the same with tile, broken stone, or pole drains as directed.

CROSS-WAYING.

25. When required, in swamps or muskegs, cross-ways shall be put in. They shall be built of logs, each log as long as the full width of the embankment, if such timber is available, or of such length as shall be directed by the Engineer, and not less than six (6) inches in diameter. The depth of the log portion of the cross-way shall not be less than one foot. Said cross-way to be thatched with full limbs and brush to a depth of at least eighteen (18) inches. Such cross-way shall be paid for at the schedule price per acre. (If the cross-logging is two feet or more in depth, with the eighteen inches of brush on top, the price will be the schedule price for two or more acres, as the case may be.) No ditches shall be made on either side of cross-ways, except by direction of the Engineer.

EMBANKMENTS AGAINST MASONRY.

26. Embankments over culverts of masonry or concrete, or iron or vitrified pipe, shall be built of the best obtainable material. The portion against the sides of the culvert or pipe shall be thoroughly tamped. The portion over the arch or crown shall be deposited as loosely as possible, using all necessary care to avoid injury to the structure or pipe. The price paid for common excavation will cover the cost of doing such work.

SLOPES WHERE RIPRAP IS USED.

27. When directed, embankments or slopes which are to be riprapped, shall be flattened to a slope of 2 to 1.

Side Ditches, Borrow Pits, &c.

SIDE DITCHES ON PRAIRIE.

28. On prairie or level country, where embankments are much in excess of excavation the material to form the embankments will usually be obtained from parallel side ditches; such ditches must be made continuous, of uniform cross-section and constructed to a regular grade to facilitate drainage.

LOCATION OF BORROW PITS.

29. Borrow pits shall be located in such places as will be approved by the Engineer. They shall be regular in width, unless otherwise permitted by the Engineer, and, if required, shall be connected with ditches and drained to the nearest water course.

BERMS.

30. Berms of not less than the following widths must, where possible, be left

between the slope stakes and edges of borrow pits or ditches: For banks under 3 feet in height, berms 6 ft. wide; for banks 3 to 10 feet in height, berms 8 feet wide; for banks over 10 feet in height, berms 10 feet wide.

SLOPES OF BORROW PITS.

31. The side slopes of borrow pits on the right-of-way nearest the embankment, shall not be less than 1½ to 1, and those nearest to the outside of the right-of-way, not less than 1 to 1, always leaving sufficient berm to prevent the right-of-way fence from caving, but in no case less than four feet.

BORROWING AT STATIONS.

32. Borrowing from the side will not be allowed on either side of the centre line within eight hundred (800) feet of a station building, or a proposed station site, except where otherwise directed by the Engineer.

Classification.

CLASSIFICATION.

33. Grading will be commonly classified under the following heads: "Solid Rock Excavation"; "Loose Rock" and "Common Excavation."

SOLID ROCK EXCAVATION.

34. Solid rock excavation will include all rock found in ledges or masses of more than one cubic yard, which, in the judgment of the Engineer, may be best removed by blasting.

LOOSE ROCK.

35. All large stones and boulders measuring more than one cubic foot and less than one cubic yard, and all loose rock whether in situ or otherwise, that may be removed by hand, pick or bar, all cemented gravel, indurated clay and other materials, that cannot, in the judgment of the Engineer, be ploughed with a 10-inch grading plough, behind a team of six good horses, properly handled; and without the necessity of blasting, although blasting may be occasionally resorted to, shall be classified as "Loose Rock."

COMMON EXCAVATION.

36. Common excavation will include all earth, free gravel or other material of any character whatever not classified as solid or loose rock.

36A. No classification other than that of common excavation will be allowed on material from borrow pits, except by order in writing of the Engineer.

SLIDES.

37. Material in slips, slides and subsidences extending beyond slopes in cuttings will not be paid for unless, in the opinion of the Engineer, such occurrences were beyond the control of the Contractor and not preventable by use of due care and diligence.

CLASSIFICATION OF SLIDES.

38. The classification of material from slides shall be made by the Engineer, and will be in accordance with its condition at the time of the slide, regardless of prior conditions.

MEASUREMENTS—HOW MADE.

39. Measurements will usually be made in excavation, and will only be made in embankments when borrow pits of great irregularity only can be had, and where it is practicable to measure the material in excavation. In such cases the following percentage will be deducted from the bank measurements, viz: When the bank is made up from side casting and shovel work, 10%; wagon and wheel scraper work, 7%; slush scraper work, 5%.

Foundations.

DIMENSIONS.

40. Foundation pits shall be of such dimensions and excavated to such depths as are shown on the plans, and, if required, shall be excavated to such further dimensions and depths as may be necessary to insure stability of the structure to be erected, according to the instructions of the Engineer, but in no case less than is shown on plans, except by the order in writing of the Engineer.

MATERIAL WHERE DEPOSITED.

41. Material excavated from foundation pits shall be deposited in the embankment, unless otherwise directed. Excavation for foundation pits, including those excavated under water, but not requiring caissons, cofferdams or other special appliances, shall be paid for at the schedule price per cubic yard excavated, such excavation to be kept dry, and the schedule price shall include the necessary bailing or pumping. Solid rock in such foundations will be paid for at a rate of three times that given in schedule, Item 4.

COFFER DAMS AND PUMPING.

41A. Foundations requiring coffer dams and pumping—excavation shall be made in the dry, that is, ample pumping capacity shall be furnished by the Contractor to insure dry work, and the price per cubic yard of excavation shall include the cost of said pumping or bailing. Coffer dams or caissons shall be built only when necessary in the opinion of the Engineer and ordered in writing by him, and shall be paid for at the schedule rates per thousand feet net timber, and per pound for iron, bolts or spikes in place in the structure, which prices shall include all labor and material incidental thereto, including caulking.

BUILT TO STANDARD PLANS.

42. Foundations must be built strictly according to the general or special plans. Material used in their construction must, in every respect, conform with the specifications of the Commissioners.

TAMPING.

43. Great care must be used to thoroughly tamp and solidify the ground in

the bottom of foundation trenches for bridges, trestles, culverts, buildings or other structures. Where mud sills are used they must be settled to a permanent bearing by ramming with heavy rammers.

Specifications for Portland Cement.

BRAND.

44. No cement will be allowed to be used, except established brands of high-grade Portland cement, which have been successfully used under similar climatic conditions, and approved by the Engineer.

WEIGHT.

45. A sack of cement shall mean 87½ lbs., four sacks making a barrel of 350 lbs.

PACKAGE.

47. The package shall be plainly labelled with the name of the brand and of the manufacturer, and must be put up in good, sound, strong barrels, well lined with paper, or in case where bags can be advantageously used, in good stout cloth or canvas, tight sacks.

TESTS.

48. Tests must be made from time to time of the fineness, specific gravity, soundness, time of setting, tensile strength and chemical composition.

FINENESS.

49. Ninety-four per cent. of the cement must pass through a sieve made of No. 40 wire Stubbs gauge, having ten thousand (10,000) openings per square inch.

SPECIFIC GRAVITY.

50. The specific gravity of the cement, as determined from a sample, which has been carefully dried, shall be between 3.10 and 3.25.

SOUNDNESS.

51. To test the soundness of the cement at least two pats of neat cement mixed for five minutes with 20 per cent. of water by weight shall be made on glass, each pat about (3) three inches in diameter and one-half (½) inch thick at the centre, tapering thence to a thin edge. To be well trowelled to work out air bubbles and surplus moisture. The pats are to be kept under a wet cloth until finally set, when one is to be placed in fresh water for twenty-eight (28) days. The second pat will be placed on the rack in "Faija hot bath tank" over the vapour of water heated to 170° Fahr. and allowed to remain there from 3 to 4 hours, after which it will be placed in the hot water, temperature 170° Fahr. where it will remain for the balance of the twenty-four hours, and then be allowed to cool. In some cases it will be found desirable to raise the temperature of the water to the boiling point 212° Fahr. Neither sample should show distortion or cracks.

TIME OF SETTING.

52. The cement shall not acquire its initial set in less than 45 minutes and must have acquired its final set in ten hours.

The cement is considered to have acquired its initial set when the pat will bear, without being appreciably indented, a wire one-twelfth of an inch in diameter loaded with one-fourth of a pound. The final set has been acquired when the pat will bear, without being appreciably indented, a wire one twenty-fourth of an inch in diameter, loaded to weigh one pound.

TENSILE STRENGTH.

53. Briquettes made of neat cement, after being kept in air for twenty-four hours under a wet cloth, and the balance of the time in water, shall develop tensile strength per square inch, as follows:

After seven days, 450 pounds; after 28 days, 540 pounds. Briquettes made of one part cement and three parts clean sharp sand, by weight, shall develop tensile strength per square inch, as follows!

After seven days, 140 pounds; after 28 days, 220 pounds.

GOVERNING TEST.

54. The highest result from each set of five briquettes made at any one time, is to be considered the governing test. Any cement not showing an increase of strength in the 28 days over the seven days' test, will be rejected.

MAKING BRIQUETTES.

55. When making briquettes, neat cement will be mixed with 20 per cent. of water by weight, and sand and cement with 12½ per cent. of water, by weight. After being thoroughly mixed and worked for five minutes, the cement or mortar will be placed in the briquette mould in five equal layers and each layer rammed and compressed by 30 blows of a soft brass or copper rammer, three-quarters of an inch in diameter (or seven-tenths of an inch square, with rounded corners), weighing one pound. It is to be allowed to drop on the mixture from a height of about one half-inch. When the ramming is completed, the surplus cement shall be struck off and the final layer smoothed with a trowel held almost horizontal and drawn back with sufficient pressure to make its edge follow the surface of the mould. The briquettes will be kept in air under a wet cloth until set, when they will be placed in clean fresh water where they will remain until broken.

CHEMICAL ANALYSIS.

56. Manufacturers shall furnish a chemical analysis which will give the average composition of the cement supplied by them.

Specification for sand for Concrete and Masonry.

SAND.

57. Sand shall be clean, sharp, of variable size of grain, largely silica and must be free of loam, mica or other deleterious substances.

Specification for Stone for Concrete.

STONE.

58. Stone for concrete shall consist of hard, strong stone, granite, gneiss and allied rocks, limestone or other approved solid stone, *or suitable gravel approved by the Engineer.* Under no circumstances will shale, slate or similar friable rocks be used.

Specification for Stone Masonry.

FOR MASONRY.

59. Stone used for masonry shall consist of the strongest, hardest and best description of rock that can be found. Sound, hard limestone, granite, sandstone (when equal to Wallace stone) or other approved rock. Particular care will be exercised to exclude rock with "drys" shaky stratification or weak cleavage planes. All stones shall be laid upon their quarry beds, and shall be well selected sound stone. Particular care will be taken to exclude all rock shattered by blasting. No stone shall be used for masonry or concrete until it has been approved by the District Engineer.

Concrete Culverts and Concrete Pipes.

MUST BE BUILT TO STANDARD.

60. Concrete culverts must be built in strict accordance with the standard plans, and the concrete used in their construction must strictly conform to the standard specification.

Specifications for Concrete.

CONCRETE FOR FOUNDATIONS, ETC.

61. Concrete will be used whenever suitable stone for masonry is not to be had at reasonable cost; it will always be used in foundations, hearting of piers, backing of abutments, small culverts, and generally, where in the judgment of the Chief Engineer, a more satisfactory work can be had than by other methods. The proportions to be used in making concrete, will vary with the nature of the work as hereinafter described. Proportions are to be by measure, the barrel being the unit, being the volume of a 350 pound barrel.

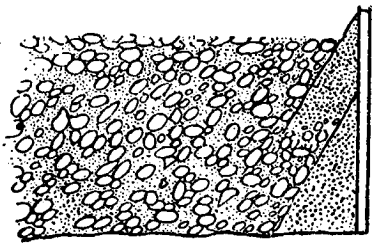
FACE CONCRETE.

62. Face concete will be used in all cases where the structure is exposed to the air or water, and when the body of the structure is made of concrete, it will consist of one part Portland cement, two parts sand, mixed together thoroughly while dry, when sufficient clean water will be added to bring the mortar to the consistency of rather stiff plasterer's mortar. (A ball of it taken in the hand will retain its form and the impress of the fingers.)

MACHINE MIXED CONCRETE.

63. Machine mixed concrete will be acceptable when a suitable batch mixer is used.

The face concrete will average 2½ inches in thickness and will be placed as nearly as possible simultaneously with the mass concrete of the body of the pier or structure. An excellent plan to secure a homogeneous mass, is to deposit the face material against the form in a triangular piece, some two inches higher than the regular bed in the body of the pier, then ramming the entire mass together; see sketch:



BODY CONCRETE FOR PIERS, ABUTMENTS AND LARGE MASSES.

64. The concrete will consist of one part Portland cement, three parts sand, six parts broken stone, or screened gravel, the same shall vary in size, the largest pieces shall pass a 2½ inch ring, the smaller may be of the size of a lima bean. In piers exposed to the action of running ice or logs, the cut-waters and up-stream corners must , if considered necessary, and ordered in writing by the Engineer, be faced with first-class stone masonry up to high water mark, which actual masonry shall be paid for at the schedule rate for first-class masonry.

HAND-MIXED.

The sand and cement shall be thoroughly mixed together, dry, when the stone will be added, the whole then to be well wet down and to be thoroughly mixed together with shovels.

MACHINE MIXED.

65. Machine mixed concrete shall be mixed in approved batch mixers and the whole of the material may be dumped into the mixers at once, providing the apportionment of material is properly made before being placed in the mixers. It is intended to secure wet concrete, the whole mass after being as above described, thoroughly mixed, will be deposited in place, in the dry. Only in exceptional cases will any concrete under any circumstances be permitted to be deposited through water, and only when the approval of the Chief Engineer has first been obtained, approving of the method to be used, and the proportions to be used. In all cases when large masses of concrete are being placed, subject to the approval of the Chief Engineer or Inspectors, large blocks of approved stone, spaced at least 12 inches apart in every direction and ten inches from the face—may be used—"plums in the pudding." In fixing the size of the stone to be so deposited, due regard will be had to the mass of the structure in general, the proper size will be found by looking at the drawing of the structure.

DEPTH OF LAYERS.

66. As a general rule concrete shall not be deposited in layers of a greater depth than 12 inches, the whole layer to be well and thoroughly rammed with

suitable rammers. Great care will be required to insure homogenity in the mass; in depositing on a layer that has set or partially set, it must be thoroughly cleaned and wet down. No layer or surface will be rammed smooth. It is desirable to leave the surface as uneven and rugged as is consistent with proper compacting of the layer.

CONCRETE FOR ARCH CULVERTS.

67. The concrete composing the arch ring will consist of one part cement, three parts sand, five parts broken stone, mixed and deposited in the manner heretofore described, except that the ring will be built up from both springing lines simultaneously. When considered necessary by the Engineer, steel beams, bars, rods or other approved reinforcement may be imbedded in the concrete, and, if necessary, secured by clamps, bolts, etc. Such steel beams, bars, rods, clamps, bolts, etc., to be furnished, placed and secured in the work by the Contractor for the price mentioned in schedule, Item 103, which price shall include the material and all labor incidental to securing it in place.

COPING COURSE AND BRIDGE SEATS.

68. The concrete for same shall consist of one part cement, two parts sand, four parts finely crushed, hard selected stone, or screened gravel, the coarse particles not to exceed three-quarters of an inch and to vary in size down to that of pea size. This coping course to be at least six inches thick. Particular care shall be exacted to insure the thorough mixing and depositing of this layer, which must be placed before the mass beneath it has set. The whole surface to be floated off even and perfectly level, with a wooden float, so as to insure a perfectly smooth, even surface.

TANK FOUNDATIONS.

69. Concrete shall consist of the same quality as that provided for piers and abutments, except that no displacers shall be used in the walls.

TURNTABLE FOUNDATIONS.

70. Concrete shall consist of the same quality as that provided for piers and abutments.

ORDINARY BUILDING FOUNDATIONS

71. Concrete shall consist of one part cement, four parts sand, eight parts broken stone or gravel. The broken stone or gravel shall vary in size from two and one-half inches in diameter to pea size. The methods of mixing and depositing to be as heretofore described.

FILLING.

72. Filling over and around culverts shall not, in any case, be done before the concrete is set. The minimum time allowed will be two weeks, but may be extended if required.

HOW PAID FOR.

73. In all concrete work the schedule price shall cover the cost of all tools,

plant, labor and material incidental to the construction thereof, including forms and centres, where necessary, but the preparation of foundations will be paid for at the specified rate per cubic yard.

Stone Masonry.

POINTING.

74. Joints below the ground line shall be thoroughly pointed up with a trowel as the work progresses, but need not be raked out.

Joints above the ground line shall be carefully raked to a depth of one (1) inch and pointed up with fresh mortar consisting of one part Portland cement and two parts of sand.

If the structure is subject to the action of running water, or is unusually exposed, the pointing mortar shall consist of one (1) part of Portland cement to one (1) part of sand; and the joints shall be raked out to a depth of one and one-half (1½) inches.

Before filling the joints be careful that they are well cleaned by brushing out all loose matter, and thoroughly wet. Apply the mortar with the trowel and calk the joints so that they will be completely filled.

If pointing is done in very hot weather great care should be taken by wetting the stones, not to allow the mortar to dry too rapidly. No pointing shall be done in freezing weather.

LAYING.

75. All stone, whether face, coping or backing, shall be laid in full flush beds of mortar mixed fresh for the work in hand. In no case shall stone be allowed to touch stone; a good bed of mortar must intervene. Wedging up of stones with spalls or chips will not be allowed. No mortar shall be spread on any stone already laid until the latter has been swept off cleanly and then thoroughly wet. All stones must be free from scales, THOROUGHLY CLEANED by washing or otherwise, from sand and dirt, and thoroughly wet before laying. All rear joints shall be thoroughly filled with mortar and struck smooth as the wall is built up.

QUALITY OF STONE.

76. Bridge seats, coping, arch sheeting, ring stones and ashlar or face stones, shall be sound and durable, of neat quality, free from any defects, and acceptable to the Engineer.

The backing shall consist of sound, durable, well shaped stones, free from defects that will impair their durability or strength, and shall consist of large stones that in general require handling with a derrick.

COPING AND BRIDGE SEATS.

77. The bridge seat course shall include the cut stone course upon which the superstructure rests. Each stone of the bridge seats shall be set to the exact proper height to receive the bridge, shall not be less than (20) twenty inches in thickness, two feet and six inches (2′6″) in length, and of sufficient width to extend twelve (12) inches into the back or parapet wall. Piers of seven (7) feet, or less, under bridge seat, shall have bridge seats extend across top of pier in one piece. They shall be finely bush-hammered on top to true planes, free from hollows or "winds," and shall be laid to joints not exceeding one-half (½) inch in thickness. They shall be laid in full beds of mortar, as grouting will not be allowed.

Copings shall include the top course of retaining walls. They shall not be less than twelve (12) inches in thickness, three (3) feet long, and of sufficient width to extend across the entire width of the wall. Top surfaces shall be bush-hammered, with edges neatly pitched to straight lines. Joints of copings shall not exceed one-half (½) inch.

ARCH SHEETING AND RING STONES.

78. Sheeting for arch-culverts shall consist of large sized stone, with radial beds and joints extending through the whole thickness of the arch, and hammer or point-dressed, so as to admit of one-half (½) inch joints. The sheeting shall be laid in continuous courses, care being taken to break joints not less than nine (9) inches, so that the arch will be thoroughly bonded. No stone shall be less than eight (8) inches wide on the intrados. Centres shall not be removed until so ordered by the Engineer.

Ring stones shall be dressed to the size and shape shown on the plans, or as directed by the Engineer, shall be laid with one-quarter inch joints, and shall bond thoroughly with the sheeting. The joints must be on truly radial lines. Faces shall be left rough and with one and one-half (1½) inch chiseled draft line on the curved margin.

The top of the third-class rubble masonry spandrel backing and arch shall have a coat at least one (1) inch thick of Portland cement mortar, one part of cement to four parts of sand (1:4) on top of which apply a coating of about one-quarter (¼) inch thick of straight run coal tar pitch. In case it is not practicable to secure the coal tar, then a richer mortar of one part cement to two parts sand (1:2) shall be used, the cost of which shall be included in the price for arch sheeting and ring stones.

FIRST-CLASS MASONRY.

79. GENERAL DESCRIPTION.—First-class masonry shall be used where directed by the Engineer for abutments, piers and retaining walls, and shall consist of rock-faced ashlar work, with rough backing. Edges shall be pitched to straight lines, beds shall be parallel and joints rectangular.

The face stones shall be arranged on their natural beds as headers and stretchers in regular continouus courses, not less than sixteen (16) inches nor more than thirty-six (36) inches in thickness, and the thickness of any course shall not exceed that of the course below it.

SIZE OF STONE.

80. Stretchers must not be less than two and one-half (2½) feet in length, and not less than one and one-half (1½) feet in width; nor in any case less in width than one and one-quarter (1¼) times their depth. Headers must not be less than four feet long where the wall is of sufficient thickness, and at least two (2) feet longer than the width of the adjacent stretchers not less than one and one-half (1½) feet in width, nor less in width than they are in depth of course. In walls of five feet or less in thickness, the headers shall extend entirely through the same.

Wing steps shall be of the full thickness of the course.

CUTTING.

81. Every stone must be laid on its natural bed. All face stones must have beds well dressed, parallel and true to proper line and made to extend the full length and width of the stone. The beds and sides of the face stones must be

cut before being placed in the work, so as to form joints not exceeding one-half (½) inch in width. No hammering on stone will be allowed after it is set; but if any inequalities occur, they must be pointed off. The vertical joints must not be less than ten (10) inches in from the face and as much more as the stone will admit. All corners and batter lines shall be run with a neat chisel draft one and one-half inches (1½) in width on each corner. The projections of the quarry face beyond the draft line shall not exceed four inches (4). The tops of wing steps shall be bush-hammered to a uniform surface.

BOND.

82. The masonry shall consist of headers and stretchers alternately arranged so as to thoroughly bond together the face stone and the backing; and every header shall be immediately over a stretcher of the underlying stone. The stones of each course of face stones shall be so aranged so as to form a bond of at least one foot (1) with the stone of the underlying course. Particular care must be taken that the stones in the course below the coping course, coming directly under the bridge seats, are large and well bedded.

BACKING.

83. The backing shall consist of large-sized, well-shaped stones, laid so as to break joints and thoroughly bond the work in all directions, and leave no spaces between them more than six inches in width, as nearly as possible, which space shall be filled with concrete. The courses may correspond with the face stones, but two (2) courses shall fill up one (1) of the face, providing no stone less than six (6) inches thick be used. The broadest shall be laid undermost, and must have a good bearing on the stone below. Two-thirds (⅔) of the upper bed shall be of the full thickness of the course.

General Description.

SECOND CLASS.

84. Second-class masonry shall consist of rock-faced ashlar work. It shall be used for such small arch-culverts, cattle passes, abutments, piers and retaining walls as the Engineer may direct, and shall include the portion of the structure above the concrete footing courses.

FACE STONES.

85. Face stones shall be of a superior quality, free from defects such as clay seams, dry-seams, weather cracks, etc., shall be rock-faced, with edges pitched to straight lines, with no projections exceeding four (4) inches; and shall have parallel beds and rectangular joints. The beds and end joints for six inches (6) back from the face line shall be point or hammer dressed to three-quarter (¾) inch joints. No face stone shall be less than eight (8) inches in thickness, nor be in breadth less than twelve (12) inches, nor less in length than its breadth. The wing steps shall be of the full thickness of the course and the steps thereof shall be bush-hammered to a smooth surface. All corners or batter lines are to be run with a neat chisel draft of one and one-half (1½) inches on each corner.

COURSES.

86. The stones need not be arranged in regular courses, but shall be laid level on their natural beds, arranged as headers and stretchers, with joints well broken.

BOND.

87. At least one-quarter (¼) of the face stones shall be headers not less than three feet (3) six (6) inches long, except where the thickness of the wall is less and extending through the wall, where the same is four feet (4) thick or less, and at least two (2) feet longer than the width of the adjacent stretcher and so distributed so as to make the best bond. The stone of each course of face stone shall be so arranged so as to form a bond of at least one (1) foot with the stone of the underlying course, except in the case of "fillers" in broken range work.

BACKING.

88. The backing shall be well-shaped, sound, durable stone, not less than six (6) inches thick, at least one-half of which (½) shall measure three (3) cubic feet, to be laid close in full mortar beds and joints, well bonded with face stones, and with joints well broken. All spaces between backing and face stone are to be filled with concrete.

General Description.

THIRD CLASS.

89. Rubble masonry shall be used for such small culverts, depot foundations and piers, pipe ends, spandrel backing for arches, and other structures as the Engineer may direct.

GENERAL CONDITIONS.

90. All stones shall be sound and durable, with the face stones free from clay seams, dry seams, weather cracks, etc. They shall be laid on their natural beds, and shall be sufficiently large to make a good, well bonded, strong job; shall be laid in the most substantial manner, and with as much neatness as this description of work will permit.

DIMENSIONS OF STONE.

91. No stone shall be used in the face that has more height than breadth of bed. No spalls shall be permitted in the bed joints.

BOND.

92. The whole wall shall be bound together with headers occupying one-fifth (1-5) of the area of the face of the wall, front and rear, extending through walls three (3) feet or less in thickness.

COURSING.

93. The walls shall be levelled up and coursed longitudinally at least every four (4) feet in height.

STONE TO BE ROUGHLY SQUARED.

94. Stone shall be roughly squared on joints, beds and faces laid so as to break joints, and in full mortar beds.

VERTICAL SPACES.

95. All inside vertical spaces shall be flushed with mortar and then packed full of spalls. No liquid grouting shall be allowed.

All rear joints shall be thoroughly filled and struck smooth as the wall is built up.

ANGLES.

96. Selected stone shall be used at all angles, and shall be neatly pitched to true lines, and laid on hammer-dressed beds.

BOX CULVERTS.

97. All stone box culverts shall have a water way at least 2½ x 3 feet. The side walls shall not be less than two (2) feet thick, and shall be built of sound, durable stones, not less than six (6) inches thick, laid in cement mortar (usually one part Portland cement to three parts sand.) The walls must be laid in true horizontal courses, but in case the thickness of the course is greater than twelve (12) inches, occasionally two (2) stones may be used to make up the thickness. The walls must be laid so as to be throughly bonded, and at least one-fourth (¼) of the area of each course must be headers going entirely through the wall. The top course must have one-half (½) its area of through stones, and the remainder of this course must consist of stone going at least one-half of the way across the wall from the inside face. The face stones of each course must be dressed to a straight edge, and pitched off a true line. All of the coping stones of head walls must be troughs, and must have the upper surfaces hammer-dressed to a straight edge, and the face pitched off to a true line with margin draft.

COVER STONES.

Cover stones shall have a thickness of at least (12) twelve inches for opening of three feet, and at least fourteen inches for opening of four feet; and must be carefully selected, and must be of such length as to have a bearing of at least one (1) foot on either wall.

The beds and vertical joints of the face stones for a distance of six inches (6) from the face of the wall, shall be so dressed as to require a mortar joint not thicker than three-fourths of an inch (¾). Joints between the covering stones must not be wider than three-fourths (¾) of an inch, and the bearing surface of cover stones upon side walls must be so dressed as to require not more than one (1) inch mortar joint.

PAVING STONES.

The paving shall consist of flat stones, set on edge, at right angles with the line of the culvert, not less than twelve (12) inches deep, and shall be laid in cement mortar. This class of paving will be paid for under the schedule rates per cubic yard for third-class masonry.

TURNTABLE MASONRY.

98. Shall consist of second-class masonry as hereinbefore described.

FOUNDATION AND WALLS FOR WATER TANK WELLS.

99. Shall consist of third-class masonry as hereinbefore described.

100. The circular walls to be parallel and true to line and to consist of third-class masonry as hereinbefore described.

Cast Iron Culvert Pipe.

QUALITY CAST IRON CULVERTS.

101. They shall be cast vertically in dry sand moulds and dried cores and shall be coated with Dr. Smith's solution, or some other solution approved by the Engineer, while hot, and shall be of the highest quality of metal in use for pipe founding purposes.

DIMENSIONS.

102. The size, length, thickness and weight shall be as in the following table:—

Diameter	Length	Thickness	Weight
18 inches	12	$\frac{3}{4}$	1800
24 "	12	$\frac{3}{4}$	2400
30 "	12	$\frac{3}{4}$	2900
36 "	12	$\frac{7}{8}$	4100
36 "	6	$\frac{7}{8}$	2100
42 "	8	$\frac{7}{8}$	3200
48 "	6	1	3000
60 "	6	$1\frac{1}{4}$	4850

Salt Glazed Double Strength Vitrified Pipe.

SALT GLAZED PIPE CULVERTS—15 and 18 inches.

102A. Shall be of well burnt vitrified clay, with a smooth, salt glazed surface, true to diameter, straight, in three feet (3) lengths, with bell and spigot. The thickness of shells for 15 inch to be one and one-quarter inches, and for 18 inch one and one-half inches.

SUB-SOIL DRAINS.

103. Agricultural tile four inches (4) in diameter, shall be straight, well burnt, true in diameter, and free from cracks or checks.

REINFORCED CEMENT PIPE CULVERTS.

104. The concrete shall consist of one part cement, one and one-half parts

sand, three parts one and one-half inch diameter broken stone or screened gravel of same dimensions. The reinforcing metal to be in accordance with the best modern practice, and both the mixing of the concrete, the method of reinforcing, the size of the pipe, length and all other matters in connection therewith, to be approved by the Engineer.

MASONRY ENDS.

105. All to have concrete or masonry ends for protection walls.

FOUNDATIONS FOR PIPE.

106. Great care must be taken to get a firm and uniform bearing for pipe culverts, and material for bedding the pipe must be free from stone.

JOINTS.

107. The joints of all pipe, both iron and vitrified, shall be well and thoroughly packed, as shown on standard plans. Cast iron pipe of 30 inches diameter and over, shall be stayed and crowned by wedging in strutts as shown on standard plans. The strutts shall not be removed until sufficient settlement has taken place in the bank. In general, this will not be less than one year from the completion of the filling.

FOUNDATIONS FOR VITRIFIED PIPE.

108. Where vitrified pipe is laid in hard ground the bottom of the bench in which the pipe is to lay should be rounded to fit the pipe as nearly as possible, so that the pipe may rest easily and solidly in its bed. If the ground is soft, a foundation satisfactory to the Engineer shall be made.

Riprapping.

RIPRAP STONE TO BE ANGULAR.

109. When required by the special or general plans as ordered by the Engineer as protection against the action of water, hand laid or "Pierre Perdu Random" of angular stones shall be laid or placed on embankments, or about foundations, or at the ends of culverts or masonry or other places, as directed. Boulders shall not be used unless ordered in writing by the Engineer.

SIZE.

The largest procurable stones shall be used, and they shall in no case measure less than one cubic foot. The largest stone shall be placed at the bottom and where the current is the greatest. They shall be laid as closely together as possible so as to avoid large openings.

TRENCHES.

110. When required, a trench shall be excavated at the base of the slope to such a depth as will insure a solid foundation, and all sand or ice or other perishable matter will be removed.

GENERAL DIMENSIONS.

111. In general, the depth of the riprapping at the base shall measure three feet at right angles to the slope and shall gradually taper off to a depth of two feet; but shall, if ordered by the Engineer, be built of any required thickness.

HOW PAID FOR.

112. Riprapping shall be paid for at the specified rate per cubic yard in place, for each class.

Paving.

WHERE USED.

113. When required by the general or special plans, as ordered by the Engineer, the ends of masonry or concrete culverts, vitrified or iron pipe, the bottom of wooden culverts, and other places, shall be protected by paving.

DESCRIPTION.

114. Paving will be made of flat stones set upon their edges, the longest dimensions at right angles to the waterway in such manner as to leave the least possible space between them, and of such size as to reach through the entire depth of the pavement.

UNDERMINING.

115. Great care must be taken at the ends of any piece of paving to make it secure, so it cannot be undermined or cut by water flowing underneath it. The lower end must receive special care to prevent this undermining. A concrete apron shall be provided when required by the Engineer.

HOW PAID FOR.

116. Paving will be paid for at the specified rate per cubic yard in place, as per Item 17 in the schedule.

Tunnels.

HOW BUILT.

117. All tunnels must be built in strict accordance with the general or special plans.

LINING.

118. Tunnels which do not require lining shall be excavated to the section and dimensions shown on the standard plans for "Tunnels, Rock Section."

TIMBER, CONCRETE OR MASONRY LINING.

119. Tunnels which require lining with timber, masonry or concrete, shall be excavated to the section and dimensions as shown on the standard plans for "Tunnels, Timbered Section."

DANGEROUS ROCK.

120. The Contractor must take out at his own expense all loose or shattered rock which is loose or likely to become so.

ROCK TUNNELS.

121. Rock tunnels shall be excavated to one foot below profile grade and refilled to such grade with rock spalls or other approved material.

EXPLOSIVES.

122. The contractor must limit the use of explosives to avoid unnecessarily shattering the roof or sides of the tunnel, or damaging the lining, and the Engineer shall have the right to restrict the use of such explosives.

SITUATION OF LINING.

123. Where lining is required, such lining must conform to the standard or special plans.

LINING

124. Lining will be made with timber, concrete or masonry, as ordered.

TIMBER LINING.

125. Where timber is used, it shall be red or yellow fir, cedar, oak, tamarac, or white or yellow pine, as may be designated, and must be of the best description of the kind required. It must be hewed or sawed square and to proper dimensions. It must be free from all loose, large or unsound knots, sap, sun cracks, shakes, wanes or other imperfections or defects what would lessen its durability.

LAGGING.

126. The lagging shall be in pieces 4 inches thick and 6 inches wide.

HOW PAID FOR.

127. Timber used for lining shall be paid for at the specified rate per thousand feet B.M. of timber left in completed structure.

TIMBER PRICE INCLUDES IRON REQUIRED.

The price paid per thousand feet will include the cost of the necessary iron and the total cost of all labor incidental to putting the timber and iron in place.

USE OF CONCRETE OR MASONRY.

128. Where concrete or masonry is used for lining, such concrete or masonry must be built in strict accordance with the section and dimensions as shown on the standard plans or special plans, and must conform strictly with the specifications for concrete or masonry.

PROTECTION OF LINING FROM BLASTING.

129. The Contractor will be required, at his own expense, to protect the lining when in place from the effects of blasting, by covering with slabs or otherwise as most conveninent. He will also be required to replace, at his own expense, any lining shattered or crushed in any stage of the work by blasting or other operations of his own.

CAVITIES BEHIND THE LINING.

130. In lined tunnels the Contractor must, to his own expense, fill in any cavities behind the lining, resulting from any cause whatever, so that the roof and sides will in all cases have a firm bearing on the lagging or lining. In timbered tunnels this packing shall consist of timber or stones. When the lining is constructed of concrete or masonry the packing shall consist of stones closely packed together.

PORTALS.

131. Material in portals will be paid for at the same rate as lining in the tunnel.

NICHES OR RECESSES.

132. Niches or recesses for the protection or convenience of railway employees shall be constructed when ordered.

DRAINAGE.

133. Drainage shall be carefully executed as shown upon the standard or special plans or as directed, and all drains or sources of water shall be treated as directed, the cost of which shall be included in the price per lineal foot of excavation.

SHAFTS.

134. The number, location and dimensions of all shafts shall be shown as on the plans, or as directed, and the specified price per cubic yard for shaft excavation shall cover all material contained between the surfaces of the ground and the cross section of the tunnel, as shown on the standard or special plans and the cost of all labor and material incidental to their construction.

WELLS OR SUMPS.

135. All wells or sumps necessary for the completed tunnel shall be made as directed and shall be paid for at the same rate per cubic yard as shaft excavation.

TUNNEL EXCAVATION.

136. Tunnel excavation shall be paid for at the specified rate per lineal foot under cover for "Tunnels, Rock Section" and "Tunnels, Timber Section." The specified rate per lineal foot shall cover the whole cost of labor and material incidental to the excavation of the tunnel and the haul and deposit of the material in the embankments at the ends of the tunnel, as directed.

NET SECTION.

137. No allowance shall be made for material taken out beyond the theoretical section shown on the standard or special plans.

DIMENSIONS.

138. The standard dimensions of the tunnel may be varied if found necessary or desired. If the area of the section be not thereby increased no extra allowance shall be made to the Contractor on account of such change. If the area of the section be thereby increased or diminished, the specified rate per lineal foot shall be increased or diminished in proportion.

Timber Structures.

TO BE BUILT TO PLANS.

139. All structures must be built in strict accordance with the general or special plans.

QUALITY.

140. All timber either sawed or hewed must be of the best description of the kind required. As directed by the Engineer, it must be sawn or hewn square and to proper dimensions. It must be free from all loose, large or unsound knots sap, sun cracks, shakes, wanes or other imperfections or defects which would impair its strength or durability.

QUALITY AND DESCRIPTION.

141. The quality and description of timber used for each portion of the structure must be as specified. Stringers must be of long leaf yellow pine, douglas fir, white pine, or other timber approved by the Engineer.

CLEARING GROUND.

142. Before commencing work on any wooden structure, the ground must be entirely cleared of logs, brush and trees for the whole of the width of the right-of-way, and during the progress of the work all pile or timber ends, chips and brush, shall be cleared from around the structure and burnt, or otherwise disposed of as the Engineer may direct.

FRAMING.

143. No shimming will be permitted. Great care must be taken in framing all timber structures, to insure perfect fit at all joints. At the completion of the work they must be left in perfect line and surface.

ERECTION OF BRIDGES AHEAD OF TRACK.

144. Bridges must be erected ahead of the track in all cases, but the maximum distance beyond the end of track to which the Contractor shall be required to haul timber or other material without extra payment, shall not exceed four miles.

Piling for Foundations.

TIMBER.

145. Piles may be of oak, rock elm, douglas fir, tamarac, cedar, hemlock, jack pine and spruce, to be straight, or reasonably straight-grained, sound, live timber, free from all bad knots, wind shakes or other defects. All diameters must be measured inside the bark, which shall be removed before delivery.

DIMENSIONS.

146. Standard dimensions for piling are as follows:—Minimum lengths in feet 15, 20, 25, 30, 35, 40, 45, 50, over 50; Diameter in inches at small end, 10, 9, 9, 9, 9, 9, 8, 8, over 7½. Butt diameter to be not less than 12 inches or more than 20 inches at five feet from butt.

LENGTHS.

147. Piles will only be accepted and paid for in lengths which are multiples of five.

HOW DRIVEN.

148. Unless otherwise directed, all piles shall be sharpened and driven small end down, capped with a suitable iron ring, as the Engineer may direct, to prevent spreading or brooming while driving, and, if required, shall be shod with an iron shoe of approved design.

DRIVING.

149. Piles shall be driven until the fall of a hammer weighing 2,000 pounds, with a clear fall of 25 feet or an equivalent blow, causes a penetration not to exceed 10 inches under the last blow, or to such further limit as directed.

BROKEN PILES.

150. Should any piling be broken in the driving, another sound pile shall be driven alongside to replace it.

BATTER PILES.

151. All piles must be driven vertically unless otherwise shown on the plan. Batter piles will be driven at the batter shown on the plan.

EXTRA LENGTHS—HOW ATTAINED.

152. When necessary to drive great depth, and piles of adequate length cannot be obtained, one shall be spliced on top of another. The first pile having been driven as far as practicable, it shall be cut off square to receive the following pile, which must also be squared and set on top of the one already driven, using a dowell pin 1 inch in diameter in the centre, extending 8 inches at least into each pile. The piles shall then be flatted on four sides and fastened together by spiking on pieces of scantling.

HOW PAID FOR.

153. Piling will be paid for under the headings of "Piles Delivered" and "Pile Driving."

ENGINEER'S BILL OF LENGTHS ONLY WILL BE PAID FOR.

"Piles delivered" will include piling furnished by the Contractor at bridge site, as ordered by the Engineer, and will be paid for by the lineal foot, but any lengths in excess of those ordered by the Engineer will not be paid for.

"Pile Driving" will be paid for at the specified rate per net lineal foot in the finished structure, and will include all work of any kind in connection therewith, but will not include the material in the piles themselves.

RINGS AND SHOES—HOW PAID FOR.

154. Rings shall not be paid for, but shoes will be paid for at the specified rate per shoe.

Sheet Piling.

POINTS.

155. Sheet piles shall be cut at the end, so as to form a point at one side and not in the middle, and when driven this point shall be kept next to the pile previously driven to ensure contact, and when required by the Engineer the Wakefield type of piling shall be used.

BROKEN JOINTS.

156. Where there are two or more rows of sheet piles, they shall be driven with broken joints.

HOW PAID FOR.

157. Sheet piling will be paid for at the specified price per thousand feet B. M. left in the work.

Frame Trestles.

CEDAR FOR MUD SILLS.

158. Mud sills not less than ten inches thick, must, in all cases, be made of sound, live cedar, unless permitted in writing by the Engineer. The use of timber other than cedar for this purpose is objectionable, and will not be permitted only in case of necessity.

SILLS AND POSTS NOT TO BE BURIED.

159. Care must be taken not to bury with earth, any portion of the sills or posts. All pits for trestle foundations must have free drainage.

ADJUSTMENTS.

160. All adjustments in height of structures, due to settlement or other causes, must be rectified by jacking up from the bottom to the proper elevation.

TIMBER CULVERTS.

161. Timber culverts will be made of sound, hewed or sawn timber, and in accordance with standard plans. They shall be of such dimensions as shall allow the insertion of cast iron or other approved pipe and in accordance with the direction of the Engineer. They shall be estimated and paid for at the specified price per thousand feet B.M.

PAVING.

162. The bottom of timber culverts will be paved to the top of the mud sills with angular rock, when it can be obtained from the adjacent cuttings, otherwise with large boulders if the Engineer so elects, and will be paid for as per Item 17 of schedule.

Crib-Work.

TIMBER CRIBS.

163. Timber cribs used in support of trusses shall be built of timber in quality similar to that used in trestles and according to plans furnished by the Engineer and to his approval, both as to workmanship and material.

HOW PAID FOR.

They will be estimated and paid for by the thousand feet B.M., according to bills furnished by the Engineer. Iron contained in them will be paid for by the pound They will be filled in with angular stones of a size and character satisfactory to the Engineer, which shall be placed in the cribs without damage to any portion of the structure, and as the Engineer may direct.

ROUND TIMBER CRIBS FOR PROTECTION WORK.

164. Round timber cribs shall be built in accordance with general plans furnished by the Engineer, under his direction and to his entire satisfaction, both as to size of material, quality and workmanship.

QUALITY.

165. Timber must be good, sound, live red or yellow fir, cedar, pine or tamarac, or other wood approved by the Engineer, free from wind shakes, loose or rotten knots, and all other kinds of decay.

HOW PAID FOR.

166. Timber in cribs will be paid for by the lineal foot, all pieces being estimated only as to length, the varying thickness not being taken into consideration, but only the best available timber must be used as directed by the Engineer.

HOW FILLED.

167. Timber crib-work required for sustaining or protecting embankments, or for deflecting or changing the channels of stream will, preferably, be filled with angular rock obtained from excavations adjacent, and care must be taken to work the largest stones to the face. If, however, no suitable material to fill them is found in the excavation, it will be obtained by borrowing.

TRENCHES.

168. When required, a trench shall be excavated at the base of the slope to such a depth as will insure a solid foundation, and all sand or ice or other perishable matter shall be removed.

CRIBS TO BE CLOSE-FITTING.

169. When cribs are built for protection against the action of the waves or the impinging of running streams, the Engineer may require the logs to be flattened on two sides, or he may resort to any other method of making the cribs tight and close-fitting, that in his judgment may be necessary.

QUALITY OF MATERIALS.

170. The materials for all timber structures must be such as are approved by the Engineer, and the workmanship must be of the best kind to secure the full bearing and strength of the materials, and must in all respects be satisfactory to the Engineer.

Specifications for Ties.

FIRST CLASS TIES.

171. Ties shall be made of the best description of timber tributary to the line of railway.

QUALITY AND DESCRIPTION OF TIMBER.

172. All timber shall be cut from live, sound trees, free from large or loose knots, wind shakes or other defects which would impair its durability or strength. The following kinds of timber will be accepted in the order named: oak, cedar, tamarac, douglas fir, pine, hemlock (black spruce only to be used under the approval of the District Engineer.)

SIZE.

173. They shall be hewn or sawn with two parallel straight faces, reasonably straight, exactly eight feet long, full seven inches thick and seven inches face. Sawn square at the ends.

SECOND-CLASS TIES.

174. They shall be of the same quality and description of timber, but the size may be as follows: Length, exactly eight feet; thickness, full six inches; face, six inches. These shall not be used in main tracks.

Track Laying.

TRACK LAYING.

175. Track laying will include all work of unloading, loading, piling and handling material; laying the main track, spurs, turnouts, wyes, and other permanent tracks, frogs, switches, rail braces, tie plates, crossings, etc.; laying and spiking plank of road crossings, setting all track markers or signs, and such necessary

light surfacing with material from the sides, cutting down or filling up the inequalities of the roadbed as will allow of the passage of trains, without damage to rail or rolling stock, until the proper ballasting is performed.

SECOND-CLASS TIES.

176. Second-class ties may be used in sidings and spurs if sound and otherwise fit for use.

BARK.

177. Bark must be removed from all ties before they are placed in the track.

NUMBER OF TIES.

178. Sixteen (16) ties will be used to each 30 foot rail length or eighteen (18) ties to a 33 foot rail on tangents and two additional ties on curves, as directed by the Engineer.

HOW SPACED.

179. Ties of full size and uniform standard should be used for joint and shoulder ties. Shoulder ties shoould be placed not more than 10 inches distant from joint ties; the remaining ties must be spaced evenly between shoulder ties. All ties must be laid at right angles to the track.

LINING.

180. The ends of cross ties in single track must be lined true on the south and east side of the track.

ADZING.

181. Cross ties must never be notched, but if necessary must bé adzed, in order to maintain a true uniform bearing, for the tie plate or the base of the rail.

TIE PICKS.

182. In moving ties with a pick, the point should be stuck into the side of the tie and not into the face.

SWITCH TIES.

183. Swan ties must, except under written authority of the Engineer, be used for all permanent switch turnouts, cross-overs and railway crossings and acute angles; and placed, spaced and lined in exact conformance with the standard plans.

BOLTING AND DRILLING.

184. All joints must be full bolted and rails drilled, when necessary. Nuts must be tightened as required until entirely satisfactory to the Engineer.

COMPROMISE SPLICES.

185. When rails of different weights or sections join each other it must be done with compromise splice bars made to fit the different rail sections and bolts holes.

SPIKING AND SLOTS.

186. A spike must be driven in each slot, inside and outside of rails and angle bars, except on bridges or trestles where spiking in slots, or against the ends of angle bars, or in any way anchoring the rails to the bridge, is prohibited.

NUTS.

187. The nuts of all track bolts shall be placed on the outside of the rails.

BROKEN JOINTS.

188. Track shall be laid with broken joints on the main line and important branches where the new steel is used; or minor branch lines where re-laying steel is used.

VARIATION OF JOINTS.

189. When track is laid with broken joints, they must not vary more than eighteen (18) inches from the middle of the opposite rail.

SHORT RAILS.

190. Short rail shall be used in inside line of rails on curves of large central angle, in order to maintain position of joints near centre of outer rail.

CROSS SPIKING.

191. Tracks must be fully spiked, using the system commonly known as "Cross Spiking," with the inside and outside spikes driven on opposite sides of the centre of the tie. They must be set as far apart as the face and character of the tie will permit.

VERTICAL SPIKING.

192. Spikes must be set one-half of their own width from edge of rail and driven vertically to full bearing on base of rail, and they must be kept in this position. Driving sloping spikes or giving them a final lateral blow to close the spikes against the rail, is forbidden.

USE OF GAUGE.

193. The track gauge must always be used when spiking.

194. Boat spikes 8 inches x $\frac{3}{8}$ inch shall be used for spiking frog and switch blocking to ties.

ELEVATION.

195. The elevation of the outer rail will be ordered and great care must be used to keep the elevation uniform. The grade line must be maintained along the inner rail and the elevation obtained by raising the outes rail. The full elevation of the outer rail must be continued beyond the end of the central curve, but shall decrease uniformly, as the Engineer directs, generally one-half inch in 30 feet, along the easement curve to the tangent point, where both rails should be level.

ELEVATION ON NON-SPIRAL CURVES.

196. For curves not having ends eased the full elevation should be extended to the end of the curve where it should run out gradually on a tangent to a level with the inner rail, by reducing the elevation of the outer rail one-half inch to 30 feet length, except in cases where tangents are too short to permit.

LEVEL RAILS

197. On all tangents the tops of the rails must be level with each other, except the approaches of the curves that are not eased.

TRACK LEVEL.

198. The track level must be used when surfacing either curves or tangents.

GAUGE.

199. Gauge of track must be exactly and uniformly as prescribed.

STANDARD GAUGE.

200. The standard gauge is 4 feet 8½ inches. Extra width of gauge on account of curvature must be given as follows:

On curves of 3 and 4 deg..... ⅜ inch
" 5 and 6 deg..... ¼ inch

EXTRA WIDTH OF GAUGE.

201. The extra width of gauge should be given by the inside rail and uniformly decreased on the easement curve, from point of central curve to point of tangent.

HANDLING RAILS.

202. Rails must be handled carefully before being put in the track, and must be uniformly supported after being placed there. Skids will invariably be used whenever necessary to unload them into piles. In all cases the greatest care must be used to avoid injury to rails by dropping them on hard substances or uneven surfaces.

DRILLING.

203. When necessary to make holes in rails for bolts they must be drilled with proper tools furnished for that purpose.

BRAND.

204. The position of the brand on the rail is immaterial whether right or left, inside or outside, but its position must be uniform in the same line of rails. When new rails are being laid different brands must not be mixed.

CURVING.

205. All rails for curves over 3 deg. must be separately curved by an approved rail bender before being placed in the track. The sledging or dropping of rail on ties to curve them is forbidden.

CARE IN CURVING.

206. Particular care must be given to insure uniform curvature of the rails throughout their length, in accordance with the following table:

For	2	deg. curve,	30 ft.	$\frac{1}{2}$	in.	33 ft.	$\frac{5}{8}$ in.
"	4	"	"	$\frac{3}{4}$	"	"	$\frac{7}{8}$ "
"	5	"	"	$1\frac{1}{4}$	"	"	$1\frac{3}{8}$ "
"	6	"	"	$1\frac{1}{2}$	"	"	$1\frac{3}{4}$ "

EXPANSION.

207. Proper allowance must be made for expansion according to temperature of rail when being laid. When the average thermometer reading on 30 or 33 feet rails, is:

90 deg. Fah., give	0	in. expansion space
70 to 90 deg. Fah., give	1/16	"
50 to 70 " "	$\frac{1}{8}$	"
30 to 50 " "	3/16	"
10 to 30 " "	$\frac{1}{4}$	"
10 to 10 " "	5/16	"

208. Rails must not be bumped together when being laid.

IRON SHIMS.

209. Proper expansion must be secured by using iron shims, according to the above specifications, except where track is laid on a steep grade, when sawn wooden shims of proper thickness will be provided. They must be left in place until track is fully spiked, bolted and anchored, and then removed.

THE PLATES.

210. Where tie plates are ordered they must be placed in pairs one on each end of the tie. The end with the widest margin must be placed on the outside of the rail.

SPIKING ON TIE PLATES.

211. On tangents only two spikes should be used in each plate; on curves use three or four as required. In general, on curves less than 6 degrees, three spikes should be used and on sharper curves, four spikes.

HOW PUT ON.

212. Tie plates must be forced into the ties before trains are allowed to run over them.

RAIL BRACES.

213. Rail braces must be used on guard rails and switches as shown on the standard plans, and on curves where ordered.

SWITCHES.

214. Switches must be put in track in accordance with the standard plans No stub switches shall be allowed in main line or cross-overs.

STUB SWITCHES.

215. At all stub switches, bridle rods must be confined between two ties, placed six inches apart.

LEAD RAILS.

216. Lead rails in all turnouts must be curved separately with the rail bender before being laid. The narrow places between rails at frogs, guard rails and switches, must be filled with standard wooden blocks.

DIFFERENCE IN WEIGHT OF RAILS.

217. When rail of a heavier pattern is used in the main track than in the side track, the main track pattern must extend as far up the side track at least as far as the switch ties extend.

DERAILING SWITCHES.

218. A standard derailing switch, stop block or safety switch must be placed at the clearance point of all sidings when ordered.

GUARD RAILS.

219. Guard rails must be placed at frogs, switches, and when ordered, on sharp curves and bridges.

TRACK MARKERS.

220. All standard track markers and signs must be placed strictly in accordance with the standard plans.

LENGTHS PAID FOR.

221. Only such sidings, spurs, turnouts, wyes, and other track, and such lengths thereof as ordered, will be estimated and paid for.

SURFACING.

222. The track will be surfaced with material obtained from the side, or with train hauled material as directed by the Engineer, but in no case shall the bottom of the ties be raised more than 3 inches above sub-grade.

SURFACING FROM THE SIDE.

223. "Surfacing 'A' " will include all work of procuring surfacing material from side ditches or other places where allowed, putting under the track, surfacing, lining and all other work incident to the preparation of the track for running work trains, where material for surfacing is obtained from the side.

SURFACING FROM TRAIN HAULED MATERIAL.

224. "Surfacing 'B' " will include the cost of all train hauled material under the track, surfacing, lining and all other work incident to the preparation of the track for running work trains where surfacing is done with train hauled material other than ballast. The surfacing must be kept up with the track laying as far as possible. All new tracks must be brought to surface and tamped up before it is run over. Rails that are damaged by reason of neglect on the part of the Contractor will be replaced at his expense.

TRAIN HAULED FILLING.

224 X. Where there is not sufficient material suitable for making embankments by men and teams within reasonable haul, of which the Engineer shall be judge, and it becomes necessary to make use of the track laid at the expense of the Commissioners to haul material for such purpose by train either for the widening of embankments to their full width or raising them to their full height, or for the purpose of filling temporary trestles, the Contractor will have the use of the Commissioners' rails, fastenings, and necessary switches for such purpose, it being understood that the track laying will only be paid for once by the Commissioners, and that any damage to rails, fastenings, or switches while in such service shall be paid for by such Contractor to the Commissioners, or the Commissioners may deduct it from the monthly or final estimate due, or to become due to the Contractor. The price given in the schedule for such train hauled filling shall include the cost of all temporary trestles which the Contractor may require, which he shall erect according to his own plans and at his own cost and risk, and all tools, plant, material and labor necessary for the loading, hauling, putting in place and trimming, as directed by the Engineer. The limit to which the contractor will be called upon to haul such train hauled filling at the price stated in this schedule will be five (5) miles; beyond such distance a price of one cent (.01) per yard per mile will be paid him, the measurement of such haul being made to the nearest mile, one-half mile or over counting as a full mile. Measurements of all train hauled filling will be made in excavation. No classification other than common excavation will be allowed on train hauled filling from borrow pits.

BALLASTING.

225. Ballasting will include the loading, hauling, unloading alongside of track, and transportation of all material hauled by train for the purpose of ballasting the track, said material to be duly accepted as ballast by the Engineer. Ballast shall consist of broken stone, gravel, or coarse sand, approved by the Engineer.

DITCHES.

226. All road and surface ditches will be left clear and free, so open and extended as to conduct water freely and quickly from the roadbed, and all side ditches must be left unobstructed.

SLOPES.

227. The side slopes and ditches must be left neat and smooth, and free from all rubbish, materials and obstructions.

Material for ballasting must not be taken from the slopes of embankments.

LAND.

228. The land for ballast pits and approaches thereto will be furnished by the Commissioners and approved by the Engineer. In selecting land for this purpose, a preference will always be given to those points where the best material can be procured within a reasonable distance as determined by the Engineer. During the working of any pit, should the material be found unfit for ballasting, the Engineer shall compel the Contractor to close such pits and open others. The cost of clearing land for ballast pits outside the right-of-way and grading and laying the main branch track to pits (but not sidings in same), shall be paid for according to the general schedule of prices.

DISTRIBUTION OF BALLAST FOR EMBANKMENT.

229. The surface of the ballast pits shall be stripped of soil where such exists, and no material whatever shall be placed on the roadbed but good, clean gravel. The maximum size of gravel must not be greater in diameter than three (3) inches.

FIRST LIFT.

230. Material sufficient for the first lift of six inches shall be delivered along the track, the track must then be raised so that there will be an average depth of six inches below the ties and the ballast must be well packed and tamped under and around them. As the raising proceeds, the end of the lift shall extend on not less than three rail lengths, and before trains are allowed to pass over the inclined portion of the track it must be made solid to prevent bending the rails or twisting the joints.

SECOND LIFT.

231. Precisely the same method shall be followed in making the second lift, so as to secure a uniform thickness of twelve (12) inches under the ties. The ballast shall fill the space between the ties full and shall conform to the section shown in the standard drawing.

TAMPING.

232. Three feet at each end of each tie shall be thoroughly tamped, the centre of the tie to be loosely tamped. After this lift, the track shall be centred, lined, topped, surfaced, and trimmed off to the proper form and width.

BALLASTING TO BE KEPT UP TO TRACK LAYING.

233. The ballasting must be kept up to the track laying in so far as is possible. All new track must be brought to surface and tamped up before it is run over. Rails that are damaged by reason of neglect on the part of the Contractor to comply with these requirements will be replaced at his expense.

LINING.

234. When the surfacing and ballasting is completed, the track must be in perfect line, surface and gauge, and must be so maintained by the Contractor until it is accepted by the Commissioners for operation. This contemplates a second adjustment of track to line and grade after it is settled under traffic. The schedule price for ballasting will include all work mentioned in Clauses 225 to 234 inclusive, no over haul being allowed.

Specifications for Fences.

FENCE.

235. The fence shall consist of an approved wire fencing at least 4 feet 6 inches high properly fastened to cedar posts as hereinafter specified, with suitable staples, stretched and built in a workmanlike manner in every respect, and to the satisfaction of the Engineer. The posts shall be of sound, live cedar, 5 inches in diameter at the top, 8 feet long, reasonably straight, with limbs and knots dressed off smoothly, with the bark removed. Such posts shall be spaced sixteen and one-half feet centre to centre, placed three feet deep in the ground, and thoroughly tamped. At all road crossings, farm crossings, jogs in the line of the fence and at intervals not exceeding 20 rods braced panels shall be built, having the posts spaced eight feet apart and a diagonal brace piece at least five inches in diameter at the top shall run from a point about one foot below the top of the end post to a short distance above the ground line of the adjacent post. The diagonal piece shall be notched into the post and be thoroughly nailed thereto with 6-inch wire nails. The posts for brace panels shall be carefully selected, not less than 8 inches diameter at the top and ten feet long. They shall be set four feet in the ground and firmly tamped. After the wire is strung the top of the post shall be cut true to a line and at an angle of 45 degrees for the purpose of shedding rain.

POSTS IN SHALLOW SOIL.

236. When the depth of the soil will not admit of the post hole depth called for above, "T" or "A" frame posts as shown on the standard drawing will be required. The foot of such posts shall be loaded with stones to prevent overturning.

FENCES AT HIGHWAY CROSSINGS.

237. At all highway crossings the fence shall be turned into the cattle guard and the posts shall be spaced equally apart to enable a sixteen foot 1 inch x 8 inch board to be nailed at the end and the centre, to the top of the posts. Such board being on edge and the line of boards to run from the fence to the cattle guard.

GATES.

238. Gates shall be made of an approved pattern of gas pipe frame and strung with wire, and to include suitable hinges and fastenings.

CATTLE GUARDS.

239. Cattle guards shall be placed at all highway crossings. They shall be of an approved pattern, made in sections with provision for removal without injury to the guard. The form and section to be approved of by the Engineer.

Highway Crossings.

HOW GRADED.

240. The approaches to the rail level shall be graded on a slope not more than five (5) per cent. with width of roadway, of not less than 20 feet.

SIGNALS.

241. At each highway crossing at rail level, there shall be placed a sign-board with the words "Railway Crossing" on both sides of the board, and in the Province of Quebec, in French also the words ("Chemin de Fer") in black letters on white ground, six inches in height. The board is to be framed into a cedar post firmly bedded at least four feet in the ground and at least 13 feet above the surface of the road.

PLANKING.

242. The highway at rail level shall be planked with three inch plank, packed up with 2 x 3 inches pieces resting on the ties. To have four planks 12 inches wide between the rails and two outside, one on either side level with the track. For single track crossing, to be 20 feet in length, at right angles to the direction of the highway.

FARM CROSSINGS, HOW GRADED.

243. The approaches shall be graded to insure a good roadway. When practicable, not to exceed a five (5) per cent. approach, the width of the finished road to be twelve feet. The crossing to be planked with four planks, two inside and two outside the rails. The interim space between the inner planks to be thoroughly packed with hard stones or gravel.

General.

CONTRACTOR TO PROVIDE WAGON ROADS, ETC.

244. The Contractor, at his own cost, must provide all wagon roads to reach and carry on the work; he must also provide all tools of every description and all supplies required for the prosecution of the work.

PRICES FOR BUILDINGS TO INCLUDE FOUNDATIONS.

245. The prices paid for buildings, water tanks, turntables, depots, section houses, and other standard structures, shall be as per schedule of prices.

MATERIAL TO BE FURNISHED BY THE COMMISSIONERS.

246. Unless otherwise provided, it shall be understood that the Commissioners are to furnish the Contractor all the rails, fastenings, tie plates, track bolts, spikes and steel bridges, either on board cars at the nearest accessible point by rail or at steamer landing, or at points along the line of road to be constructed, as may be directed by the Chief Engineer.

OTHER MATERIALS.

247. All other materials required for the construction of the Railway shall be supplied by the Contractor at the schedule price for same.

CONTRACTOR TO HANDLE ALL MATERIAL.

248. The Contractor will be required to handle all material at his own expense, including unloading and loading in cars, and all material must be unloaded

from cars within three days after its arrival, unless special authority to the contrary is given by the Engineer. Any violation of this rule will subject the Contractor to the usual demurrage.

HAULING.

249. Whenever cross-ties, piles, timber or other material is delivered along the line of the road, the Contractor must do the hauling to put in place, including the loading in cars when necessary.

SPECIFICATIONS FOR STANDARD TELEGRAPH LINE.

POLES

All poles shall be of live green cedar, sound, straight, cut square at both ends, all knots trimmed close, thoroughly peeled to within five feet of the butt and must not be less than seven (7) inches in diameter at small end, inside the bark.

POLE-LINE.

Shall be of twenty-five (25) foot poles for body of line and longer lengths at railway and highway crossings, through railway yards, and so proportioned to the contour of the country, that the wires may be strung without abrupt changes of level.

Poles shall be placed generally at six (6) feet inside of the right-of-way limit, except on such cuttings and embankments that the nature of the formation renders such position unsuitable, but no pole shall be set at a distance less than twelve (12) feet from the nearest rail. In wooded country, poles may be set thirty feet from the nearest rail.

Under no circumstances shall a pole or poles be set in a position that would interfere with a clear view of railway signals from station windows or engine cabs. In locating the line on straight sections, poles shall be placed at equal distances of one hundred and fifty (150) feet, and in curves at one hundred and thirty-five (135) feet.

Through station yards and at all railway and highway crossings poles not less than thirty (30) feet in length shall be set. All poles shall be set perpendicularly, except on curves or corners where they can be leaned *slightly* against the strain.

Holes shall be dug large enough to admit the poles without hewing, and shall be full size at the bottom, to permit of the use of iron tampers.

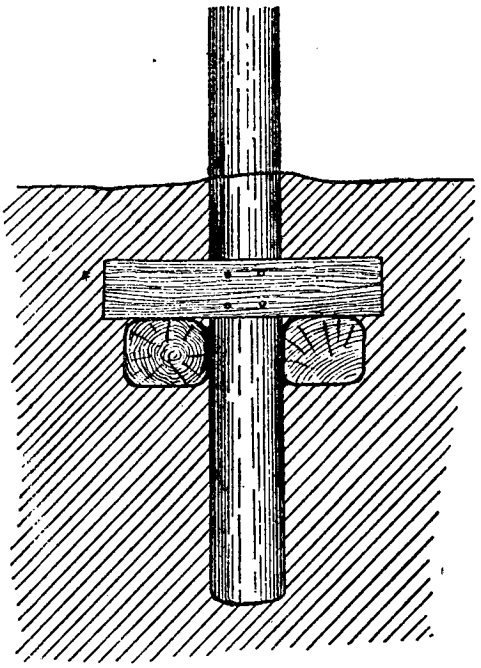
When the pole is placed in position, one shovel only shall be used in filling the hole, and two tampers used in packing the filling continuously until the hole is filled. The soil must be piled above the surface and firmly packed around the pole.

All poles shall be set beneath the surface of the ground as follows:—

25 and 30 foot lengths	5 feet
35 and 40 foot lengths	6 feet
45, 50 ft. and longer lengths	7 feet

Where solid rock is encountered, deduct one foot from the above scale of depths.

In wet or marshy locations, or where it is necessary to set poles on slopes, they should be set at a greater depth than previously indicated, to prevent the possibility of being blown over by wind or lifted by frost.



SIDE VIEW OF POLE WITH FOOT FOR VERY SOFT MARSH. CRIBBING MADE OF PIECES OF OLD POLES. LENGTHS AS REQUIRED.

In soft or marshy ground, weather braces shall be framed with a foot to hold the poles from being pushed into the ground. The size of the foot shall be determined by the strain the brace is designed to hold.

Instead of the foot, it will be permitted, when the ground is so soft as to prevent proper tamping, to fill in with stone, and brace the pole in four directions.

Poles to be set in quicksand shall be tapered from a point eighteen (18) inches above the butt to the butt, by the use of an axe, as piling is pointed before being driven.

FITTING OF POLES.

The top of the pole shall be roofed, and shall have not less than two (2) gains four and a quarter ($4\frac{1}{4}$) inches wide by three-quarters ($\frac{3}{4}$) of an inch deep, spaced twenty-two (22) inches on centres. The centre of the upper gain shall be ten (10) inches from the apex of the pole roof.

The direction of the apex of the "roof" shall be at right angles with the cross-arm, or parallel to the wires.

BRACES.

All braces shall be of cedar and set at a uniform distance from the butt of the pole, at least six (6) feet wherever possible, the top of the pole brace shall be just below the bottom gain, and shall be fastened with lag bolts.

LINE PROPS.

Line props shall be used on every fifteenth (15th) pole, placed parallel to the line in alternate positions. Props shall be of cedar and not less than fifteen (15) feet in length, set in the ground from two to three feet, not less than six (6) feet from the butt of line pole, and shall be fastened with lag bolts.

ANCHORS.

Through station yards, and for one thousand (1,000) feet each side and beyond stations, braces must not be used; anchors only shall be used.

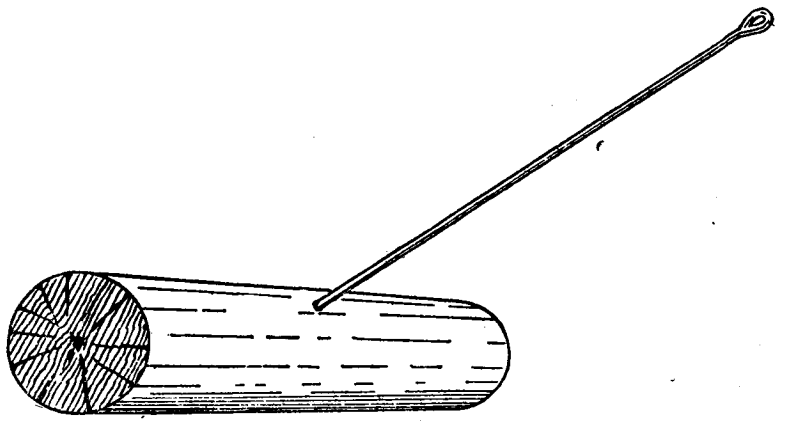
All excavations for anchor logs shall be five (5) feet deep wherever practicable. If impracticable to obtain this depth on account of the nature of the ground, the excavation may be made not less than three and one-half (3½) feet deep. Anchor logs must be of cedar.

CURVES.

All poles in curves shall be re-inforced by anchor guys or props.

CROSSINGS.

At all crossings, the poles on each side shall be double armed and of such height as to allow the arm in the bottom gain to carry the wires at least twenty-five (25) feet above the surface of the ground or rail level.



ANCHOR 5 FEET LONG, MADE OF CEDAR, DEPTH TO SUIT REQUIREMENTS.

CAPACITY OF LINE.

The line shall have an ultimate capacity for two (2) six (6) pin cross-arms and twelve (12) wires.

GUY WIRES.

Guy wires shall be of seven (7) strands No. thirteen (13) gauge steel rope. The ends of the guys shall be wrapped twice around the pole immediately under the lowest gain, and fastened to the guy rod. The ends of the wire shall be fastened by standard two bolt clamps. Under no circumstances shall guy wire be secured to the anchor beneath the surface of the ground.

In locating anchor guys, the distance from the butt of the pole shall not be less than one-fifth (1–5th) the length of the pole. In exposed places, guy wires must be protected by a guard of wood or iron pipe.

MECHANICAL ANCHORS.

An approved mechanical device may be substituted for the anchor log and iron guy rod.

OFFICES POLES.

Office poles shall be securely guyed to keep the strain of the wires off the office fixtures and buildings.

PLACING CROSS ARMS.

When planting poles, the cross-arms must face each other on every alternate span between poles.

Cross arms must be secured by two (2) seven (7) inch lag bolts, and two (2) iron braces as required by standard specifications. Braces to be fastened to the back of the cross-arms.

LONG SPANS.

At all crossings with spans of two hundred (200) feet and over, poles on either side shall be equipped with double arms.

LIGHTNING ARRESTORS.

A lightning rod of number eight (8) iron wire shall be securely attached to every tenth (10th) pole, with one and one-half (1½) inch staples. The rod shall project three (3) inches above the top of the pole to within one (1) foot of the butt, where four (4) spiral turns will be made around the pole, and a hand coil of about (6) feet fastened to the bottom. All office and cable poles shall be equipped in the same manner, except that two (2) number eight (8) iron twisted wires shall be used.

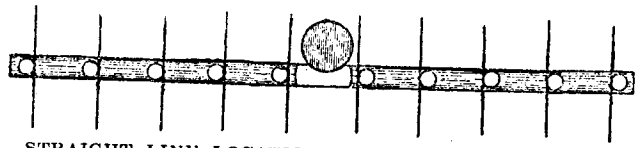
WIRES.

The first wire erected shall be No. eight (8) gauge, iron, weight 400 pounds per mile. The second wire shall be No. 6 gauge, iron, weight 574 pounds per mile.

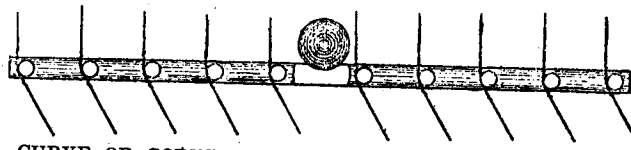
ERECTION OF WIRES.

String wires so as to avoid kinking and other damage, and remove all tags. Wires shall be tied on the side of the insulator nearest the pole, except on curves or corners where it is necessary to place it on the opposite side so that the strain will be against the insulator. (See sketch).

The ties must have three (3) turns on each side of the insulator, and the ends bent in and pointed toward the groove in the insulator.



STRAIGHT LINE LOCATION OF WIRES ON INSULATOR.



CURVE OR CORNER LOCATION OF WIRE ON INSULATOR.

JOINTS.

When connecting iron wires, first clean the wire, then use pliers and connectors, giving not less than five (5) turns on each side of the joint. All joints must be soldered.

EQUIPMENT.

The contractor shall furnish all the batteries, instruments, switchboards and all necessary equipment, in every particular, to secure a first-class installation, having due regard to the requirements of the service, the whole to be done in a workmanlike manner, fully guaranteed, and to the satisfaction of the Chief Engineer.

COPPER WIRES.

Extraordinary care must be taken to prevent kinking or other damage. When stringing copper wire, draw out by a rope over the cross-arm the full length of the coil, then pull up with approved grips. The wire shall then be tied throughout, the Grips being left on until the next coil is strung, the joint made, wire pulled up, and Grips attached in the same manner.

No mechanical device except approved Grips shall be used in pulling up copper wire.

TYING.

Copper wire shall be tied by hand. One side of the tie shall pass over the line wire, making five (5) complete turns, the other side shall pass under the line wire, also making five (5) complete turns.

Ties shall be of annealed copper wire of the same gauge as line wire, not less than twenty (20) inches in length, and must be well stretched before being used. After making the full number of twists on the line wire, turn the ends back against the line wire toward the insulator. These ends shall not be cut.

JOINTS.

Copper wire shall be connected by approved sleeves. Each sleeve shall have three (3) complete twists. Two pairs of approved splicing clamps only shall be used in making the joints.

After the joint is made, the end of the wire shall be bent at right angles to the joint and cut close to the side of the sleeve.

String all wires so that the sag between the poles shall be as given in the following table, making the allowance indicated for the temperature and length of span.

SAG IN ALL LINE WIRE.

Sag Expressed in Inches.

Temperature	Span		
	135 ft.	150 and 165 ft.	200 ft.
30 below	$3\frac{3}{8}$	$4\frac{1}{2}$	8
10 "	$3\frac{3}{4}$	5	9
10 above	$4\frac{3}{8}$	$5\frac{3}{4}$	$10\frac{1}{4}$
30 "	$5\frac{1}{8}$	$6\frac{3}{4}$	12
60 "	7	9	$15\frac{3}{8}$
80 "	$8\frac{5}{8}$	$11\frac{1}{4}$	$18\frac{3}{4}$
100 "	11	14	$22\frac{1}{4}$

SPECIFICATIONS FOR MATERIAL.

SPECIFICATIONS FOR GALVANIZED IRON TELEGRAPH WIRE.

1. The wire to be soft and pliable, and capable of elongating 15 per cent. without breaking, after being galvanized.

2. Extreme tensible strength is not required, but the wire must not break under a less strain than two and one-half times its weight in pounds per mile. Tests for tensile strength will be made by direct application of weight, or by means of a lever, at the option of the inspecting Officer.

3. Tests for ductility will be made as follows:—The pieces of wire will be gripped by two vises, six inches apart, and twisted. The full number of twists must be distinctly visible between the vises on the six inch piece. The number of twists in a piece of six inches in length must not be less than 15.

4. The weight per mile for different sizes of wire will be:—For No. 6 gauge, 574 lbs.; No. 8 gauge, 400 lbs.; No. 9 gauge, 330 lbs.; or, as near these figures as practicable. A variation of not more than two per cent. will be allowed.

5. The electrical resistance of the wire in Ohms per mile at a temperature of 68 degrees Farenheit, must not exceed the quotient arising from dividing the constant number 5000 by the weight of the wire in pounds per mile. Example:—The mileage resistance of a wire weighing 400 pounds per mile, should not exceed $5000 \div 400 = 12.50$ Ohms.

6. The wire must be cylindrical and free from scales, inequalities, flaws, sand splits and other imperfections and defects. Each coil must be warranted not to contain any weld, joint or splice whatever in the rod before drawn. All wire to be "killed" or stretched about two per cent. before delivery.

7. It is desired to obtain the wire in coils, all of one piece. If this cannot be undertaken, the contractor may tender for a supply of wire with two pieces only to the coil, joined by the ordinary twist joint and carefully soldered or electrically welded. It should be stated in the tender whether there will be one or two pieces in each coil. The length of the wire in each coil shall be as follows:—No. 8 B.W.G., or smaller, one-half mile; No. 6 B.W.G., one-third mile. A variation of not more than three per cent. from the above will be allowed. The grade of iron wire to be used is that known as "Extra Best Best."

8. The wire must be well galvanized, and capable of standing the following tests:—The wire will be immersed in a saturated solution of sulphate of copper at 68 degrees Fahrenheit, and permitted to remain one minute, and then wiped clean. This process will be performed four times. If the wire appears black after the fourth immersion, it shows that the zinc has not all been removed and that the galvanizing is well done, but if it has a copper color, the iron is exposed, showing that the zinc is too thin.

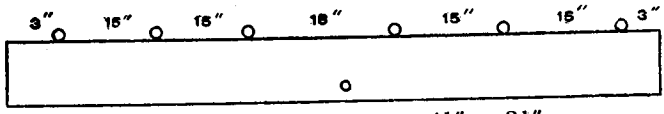
SPECIFICATIONS FOR HARD-DRAWN COPPER LINE WIRE.

Each coil must be drawn in one continuous length without joints. The wire must be cylindrical and free from scales, flaws, inequalities and other imperfections. It must have a tensile strength to sustain three times its weight in pounds per mile; must withstand, without breaking, thirty twists in six inches, and must be capable of elongation 1¼ per cent. before breaking; must permit of being wrapped a number of times about its own diameter, and unwrapped without showing signs of breaking.

Its electrical resistance per mile in international Ohms. at 68 degrees Fahrenheit, must not exceed the quotient arising from dividing the constant 912 by its own weight in pounds per mile.

CROSS-ARMS.

The cross-arms to be perfectly sound, seasoned, straight grained, red pine or British Columbia Douglas Fir, free from knots or other defects, surfaced on all sides, rounded off on top edge to produce the full size of seven (7) foot lengths, four and one quarter (4¼) inches by three and one-quarter (3¼) inches, bored for six (6) one-half (½) inch holes to take standard steel pins, spaced as per sketch. Two (2) central lag screws holes nine-sixteenths (9-16) of an inch in diameter bored in each cross-arm, staggered vertically three (3) inches.



SIZE WHEN DRESSED 4¼" x 3¼".

PINS.

To be of approved steel pattern.

INSULATORS.

Double petticoat design, weight twenty-five (25) ounces, to be manufactured of best glass used for the purpose, free from blow holes and other defects. The threading shall be neatly and fully formed and the whole shape made uniformly true throughout.

The initial "T.C.R." shall be blown on the outside surface of the glass on the margin below the tie line groove, in block letters one-half an inch in height.

CROSS-ARM LAG SCREWS.

These are to be of wrought iron or steel one-half an inch in diameter, full seven inches long under head, with full three inches of thread, six (6) threads per inch, gimlet pointed, with standard square heads with flat circular top, surface of five-eighths (⅝) inch in diameter with remaining surface and corner pressed to the standard rounding surface.

Washers: one and three-eighths (1⅜) inch by nine-sixteenths (9–16) inch. No. twelve (12) gauge.

CROSS-ARM BRACES.

To be of wrought iron or steel, one inch wide, twenty-eight (28) inches long, seven-thirty-second (7–32) inch thick, with a hole punched at each end seven-sixteenths (7–16) of an inch in diameter, the centre of which shall be three-quarters (¾) of an inch from end of brace.

BRACE BOLTS.

To be one-half (½) by three and one-quarter (3¼) inches. Three-eighths (⅜) by two and one-quarter (2¼) inches. Gimlet pointed, flat head, standard make.

GUY RODS.

To be of wrought iron or steel, five-eighths, (⅝) inch diameter, five foot (5) six inches (6) in length, threaded for four (4) inch plate and nut, top end welded to form a loop.

Turntables.

Shall be of medium steel, plate girder type, seventy-five feet long, with a capacity of 200 tons.

Track Scales.

Shall be of 150 tons capacity, 50 feet long and shall be housed from the weather, and shall consist of the most approved pattern of railroad track scales, with concrete or masonry foundations, and all to the satisfaction of the Engineer.

Buildings.

Tool houses, outbuildings, section houses, passenger or combination freight and passenger station buildings, freight sheds, engine houses, car and locomotive repair shops and such other buildings as may be required, shall be built in accordance with the detailed plans and specifications which may be furnished from time to time by the Chief Engineer.

Water Station.

Water tanks shall be built frost proof. Minimum capacity of 50,000 gallons, resting on concrete or masonry foundations, in accordance with the detailed plans and specifications, and to the satisfaction of the Chief Engineer.

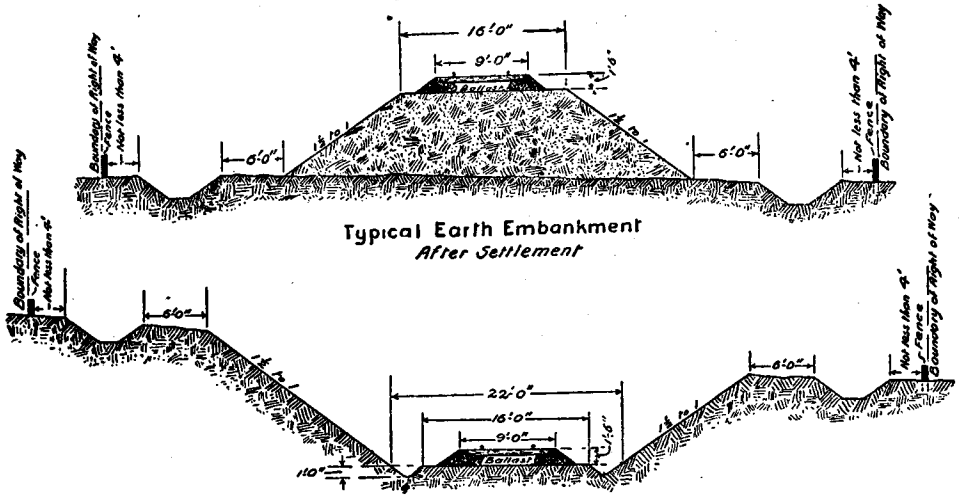
Steel Bridges.

Shall he designed and built in accordance with the provisions of the general specifications for railway bridges, issued by the Department of Railways and Canals, 1905 edition. The class of loading to be used for all bridges is that designated HEAVY.

THE NATIONAL TRANSCONTINENTAL RAILWAY.

EASTERN DIVISION.

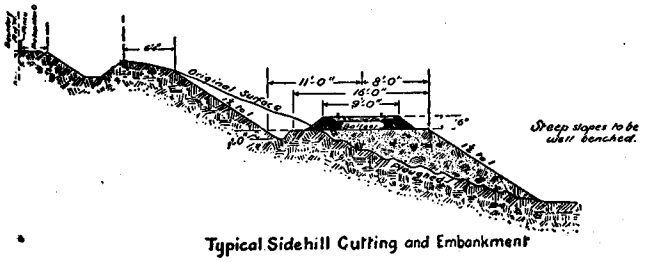
DRAWING No. 1.



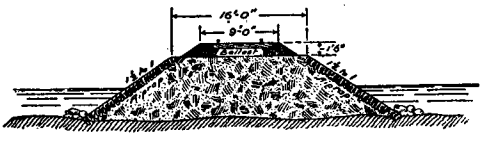
Typical Earth Embankment
After Settlement

Typical Earth Cutting

DRAWING No. 2.



Typical Sidehill Cutting and Embankment

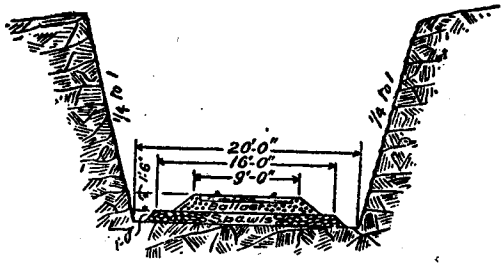


Typical Embankment in Water
Shewing Riprap Protection

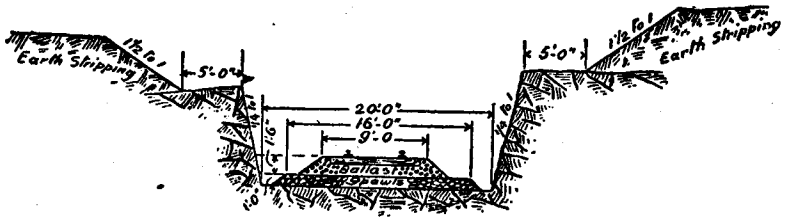
THE NATIONAL TRANSCONTINENTAL RAILWAY.

EASTERN DIVISION.

DRAWING No. 3.

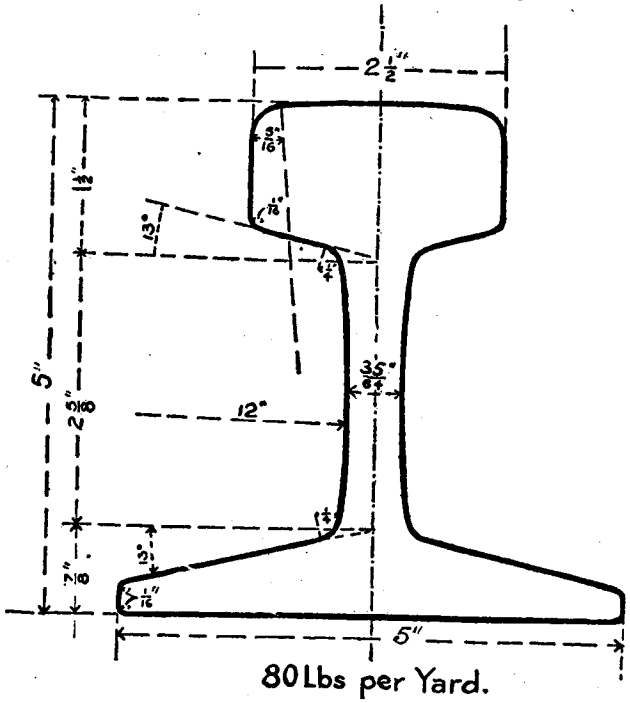


Typical Rock Cutting.



Typical Rock and Earth Cutting.

DRAWING No. 4.



80 Lbs per Yard.

Approved,

Chief Engineer, Eastern Division, Transcontinental Railway.

Approved,

Chief Engineer, Grand Trunk Pacific Railway.

Approved,

Chief Engineer, Department of Railway and Canals, of Canada.

Ottawa,----------190----

TRANSCONTINENTAL RAILWAY

(EASTERN DIVISION)

District.....Sec.

Contractor.

Estimate of work done and materials furnished for the month of

.....190.....

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
1	Clearing, including close cutting	acre			
2	Trees cut down outside right of way	each			
3	Grubbing	acre			
4	Solid rock	c. yd.			
5	Loose rock and other materials (sec. 35 spec.)	"			
6	Common excavation	"			
7	Excavation in foundations, no coffer dams	"			
8	Excavation of foundation within coffer dams	"			
9	Overhaul all materials per c. yd. per 100 ft. over 500 ft. haul	"		0 01	
10	Piles delivered as per engineer's bill	lin. ft.			
11	Pile driving	"			
12	Sheet piling per M. ft. b.m.				
13	Wakefield type "				
14	Cross-logging, 1 ft. deep with 18-in. brush-work	acre			
15	Pole drains	lin. ft.			
16	French stone drains	"			
17	Paving in culverts (not laid in cement)	c. yd.			
18	Crib filling with stone	"			
19	Hand laid rip-rap	"			
20	Pierre Perdu rip-rap	"			
21	Piling out reserved stone from rock cuttings	"			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
22	Round logs in cribs	lin. ft.			
23	Cedar mud sills, per M. ft. b.m.				
24	Framed trestles per M. ft. b.m. except stringers				
25	Caps, walings and braces for pile trestles, per M. ft. b.m.				
26	Sawn ties and guard rails for bridges per M. ft. b.m.				
27	Stringers per M. ft. b.m.				
28	Cedar timber in culverts, 8-in. x 12-in., 10 in. x 12-in., and 12-in. x 12-in., per M. ft. b.m.				
29	Plank in highway and private road crossings per M. ft. b.m.				
30	Timber, best quality, for culverts, per M. ft. b.m.				
(a)	Timber in coffer dams or ordinary foundations	M. ft. B.M.			
(b)	Timber in caissons	"			
	Vitrified pipe culverts—				
33	15-in. diameter	lin. ft.			
34	18-in. diameter	"			
	Reinforced concrete pipe—				
36	14-in. diameter	"			
38	18-in. diameter	"			
40	24-in. diameter	"			
41	30-in. diameter	"			
42	36-in. diameter	"			
44	48-in. diameter	"			
46	60-in. diameter	"			
47	4-in. agricultural under tile drains	"			
	Cast iron pipe culverts—				
49	18-in. diameter	"			
51	24-in. diameter	"			
52	30-in. diameter	"			
53	36-in. diameter	"			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
55	48-in. diameter	lin. ft.			
57	60-in. diameter	"			
58	Concrete facina minture 1-2, 2½-in. thick, including forms	c. yd.			
59	Concrete 1-2-4 coping course 6-in. thick, including forms	"			
60	Concrete 1-3-5, including forms	"			
61	Concrete 1-3-6, including forms	"			
61a	Concrete 1-2-5, including forms and centres	"			
62	Concrete 1-3-5 in arch culverts, including forms and centres	"			
63	Concrete 1-3-6 in arch culverts, including forms and centres	"			
64	Concrete 1-3-6 in box culverts, including forms	"			
65	Concrete 1-4-8 ordinary foundations including forms	"			
66	Concrete 1-4-8 walls of building including forms	"			
67	First-class masonry	"			
68	Second-class masonry	"			
69	Third-class masonry	"			
70	Dry masonry	"			
71	Masonry in arch ring, including centering	"			
72	Track-laying in main line with ordinary frogs, switches, and sidings, including light surfacing 'A'	mile			
73	Track-laying in yards at terminals	"			
74	Train hauled surfacing 'B' no overhaul allowed	c. yd.			
(c)	Train hauled filling, including temporary trestle	c. yd.			
(d)	Overhaul on train hauled filling per cubic yard per mile over five (5) miles			0 01	
(e)	Removal of moss per cu. yd., no overhaul allowed				
75	Ballasting, no overhaul allowed	c. yd.			
76	Ties, first-class	"			

Item	Description of Work	Measure	Quantity	Rate	Amount
				$ cts.	$ cts.
77	Ties, second-class	each			
78	Ties for switches, sawn to dimensions per M. ft. b.m.				
79	Public road signs	each			
80	Mile posts, whistle posts, and road signs	"			
81	Semaphores at stations, complete	"			
82	Interlocking appliances, complete, eight levers including all connections, signals, etc	"			
83	Each additional lever	"			
84	Fencing	rod			
85	Gates	each			
86	Tunnels, rock sections (unlined)	lin. ft.			
87	Tunnels, lined	"			
88	Tunnels, concrete lining	c. yd.			
89	Tunnels, masonry lining	"			
90	Drainage tunnels, 4 c. yds. per ft	lin. ft.			
91	Telegraph line	mile			
92	Water tanks, 50,000 galls. complete, including foundations	each			
93	Turntables, including everything except foundations	"			
94	Track scales, including everything except foundations	"			
95	Tunnel shafts	c. yd.			
96	Iron in drift bolts	lbs.			
97	Iron in screw bolts	"			
98	Forged or cut spikes	"			
99	Cast-iron washers and separators	"			
100	Cattle-guards (3 sections)	3 sections			
101	Cast-iron pile shoes	each			
102	Cast-iron water pipes of any dia. from 4" to 10" per ton of 2,000 lbs.				
103	Steel imbedded in concrete	lbs.			

N. T. R.

INVESTIGATING COMMISSION

Exhibit 11

Correspondence in connection with calling for Tenders.

(See Page 19 of Report)

OTTAWA, Jan. 16th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

DEAR SIRS:—

In accordance with your verbal instructions of to-day, I understand we may defer for a time the preparation of plans and profiles for filing with the Department in order to rush to completion by the 27th inst. a complete set of tracings from Winnipeg to Lake Superior Junction and from Quebec to point near La Tuque; without showing quantities on the profiles. I am putting on extra men and working the regular staff at night in order to insure this, and, in the meantime, would ask the Board to kindly instruct me definitely by what sections of the Act we are to be guided in preparing plans for filing and from whom I shall ask instructions as to whether plans and profiles have to be made in triplicate tracings or whether blue prints will answer. I have the printed regulations of the Permanent Railway Board in this regard but understand they do not apply.

Yours very truly,
(Sgd.) D. MACPHERSON,
Ass't. Chief Engineer.

OTTAWA, Jan. 18th, 1906.

File No. 1193.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

DEAR SIRS:—

In compliance with your request for a recommendation as to whether quantities and classification of material should be shown on our profiles on which tenders are based. It seems to me inadvisable to show quantities, as we are calling for tenders on first location profiles, which are likely to be modified by revision. It would, however, give tenderers some useful **general** information to mark on the different large cuttings the supposed classification, but it should distinctly be understood that this information is only given for what it is worth and cannot, under the circumstances, be accurate or in any way binding on the Commissioners.

Yours very truly,
(Sgd.) D. MACPHERSON,
Ass't. Chief Engineer.

OTTAWA, Jan. 26th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

DEAR SIRS:—

I beg leave to report, for your information, that I have had all the plans and profiles retraced so as not to show quantities, and that the complete sets of blue prints, to show tenderers, which I promised to have ready for Saturday, were

completed Thursday night. I was enabled to do this by the employment of a few extra men and the hearty co-operation of the staff, who worked Saturday afternoon and every night since the order was given.

Yours very truly,
(Sgd.) D. MACPHERSON,
Acting Chief Engineer.

OTTAWA, Jan. 27th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Dear Sirs:—

In compliance with your request for my opinion as to the advisability of including the masonry substructures of bridges in the general contract and excluding the steel superstructures; I would beg leave to say that it is not an unusual thing to let masonry contracts separate from the general contract, when letting ordinary contracts for railways in settled districts, where the means of transporting material would not be largely under the control of the general contractor; but in such a large contract as you propose letting, through an unsettled country with restricted means of communication, any contractor capable of undertaking the work as a whole would necessarily have better facilities and could do the masonry work cheaper than anyone else. Having regard to all the circumstances, it seems therefore advisable to let masonry substructures in the general contract. Steel superstructures should, as a general rule, be let by separate contract and I would advise that the same Company or Companies who manufacture the bridges should erect them, otherwise it is difficult to fix the responsibility in case of any damage to the bridges during erection. This might make it necessary to modify clause 246 of the Specifications, in regard to delivery of steel bridges to contractors.

Yours very truly,

(Sgd.) D. MACPHERSON,
Acting Chief Engineer.

Hon. S. N. PARENT,

Chairman of the Commissioners of the Transcontinental Railway,
Ottawa.

OTTAWA, 30th January, 1906.

Dear Sir,—

Our Commission will be soon ready to call for tenders on two sections of the line. As work of this importance involves many questions which may give rise to differences of opinion, the Commissioners would like to have your opinion, as Government Consulting Engineer, on the following points, namely:—

1. Plans and profiles are to be submitted for the information of tenderers. Would it be advisable to have the quantities appear on the profiles, or on the contrary should not this source of information be withheld from the contractors.

2. Should tenders be called for the following work as one contract, viz:— the clearing, grubbing, grading, embankment protection, truss, pile and trestle bridging, masonry, concrete culverts, pipe culverts, piers, abutments, road crossings, cattle guards, tracklaying, surfacing, ballasting, water service, stream diversion, turntables, roundhouses, section houses, gates, telegraph lines, including such other work to complete and finish, ready for operation, a single track railway with side tracks, yards, terminal yards, depot grounds, spurs and other necessary and appurtenant tracks, extending from a point in District "F", designated on the said plans of the Commissioners, to a distance of about 245 miles, and from a point in District "B", also designated on the said plans of the Commissioners, to a distance of about 150 miles. The Commissioners furnishing all the rails and fastenings, tie plates, track bolts, spikes, and ties.

Depots, shops and steel bridges we think advisable to ask by separate tenders.

Do you consider advisable to take from the main contract fences, telegraph lines, masonry for steel bridges and ask separate tenders for these works?

Thanking you in advance, I remain,

Yours truly,

(Sgd.) S. N. PARENT,
Chairman.

C. SCHREIBER, Esq.,
Gen'l Consulting Engineer, to the Government,
Ottawa.

Office of the General Consulting Engineer to the Government,
Room No. 150, Western Departmental Building,

OTTAWA, CANADA, January 31st, 1906.

My dear Sir.

I have to acknowledge the receipt of your communication of yesterday's date, requesting my opinion upon certain points in connection with the calling for tenders for two sections of the Eastern Division of the National Trans-Continental Railway.

In reply to your first question as to the advisability of having the quantities of work to be done appear on the profiles, I would say that, assuming that the profiles show the cuttings and embankments, and the structures to be built at each point, and that the Specification describes the work to be executed, no further information is needed by intending contractors on a schedule price contract. Especially would it be undesirable to exhibit quantities and classification, upon a location which is liable to be revised or changed. The Department of Railways and Canals has, for many years, refrained from exhibiting quantities or classification, as contractors have, subsequently, put forward claims, upon the ground that the details so given had misled them. There is no necessity for supplying such information, and I strongly advise that quantities be not exhibited.

With regard to the question of the extent of the works to be tendered for as one contract, I would say that I am firmly of opinion it would be in the interest of

the speedy prosecution of the work, and of economy in its cost, and therefore in the public interest to include in one contract, upon so large and important piece of work, the telegraph line, clearing, grubbing, road crossings, cattle guards, track-laying, surfacing, ballasting, water service, stream and road diversions, turntable sub-structures, engine houses, section houses, fences, gates, and all works below subgrade or formation level, in fact, all work necessary, when the bridge superstructures are in place, to complete, ready for operation, a single track railway, with side tracks, switches, yards, terminal yards, depot grounds, spurs and other needful appurtenant tracks. In fact, the contract should cover all materials and works, of every description, except the supply and erection of the bridge superstructures and steel turntables, and the supply of steel rails and fastenings, tie plates, track bolts, spikes, ties, which will be furnished by the Commissioners. There is no necessity for the inclusion of the passenger stations, freight houses, warehouses and fuel sheds in the contract, should another course be deemed desirable, and tenders could, in each case, be sought for them as separate and distinct works, apart from the general contract.

As to my reason for advising the inclusion of the telegraph in such general contract, it is this. The contractors are the parties chiefly interested in having the telegraph line in use at an early stage of the work, as it would materially assist them in directing the details of construction and the movement of supplies along their contract works. Hence it is natural to expect that the erection of the telegraph line, if in their hands, would follow close upon the work of clearing, thus ensuring its construction at an early stage.

My reason for recommending the fencing also being so covered, I may say, is that it is the custom in Government contracts to provide that the contractors shall be responsible for all damage done on adjoining land by cattle, etc., trespassing, and it has, therefore, been considered only reasonable that they should be able to protect themselves by the erection of fences along the line where such trespass might be looked for.

Faithfully yours.

(Sgd). COLLINGWOOD SCHREIBER,

Government Chief Engineer of the Western Division of the National Trans-Continental Railway.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 12

Copy of Advertisement for Tenders for General Grading Contracts.

(See Page 19 of Report)

NOTICE TO CONTRACTORS.

Sealed Tenders addressed to the undersigned, marked on the envelope 'Tender for Construction,' will be received at the office of the Commissioners of the Transcontinental Railway, at Ottawa, until twelve o'clock noon of Thursday, the 20th day of August, 1908, for the work required for the construction, in accordance with the plans, profiles and specifications of the Commissioners, of the following sections of the Transcontinental Railway, viz:—

(1) District 'C.'—From a point designated on the plans of the Commissioners near Weymontachene, in the province of Quebec, 196.38 miles west of the north abutment of the Quebec bridge (such point being on the boundary between Districts 'C' and 'D') westerly for a distance of about 107 miles. Date of completion, 31st December, 1910.

(2) District 'C.'—From a point designated on the plans of the Commissioners, about 107 miles west of Weymontachene, in the Province of Quebec, westerly to the end of the Grand Trunk Pacific Railway Company's contract, a distance of about 114.97 miles. Date of completion, 31st December, 1910.

(3) Districts 'D' and 'E.'—From a point designated on the plans of the Commissioners, being at the western end of Fauquier Bros.' Abitibi contract, in the Province of Ontario, in a westerly direction for a distance of about 104.24 miles. Date of completion, 31st December, 1910.

(4) District 'E.'—From a point designated on the plans of the Commissioners, about sixty miles west of the easterly boundary of District 'E,' in the Province of Ontario, easterly to the end of Fauquier Bros. contract, north of Lake Nepigon, a distance of above 100 miles. Date of completion, 31st December, 1910.

(5) Districts 'E' and 'F.'—From a point designated on the plans of the Commissioners, at the western end of Fauquier Bros, contract north of Lake Nepigon, in the Province of Ontario, westerly to a point at or near Dog Lake, a distance of about 126 miles. Date of completion, 1st September, 1910.

(6) District 'F.'—From a point designated on the plans of the Commissioners at or near Dog Lake, in the Province of Ontario, to a point at or about mile 2.6 west of what is known as Peninsula Crossing, by alternative routes as shown on the plans, a distance of about 23.76 miles by the northerly route and 24.13 miles by the southerly route, the selection of the route to be at the option of the Commissioners. Date of completion, 1st September, 1909.

Plans, profiles and specifications may be seen in the office of the Chief Engineer of the Commissioners at Ottawa; also in the offices of the following District Engineers, viz:—John Aylen, Acting District Engineer, North Bay, Ont.; T. S. Armstrong, Nepigon, Ont.; and S. R. Poulin, St. Boniface, Man.

Persons tendering are notified that tenders will not be considered unless made in duplicate, and on the printed forms supplied by the Commissioners.

A separate tender must be submitted for each section.

Tenderers shall not be in any way entitled to rely upon the classification, or any other information given by any person on behalf of the Commissioners; and before submitting any tender, bidders should make a careful examination of the plans, profiles, drawings and specifications, and read the forms to be executed, and fully inform themselves as to the quality of materials, and character of workmanship required; and are understood to accept, and agree to be bound by, the

terms and conditions in the form of contract, specifications, &c., annexed to the form of tender.

Each tender must be signed and sealed by all the parties to the tender, and witnessed, and be accompanied by an accepted cheque on a chartered bank of the Dominion of Canada, payable to the order of the Commissioners of the Transcontinental Railway, as follows:—

For Sec. No.	1,	District	'C'	$150,000
" "	2,	"	'C'	150,000
" "	3,	"	'D' & 'E'	150,000
" "	4,	"	'E'	150,000
" "	5,	"	'E' & 'F'	200,000
" "	6,	"	'F'	100,000

Any person whose tender is accepted shall within ten days after the acceptance thereof furnish such additional approved security as may be required by the Commissioners; sign the contract, specifications, and other documents required to be signed by the said Commissioners; and, in any case of refusal or failure on the part of the party whose tender is accepted to complete and execute a contract with the said Commissioners, and to furnish the additional approved security within ten days after the acceptance of the tender, the said cheque shall be forfeited to the Commissioners as liquidated damages for such refusal or failure and all contract rights acquired by the acceptance of the tender shall be forfeited. The cheques deposited by the parties whose tenders are accepted will be deposited to the credit of the Receiver General of Canada as part of the security for the due and faithful performance of the contract according to its terms. Cheques deposited by parties whose tenders are rejected will be returned within ten days after the signing of the contract.

Attention is called to the following clauses in the form of contract:—

'All mechanics, labourers, or other persons who perform labour for the purposes of the construction of the works hereby contracted for, shall be paid such wages as are generally accepted as current for competent workmen in the district in which the work is being performed, and if there is no current rate in such district, then a fair and reasonable rate; and, in the event of a dispute arising as to what is the current or a fair and reasonable rate, it shall be determined by the Commissioners, whose decision shall be final.'

'This agreement is subject to the regulations now in force, or which may at any time hereafter be in force during the construction of the works hereby contracted for, made under the authority of the Department of Labour, and which are, or shall be, applicable to such works.' (The schedule of minimum wages determined upon by said Department will form part of the contract).

'The contractor shall in connection with the whole of the said work, as far as practicable, use only material, machinery, plant, supplies and rolling stock manufactured or produced in Canada, provided the same can be obtained as cheaply and upon as good terms, in Canada as elsewhere, having regard to quality and price.'

The contractor shall conform to the fire regulations adopted by the Commissioners, and also to the laws and regulations respecting fires in the different provinces wherein the work is being performed.

The right is reserved to reject any or all tenders.

By order,

P. E. RYAN,

Secretary.

The Commissioners of the Transcontinental Railway.

Ottawa, 18th July, 1908.

Newspapers inserting this advertisement without authority from the Commissioners, will not be paid for it.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 13

Copy of Order in Council re Security on Contract.

(See Page 20 of Report)

Copy File No. 14–164782.

Extract from a report of the Committee of the Honourable the Privy Council, approved by His Excellency on the 24th April, 1897.

On a memorandum dated 21st April, 1897, from the Minister of Railways and Canals, representing that whereas on the 24th of December, 1896, an Order in Council was passed amending the Order of the 23rd of March, 1880, in the matter of the amount of security to be required from Contractors for Public Works and increasing such amount from 5% to 10% of the estimated value of the contract, it appears, on further consideration, expedient that such increase should not apply to all contracts alike, but that a distinction should be drawn between those of minor importance and works of magnitude which involve the locking up of considerable sums of money.

The Minister accordingly recommends that the provisions of the said order of the 24th of December, 1896, be so far modified as to make them applicable to contracts the estimated value of which is under $250,000, and that in cases of contracts the estimated value of which is over that amount, the security to be taken thereunder be that contemplated by the previous Order referred to, namely, 5% of such estimated value.

The Committee submit the above recommendation for your Excellency's approval.

JOHN J. McGEE,
Clerk of the Privy Council.

The Honourable the Minister of Railways and Canals.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 15

Letter from H. A. Woods re Classification.

(See Page 64 of Report)

COPY

Montreal, Que., October 7, 1907.

MR. HUGH D. LUMSDEN,
Chief Engineer, Eastern Division,
National Transcontinental Railway,
Ottawa, Ont.

Dear Sir:—

Classification of Material, District "B"

At the request of District Engineer Armstrong he was furnished recently with a statement of classification for the heavier work on the above section which were, when given in detail, so different from his expectations that he requested the writer to visit the work.

During the past week we passed over portions of the work from the Batiscan River west for fifteen or twenty miles and later, from Miles 115 to 132.

With reference to the former portion, the classification was given in distances of from 3 to 5 miles, and, as we did not have total quantities of graduation, could not judge with reference to any particular cutting, although percentages for entire distance seemed excessively heavy in both loose and solid rock.

With the latter portion we had detailed percentage for each cut and were greatly surprised at the allowances made for solid and loose rock. In nearly every case, where the cutting was not entirely all ledge, the estimate given for solid rock is double, or more than double, what it should be. In fact, the specifications had been entirely ignored and an excessive allowance made, not by reason of an error in judgment, but, as I understand, by special instructions from the Assistant District Engineer:

Let me give you some illustrations:—

Take the cutting from Stations 5818 to 5826, estimated 71% solid rock and 29% loose rock. Slopes taken out 1½ to 1. Very little ledge in this cut. Some large boulders but a very large percentage is common excavation.

Station 5842 to 5860. Classified 94% solid rock, 6%loose rock. Slopes taken out 1½ to 1. Solid rock over classified at least. 100%.

Station 5866 to 5875. Estimated 80% solid rock, 20% loose rock. No rock in place in this cut. Many large boulders but a large amount of earth.

Station 5882 to 5901. Estimated 78% solid rock, 22% loose rock. A large amount of this cut wasted with slip scrapers and ploughing being done with two horses. There are hundreds of yards of earth here without a stone, large or small.

Station 6030 to 6046. Estimated 40% solid rock, 10% loose rock. This is the large sand cut west of O'Brien's camp. Of the 95,000 yards moved to August 31st in this cut at least 80,000 yards were pure sand.

Station 6071 to 6078. Estimated 99% solid rock, 1% loose rock. Very little solid rock in place. Slopes taken out 1½ to 1.

West of the St. Maurice River.

Station 6391 to 6394. Estimated 46% solid rock, 33% loose rock. Sand cut with few boulders and possibly 1,500 yards ledge in bottom of cut not yet taken out.

Station 6493 to 6504. Estimated 20% solid rock, 49% loose rock. No evidence of any ledge and very few large boulders. Nearly all sand.

Station 6506 to 6512. Estimated 16% solid rock, 44% loose rock. This is purely a sand cut, with very few boulders. Upper slope nearly 100' high, material wasted into river. Certainly not 10% of this should be classified.

Station 6522 to 6548. Estimated 26% solid rock, 49% loose rock. This is borrowed material from the side. Very little solid rock shown, except what was used for blind drains, but some large boulders not placed in embankment.

On account of heavy rains we were not able to go west of station 6600 but we understand that classification is made about as noted above.

In every case where cuttings are not entirely in ledge we find the material over-classified very largely. Mr. Armstrong has been able to visit this work at different times, perhaps quite as often as the Assistant District Engineer. His estimate and my own are not very different as to the amount of classified material and until he received detailed quantities he had no intimation that such heavy classification had been given. In many cases, particularly in sand and gravel cuts, he had supposed that no classification would be given, except perhaps for a few boulders as loose rock.

I am informed also that on the work east of the St. Lawrence River heavy classification is being made in borrowed material where ploughing is done with one team and material moved in slip scrapers.

As before stated, these over-classifications are not made through error in judgment, nor upon the decision of the Resident or Division Engineers, who are fully acquainted with the character of the work, but by arbitrary orders from their superior. To such classification as mentioned above, increasing the cost of the work to such an alarming extent, we most seriously protest and respectfully request that either yourself or the Assistant Chief Engineer visit the work and pass judgment upon the classification as made. Please note that the percentages given above indicate the work done to August 31st. We are not advised what the September estimate will show.

Yours truly,
Sgd. H. A. Woods,
Assistant Chief Engineer.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 16

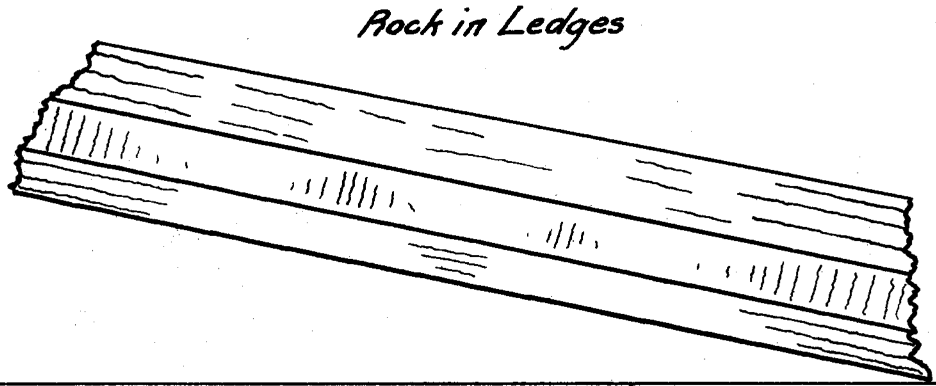
Mr. Lumsden's Blueprint showing Assembled Rock.

(See Page 65 of Report)

NATIONAL TRANSCONTINENTAL RAILWAY
SOLID ROCK EXCAVATION

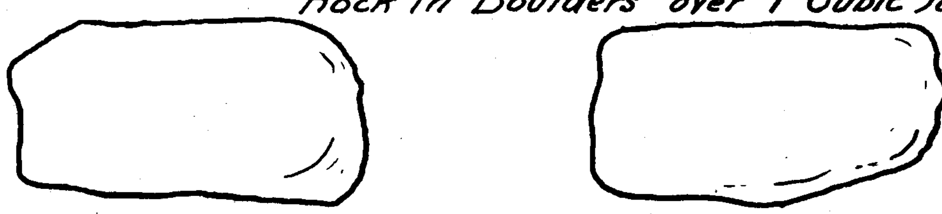
Rock in Ledges

Diagram



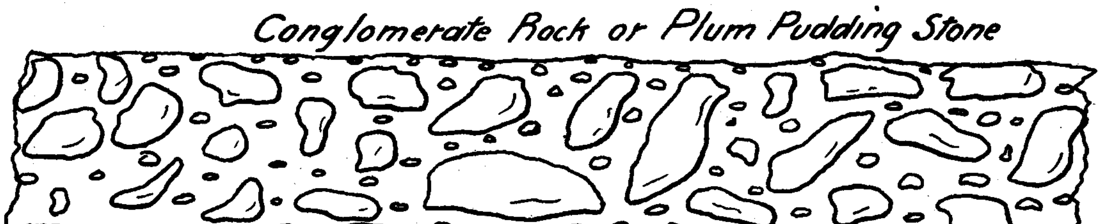
No 1

Rock in Boulders over 1 Cubic Yard



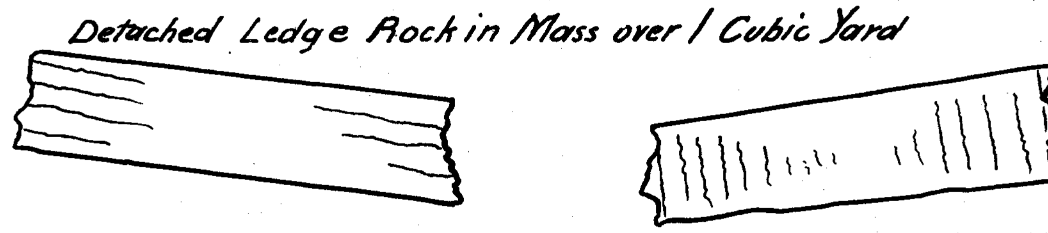
No 2

Conglomerate Rock or Plum Pudding Stone



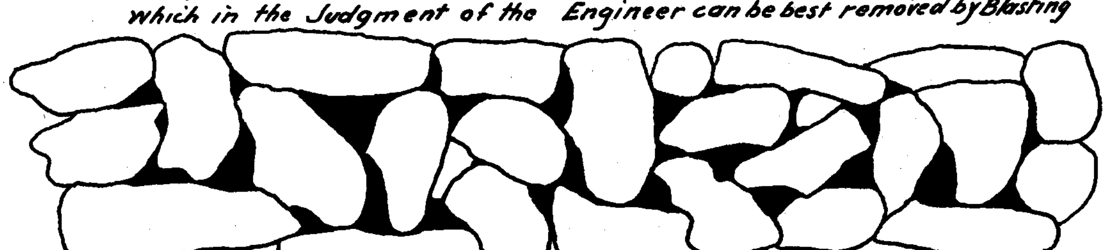
No 3

Detached Ledge Rock in Mass over 1 Cubic Yard



No 4

Rock in Masses of over 1 Cubic Yard (Assembled Rock)
which in the Judgment of the Engineer can be best removed by Blasting



No 5

Shale Rock
which in the Judgment of the Engineer can be best removed by Blasting

No 6

No 1. Is a mere matter of measurement by the Engineer
No 2. Is a mere matter of measurement by Rock Measurers
No 3. Is a mere matter of measurement by the Engineers
No 4. Is a mere matter of measurement by Rock Measurers

Nos 5 & 6 { To form a judgment as to whether or not it is best removed by Blasting, the Chief Engineer must view the work in progress or leave it to be decided by the Engineer in charge, whose duty it is to frequently visit the work during its operation and be governed thereby & act accordingly

Hugh D. Lumsden, Chief Engineer
Ottawa ~~[illegible]~~ Jan 16/08

3608 D/2

N.T.R. INVESTIGATING COMMISSION EXHIBIT No. 16

N. T. R.

INVESTIGATING COMMISSION

Exhibit 18

Statement of Overbreak.

(See Page 69 of Report)

NATIONAL TRANSCONTINENTAL RAILWAY

STATEMENT SHOWING COST OF OVERBREAK, AS ORIGINALLY RETURNED, ALL YARDAGE AT SOLID ROCK PRICES.

District	Contract No.	Cu. Yds.	Rate	Cost
"B"	7	102,462	1.45	$148,569 90
	8	71,960	1.45	104,342 00
	9	84,845	1.50	127,267 50
	10	335,690	1.50	503,535 00
	11	80,246	1.65	132,405 90
	12	162,027	1.60	259,243 20
	Total.....	.....	.....	$1,275,363 50
"F"	19	258,541	1.48	382,640 68
	20	14,622	1.45	21,201 90
	21	1,415,081	1.70	2,405,637 70
	Total.....	.....	.....	$2,809,480 28
	Grand Total	.....	.....	$4,084,843 78

NATIONAL TRANSCONTINENTAL RAILWAY INVESTIGATING COMMISSION

STATEMENT SHOWING SOLID ROCK RETURNS IN LEDGE ROCK CUTTINGS DISTRICTS B. & F. AS MODIFIED BY ARBITRATORS AND SUBSEQUENT REVISIONS.

District	Contract No.	Solid Rock inside slopes C. Yds.	Overbreak C. Yds.	Percentage of Over B.	Overbreak returned as								Total Value of Overbreak	Remarks
					Solid rock	Rate	Loose rock	Rate	Train Fill	Rate	Other Class	Rate		
B	7	341,588	102,462	30	80,303	1.45	20,453	.50			1,706	1.50	$ 129,224.85	
	8	207,909	71,960	34·6	55,920	1.45	9,508	.65	9,806	.45			91,674.72	
	9	203,296	84,845	41·7	84,015	1.50	830	.50					126,437.50	Large
	10	706,862	335,690	47·4	272,156	1.50	107,39	.50	77,506	.55	1,125	1.75	458,200.55	quantities
	11	314,485	80,246	25·5	70,308	1.65	2,658	.60	10,919	.50			123,062.50	of shale
	12	595,201	162,027	27·2	120,624	1.60	41,095	.57			308	.22	216,490.31	rock on
	Totals.....	2,369,341	837,230	35·3	683,326		85,278		98,231		3,139		$1,145,090.43	
F	19	1,015,631	258,541	25·4	256,692	1.48			4,763	.55			381,523.81	these
	20	58,805	14,622	24·4	14,622	1.45							21,201.90	Contracts.
	21	3,590,270	1,415,081	39·4	1,029,643	1.70	56,408	.60	332,720	.52	29,545	.30	1,975,715.80	
	Totals.....	4,664,706	1,688,244	36·1	1,300,957		56,408		337,483		29,545		2,378,441.51	
Grand	Totals.....	7,034,047	2,525,474	35·9	1,984,283		141,686		435·714		32,684		3,523,531.94	

NATIONAL TRANSCONTINENTAL RAILWAY.

STATEMENT SHOWING WHAT WOULD HAVE BEEN COST OF OVERBREAK IN LEDGE ROCK CUTTINGS IF RETURNED ALLOWING A QUANTITY EQUAL TO 20% OF PRISM QUANTITIES, DIVIDED INTO 70% SOLID AND 30% LOOSE ROCK. AVOIDABLE OVERBREAK RETURNED AS TRAIN FILL, ALLOWING 1½ TIMES YARDAGE OF SOLID ROCK.

District	Contract No.	Inside Slopes Cu. Yds.	Overbreak Cu. Yds.	20% Unavoidable returned as				Balance		Total Value of Overbreak	
				70% Solid Rock	@	30% Loose Rock	@	Train Fill	@		
"B"	7	341,588	102,462	47,822	$1.45	30,742	.50	51,217	.40	$ 104,999 70	
	8	207,909	71,960	29,107	1.45	18,712	.65	45,567	.45	74,873 10	
	9	203,296	84,845	28,461	1.50	18,297	.50	66,279	.55	88,293 45	
	10	706,862	335,690	98,960	1.50	63,618	.50	291,477	.55	340,561 35	
	11	314,485	80,246	44,028	1.65	28,303	.60	26,023	.50	92,639 50	
	12	595,201	162,027	83,328	1.60	53,568	.57	65,480	.40	190,050 56	
Totals.....		2,369,341	837,230	331,806		213,240		546,043		$891,417 66	
"F"	19	1,015,631	258,541	142,188	1.48	91,407	.85	83,122	.55	333,851 29	
	20	58,805	14,622	8,233	1.45	5,291	.55	4,290	.65	17,636 90	
	21	3,590,270	1,415,081	502,638	1.70	323,124	.60	1,066,540	.52	1,602,759 50	
Totals.....		4,664,706	1,688,244	653,059		419,823		1,153,952		$ 1,954,247 69	
Grand Total....		7,034,047	2,525,474	984,865		633,063		1,699,995		$ 2,845,665 35	

N. T. R.

INVESTIGATING COMMISSION

Exhibit 19

Correspondence in connection with use of Momentum Grades.

(See Page 71 of Report)

August 9th, 1905.

"H. A. WOODS, ESQ.,
"Asst. Chief Engineer,
"Grand Trunk Pacific Railway,
"Montreal, P. Q.

"Dear Sir:—

"Would you kindly send me a set of your speed and distance diagrams for "calculating momentum grades, giving details of weights of engines used.

Yours very truly,
(Signed) D. MACPHERSON.

"MONTREAL, QUE., Aug. 14th., 1905.

"MR. D. MACPHERSON,
"Assistant Chief Engineer,
"Transcontinental Railway,
"Ottawa, Ont.

"Dear Sir,—

"Replying to your letter of Aug. 9th., asking for a set of our speed and dis- "tance diagrams for calculating momentum grades. I beg to say that we have "not considered momentum grades, in any way, in our located lines, and I question "the utility of doing so on grades as low as we are using.

"For details of weight and engines used, I have to say that we propose to "use the new Government Specifications for Bridges, using the "Heavy" class "of engines. This I understand gives the weight of engine and tender 355,440.

Yours truly,
(Signed) H. A. WOODS,
Asst. Chief Engineer.

Nov., 20th, 1905.

"H. D. LUMSDEN, Esq.,
"Chief Engineer,
"Ottawa.

"Dear Sir:—

"Attached is correspondence I have had with our District Engineers and "with the Assistant Chief Engineer of the Grand Trunk Pacific Railway, on the "subject of virtual grades.

"You will see that some of our Engineers are in favor of using same in certain "places and some are not. Mr. Woods is not in favor of using them. They are, "of course, only suitable for undulating country and not for long stretches of "country on maximum grades.

"Engineering has been described as the art of making a dollar earn the most "money and a judicious use of virtual grades at points where the Locomotive "Engineer has a chance to "take a run at the grade," would undoubtedly save "money in construction and admit of the line being operated with maximum

"virtual grades of 0.4 and 0.6 though the actual grades would appear on the "profile as steeper. Of course if we have actual grades of 0.4 in locations where "the engine can get a run at them, they can be operated as virtual grades of less "slope and the haulage capacity of the engine will be greater than on a virtual "grade of 0.4. Will you kindly let me have your ruling early as to whether or "not we shall use virtual grades where possible. Please return fyle.

Yours very truly,
(Sgd.) D. MACPHERSON,
Asst. Chief Engineer.

File 3737.

"D. MACPHERSON, Esq.,
"Assistant Chief Engineer,

"Dear Sir:—

"In reply to your letter of the 20th inst. *re* actual and virtual grades. I "am certainly of the opinion that we must adhere to actual grades so far as our "construction is concerned, and all District Engineers should be so instructed. "Should any exceptional cases arise they should be submitted to this office, but "you must bear in mind they must be approved by the Grand Trunk Pacific "Railway Company before they can be adopted. I return herewith all corres-"pondence.

Yours truly,
(Sgd.) HUGH D. LUMSDEN.

"Enclos.

OTTAWA, November 22nd, 1905.

"GUY C. DUNN, Esq.,
A. E. DOUCET, Esq.,
A. N. MOLESWORTH, Esq.,
S. R. POULIN, Esq.,
C. E. PERRY, Esq.,
A. E. HODGINS, Esq.,

DISTRICT ENGINEER.

"Dear Sir:—

Re VIRTUAL GRADES.

"Referring to previous correspondence on the subject of virtual grades I "have gone into the matter with all the District Engineers, and with the Assistant "Chief Engineer of the Grand Trunk Pacific Railway, after which I submitted "the correspondence to the Chief Engineer, who has given his ruling that we "must adhere to actual grades. You will please be governed accordingly. Should "any exceptional case arise where it seems impossible to get the actual grade, "with reasonable cost, such exceptional cases will be gone into on their merits, "but, on account of the wording of the Act, it may be necessary to submit such "cases for the approval of the Grand Trunk Pacific Company.

Yours truly,
(Sgd.) D. MACPHERSON,
Asst. Chief Engineer.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 20

Correspondence in connection with Train Filling.

(See Page 75 of Report)

OTTAWA, March 8th, 1906.

To the Commissioners of the Transcontinental Railway,
Ottawa.

Sirs:—

I beg to suggest to the Commissioners that before the acceptance of any tender by them, the contractor should understand that his price for common excavation includes all train hauled material for the making up of embankments, and if the contractor finds it to his advantage to construct temporary trestles to enable him to make up such embankments by train hauled material, he may do so on obtaining the consent in writing of the engineers, but the contractor's price for common excavation must be understood to cover the cost of such temporary trestles, and the filling in of same by train hauled material, and such filling shall be completed as soon as practicable. No overhaul will be allowed for train hauled material.

The contractor must also understand that all temporary trestles erected for his own convenience in hauling by teams or dump cars (other than as stated under heading of 'Temporary Bridge or Haulway' in Clause 17 of the General Specifications) shall be erected at his own expense, and that in the schedule of prices to be paid for the various items for material and work finished or performed, the prices given by him in his tender are to be taken and considered to be the prices for such material in the finished work, except in cases of Items 10 and 21, and that the ties under 76, 77, and 78 of the said schedule are to be finished by the Commissioners and that his price for tracklaying is to cover the cost of handling and putting in all such ties.

Yours obedient servant,
(Sgd.) H. D. LUMSDEN.

(Memo on Mr. Lumsden's file in connection with letter of March 8th, 1906, to Commissioners.)

This letter is written for the information of the Commissioners and is instigated by the fact that several supposed intending tenderers have asked the question as to payment for temporary trestles and overhaul.

It is a common practice in railway construction through a rough and broken country where suitable material is scarce and costly to obtain that embankments might in the first instances be made narrow and low and afterwards filled out or made up to the full subgrade by train haul made from the best available pits, and in some cases it is preferable to put in temporary trestle rather than raise the track as the work progresses.

Contractors tendering, who had not been accustomed to such a country, may make their price with the idea that they would be paid 1c. per 100 feet, over the 500 ft. of free haul (provided for in the General Specifications, Clause 17) for all train hauled material, and also for the erection of temporary trestles. As for the latter part of the letter it is only to be certain before signing any contract that the tenderer understands that the prices given by him are for the material in the work and not for the material only.

(Sgd.) H. D. LUMSDEN,
Ottawa, March 8th, 1906.

KENORA, June 9th, 1906.

H. D. LUMSDEN, Esq.,

Dear Sir:—

Mr. McArthur has raised the question who will pay for temporary trestles if train filling is ordered in heavy fills. *He is very anxious to do some train filling west of the C. P. R. crossing in place of permanent trestles.* He has not put in a price for temporary trestles and claims that his price per cubic yard for train filling does not include anything but the loading and off loading material for banks from flat cars.

Yours truly,
(Sgd). A. E. HODGINS,
District Engineer.

———

OTTAWA, June 12th, 1906.

A. E. HODGINS, Esq.,
District Engineer,
Kenora, Ont.

Dear Sir:—

In reply to yours of the 9th instant *re* Mr. McArthur' raising the question as to who should pay for trestles where train filling was ordered in heavy filling, I may say that owing to the short time for the completion of this work, it was not the intention that the present contractors should be called upon to make up any *very heavy fills*, the material for which had to be hauled by train, but that we should put in standard trestle in such places. Of course, if the contractor prefers to make up a fill by train hauled material rather than put in our standard trestle, he can do so with your approval, but in such cases he must provide the necessary temporary trestle at his own cost (except under Clause 17, headed 'Temporary Bridge or Haulway'). We have no special price for train hauled material but only for train hauled surfacing by which is meant that where the track is laid before ballasted it may be found advisable to haul a few car loads of sand or gravel in order to save the rails from permanent injury. I may also say that it is not the intention to use rock borrow except only when an order in writing has been given from this office.

Yours truly,
(Sgd.) H. D. LUMSDEN.

November, 5th, 1906.

H. D. LUMSDEN, Esq.,
Chief Engineer,
Transcontinental Railway.

Dear Sir:—

I have received the following letter from Mr. M. P. Davis.—'Would you please instruct your engineers to give us bills of timber for temporary trestles required for fills at stations 237 to 261, 870 to 890, 1028 to 1033, 1515 to 1524, 1840 to 1865, 1935 to 1970, 2040 to 2055, 2465 to 2515. It is important that we get this information at the earliest possible date so that the material may be delivered during the winter months, and oblige,

(Sgd.) M. P. DAVIS.'

Now to supply this information opens up the question of temporary trestles, train hauled material, and you will, of course, recollect that no decision has as yet been come to with regard to this matter. As I pointed out with regard to this matter before it would have been easy to have included train hauled material in our specifications, but as matters stand now it seems to me that we are at the contractors' mercy and that we will have to make the best we can of a bad bargain. I will await your further order before supplying this information.

Yours truly.
(Sgd.) A. E. DOUCET,
District Engineer.

November 12th, 1906.

H. D. LUMSDEN, Esq.,
Chief Engineer,
Transcontinental Railway.

Dear Sir:—

I enclose herewith a letter which I have just received from Messrs. M. P. and J. T. Davis, concerning the price of train hauled material and for which you suggested that they should submit a price to the Commissioners.

Yours truly,
(Sgd.) A. E. DOUCET.

File 4134.

December 4th, 1906.

A. E. DOUCET, Esq.,
District Engineer,
Quebec, P. Q.

Dear Sir:—

In regard to Mr. Davis' letter to you, dated the 12th ulto. attached, I may say that Clause 17 of our General Specifications only refers to material under the heading of grading, which the contractor handles entirely with his own equipment, appliances and labour, prior to the Commissioner's track being laid, and should not be interpreted to cover cases where the contractor makes use of the rails, fastenings and ties furnished by the Commissioners, the latter also paying for the track laying. As to points at which suitable material for the making up of embankments is not obtainable within reasonable reach, and they are made up by train haul, it is found that where borrow pits of sand, gravel, or easily worked material are to be found, either on the line of railway or within short distances thereof, and within a few miles of the site of such embankments, that such embankments, up to say twenty-five feet in height, can be most economically constructed by, where practicable, dropping the grades at the end of the embankments and raising them by train to their full width and height, the cost of such raising of grades by train haul would be amply covered by an addition of 10c per yard to the ordinary earth work price. Where it is impracticable to do this, the additional cost per yard of material in embankments to cover the cost of the erection of temporary trestle; in embankments from ten to twenty-five feet in height an addition of 22c, and in embankments from twenty-five to forty-five feet in height an addition of 10c. per yard to the ordinary earth work price will amply cover this, and for greater heights, up to say sixty foot, 7½c. per yard added to the original earth work price. I may say that in general it is more profitable to contractors, where borrow of good sand, gravel, or easily worked material can be obtained within a few miles that can be loaded on cars by steam shovel, and unloaded by plough or unloaded, to make up fills in this way (when the track has been found for the contractor) at their original price, than to do so by men and horses where the haul exceeds the five hundred foot limit, and especially in this case where the ordinary material to be moved, by men or teams, is clay or stiff material. Mr. Davis makes an exception of material hauled from cuts, and asks 1c. per yard per 100 ft. on all such material. This should not be allowed if it is wasted and our track is used to take out such material. Mr. Davis also asks 2c. per yard per mile for haul over seven miles; this is just double what I consider it is worth. My opinion is that if the present contractors are allowed an addition to their ordinary earth work price (21c. per yard) of 15c. per yard for all train hauled material to make up embankments (other than ballast) such addition to cover all cost of lifting track, putting in temporary trestle and filling same up, to a haul of five miles, and an addition of 1c. per yard per mile for haul over five miles, such an arrangement would be a fair and equitable one as between the Commissioners and the contractors, it being understood that this extra price of 15c per yard does not apply to material wasted from cuttings or to material to make up embankments hauled by train for a less distance than 2,000 feet.

Yours truly,
(Sgd.) HUGH D. LUMSDEN.

Enclos.

January 22nd, 1907.

To the Commissioners of the Transcontinental Railway,
Ottawa.

Sirs:—

On the 14th December last at a meeting in Quebec with Messrs. Davis Bros. and Messrs. Macdonell and O'Brien, the contractors for the 150 miles from the Quebec Bridge westerly, the Chairman, Mr. Doucet and Messrs. Woods and Armstrong, the Grand Trunk Pacific Supervising Engineers being also present, the question of haul over 2,600 feet and temporary trestle was taken up, the contractors claiming 65c. per cubic yard and to cover such trestle and any length of haul over 2,600 ft. After a long discussion I eventually consented to a price of 55c. per cubic yard, which in my opinion is a very good one. I also allowed the 20c. per lineal foot for piles delivered as well as 40c. per foot for piles driven, having found in making a comparison of the tenders that had been so computed except where specially mentioned otherwise. As this arrangement may increase the cost of construction I beg to call your attention to my letter of March 8th last, and to strongly recommend that before other contracts are let the specifications may be so amended as to make a number of the clauses clear, saving future trouble and tend to the economical construction of the line.

Your obedient servant,
(Sgd.) H. D. LUMSDEN.

March 21st, 1907.

A. E. HODGINS, Esq.,
District Engineer,
Kenora, Ont.

Dear Sir:—

The many inquiries made by you for permission to use rock borrow in fills leads me to send you a copy of our revised General Specifications, approved by the Government, and on which contracts have already been awarded. You will note in this on page 41, Clause 224x, a specification for train hauled material including temporary trestle. I may say that out of nine tenders lately received for such work, the average price was 51⅔c. varying from a minimum of 45c. to a maximum of 60c.

I think it would be well for you to interview Mr. McArthur and see at what rate you could arrange with him for similar work on his contract. This would enable him to use round timber trestle or piles, in a number of places where under such present conditions standard timber trestle would be required, but of course you will have to be the judge as to where he could use such so as not to cause too great a delay in the completion of the work. I should like you to take this matter up at once and submit here for approval any offer Mr. McArthur may make as soon as possible.

(Sgd.) H. D. LUMSDEN.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 21

Correspondence in connection with the use of Wooden Trestles.

(See Page 74 of Report)

Jan. 9th, 1907.

H. A. Woods, Esq.,
Asst. Chief Engineer,
Grand Trunk Pacific Railway,
Montreal, P.Q.

Dear Sir,—

I have been endeavouring to settle the question of using standard timber trestles in a number of large fills as talked over with you, the intention being to allow these trestles to stand as long as they are safe, then to put in the permanent waterway where required and fill by train. I am told, however, that the Grand Trunk Pacific, who will then be operating the road, could charge anything they liked for such permanent waterway and filling. Though this seems to me absurd it would strengthen my position if I could have a letter from Mr. Kelliher and yourself stating that the maximum price that the G. T. P. would charge for the construction of the permanent bridge and waterway would not in any case exceed the price for similar work now, or hereafter, to be paid to the contractors on the section that such work may be situated, and the maximum price for train filling such trestles would not exceed say 25c. per cub. yard measured in borrow pits, or such other rate as you may consider fair.

Yours truly,

(Sgd.) Hugh D. Lumsden.

Montreal, Que., Jan. 11th, 1907.

Mr. Hugh D. Lumsden,
Chief Engineer, Transcontinental Ry.,
Ottawa, Ont.

Dear Sir:—

I have yours of the 9th inst., in which you state that you are endeavouring to settle the question of using standard timber trestles in a number of large fills, the intention being to allow these trestles to stand as long as they are safe and then put in permanent water-ways required and fill by train. In order to make an intelligent estimate of where this class of work would be economical and good engineering practice to substitute for steel structures and solid embankments you requested that Mr. Kelliher and myself would state a maximum price that the Grand Trunk Pacific would charge for the construction of permanent bridge and water-ways if the work was turned over by the Commission before it was completed. In reply to same I have to say that, after a conference with Vice-President Morse and Chief Engineer Kelliher, they both state that the price you mentioned, 25 cents per cubic yard, measured in borrow pits, for train hauled filling and that the price for permanent bridge and water-ways would not exceed the price for similar work now or hereafter to be paid to the contractors, was eminently fair. Vice-President Morse desired me to say that, without fixing a price upon this train hauled material, that the price would not exceed 25 cents per cubic yard. It would seem to me that the above answers your inquiry fully and I trust it may be of some service

to you in giving instructions to your staff as to where this class of work should be placed.

I may say further that the use of standard timber trestles has been allowed by the Government on the Western Division and we see no reason why we should not accept the same character of work from the Transcontinental Commission.

Yours truly,
(Sgd.) H. A. WOODS,
Assistant Chief Engineer.

File-6190 Jan. 12th, 1907.

Dear Sir,—

RE WORK COVERED BY TENDERS NOW BEING CALLED FOR.

In order to insure the economical construction of the line in your district it may be found advisable to make use of standard timber trestle in many places where suitable material is not available in the vicinity for the making up of embankments, or where it may be impracticable during construction to put in the permanent structures required. If you have not already provided for such, will you please at once furnish me with a memo. of points in your District where standard trestle may be required, giving approximate quantities in trestle and deductions to be made from common excavation covering same. Should tenderers enquire tell them that such trestles may be used.

Yours truly,
(Sgd.) HUGH D. LUMSDEN.

District Engineers: "A", "B," "C" and "D."

No. 10248. QUEBEC, 15th Jany, 1907.

HUGH D. LUMSDEN, Esq.,
Chief Engineer,
Ottawa.

Dear Sir:—

Acknowledging your circular of January 12th, file 6190. We will not need any standard timber trestles in my district, as suitable material can be found in the vicinity for the making up of embankments.

Yours very truly.
(Sgd.) A. E. DOUCET,
District Engineer.

No. 9974.

ST. JOHN, N. B., January 17th, 1907.

HUGH D. LUMSDEN, Esq.,
Chief Engineer N. T. C. Ry.,
Ottawa, Ont.

Dear Sir:—

I beg to acknowledge receipt of your letter of the 16th inst., *re* work covered by tenders now being called for. Since receiving same I have gone carefully over our profiles and do not consider it would be advisable or economical to make use of standard timber trestles on either of the contracts. On Contract No. 1 there are two or three places where it would be advisable to use timber if material was difficult to procure, but we can make the fills up from side work to a height of ten or twelve feet and I feel confident of getting enough stuff to make up the balance from the cuts at each end. On Contract No. 2 there are one or two places where it was questionable if it would not be advisable to use 60 ft. trestles from grade as per suggestion made by Mr. Uniacke, but although the material in this vicinity is rock I think we can get sufficient earth to make up these fills, and I cannot figure out that there is very much economy in putting in sixty feet of timber to save a small end abutment.

Yours truly,

(Sgd.) GUY C. DUNN,,
District Engineer

File 6190.

Jan. 19th, 1907.

GUY C. DUNN, Esq.,
District Engineer,
St. John, N. B.

Dear Sir:—

Yours of the 17th inst. *re* use of standard timber trestle received. My Object in writing you was to call your attention to the fact that there are many cases in crossings of ravines, say 35 to 70 feet in depth and several hundred feet in length, whereby putting in standard timber trestle now, and when such becomes unsafe (say in 8 or 9 years) filling it by train at a cost of say 25c. or less, per yard, is in the end more economical than putting in expensive water-way, say 20 foot arch culvert, and filling at contractors' prices now, or putting in steel viaduct on concrete foundations. It is unquestionably more expensive to build concrete structures now than when the material can be landed at the site by train, and large railway corporations with all modern appliances can do trestle filling at their convenience at a less cost than contractors. As to steel viaducts; constant renewal of deck and painting of steel makes a considerable sum when capitalized and added to the first cost, whereas an embankment and say arch or box culverts may be said to be permanent. There is also a considerable saving of interest on the difference between the cost of permanent water-way and filling now, and the substitution of trestle for say 8 or 9 years.

I want to provide in our estimates for the work about to be let the use of timber in such places should we determine to make use of it, deducting an equivalent amount of earth.

Please let me hear from you again on this subject.

Yours truly,
(Sgd.) HUGH D. LUMSDEN.

File 6190.

Jan. 19th, 1907.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs:—

As I have about completed the estimates for the several sections on which we are now asking tenders, I should like to have your instructions as to whether I am to provide for the erection of standard timber trestle, in such places as I am satisfied that the final cost of its erection now and after a lapse of eight or nine years of construction of a permanent water-way and filling such trestle by train is less than the making up of such permanent water-way and embankment now. As the question of the subsequent cost of the construction of permanent water-ways and train filling was an important one and certain to be raised I wrote to Mr. H. A. Woods, Assistant Chief Engineer of the G. T. P., and attach a copy of his reply. I am satisfied that at a number of places, especially on the more inaccessible sections, it will be found that a considerable saving can be effected, both in time and money, by the use of this mode of construction. The only objection that I can see is the possibility of some of these trestles being destroyed by fire before being filled in, but by the use of cars in the clearing and keeping cleared of the ground at the sites of such trestles, and the maintaining of barrels of water at intervals on such trestles during the summer months this danger can be minimized.

No. 9996.

ST. JOHN, N. B., January 21st, 1907.

HUGH D. LUMSDEN, Esq.,
Chief Engineer N. T. C. Ry.,
Ottawa, Ont.

Dear Sir:—

I beg to acknowledge receipt of your letter of the 19th inst., in regard to standard timber trestles for temporary purposes. I will go into this question more carefully, make some comparative estimates, and advise you in regard to same as soon as possible.

Yours truly,
(Sgd.) GUY C. DUNN,
District Engineer.

NORTH BAY, January 22nd, 1907.

MR. H. D. LUMSDEN,
Chief Engineer,
Ottawa, Ont.

Dear Sir:—

I beg to enclose a tableau giving an estimate of the cost of Permanent Structures at the different points at the Eastern Section of my district, together with the cost of embankment which would be saved by putting a wooden structure of a certain length at each of the respective places. I also give the difference in cost of Permanent Structures and Wooden Trestle which would amount to about $416,515.00. I have also a column at 4% interest on the money not expended for seven years, and the probable cost of the Permanent Structure after seven years. On the last the difference would be simply in the cost of the concrete or masonry. There is a column showing the probable total saving and also the surplus cost by using wooden structures. I would not advice the using of wooden structures at every one of the points where saving is shown, for instance at the Circle River, Low Bush River and Mistongo River, I think should have Permanent Structures at once, as the Mistongo River is a viaduct which is not taken into consideration in this matter, and probably it will depend on the character of the material at the end of the viaduct to see whether it would necessitate some 400 or 500 feet of wooden approaches. All structures which are under an embankment of less than 25 feet would cost less to have a Permanent Structure at once than to wait until the track is there.

I think that this table will put you in a position to judge very quickly of the places where we will gain by putting temporary wooden structures. I did not compound the interest on the amount saved. The compounding of which, amounting to about one-third of the interest, would be offsetted by the necessary repairs to the wooden structures during the seven years of their existence.

Yours truly,
(Sgd.) S. R. POULIN,
District Engineer, "D".

File 6190 Feb. 4th, 1907.

Dear Sir:—

Re use of Standard Timber Trestles on the Eastern Division. I received some time ago a letter from your Assistant Chief Engineer Mr. H. A. Woods, copy of which I attach, and I should like very much to have this letter confirmed by yourself and Mr. Kelliher.

Yours truly,

Enclos.

FRANK W. MORSE, ESQ.,

Vice President Grand Trunk Pacific Ry.
Montreal, P. Q.

En route Montreal to Ottawa,
February 13th. 1907.

1072
MR. HUGH D. LUMSDEN,
Chief Engineer, Trans-Con. Ry. Commission,
Ottawa, Ont.

Dear Sir:—

I have yours of the 4th. inst. subject standard timber trestles on the Eastern Division, and in reply thereto will say that I fully endorse and approve, and will be governed by Mr. Woods' letter of January 11th to you, on this subject.

Yours truly,
(*Sgd.*) FRANK W. MORSE,
Vice President & Gen. Manager.

OTTAWA, March 1st, 1907.

HON. S. N. PARENT,
Chairman.

Dear Sir,

In reply to yours of the 26th ult., accompanied with a copy from Mr. H. A. Woods, Asst. Chief Engineer of the G. T. R. wherein he states that the price for train hauled material to fill in wooden trestles by the Co., would not exceed 25 cents per cubic yard. To this you ask my opinion if Mr. Wood's letter could legally be considered binding on their part. In my opinion it would not legally bind the Company.

To make this proposition binding would require a regular agreement applying to each particular point where the work is to be done, the whole to be confirmed by a resolution of the Board of Directors.

I am, Sir,
Your obedient servant,
(*Sgd.*) H. ATKINSON,
Law Clerk.

OTTAWA, March 1st, 1907.

HUGH D. LUMSDEN, ESQ.,
Chief Engineer.

Re Filling in Timber Trestles.

Dear Sir:—

After reading the letter of the 13th ult., to you from F. W. Morse, Esq., General Manager of the G. T. P. stating that he fully endorsed and approved of Mr. H. A. Woods letter of Jan'y 11th last on the above subject. I am to say

it does not change my opinion as expressed in my letter to the Hon. Mr. Parent of this date.

I am, Sir,
Your obedient servant,
(*Sgd.*) H. ATKINSON,
Law Clerk.

H. A. /B.

File 6190.

March 1st. 1907.

H. A. WOODS, ESQ.,
Assistant Chief Engineer, G. T. R.
Montreal, P. Q.

Dear Sir,

Referring to our correspondence *re* use of Standard Timber Trestle in construction of the Eastern Division, I beg to hand you herewith copy of two letters from our Law Clerk in view of which opinions it will be incumbent on your Company to make formal application for the use of such structures in particular cases, supported by resolution by the Board of your Directors along the lines indicated in Mr. Atkinson's letters, such resolutions binding your Company to the maximum price of the subsequent filling of the structure, and for the construction of any permanent structure that may be necessitated thereby; and to replace any such structures as may be destroyed by fire after the road has been taken over by the Company; and in the event of destruction by fire of any such structures before the road has been taken over by your Company, agreeing that the cost of replacement will be included in "Cost of Construction."

Yours truly,
(*Sgd.*) HUGH D. LUMSDEN.

Enclos.

MONTREAL, QUE., March 4, 1907.

MR. HUGH D. LUMSDEN,
Chief Engineer, Nat. Transcontinental Ry.,
Ottawa, Ont.

Dear Sir:—

I beg to acknowledge the receipt of your favor of March 1st, together with copies of two letters from Mr. H. Atkinson, Law Clerk, *re* use of standard timber trestles, construction of the Eastern Division. I have forwarded same to our General Manager for his action in the matter.

I may say, however, that to me it seems singular that an agreement of this kind should have to be made in each particular case and approved by the Board of Directors of this Company.

No action of approval by our Board is necessary in regard to our own work. The class of structure and kind of work is entirely within the jurisdiction of our Chief Engineer, if approved by the General Manager.

Yours truly,

(*Sgd.*) H. A. WOODS,
Assistant Chief Engineer.

OTTAWA, April 2nd, 1907.

H. ATKINSON, ESQ.,
Law Clerk, Transcontinental Commission,
Ottawa, Ont.

Dear Sir:—

Standard Timber Trestles for Eastern Division.

Referring to this subject I have seen your several opinions relating thereto and have to say that I quite endorse the same. In accordance with the view expressed by you I have drawn a By-Law to be passed by the Directors of the Grand Trunk Pacific Railway, in pursuance of which a formal contract may be entered into along the lines suggested. Kindly say if the draft By-Law meets your approval, and I will have it passed at once, to be followed by the preparation of the necessary formal contract.

Yours truly,
D'ARCY TATE,
Asst. Solicitor.

Encl.

BY-LAW No.....

WHEREAS, it is proposed by the Commissioners of the Transcontinental Railway to erect standard timber trestles in a number of large fills, on the Eastern Division, the intention being to allow these trestles to stand as long as they are safe, and afterwards put in permanent waterways, and fill by trains.

AND WHEREAS, the Grand Trunk Pacific Railway Company are agreeable to what is proposed in this respect, and are willing to do the filling hereafter required at 25 cents per cubic yard measured in borrow pits for train hauled filling, and to construct the necessary permanent bridges and waterways at a price not exceeding the maximum price now, or hereafter paid by the Commissioners to Contractors for similar work.

Therefore, it is,

Moved by

Seconded by,

That the Vice President be, and he is hereby authorized to execute a formal contract with the Commissioners of the Transcontinental Railway in respect of the erection of standard timber trestles by the said Commissioners, wherever in the opinion of the Chief Engineer of the Transcontinental Railway Commission and the Chief Engineer of the Grand Trunk Pacific Railway Company it is consistent with economical and good engineering practice so to do, such timber trestles to be ultimately filled in by the Grand Trunk Pacific Railway Company for the Commissioners at the price of 25 cents per cubic yard measured in borrow pits for train hauled filling, and the permanent bridge and the waterways to be

constructed by the Grand Trunk Pacific Railway Company for the Commissioners at a price not exceeding the maximum price now, or hereafter paid by the Commissioners to Contractors for similar work.

OTTAWA, April 3rd, 1907.

HUGH D. LUMSDEN, Esq.,
Chief Engineer.

Dear Sir:—

STANDARD TIMBER TRESTLES FOR EASTERN DIVISION

Herewith please find copy of a letter received from D'Arcy Tate, Esq., Asst. Solicitor, G. T. P. Railway, and also a draft By-Law relative to the above subject.

Would you kindly examine the By-law, and have it submitted to the Board, and return to me and oblige.

I am, Sir,
Your obedient servant,
(Sgd.) H. ATKINSON,
Law Clerk.

H.A./B.

OTTAWA, April 5th, 1907.

HUGH D. LUMSDEN, Esq.,
Chief Engineer.

Dear Sir:—

STANDARD TIMBER TRESTLES FOR EASTERN DIVISION

Herewith I beg to hand you the proposed By-Law to be passed by the Directors of the G. T. P. concerning the above as corrected by you, and which is more in conformity with the letter from Mr. Woods to you of January 11th last, than the By-Law which was submitted by Mr. Tate to me.

I am, Sir,
Your obedient servant,
(Sgd.) H. ATKINSON,
Law Clerk.

H.A./B.

OTTAWA, May 14th, 1907.

HUGH D. LUMSDEN, Esq.,
Chief Engineer.

Dear Sir:—

I beg to hand you herewith copy of a certified copy of resolution of the Executive Committee of the Grand Trunk Pacific Railway relating to the erection of standard timber trestles on the Eastern Division; also copy of a certified copy of a resolution of said Executive Committee approving specifications for:

(1) Steel rails, marked "a"—being the specifications according to which the Dominion Iron & Steel Co., is now manufacturing rails for this Commission.

(2) Steel rails, marked "b"—being the specifications in accordance with which The Algoma Steel Company is now manufacturing rails for this Commission.
(3) Standard specifications for steel splice bars.
(4) Specifications for track bolts and nuts.
(5) Specifications for track spikes.

Yours truly,
(Sgd.) P. E. RYAN.

2 enclos.

EXTRACT from Minutes of a Meeting of the Executive Committee of the Grand Trunk Pacific Railway Company, held in the President's Room No. 301 of the General Offices, McGill Street, Montreal, Thursday, May 9th, 1907, at Eleven o'clock, A.M.

PRESENT:

CHAS. M. HAYS, Esq., Chairman.
FRANK W. MORSE, Esq.,
WM. WAINWRIGHT, Esq.

Attended by Henry Philips, Secretary.

The following resolution *re* the erection of standard timber trestles on the Eastern Division was submitted:—

WHEREAS it may be found expedient by the Commissioners of the Transcontinental Railway to erect standard timber trestles in a number of large fills, on the Eastern Division, the intention being to allow these trestles to stand as long as they are safe and afterwards put in permanent waterways, and fill by train.

AND WHEREAS the Grand Trunk Pacific Railway Company approves of the erection of such Timber Trestles, and are willing to do the filling hereafter required at a price not to exceed 25c. per cubic yard measured in borrow pits for train hauled filling, and to construct the necessary permanent bridges and waterways at a price not to exceed the price now, or hereafter paid by the Commissioners to Contractors for similar work on the Section where the work may be required.

NOW THEREFORE upon motion of Mr. Frank W. Morse, seconded by Mr. Wm. Wainwright, it was unanimously

RESOLVED that the Vice-President be and he is hereby authorized to execute a formal contract with the Commissioners of the Transcontinental Railway in respect of the erection of standard timber trestles by the said Commissioners, wherever in the opinion of the Chief Engineer of the Transcontinental Railway Commission and the Chief Engineer of the Grand Trunk Pacific Railway Company, it is consistent with economical and good engineering practice so to do, such timber trestles to be ultimately filled in by the Grand Trunk Pacific Railway Company for the Commissioners at a price not to exceed 25c. per cubic yard measured in borrow pits for train hauled filling and the permanent bridge and the waterways to be constructed by the Grand Trunk Pacific Railway Company for the Commissioners at a price not exceeding the price now, or hereafter paid by the Commissioners to Contractors for similar work on the section where such work may be required.

Carried.

Certified a true copy,
(Sgd.) HENRY PHILLIPS,
Secretary.

(SEAL)

N. T. R.

INVESTIGATING COMMISSION

Exhibit 22

Statement showing Saving which might have been made by use of Wooden Trestles.

(See Page 78 of Report)

NATIONAL TRANSCONTINENTAL RAILWAY.

STATEMENT SHOWING SAVING WHICH MIGHT HAVE BEEN EFFECTED BY THE CONSTRUCTION OF WOODEN TRESTLES AT 150 LOCATIONS BETWEEN MONCTON AND WINNIPEG

SUMMARY.

District	Number of Locations	Present Fill and Structure				Timber Trestles				Saving at end of Seven Years	To make permanent in 7 Years			Ultimate Saving
		Cost of Fill	Cost of Structure	Total Cost	Total Cost & Int. at 4% for 7 Years	Length	Height	First Cost	Cost & Int. at 4% for 7 Years		Fill at 25 cts.	Structure	Total	
A	26	.....	.....	$1,840,865	$2,420,733	.....	.....	533,967	702,160	1,718,573	.....	.....	789,287	929,286
B	17	.....	.....	1,231,944	1,751,503	.....	.....	309,297	538,222	1,213,281	.....	.....	896,684	316,597
C & D	14	.....	.....	501,441	659,394	.....	.....	111,332	146,401	512,993	.....	.....	323,020	189,973
E	11	.....	.....	604,678	795,147	.....	.....	171,200	225,121	570,026	.....	.....	354,546	215,480
F	62	.....	.....	2,253,885	2,963,810			781,134	1,023.285	1,940,525	.....	.....	996,843	943,682
Totals...	150	.....	.....	$7,554,758	$10,065,944	.....	.....	$2,259,372	$3,098,660	$6,967,284	.....	.....	$4,020,057	$2,947,227

N. T. R.

INVESTIGATING COMMISSION

Exhibit 23

Statement of Rock Borrow.

(See Page 79 of Report)

Rock Borrow

The following figures show the cubic yards of solid rock excavated from solid rock, borrow pits or from the sides of cuttings which was used to construct embankments for which cheaper material was not available, but which need not have been used had wooden trestles been installed.

District.	*Cubic Yards of Solid Rock.*	*Cost.*
A.	743,976	$ 835,077.00
B.	256,947	410,867,25
F.	852,881	1,397,368.25
Total	$1,853.804	$2,643,312.50

704,654 cubic yards of the solid rock borrow used on District "A" was paid for at a special price of $1.10¼ per cubic yard under an arrangement with the contractors and by approval of an Order in Council.

The balance of the yardage on all three districts was paid for at the regular contract price for solid rock, varying from $1.45 to $1.70 per cubic yard.

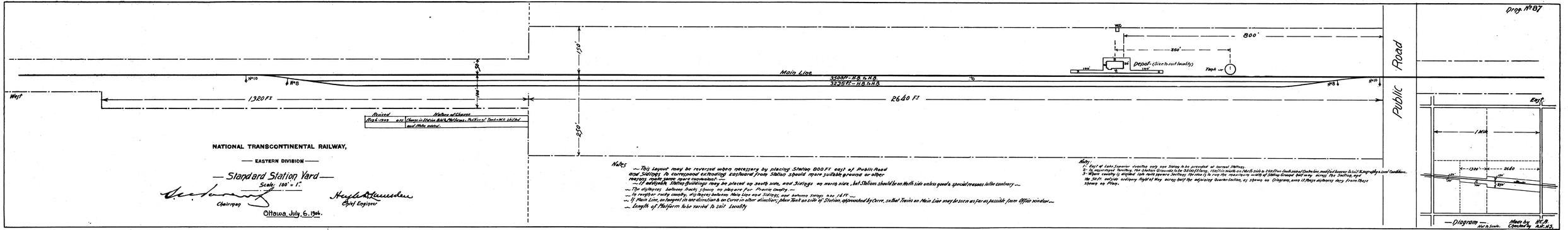
N. T. R.

INVESTIGATING COMMISSION

Exhibit 24

Standard Siding Plan.

(See Page 102 of Report)



NATIONAL TRANSCONTINENTAL RAILWAY,

— EASTERN DIVISION —

— Standard Station Yard —

Scale: 100' = 1"

Chairman

Chief Engineer

Ottawa July 6. 1906.

Notes

— This Layout may be reversed when necessary by placing Station 800 Ft east of Public Road and Stations to correspond extending Eastbound from Station should more suitable ground or other reasons make same more convenient. —

— If advisable Station Buildings may be placed on south side, and Sidings on north side. but Stations should be on North side unless good & special reasons to the contrary —

— The distances between Posts Spacing on map are for Prairie Country —

— In rougher rocky country, distances between Main Line and Sidings, and between Sidings, is to 14 Ft —

— If Main Line, on tangent in one direction & on Curve in other direction; place Post on side of Station, approached by Curve, so that Trains on Main Line may be seen as far as possible from Office window —

— Length of Platform to be varied to suit Locality

Note

1st. East of Lake Superior direction may also Sidings to be provided at several Stations.

2nd. In unsurveyed Territory, the Station Grounds to be 5280 Ft long, 1760 Ft width, to the North side of the 2640 Foot Southern end of Station line, modified however to suit Topographical and Local Conditions.

3rd. Where country is wooded, 10 chains square Section Posts are to be placed at the intersection points of Station Ground Base Lines, namely, the 2640 Ft Station, and the 50 Ft. outside ordinary Right of Way survey limit for adjoining Quarter-Sections, as shown on Diagram, over 10 Miles distance may from these shown on Plans.

N .T. R.

INVESTIGATING COMMISSION

Exhibit 25

Correspondence in connection with use of Light Rails in Sidings.

(See Page 104 of Report)

GRAND TRUNK PACIFIC RAILWAY,

MONTREAL, QUE., March 5th, 1906.

MR. D. MACPHERSON,
Ass't Chief Engineer, Transcontinental Ry.,
Ottawa, Ont.

Dear Sir:—

Replying to your letter of March 2nd, subject use of 80 lb. rails on main line and sidings. I have to say that we do not expect to use the 80 lb. rail on either passing tracks or terminal yards. We shall probably draw largely from the Grand Trunk Railway for these purposes, using either a re-rolled rail of about 70lb. per yard, or a 67 lb. rail. As the Transcontinental Commission will have no such opportunity to secure lighter rails, it may be well to use the 80 lb. rail entirely. This will be a matter for the Commissioners to decide upon. I may say, however, that it will be satisfactory to our Manager if they decide to use the 80 lb. rail throughout.

Yours truly,

(*Sgd.*) H. A. WOODS,
Ass't Chief Engineer.

AT WINNIPEG, March 20th, 1908.

Dear Mr. Parent:—

We are in our side tracks west, outside the lead rails to a point beyond the frog, using 65 to 70 lb. rail. We are doing this for the purpose of reducing cost. As I have always told you and your colleagues, we would be willing for you to adopt any practice which we had inaugurated.

I write you to suggest that it would be well to order a lighter rail for side tracks, as it would lessen our capital expenditure.

Yours truly,

(*Sgd.*) FRANK W. MORSE.

Hon. S. N. PARENT,
Chairman, Transcontinental Ry. Com.,
Ottawa, Ont.

April 8th, 1910.

B. B. KELLIHER, ESQ.
Chief Engineer, G. T. P. Ry.,
Winnipeg, Man.

Dear Sir:—

The other day in conversation with your Vice-President and General Manager, he suggested that we should use 60 lbs. rails in yards and sidings, instead of 80 lbs. as that was the practice west of Winnipeg. Since then I have had an estimate prepared which shows that about $142,000.00 can be saved by substituting 60 lbs. rails for 80 lbs. in all yards and sidings for which rails have not been ordered

or laid. I would be glad to have a letter from you stating that, in your opinion, it would be advisable to use 60 lbs. rails in yards and sidings in future instead of 80 lbs. rails. On receipt of your letter I will recommend to the Commission that this plan be adopted and the above saving effected thereby.

Yours truly,
(*Sgd.*) GORDON GRANT,
Chief Engineer.

OTTAWA, April 15th, 1908.

FRANK W. MORSE, ESQ.,
Vice President and General Manager,
Grand Trunk Pacific Railway,
Montreal, P. Q.

Dear Sir:—

Your letter of the 20th March ultimo to the Chairman suggesting that a lighter rail than an 80 lb. rail be used in sidings on the Eastern Division was duly received and submitted to the Board.

In reply, I am directed to say that our Chief Engineer reports that the question of using a lighter rail in the sidings than in the main line was taken up in March 1906 with the Assistant Chief Engineer of your Company, who replied under date of March 5th 1906 that either a re-rolled rail of about 70 lbs. per yard or a 67 lb. rail would probably be used in sidings on the Western Division, as you would be in a position to draw largely from the Grand Trunk Railway for this purpose; but that as the Transcontinental Commission would have no such opportunity to secure lighter rails, it might be well to use the 80 lb. rail entirely. It would be satisfactory to you, be stated, if the Commissioners decided to use the 80 lb. rail throughout. In consequence of this, contracts were awarded for 80 lb. rails for the main line, sidings and yards of the sections of the Eastern Division under contract previously to March last.

If it be now desired that a change be made, the Commissioners think that such should be requested by a resolution of your Board.

Our Chief Engineer thinks it an advantage to have a uniform rail throughout, and states that the substitution of a 70 lb. for an 80 lb. rail in the sidings would effect a saving for the whole Eastern Division of only about $120,000.

Yours very truly,
(*Sgd.*) P. E. RYAN.

April 19th, 1910.

MR. GORDON GRANT,
Chief Engineer, N. T. Rly.,
Ottawa, Ont.

Dear Sir:—

Referring to your letter of the 8th inst., File 10,601, relative to use of 60 lb. rails in yards and sidings instead of 80 lb.

Your suggestion to substitute 60 lb. rails for 80 lb. in all yards and sidings

for which rails have not been ordered or laid is fully approved by our Vice-President and General Manager and myself, and I would be glad if you will recommend the adoption of same to the Commission.

Yours truly,

(*Sgd.*) B. B. KELLIHER,
Chief Engineer.
B.

OTTAWA, April 25th, 1910.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs,—

Re use of 60 ***lb.*** *rails instead of* 80 ***lb.*** *rails in sidings and yards.*

I attach herewith a copy of a letter dated the 8th of April which I wrote to Chief Engineer Kelliher of the Grand Trunk Pacific Railway, stating that, in conversation the other day with their General Manager Mr. Chamberlain, he suggested that 60 lb. rails should be used in both yards and sidings.

I may say in regard to this that I have always been of that opinion and discussed the matter several times with both the ex-Chief Engineer and the Assistant Chief Engineer, both of whom were opposed to the use of 60 lb. rails in yards and sidings. Why 80 lb. rails were used in yards and sidings I cannot say, as it is not the practice on other roads to use the same weight of rails in sidings as they do in the main line. Therefore, if we can effect a saving of about $150,000.00 by substituting 60 lb. rails in yards and sidings, I recommend that this be done.

I attach copy of a letter I have received from Mr. Kelliher in answer to mine of the 8th instant, in which he states that the Vice-President and General Manager as well as himself would be glad if I would recommend the adoption of the 60 lb. rails to the Commission. I would be glad to have your instructions in the matter.

Your obedient servant,
(Sgd.) GORDON GRANT,
Chief Engineer.

Enc.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 27

Engineer's Estimate prepared in connection with Contract No. 8.
(See Page 34 of Report)

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY.

DISTRICT "B" – Section 3 –

APPROXIMATE ESTIMATE OF COST OF CONSTRUCTION

– Engineer's Estimate –

FROM 0 MILE TO 150 MILE [redacted]) East of Quebec Bridge

Item No.	DESCRIPTION OF WORK	Measure	Total Measure	Rate	Amount	Total Amount	REMARKS
0	Right of way	acre.					
1	Clearing, including close cutting	acre.	1262	40.	50480		
2	Trees cut dow outside right-of-way	each.		1.			
3	Grubbing	acre.	121	150.	18150		
4	Solid Rock	c. y.	918381	1.75	1607167		
5	Loose rock & other materials (section 35 Spec.)	c. y.	395645	.70	276952		
6	Common excavation	c. y.	3091210	.28	865539		
7	Excavations in foundations, no coffer dams	c. y.	14268	.70	9988		
8	Excavation of foundations, within coffer dams	c. y.		2.50			
9	Overhaul, all materials per cub. yd. per 100 ft. over 500 ft. haul	c. y.	22845600	.01	228456		
10	Piles delivered as per Engineer's bill	lin. ft.	35360	.15	5304		
11	File driving	lin. ft.	35360	.25	8840		
12	Sheet piling, per M. ft. B. M.		150000	60.	9000		
13	Wakefield type, per M. ft. B.M.			75.			
14	Cross-logging 1 ft. deep, with 18 in's brushwork	acre.		900.			
15	Pole drains	lin. ft.		.50			
16	French stone drains	lin. ft.		1.50			
17	Paving in culverts (not laid in cement)	c. y.		6.			
18	Crib filling with stone	c. y.	7500	1.50	11250		
19	Hand laid rip-rap	c. y.	1724	3.	5172		
20	Pierre Perdu random rip-rap	c. y.	7500	2.	15000		
21	Piling out reserved stone from rock cuttings	c. y.	15000	1.	15000		
22	Round logs in cribs	lin. ft.	15000	.25	3750		
23	Cedar mud sills, per M. ft. B. M			40.			
24	Framed trestles, per M. ft. B.M. ex'pt stringers			45.			
25	Caps, Walings, and Braces for pile trestles, per M. ft. B. M.			45.			
26	Sawn ties & guard rails for bridges per M.ft.B.M.			45.			
27	Stringers, per M. ft. B.M.			60.			
28	Cedar timber in culverts, 8 ins. x 12 ins., 10 ins. x 12 ins. and 12 ins. x 12 ins. per M. ft. B.M.		355000	45.	15975		
29	Plank in highway and private road crossings per M. ft. B.M.		843000	40.	33720		
30	Timber, best quality, for culverts, per M.ft. B.M.			40.			
	(a) Timber in coffer dams or ordinary foundations, M. ft. B.M.			45.			
	(b) Timber in caissons, M. ft. B. M.			45.			
33	Vitrified pipe culverts, 15 inches diam.	lin. ft.		1.30			
34	do. 18 inches diam	lin. ft.		1.40			
36	Reinforced concrete pipe, 14 inches diam.	lin. ft.		1.35			
38	do. 18 inches diam	lin. ft.	1275	1.70	2167		
40	do. 24 inches diam	lin. ft.	1826	2.50	4565		
41	do. 30 inches diam	lin. ft.	32	3.75	120		
42	do. 36 inches diam	lin. ft.	3025	5.50	16637		
44	do. 48 inches diam	lin. ft.		11.			
46	do. 60 inches diam	lin. ft.		16.			
47	4 inches Agricultural under tile drains	lin. ft.		.10			
49	Cast iron pipe culverts, 18 inches diam	lin. ft.		3.75			
51	do. 24 inches diam	lin. ft.	1500	5.	7500		
52	do. 30 inches diam	lin. ft.		6.			
53	do. 36 inches diam	lin. ft.		8.			
55	do. 48 inches diam	lin. ft.		12.			
57	do. 60 inches diam	lin. ft.		20.			
58	Concrete facing mixture (1-2) 2½ in. thick including forms	c. y.	1091	18.	19638		
59	Concrete 1 2-4 coping, course 6 in. thick, including forms	c. y.	968	15.	14520		
60	Concrete 1-3-5, including forms	c y.		12.			
61	Concrete 1-3-6, including forms	c. y.	38769	10.	387690		
62	Concrete 1-3-5 in arch culverts, incl'd'g forms and centres	c. y.	27203	13.	353639		
63	Concrete 1-3-6 in arch culverts, incl'd'g forms and centres	c. y.	1420	11.	15620		
64	Concrete 1-3-6 in box culverts, incl'd'g forms	c. y.		11.			
65	Concrete 1-4-8 ordinary foundations, incl'd'g forms	c. y.	1500	9.	13500		
66	Concrete 1-4-8 walls of building, incl'd'g forms	c. y.	750	10.	7500		
67	First-class masonry	c. y.		15.			
68	Second-class masonry	c y.		11.			
	TOTALS CARRIED FORWARD				4022839		

Form 89A, 500 revised, 15-1-07.

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY.

DISTRICT "B" — Section 3 —

APPROXIMATE ESTIMATE OF COST OF CONSTRUCTION

FROM 0 MILE TO 150 MILE (Continued) East of Quebec Bridge

Item No.	DESCRIPTION OF WORK	Measure	Total Measure	Rate	Amount	Total Amount	REMARKS
	TOTALS BROUGHT FORWARD					4022839	
69	Third-class masonry	c. y.	2615	9.	23535		
70	Dry masonry	c. y.		6.			
71	Masonry in archring, including centreing	c. y.		20.			
72	Track-laying in main line, with ordinary frogs, switches and sidings, including light surfacing A	mile	150	400.	60000		
73	Track-laying in yards at terminals	mile	16	400.	6400		
74	Train hauled surfacing (B) no overhaul allowed	c. y.	15000	.40	6000		
	(c) Train hauled filling including temporary trestle	c. y.	1415000	.45	636750		
	(d) Overhaul on train hauled filling per cu. yd. per mile over five (5) miles	0.01		.01			
	(e) Removal of moss per cu. yd., no overhaul allowed			.20			
75	Ballasting, no overhaul allowed	c. y.	498000	.50	249000		
76	Ties, first-class	each	398400	.50	199200		
77	Ties, second-class	each	99600	.45	44820		
78	Ties for switches, sawn to dimen's per M. ft. B.M.		198000	40.	7920		
79	Public Road Signs	each	58	10.	580		
80	Mile posts, whistle posts, and road signs	each	266	3.	798		
81	Semaphores at stations, complete	each	42	400.	16800		
82	Interlocking appliances, complete, eight levers including all connections, signals, etc	each	2	6500.	13000		
83	Each additional lever	each		200.			
84	Fencing	rod	96000	1.20	115200		
85	Gates	each	2072	7.	14504		
86	Tunnels, rock section, (unlined)	lin. ft.		75.			
87	Tunnels, lined	lin. ft.		85.			
88	Tunnels, concrete lining	c. y.		13.			
89	Tunnels, masonry lining	c. y.		15.			
90	Drainage tunnels, 4c. yds. per foot	lin. ft.		25.			
91	Telegraph line	mile	150	225.	33750		
92	Water tanks, 50,000 gals., complete including foundations	each	7	3500.	24500		
93	Turntables, including everything except foundations	each	1	5000.	5000		
94	Track scales do do	each	1	2000.	2000		
95	Tunnel shafts	c.ys.		5.			
96	Iron in drift bolts	lbs.	32500	.05	2030		
97	Iron in screw bolts	lbs.	5500	.07	3107		
98	Forged or cut spikes	lbs.	1680	.06	101		
99	Cast iron washers and separators	lbs.		.04½	1240		
100	Cattle guards (3 sections)	3 sections	116	25.	2900		
101	Cast iron pile shoes	each		1.50			
102	Cast iron water pipes of any dia. from 4" to 10" per ton of 2,000 lbs.	ton 2,000 lbs.		50.			
103	Steel imbedded in concrete	lbs.		.05			
	TOTALS					5491974	

O.K. A.M.L.

Hugh L. Lumsden
Chf. Engr

8th Feb. 07

J. MacPherson
Asst. Chief Engr.

226

N. T. R.

INVESTIGATING COMMISSION

Exhibit 28

Letter from Mr. D. MacPherson in connection with Contract No. 8.

(See Page 35 of Report)

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY

D. MACPHERSON,
Assistant to the Chairman.

OTTAWA, December 26th, 1912.

GEO. LYNCH STAUNTON, ESQ.,
Chairman, Investigating Commission Transcontinental, Railway,
Ottawa.

Dear Sir:—

Replying to questions in yours of 20th inst:—

1. What date was the first engineer's estimate of the various quantities of work and material, necessary for the completion of this contract, drawn up?

Ans. The first engineer's estimate was made up about January 18th, 1907.

2. How many copies of this estimate were made?

Ans. Am unable to say; but it was made out on schedule Form 89, from which blue print copies could be made.

3. Did any member or officer of the Commission request to be supplied with a copy of this estimate?

Ans. The Chairman, on 21st January, asked for a statement of the engineers' estimated quantities for each item on the schedule Form 89, covering the five sections for which tenders closed on February 14th.

4. If such a request was made, was it complied with, and, if so, to whom and upon what date were copies of this estimate handed?

Ans. Yes; Chairman was, on 23rd January, handed a copy of above mentioned schedules, printed and bound in the general specifications and form of tender, on which the engineers' estimated quantities were filled in.

5. Upon what date was the second engineer's estimate made of the amount of work involved on the mileage covered by contract No. 8?

Ans. A second estimate was made only in so far as to add some estimated quantities of trestle timber which had been inadvertently omitted. I have no record of the exact date this was done, but am absolutely positive it was done before tenders closed on 14th February.

6. Upon what date were you handed the lists of prices contained in the various tenders for this work so that they might be monied out in accordance with the quantities contained in the engineers' estimates?

Ans. On the afternoon of 15th February.

7. In what items did the second engineer's estimate differ from the first engineer's estimate?

Ans. Items 24, 26 and 27 of general contract schedule, Form 89, had zero quantities in first estimate, and in the revised form the following estimated quantities of timber, in board measure, were inserted:

ITEM 42	ITEM 26	ITEM 27
732 190	166 600	192 780

8. Did you then, having received copies of the various tenders, proceed to money out these tenders according to the second engineer's estimate, and, if not, why?

Ans. Yes; but before the results were formally submitted to the Board by the Chief Engineer, the Chairman when he discovered the timber items, 24, 26 and 27, he ordered the quantities changed back to zero; which was done.

9. Was there a new engineer's estimate compiled in your office after you had received copies of the various tenders, and, if so, under whose instructions was this done?

Ans. No new estimates made, except to strike out timber quantities, as explained in answer to question 8.

10. Upon what date was this estimate signed, and upon what dates do your records show that Mr. Lumsden was absent in Winnipeg?

Ans. Estimate signed by Mr. Lumsden and myself, February 18th. The former left for Winnipeg on the 5th of February and returned February 13th.

You will find from the official Minute Book, that neither Mr. Lumsden nor I were present at the Board Meetings on February 14th and 15th when these tenders were being opened and dealt with, though we were both in the office, and one or the other was supposed to attend all Board Meetings. It was officially intimated to the Chief that he was not to attend the Board Meetings on the aforesaid dates. At the opening of such important tenders it would appear that the Chief Engineer should have been present.

The corrections made in estimated quantities by the Engineering Department before opening of tenders, was merely routine duty, and needs no defence.

The deliberate order to change estimated quantities after tenders were opened and moneyed out, and it was evident that such change would eliminate the legitimately lowest tender, seems to call for considerable defence.

Yours truly,

D. MACPHERSON,
Ass't to the Chairman.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 29

Original Sheets in moneying out T. D. MacArthur's Contract.

(See Page 57 of Report)

No 1 McArthur Construction Co Ltd of Canada.
No 2 The Pacific Construction Co
No 3 The Grand Trunk Pacific Railway Co
No 4. J.W. McArthur

THE NATIONAL TRANSCONTINENTAL RAILWAY.

DISTRICT "F"

6000000
300,000,00

Comparative Estimate showing cost of 244 Miles of the T.C.RY. From Penninsula Crossing to near Winnipeg based upon First Location Quantities and revised prices for certain miner items after consultation with the District Engineers and cost of same work calculated or prices submitted in Tenders 1. 2. 3 & 4.

Note:– Our prices for Turntables & Track Scales include Superstructures only erected

Item No	Description of Work	Unit	Quantity	Engineer's Estimate Rate	Engineer's Estimate Amount	Tender No 1. Rate	Tender No 1. Amount	Tender No 2 Rate	Tender No 2 Amount	Tender No 3 Rate	Tender No 3 Amount	Tender No 4 Rate	Tender No 4 Amount	Remarks.
1	Clearing	Acre	3013	30 00	90390 00	60 00	180,780 00	45 00	135,585 00	60 00	180,780 00	40 00	120,520 00	
2	Trees cut down outside right of way	each	2200	50	1100 00	1 00	2,200 00	1 00	2,200 00	1 00	2,200 00	50	1,100 00	
3	Grubbing	acre	236	120 00	28320 00	250 00	59,000 00	100 00	23,600 00	100 00	23,600 00	75 00	17,700 00	
4	Solid Rock	c.y.	3696,336	1 80	6,653404 80	1 88	6,949,111 68	1 65	6,098954 40	1 78	6579478 08	1 70	6,283,771 20	
5	Loose Rock & other materials (See 35 Spec)	c.y.	733 454	70	513,417 80	68	498 748 72	55	403,399 70	50	366,727 00	60	440072 40	
6	Common Excavation	c.y.	11,233,247	30	3,369,974 10	35	3,931,636 45	29	3,257,641 63	32	3,594,639 00	30	3369474 10	
7	Excavation in Foundations no coffer dams	c.y.	550	70	385 00	2 50	1,375 00	75	412 50	1 00	550 00	55	302 50	
8	Excavation of Foundations within coffer dams	c.y.	750	1 60	1200 00	5 00	3,750 00	1 50	1,125 00	10 00	7,500 00	3 00	2,250 00	
9	Overhaul	c.y.	22,697,260	01	226972 60	01	226972 60	01	226,972 60	01	226,972 60	01	226,972 60	
10	Piling delivered as per Engineers Bill	Lin Ft.	x 282,555	15	42,383 25	35	98,894 25	20	(?) 56,511 00	22	62,162 10	25	70,638 75	
11	Piling driven	Lin Ft	+ 258,860	25	64,715 00	65	168,259 00	35	90,601 00	24	62,126 40	Driving only 15	38,859 00	
12	Sheet piling	per M.Ft.B.M	129 74,000	40 00	3960 00	65 00	4810 00	40 00	2960 00	50 00	3,700 00	75 00	5,550 00	
14	Cross Logging 1 ft deep	acre	67.8	1500 00	101 700 00	5000 00	334,000 00	1000 00	67,800 00	2500 00	169,500 00	500 00	339,00 00	
15	Pole drains	Lin Ft	49 00	25	1225 00	50	2450 00	1 00	4,900 00	20	980 00	25	1225 00	x
16	French Stone drains	Lin Ft	2835	50	1417 50	1 00	2,835 00	1 00	2,835 00	35	992 25	1 25	3543 75	
17	Paving in Culverts	c.y.	1064	6 00	6,384 00	7 00	7,448 00	8 00	8,512 00	8 00	8,512 00	2 75	2926 00	
18	Crib Filling with stone	c.y.	950	1 50	1,425 00	2 50	2,375 00	2 50	2,375 00	1 25	1,187 50	2 75	2612 50	
19	Hand laid rip-rap	c.y.	12,226	3 00	36,678 00	5 00	61,130 00	3 50	42,791 00	2 50	30,565 00	2 75	33,621 50	
20	Pierre Perdu rip-rap	c.y.	3850	1 50	5,775 00	3 50	13,475 00	2 50	9,625 00	1 25	4812 50	1 75	6,737 50	
21	Piling out reserved stone	c.y.	850	1 00	850 00	1 00	850 00	1 00	850 00	55	467 50	1 00	850 00	x
22	Round logs in cribs	Lin Ft	10,500	25	2625 00	35	3,675 00	30	3,150 00	20	2100 00	20	2100 00	
24	Framed Trestles except stringers	per M.Ft B.M	9635,793	45 00	433610 68	60 00	578,147 58	38 00	366,160 13	45 00	433,610 69	35 00	337,252 75	No 4 in Structures
25	Caps, walings & Braces for Pile Trestles	per M Ft. B.M	225,500	45 00	10,147 50	60 00	13,530 00	38 00	8,569 00	45 00	10,147 50	32 00	7,216 00	No 4 " "
27	Stringers	per M.Ft. B.M	3302,968	60 00	198,178 08	60 00	198,178 08	38 00	125,512 78	45 00	148,632 56	42 00	138,724 66	No 4 " " B.C. Fir
29	Plank in Highway Private Road Crossings	per M.Ft. B.M	56,250	30 00	1,687 50	40 00	2,250 00	25 00	1,406 25	35 00	1968 75	30 00	1,687 50	
30	Timber, best quality, for culverts	per M Ft B.M	50,000	40 00	2,000 00	40 00	200 00	30 00	1,500 00	40 00	2,000 00	30 00	1,500 00	
34	Vitrified pipe culverts 18" dia.	Lin ft	2,242	1 70	3,811 40	2 25	5,044 50	2 25	5,044 50	1 60	3587 20	1 45	3,250 90	
38	Reinforced Concrete Pipe 18" dia.	Lin Ft	872	1 50	1,308 00	2 25	1,962 00	2 15	1,874 80	1 50 } cost+10%	1308 00	1 50	1,308 00	x
40	" " " 24" dia.	Lin ft	396	1 70	673 20	3 00	1,188 00	2 45	970 20	1 70 }	673 20	1 70	673 20	x
58	Concrete facing mixture 2½" thick	c.y.	1410	18 00	25,380 00	25 00	35,250 00	20 00	28,200 00	20 00	28,200 00	15 00	21,150 00	
59	Concrete coping course 6" thick	c.y.	470	14 00	6580 00	18 00	8,460 00	12 00	5,640 00	15 00	7,050 00	15 00	7,050 00	
60	Concrete 1.3.5	c.y.	1000	12 00	12000 00	14 00	14,000 00	12 00	12,000 00	11 00	11,000 00	12 00	12,000 00	x
61	" 1.3.6	c.y.	264	✓ 10 00	2640 00	13 50	3,564 00	12 00	3168 00	11 00	2,904 00	15 00	3,960 00	
62	" in arch Culverts 1-3-5.	c.y.	2651	13 00	34463 00	16 00	42,416 00	12 00	31,812 00	13 00	34,463 00	13 00	34,463 00	x
63	" " " " 1-3-6	c.y.	7049	✓ 11 00	77,539 00	16 00	112,784 00	12 00	84,588 00	12 00	84,588 00	15 00	105,735 00	
64	" " Box " 1-3-6	c.y	212	11 00	2332 00	14 50	3,074 00	12 00	2544 00	12 00	2544 00	11 00	2332 00	x
65	" " ordinary foundations 1-4-8	c.y.	2700	9 00	24300 00	10 00	27 000 00	11 00	29 700 00	10 00	27,000 00	13 00	35,100 00	
66	" " walls of Building 1-4-8	c.y.	2000	10 00	20,000 00	12 50	25 000 00	11 00	22,000 00	12 00	24,000 00	10 00	20,000 00	x
67	First-class masonry	c.y.	16,260	✓ 17 00	276,420 00	24 00	390,240 00	18 00	292,680 00	18 00	292,680 00	18 00	292,680 00	
68	Second-class masonry	c.y.	35773	✓ 14 00	500,822 00	20 00	715,460 00	15 00	536,595 00	15 00	536,595 00	13 00	465,049 00	
70	Dry masonry	c.y.	1600	7 00	11,200 00	7 00	11,200 00	7 00	11,200 00	5 00	8,000 00	6 00	9,600 00	
71	Masonry in Arch ring	c.y	500	20 00	10,000 00	40 00	20,000 00	20 00	10,000 00	30 00	15,000 00	18 00	9000 00	
72	Track laying in Main Lines	Mile	280	500 00	140,000 00	1200 00	336,000 00	500 00	140,000 00	300 00	84,000 00	500 00	140,000 00	
73	" " " Yards at Terminals	Mile	20	500 00	10,000 00	1500 00	30,000 00	500 00	10,000 00	300 00	6,000 00	500 00	10,000 00	
74	Train hauled surfacing	c.y.	214,600	40	85,840 00	80	171,680 00	50	107,300 00	50	107,300 00	30	64,380 00	
75	Ballasting	c.y.	900,000	50	450,000 00	1 50	1,350,000 00	50	450,000 00	55	495,000 00	40	360,000 00	
79	Public Road Signs	each	440	10 00	4400 00	12 00	5,280 00	6 00	2,640 00	7 50	3,300 00	2 30	1,012 00	
80	Mile posts, whistle posts & road signs	each	1124	3 00	3372 00	5 00	5620 00	3 00	3372 00	3 50	3,934 00	65	730 60	
81	Semaphores at Stations	each	34	550 00	18,700 00	200 00	6800 00	400 00	13,600 00	550 00 } cost+10%	18,700 00	550 00	18,700 00	x
82	Interlocking appliances 8 levers	each	1	6000 00	6,000 00	4500 00	4500 00	4,500 00	4,500 00	6000 00 }	6,000 00	6000 00	6,000 00	x
83	Each additional lever	each	5	200 00	1,000 00	500 00	2,500 00	500 00	2,500 00	200 00 }	1,000 00	200 00	1,000 00	x
84	Fencing	rod	50,720	1 00	50720 00	1 50	76,080 00	1 15	58,328 00	1 60	81,152 00	1 05	53,256 00	
85	Gates	each	320	6 00	1920 00	6 00	1,920 00	5 00	1,600 00	7 00	2240 00	8 00	2560 00	
90	Drainage Tunnels 4 cy. per ft.	Lin ft	250	25 00	6,250 00	40 00	10,000 00	25 00	6250 00	30 00	7500 00	25 00	6250 00	x
91	Telegraph Line	Mile	244	200 00	48,800 00	500 00	22,000 00	200 00	48,800 00	250 00	61,000 00	225 00	54,900 00	
92	Water Tanks 50,000 gals	each	13	4000 00	52000 00	4500 00	58,500 00	5000 00	65 000 00	2500 00	32,500 00	2200 00	28,600 00	
93	Turntables	each	3	3000 00	9000 00	4500 00	13,500 00	5000 00	15,000 00	3250 00	9750 00	3000 00	9,000 00	x
94	Track Scales	each	2	1000 00	2,000 00	2500 00	5,000 00	4,500 00	9,000 00	2500 00	5000 00	1000 00	2,000 00	x
96	Iron in Drift bolts	lb	89078	06	5344 68	06	5344 68	06	5,344 68	05	4453 90	06½	5,790 07	
97	" " Screw bolts	lb	476,800	06	28,608 00	07	33376 00	06	28,608 00	06	28,608 00	07	33,376 00	
98	Forged or cut Spikes	lb	150,093	05	7,504 65	06	9005 58	06	9,005 58	05	7500 65	06½	9,756 04	
99	Cast iron washers & Separators	lb	315,660	03	9469 80	05	15783 00	06	18,939 60	05	15,783 00	06	18,939 60	
100	Cattle guards (3 Sections)	each	440	15 00	6600 00	35 00	15400 00	10 00	4400 00	12 00	5280 00	18 00	7920 00	
101	Cast iron pile shoes	each	200	50	100 00	5 00	1000 00	3 00	600 00	1 75	350 00	6 50	1300 00	
					13,756,023.54		17,048,813 12		13,028,753 35		13,991,860.42		13,010,398 92	

Tender No 3.– These items marked "cost + 10%" figures used are those used in Engineer's estimate.

3 000
5 300
848
10 000

(Sgd) [signature] Asst Chief Eng

[signature] Dist Eng

Tender No 3. These items marked "Cost + 10%" figures used are those used in Engineer's Estimate.

Note:– In Tender No 4 for items marked thus x no prices were given for purpose of Comparison the figures used are those used in Engineer's Estimate

V/260

308A

March 26th 1906

308A – V/520

N.T.R. Investigating Commission Exhibit No. 29

THE NATIONAL TRANSCONTINENTAL RAILWAY

Form 89

DISTRICT "F"

APPROXIMATE ESTIMATE OF COST OF CONSTRUCTION

PARTY FROM 0 MILE TO 7/14 MILE

11/5/06 F.

QUANTITIES

Item No.	DESCRIPTION OF WORK	Measure	Estimate #4 Tenders. Miles from 0 to 7/14 Rate	Miles from ... to ...	Miles from ... to ...	Miles from ... to ...	Miles from ... to ...	Miles from ... to ...	Miles from ... to ...	Miles from ... to ...	Miles from ... to ...	Miles from ... to ...	Total Measure	Rate	Amount	Total Amount	REMARKS
0	Right of way	acre.															
1	Clearing	acre.	40														
2	Trees cut down outside right-of-way	each.	50														
3	Grubbing	acre.	75														
4	Solid Rock	c. y.	170														
5	Loose rock & other materials (section 35 Spec.)	c. y.	60														
6	Common excavation	c. y.	30														
7	Excavations in foundations, no coffer dams	c. y.	55														
8	Excavation of foundations, within coffer dams	c. y.	2														
9	Overhaul all materials per cub. yd. per 100 ft over 500 ft. haul	c. y.	01														
10	Piling delivered as per Engineer's bill	lin. ft.	25														
11	Piling driven	lin. ft.	drawings only 15														
12	Sheet piling, per M. ft. B. M.		75														
13	Wakefield type, per M. ft. B. M		100														
14	Cross-logging 1 ft. deep, with 18 in's. brushwork	acre.	600														
15	Pole drains	lin. ft.	25														
16	French stone drains	lin. ft.	175														
17	Paving in culverts	c. y.	275														
18	Crib filling with stone	c. y.	275														
19	Hand laid rip-rap	c. y.	275														
20	Pierre Perdu random rip-rap	c. y.	175														
21	Piling out reserved stone from rock cuttings	c. y.	1														
22	Round logs in cribs	lin. ft.	30														
23	Cedar mud sills, per M. ft. B. M		35														
24	Framed trestles, per M. ft. B. M. ex'pt stringers		35	For Structure													
25	Caps, Walings, and Braces for pile trestles, per M. ft. B. M		35	"													
26	Sawn ties & guard rails for bridges per M ft B.M.		35	"													
27	Stringers, per M. ft. B. M		45 acct.	"													
28	Cedar timber in culverts, 8 ins. x 12 ins., 10 ins. x 12 ins. and 12 ins. x 12 ins. per M. ft. B. M.		10														
29	Plank in highway and private road crossings per M. ft. B. M.		30														
30	Timber, best quality, for culverts, per M ft. B.M.		30														
31	Vitrified pipe culverts, 12 inches diam	lin. ft.	95														
32	14 inches diam	lin. ft.	125														
33	15 inches diam	lin. ft.	135														
34	18 inches diam	lin. ft.	145														
35	Reinforced concrete pipe, 12 inches diam	lin. ft.	120														
36	14 inches diam	lin. ft.	130														
37	16 inches diam	lin. ft.	140														
38	18 inches diam	lin ft.	150														
39	20 inches diam	lin. ft.	160														
40	24 inches diam	lin. ft.	170														
41	30 inches diam	lin. ft.	7														
42	36 inches diam	lin. ft.	250														
43	42 inches diam	lin. ft.	350														
44	48 inches diam	lin. ft.	450														
45	54 inches diam	lin. ft.	550														
46	60 inches diam	lin. ft.	650														
47	4 inches Agricultural under tile drains	lin. ft.	05														
48	Cast iron pipe culverts, 16 inches diam	lin. ft.	230														
49	18 inches diam	lin. ft.	3														
50	20 inches diam	lin. ft.	350														
51	24 inches diam	lin. ft.	545														
52	30 inches diam	lin. ft.	675														
53	36 inches diam	lin. ft.	765														
54	42 inches diam	lin. ft.	650														
55	48 inches diam	lin. ft.	750														
56	54 inches diam	lin. ft.	8														
57	60 inches diam	lin. ft.	10														
58	Concrete facing mixture (1-2) 4/12 in. thick	c. y.	15														
59	Concrete 1 2-4 coping, course 6 in. thick	c. y.	15														

Note: Red figures show how made up by Chief Engineer for the items to be worked. No prices were quoted in Tenders No 4.

TOTALS CARRIED FORWARD

Sheet 2

THE NATIONAL TRANSCONTINENTAL RAILWAY

Form 89

DISTRICT "F"

APPROXIMATE ESTIMATE OF COST OF CONSTRUCTION

PARTY FROM 0 MILE TO 244 MILE (Continued)

QUANTITIES

Item No.	DESCRIPTION OF WORK	Measure	#4 Tender. ~~Miles from~~ ......to..	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Total Measure	Rate	Amount	Total Amount	REMARKS
	TOTALS BROUGHT FORWARD......																
60	Concrete 1-3-5..............................	c. y.	12														
61	Concrete 1-3-6....	c. y.	15														
62	Concrete 1-3-5 in arch culverts, incl'd'g curbing	c. y.	13														
63	Concrete 1-3-6 in arch culverts, do	c. y.	15														
64	Concrete 1-3-6 in box culverts, do	c. y.	11														
65	Concrete 1-4-8 ordinary found't'ns, do	c. y.	13														
66	Concrete 1-4-8 walls of building, do	c. y.	10														
67	First-class masonry..........................	c. y.	18														
68	Second-class masonry.........................	c. y.	13														
69	Third-class masonry..........................	c. y.	9														
70	Dry masonry....................	c. y.	6														
71	Masonry in arch ring, including centreing.....	c. y.	18														
72	Track-laying in main line, with ordinary frogs, switches and sidings, including light surfacing A....	mile	500														
73	Track-laying in yards at terminals....	mile	500														
74	Train hauled surfacing B.....................	c. y.	30														
75	Ballasting ,.............................	c. y.	40														
76	Ties, first-class............................	each															
77	Ties, second-class	each															
78	Ties for switches, sawn to dimen's per M.ft. B.M.																
79	Public Road Signs............................	each	230														
80	Mile posts, whistle posts, and road signs......	each	65														
81	Semaphores at stations, complete.............	each	550														
82	Interlocking appliances, complete, eight levers	each	6000														
83	Each additional lever........................	each	300														
84	Fencing..................................	rod	105														
85	Gates..	each	8														
86	Tunnels, rock section, (unlined)	lin. ft.	75														
87	Tunnels, lined...............................	lin. ft.	85														
88	Tunnels, concrete lining.....................	c. y.	15														
89	Tunnels, masonry lining......................	c. y.	15														
90	Drainage tunnels, 4 c. yds. per foot...........	lin. ft.	75														
91	Telegraph lines..............................	mile	245														
92	Water tanks, 50,000 gallons..........	each	2500														
93	Turntables	each	3000														
94	Track scales..........	each	1000														
95	Tunnel shaft...............	each	5														
96	Iron in drift bolts.................	lbs.	06½														
97	Iron in screw bolts..............	lbs.	07														
98	Forged or cut spikes.........................	lbs.	06½														
99	Cast iron washers and separators..	lbs.	06														
100	Cattle guards (3 sections)....................	each	18														
101	Cast iron pile shoes.	each	650														
	TOTALS																

N.T.R. Investigating Commission Exhibit No. 29

THE NATIONAL TRANSCONTINENTAL RAILWAY

Form 89

DISTRICT "B"

APPROXIMATE ESTIMATE OF COST OF CONSTRUCTION

PARTY FROM 0 MILE TO 180 MILE

11/5/06 F.

Item No.	DESCRIPTION OF WORK	Measure	QUANTITIES: Miles from ..to.. Rate	Miles from ..to..	Miles from ..to..	Miles from ..to..	Miles from ..to..	Miles from ..to..	Miles from ..to..	Miles from ..to..	Miles from ..to..	Miles from ..to..	Total Measure	Rate	Amount	Total Amount	REMARKS
0	Right of way	acre.															
1	Clearing	acre.	40														
2	Trees cut down outside right-of-way	each.	250														
3	Grubbing	acre.	150														
4	Solid Rock	c. y.	150														
5	Loose rock & other materials'(section 35 Spec.)	c. y.	50														
6	Common excavation	c. y.	24														
7	Excavations in foundations, no coffer dams	c. y.	1														
8	Excavation of foundations, within coffer dams	c. y.	175														
9	Overhaul, all materials per cub. yd. per 100 ft over 500 ft. haul	c. y.	01														
10	Piling delivered as per Engineer's bill	lin. ft.	20														
11	Piling driven	lin. ft.	40														
12	Sheet piling, per M. ft. B. M.		50														
13	Wakefield type, per M. ft. B. M.		60														
14	Cross-logging 1 ft. deep, with 18 in's. brushwork	acre.	900														
15	Pole drains	lin. ft.	50														
16	French stone drains	lin. ft.	150														
17	Paving in culverts	c. y.	4														
18	Crib filling with stone	c. y.	2														
19	Hand laid rip-rap	c. y.	275														
20	Pierre Perdu random rip-rap	c. y.	175														
21	Piling out reserved stone from rock cuttings	c. y.	1														
22	Round logs in cribs	lin. ft.	35														
23	Cedar mud sills, per M. ft. B. M		40														
24	Framed trestles, per M. ft. B. M. ex'pt stringers		48														
25	Caps, Walings, and Braces for pile trestles, per M. ft. B. M.		48														
26	Sawn ties & guard rails for bridges per M ft B.M.		45														
27	Stringers, per M. ft. B. M		60														
28	Cedar timber in culverts, 8 ins. x 12 ins., 10 ins. x 12 ins. and 12 ins. x 12 ins. per M. ft. B. M.		40														
29	Plank in highway and private road crossings per M. ft. B. M.		25														
30	Timber, best quality, for culverts, per M ft. B.M.		35														
31	Vitrified pipe culverts, 12 inches diam.	lin. ft.	75														In Work
32	14 inches diam.	lin. ft.	90														" "
33	15 inches diam.	lin. ft.	110														" "
34	18 inches diam.	lin. ft.	130														" "
35	Reinforced concrete pipe, 12 inches diam.	lin. ft.	1														" "
36	14 inches diam.	lin. ft.	110														" "
37	16 inches diam.	lin. ft.	130														" "
38	18 inches diam.	lin. ft.	150														" "
39	20 inches diam.	lin. ft.	2														" "
40	24 inches diam.	lin. ft.	265														" "
41	30 inches diam.	lin. ft.	3														" "
42	36 inches diam.	lin. ft.	4														" "
43	42 inches diam.	lin. ft.	460														" "
44	48 inches diam.	lin. ft.	540														" "
45	54 inches diam.	lin. ft.	7														" "
46	60 inches diam.	lin. ft.	1875														" "
47	4 inches Agricultural under tile drains	lin. ft.	10														" "
48	Cast iron pipe culverts, 16 inches diam.	lin. ft.	287														In Work
49	18 inches diam.	lin. ft.	378														" "
50	20 inches diam.	lin. ft.	460														" "
51	24 inches diam.	lin. ft.	5														" "
52	30 inches diam.	lin. ft.	6														" "
53	36 inches diam.	lin. ft.	750														" "
54	42 inches diam.	lin. ft.	11														" "
55	48 inches diam.	lin. ft.	1350														" "
56	54 inches diam.	lin. ft.	1728														" "
57	60 inches diam.	lin. ft.	21														" "
58	Concrete facing mixture (1-2) 2½ in. thick	c. y.	12														
59	Concrete 1 2-4 coping, course 6 in. thick	c. y.	12														

TOTALS CARRIED FORWARD

N.T.R. INVESTIGATING COMMISSION EXHIBIT No. 29

Sheet 2 Form 89

THE NATIONAL TRANSCONTINENTAL RAILWAY

DISTRICT "B"

APPROXIMATE ESTIMATE OF COST OF CONSTRUCTION

PARTY FROM 0 MILE TO 150 MILE (Continued)

QUANTITIES

Item No.	DESCRIPTION OF WORK	Measure	#7 Tender Rates (~~Miles from~~ ......to......)	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Miles from ......to......	Total Measure	Rate	Amount	Total Amount	REMARKS
	TOTALS BROUGHT FORWARD......																
60	Concrete 1-3-5	c. y.	11														
61	Concrete 1-3-6	c. y.	10														
62	Concrete 1-3-5 in arch culverts, incl'd'g curbing	c. y.	11														
63	Concrete 1-3-6 in arch culverts, do	c. y.	10														
64	Concrete 1-3-6 in box culverts, do	c. y.	9														
65	Concrete 1-4-8 ordinary found't'ns, do	c. y.	8														
66	Concrete 1-4-8 walls of building, do	c. y.	9														
67	First-class masonry	c. y.	12														
68	Second-class masonry	c. y.	10														
69	Third-class masonry	c. y.	9														
70	Dry masonry	c. y.	6														
71	Masonry in arch ring, including centreing	c. y.	20														
72	Track-laying in main line, with ordinary frogs, switches and sidings, including light surfacing A	mile	400														
73	Track-laying in yards at terminals	mile	600														
74	Train hauled surfacing B	c. y.	75														
75	Ballasting	c. y.	40														
76	Ties, first-class	each	}														
77	Ties, second-class	each	2 }														
78	Ties for switches, sawn to dimen's per M.ft. B.M.		40 }														
79	Public Road Signs	each	25														
80	Mile posts, whistle posts, and road signs	each	20														
81	Semaphores at stations, complete	each	700														
82	Interlocking appliances, complete, eight levers	each	6500														
83	Each additional lever	each	200														
84	Fencing	rod	110														
85	Gates	each	6														
86	Tunnels, rock section, (unlined)	lin. ft.	80														
87	Tunnels, lined	lin. ft.	85														
88	Tunnels, concrete lining	c. y.	15														
89	Tunnels, masonry lining	c. y.	20														
90	Drainage tunnels, 4 c. yds. per foot	lin. ft.	30														
91	Telegraph lines	mile	225														
92	Water tanks, 50,000 gallons	each	3500														
93	Turntables	each	4000														
94	Track scales	each	3500														
95	Tunnel shaft	Cubic yds	8														
96	Iron in drift bolts	lbs.	04														
97	Iron in screw bolts	lbs.	05														
98	Forged or cut spikes	lbs.	05														
99	Cast iron washers and separators	lbs.	04½														
100	Cattle guards (3 sections)	each	25														
101	Cast iron pile shoes	each	150														
	TOTALS																

March 26th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs:—

Herewith please find comparative estimate showing cost of 150 miles of the Transcontinental Railway, from the North end of the Quebec Bridge Westerly based on quantities derived from the revised location, up to March 10th, 1906, and revised prices for certain minor items after consultation with the District Engineer, and also cost of same work calculated at prices submitted in tenders 5, 6, 7, 8, 9, 10.

Your obedient servant,

Enclos. (*Sgd.*) H. D. L.

March 21st, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs:—

In regard to the attached estimate made by Mr. Doucet, it seems in every way to confirm the comparisons made in this office, when the decreases in quantities made by Mr. Doucet's revision are taken into consideration. Our comparative estimate included assumed quantities and prices for various items not given by Mr. Doucet, and were put in in case circumstances might arise necessitating the use of any of them, especially so in the case of trees cut outside of right of way (item No. 2), and cross logging (item No. 14). I note that Mr. Doucet has included sawn ties for bridges (No. 26) and sawn ties for switches (No. 78) with these tenders. My understanding was that No. 26 was to go with the contract for the steel bridge superstructure (with the exception of possibly a few ties required for short timber spans, and No. 78, to go with the contract for ties. Mr. Doucet's prices for stone filling for cribs (No. 18) seems to me high, and for concrete facing (No. 58) too low. I see no objection to these figures being submitted to the Consulting Engineer to the Government.

Your obedient servant,

(*Sgd.*) H. D. L.

March 19th, 1906.

P. E. RYAN, ESQ.,
Secretary.

Dear Sir:—

I beg to hand you herewith duplicate copies of condensed profiles on a scale of 4 miles to one inch horizontal, and 400 feet to one inch vertical, to accompany maps of portions of Districts "B", and "F", which have been submitted to the Government for approval.

Yours truly,

(*Sgd.*) H. D. L.

March 16th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

DISTRICT "F."

Sirs:—

Herewith I beg to hand you sheets showing the results of the moneying out of the quantities estimated by us, by the prices given in the various numbers designating tenders submitted to us, together with a summary of the same. The amount of the estimate made by me, using the same quantities, is $13,800,576.29, so it can been seen at once how the values under the respective numbers compare with the estimate made by me,

Your obedient servant,

March 16th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

DISTRICT "B".

Sirs:—

Herewith I beg to hand you sheets showing the results of the moneying out of the quantities estimated by us, by the prices given in the various numbers designating tenders submitted to us, together with a summary of the same. The amount of the estimate made by me, using the same quantities, is $6,842,534.26, so it can be seen at once how the values under the respective numbers compare with the estimate made by me.

Your obedient servant,

March 16th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

VIADUCT.

Sirs:—

Herewith please find quantities and prices for the various tenders made by Bridge Companies, for the Cap Rouge Viaduct, together with a summary of the same. All the designs submitted comply with our requirements

Your obedient servant,

Enclos.

March 14th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs:—

Herewith please find an estimate of the works now tendered on in Districts "B", and "F", exclusive of viaduct. This estimate, which was prepared before knowing any of the prices given by tenderers, I believe to be ample for the completion of the work, and leave a fair margin of profit for the contractor, but a variation of say 10% might be a reasonable price for a tenderer to make. If below this margin of 10%, it would, in my opinion, be too low to insure the completion of the work.

Your obedient servant,

Enclos.

I confirm the above.
(*Sgd.*) D. MACPHERSON,
Assistant Chief Engineer.

March 14th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs:—

Herewith please find duplicate maps on a scale of 4 miles to 1 inch, of portions of Districts "B" and "F", showing the route of this railway as now being tendered on. You have already verbally approved of these, and I am now submitting these copies for the approval of the Government.

Your obedient servant,

OTTAWA, March 16th, 1906.

TRANSCONTINENTAL RAILWAY.

TENDERS. DISTRICT F.

Number of Tender.	Total Amount of Tender	Difference between Tenders.	Remarks.
	$ c	$ c	
4	13,010,399 00		In Tender No. 4 no prices were given for Items 15, 21, 28, 32, 33, 35, to 50 inclusive, 54 to 57 inclusive, 60, 62, 64, 66, 81, 82, 83, 90, 93 and 94, and for the sake of comparison these items were fixed at prices fixed by Chief Engineer.
		64,869 21	
2	13,1[illegible]73 35		
		937,952 07	
3	14,069,625 42		In Tender No. 3 Items 35 to 46 inclusive, and 81 to 83 inclusive, were bid for at cost plus 10%, and for sake of comparison were figured at prices fixed by Chief Engineer.
		3,089,997 70	
1	17,159,623 12		
		4,092,818 98	Difference between Tenders Nos. 4 and 1.

D. MACPHERSON,
Asst. Chief Engineer.

CANCELLED

OTTAWA, March 16th, 1906.

TRANSCONTINENTAL RAILWAY.

TENDERS. DISTRICT B.

Number of Tender.	Total Amount of Tender	Difference between Tender	Remarks.
	$ c	$ c	
7	5,297,257 00	252,737 48	
8	6,176,570 70	1,019,851 40	
6	7,196,422 10	206,192 86	In Tender No. 6 Items 35 to 46 inclusive, and 81 to 83 inclusive, were bid for at cost, plus 10%, and for sake of comparison were figured at prices fixed by Chief Engineer.
5	7,402,614 96	520,850 63	In Tender No. 5 the same remark applies to Items 35 to 46 inclusive, and 81 to 83 inclusive, as for No. 6.
10	7,923,465 59	868,468 61	In Tender No. 10 Item 91, for Telegraph Line, has remark: "For 10 Wires."
9	8,791,934 20		
		$2,868,100 98	Difference between 7 and 9.

D. MACPHERSON,
Asst. Chief Engineer.

CANCELLED

N. T. R.

INVESTIGATING COMMISSION

Exhibit 30

Correspondence in connection with La Tuque Pusher Grade.

(See Page 100 of Report)

CORRESPONDENCE referred to in the foregoing Report *re* La Tuque Pusher Grade.

File 4866. OTTAWA, June 15th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs,—

Herewith I beg to hand you a letter from the Assistant Chief Engineer, together with a sketch plan and profile of the lines run, in regard to the location of our line in the vicinity of La Tuque, and also as to securing land for a Divisional Yard at that point. It will be seen by the comparative estimate (also attached) made by the District Engineer, Mr. Doucet, of the three lines run in that vicinity that there is a large difference in cost in favour of the blue line, viz: $485,807.00 of a saving in a distance of say 10 miles; but on line "C" or blue line, it will be necessary to use a 0.65 grade compensated or curvature adverse to eastbound traffic, but if a divisional yard is established at this point it would not be a serious objection and I would beg to recommend that the matter be at once submitted to the Government for their approval as the contractors are now waiting at that point to start work. It would also be advisable in the event of determining to make a divisional point here to at once get options on the necessary land for such purpose.

Your obedient servant,

(Sgd.) HUGH D. LUMSDEN.

File-4960. OTTAWA, July 4th, 1906.

The Commissioners of the Transcontinental Railway,
Ottawa, Ont.

Sirs,—

Herewith I beg to hand you plans and profiles of the alternative lines run in the vicinity of La Tuque, together with an estimate of cost of same, for the purpose of receiving the sanction of the Government to the use of a 0.65 compensated grade at this point, and would beg to recommend the adoption of the shortest line "C" with a 0.65 compensated grade adverse to east-bound traffic. My reasons for doing so are that La Tuque is likely to be a divisional point, and this grade will commence within a half mile of it, and is 4 4-5 miles long, and the cost of the construction of line "C" is $516,113.00 less than the best of the other two lines. When its operation value is taken into consideration it is still $485,807.00 less than either of the other lines, and it is also two miles shorter.

As construction has been delayed at this point pending a decision, it is important that such should be given as soon as possible.

Your obedient servant,
(Sgd.) HUGH D. LUMSDEN.

The Commissioners referred the whole matter to the Minister of Railways and Canals.

OTTAWA, July 4th, 1906.

Sir,—

I have the honour by direction of the Board to hand you herewith plans and profiles of three alternative lines run in the vicinity of La Tuque, together with statements showing the estimated cost of each; also a letter from our Chief Engineer dated the 4th inst., recommending the adoption of the shortest line marked C with a 0.65 compensated grade adverse to eastbound traffic.

The Commissioners desire that you will have the kindness to submit the matter to His Excellency the Governor General in Council, for the approval of the adoption of Line "C" with a 0.65 compensated grade adverse to eastbound traffic for a distance of 4 4-5 miles.

You will note that the engineers of the Commission estimate that the saving in cost of construction of line "C" will be $516,113.00 over the best of the other two lines, and that the saving in construction and operation will be $485,807.

I have the honour to be, Sir,

Your obedient servant,

(Sgd.) P. E. RYAN,

Secretary.

The Honourable, The Minister of Railways and Canals,
Ottawa.

Encl.

This letter was referred to the Chief Engineer, M. J. Butler, who reported on July 8th, 1906, as follows:—

OTTAWA, July 5th, 1906.

Sir,—

Under date of the 4th inst. the Commissioners of the Transcontinental Railway submit a report of the Chief Engineer, Mr. H. D. Lumsden, and of the District Engineer, Mr. A. E. Doucet, recommending that a pusher grade of 0.65 be adopted for a distance of four and four-fifths (4 4-5) miles, near La Tuque; and they allege that the adoption of this grade would save two (a) miles in distance, and four hundred and eighty-five thousand, eight hundred and seven ($485,807.00) dollars in money.

I have considered the matter and without attempting to go into the minutiæ of the calculations submitted beg to report that in my judgment, permission ought not to be granted for any grade in excess of four tenths of one per cent, (0.4); for the reason that it has been stated over and over again by members of the Government that a four-tenths grade had been secured from Winnipeg to Quebec, and it seems to me that no circumstances should be permitted to interfere with the adoption of this grade between the points named.

East of Quebec the conditions are different and pusher grades may well be adopted between Quebec and Moncton; but that, however, is not now under discussion.

I have the honour to be, Sir,

Your obedient servant,

(Sgd.) M. J. BUTLER,

Deputy Minister and Chief Engineer.

Hon. H. R. Emmerson, K.C., P.C.,
Minister of Railways and Canals,
Ottawa.

The Government having approved Mr. Butler's report, he notified Mr. Parent of their decision in the following telegram:—

B65MO C G 13 DH Ottawa, Ont., July 14–06.

Hon. S. N. Parent,
Chairman Trans. Ry.
Quebec.

Government will not approve any pusher grades in line between Quebec and Winnipeg.

M. J. BUTLER.

2.20 P.M.

and the Engineers in the field were advised that the pusher grade proposition had been rejected and they proceeded with the work of building the expensive and costly 0.4% grade line

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The following letter from District Engineer Doucet, dated June 21st, 1906, gives his arguments for the 0.65 grade line.

QUEBEC, 21st June, 1906.

Hon. S. N. Parent
Chairman,
Ottawa,

Dear Sir,—

With reference to the Government's refusal to adopt the short pusher grade at LaTuque, I am very anxious to place myself on record as dissenting most emphatically from the decision arrived at of not countenancing pusher grades between Quebec and Winnipeg, as I am certain that a rigid adherence to such a ruling will cost the Government many millions of dollars. The Act says that the Eastern Division shall be constructed by the Government upon such location and according to such plans and specifications as it shall determine, having due regard to direction, easy gradients and favourable curves. The objection to the pusher grade, particularly at Divisional points, of which LaTuque will be one, is reduced to a minimum when one takes into account the immense sums of money saved at certain points by their use. It has been stated that the Transcontinental Railway would be built on a 4–10 grade eastbound, and the use of a few pusher grades at divisional points will not contradict this statement if provisions are made and allowances provided for overcoming the extra amount of power required for hauling trains loaded for a 4–10 grade up the pusher grade, without dividing them into sections.

The grades at the approaches of the Quebec Bridge are 1%, whereas what we intend putting in at La Tuque is but 65/100 of 1%. At Quebec where will always be spare engines for assisting trains up the 1% grade, and La Tuque being a divisional point will also have a spare engine or two always on hand.

Again, pusher grades are not contrary to good location, if such a saving in the cost of construction as will much more than compensate for the cost of pusher-

engines can be made. It is rather the very contrary and I am certain American engineers will not be at all complimentary to our knowledge of railway location when the interest of the extra cost of construction in this one case at La Tuque is taken into account.

From our present knowledge of the ground at La Tuque we are convinced that there is but one line to build, and that is the line on the 0.65 pusher grade for the following reasons:

1st. It is the cheapest to construct, on a conservative estimate, by $508,000.
2nd. It is two miles shorter than the line located on a 4/10 grade.
3rd. It has 419° less curvature.
4th. It has 8 curves less.
5th. It has no tunnels, whereas, the 4/10 grade location has two.
6th. The pusher grade is but 4 8/10 miles long.
7th. It begins at the end of the Divisional Yard.
8th. It has but 0.65% grade, or plus 60% of the main line grade; therefore, any old yard engine can be used as a pusher.
9th. It is the most direct, has less curvature, two of the conditions required by the Act, and the increased gradient can be taken care of by the yard engine.
10th. It is so short and so close to the yard that no telegraph office at the head of the grade will be required.
11th. It will lessen the 70,000 c. yds. of solid rock at the head of the grade by one-half and thus save a considerable amount of time in construction.
12th. It will eliminate two serious difficulties in connection with the line of the Quebec & Lake St. John Ry.
13th. The use of a 4/10 grade will practically destroy our station ground, as we will be forced to continue the grade throughout its full length and for two miles north, thereby very materially increasing the heavy embankments at the Big Bostonnais River and the Bostonnais Bridge itself.

The comparative estimate of cost of construction and equating values of the two lines is as follows:—

Cost of Construction.	4/10 grade	0.65 pusher g.
Cost of construction	$1,206,014	$698,192
Distance, Pusher Grade, 2 mls. shorter—2 x $54,000	108,000	
Curvature, Pusher Grade has 419° less—419° x 36.00	15,084	
Curvature, Pusher Grade has 8 curves—8 x $1,000	8,000	
Rise and Fall same on both lines		
Pusher engine 4 8/10 miles x 0.70 x 365 days @ 4%		153,300
	$1,337,098	$851,482
	851,482	
Saving by adoption of pusher g	$485,616	

It seems to me that if the Engineers responsible for the rejection of our proposition to use a pusher grade had taken the opportunity to visit La Tuque, their decision would have been far different, and I cannot help pointing out once again

that a grave error has been committed in laying down an arbitrary ruling that pusher grades will not be entertained between Quebec and Winnipeg. I hope it is not too late to revise this decision, but at all events I am most anxious, as I mentioned at the beginning of this letter, to place myself on record as strongly protesting in favour of a 0.65 pusher grade at the Divisional Point of La Tuque.

Yours very truly,
(Sgd.) A. E. DOUCET,
District Engineer.

Mr. Butlers' telegram of July 14th does not appear to have closed the matter for on July 25th, 1906, Mr. S. N. Parent wrote to Mr. Hayes as follows:—

OTTAWA, 25th July, 1906.

Dear Mr. Hayes:—

Herewith I am sending you for the information of your Company, copy of letters, plans and profiles, regarding the location of our line in the vicinity of La Tuque, Que.

With our engineers, I am of the opinion that pusher grades are not contrary to good location, if such a saving in the cost of construction as will much more than compensate for the cost of pusher engines can be made. It is rather the very contrary, and I am certain American engineers will not be at all complimentary to our knowledge of railway location when the interest of the extra cost of construction in this one case at La Tuque is taken into account, if any other line should be adopted.

From our present knowledge of the ground at La Tuque, we are convinced that there is but one line to build, and that is the line on the 0.65 pusher grade, for the following reasons:

1st. It is the cheapest to construct, on a conservative estimate, by $508,000.
2nd. It is two miles shorter than the line located on a 4/10 grade.
3rd. It has 419° less curvature.
4th. It has 8 curves less.
5th. It has no tunnels, whereas the 4/10 grade location has two.
6th. The Pusher Grade is but 4 8/10 miles long.
7th. It begins at the end of the Divisional Yard.
8th. It is but 0.65% grade, or plus 60% of the main line grade, therefore, any old yard engine can be used as a pusher.
9th. It is the most direct, has less curvature, two of the conditions required by the Act, and the increased gradient can be taken care of by the yard engine.
10th. It is so short and so close to the yard that no telegraph office at the head of the grade will be required.
11th. It will lessen the 70,000 c. yds. of solid rock at the head of the grade by one-half and thus save a considerable amount of time in construction.
12th. It will eliminate two serious difficulties in connection with the line of the Quebec & Lake St. John Railway.
13th. The use of a 4/10 grade will practically destroy our station ground throughout its full length and for two miles north, thereby very materially increasing the heavy embankments at the Big Bostonnais River and the Bostonnais Bridge itself.

The comparative estimate of cost of construction and equating values of the two lines it as follows:—

Cost of Construction.	4/10 grade	0.65 pusher g.
Cost of construction	$1,206,014	$698,192
Distance, Pusher Grade, 2 miles shorter—2 x $54,000.	108,000	
Curvature, Pusher Grade has 419° less—419° x 36.00.	15,084	
Curvature, Pusher Grade has 8 curves less—8 x $1,000	8,000	
Rise and Fall same on both lines.		
Pusher Engine 4 8/10 miles x 0.70 x 365 days @ 4%		153,300
	$1,337,098	$851,482
	851,482	
Saving by adoption of pusher g	$485,616	

I must say that the Commissioners entirely agree with these conclusions; but before taking a decision on the matter the Government would like to have the opinion of your Company.

Will you kindly give this question your early consideration and advise me,

Yours very truly,
(Sgd). S. N. PARENT.

2 encl.
4 plans.

Which was replied to on August 27th, 1906, as follows:

Grand Trunk Pacific Railway, Montreal, Canada.

August 27th, 1906.

My dear Mr. Parent:—

Your letter of July 25th, with copies of correspondence from your engineers, plans and profiles, regarding the location of the Transcontinental Railway in the vicinity of La Tuque, Que., duly received, and earlier reply thereto has been prevented by the absence in the West of Vice-President and General Manager Morse and his staff, Chief Engineer Kelliher, and Assistant Chief Engineer Woods.

These gentlemen having now returned and given careful consideration to the plans and profiles submitted with arguments bearing thereupon, concur with me in the opinion that under the circumstances set forth in the correspondence, we would not be justified in insisting at this time on the construction of the line on a four-tenths per cent grade, but that a 0.65 "pusher" grade should be adopted thereof in lieu thereof, because of the cheaper cost (estimated by your engineers at $508,000,) the two miles shorter distance, the 410 degrees less curvature, eight curves less and the absence of tunnels, (whereas the four-tenths grade location has two tunnels,) location of the pusher grade at the end of proposed Divisional yard, saving 70,000 cubic yards of solid rock excavation and interference with proposed station ground.

The foregoing are all practical reasons which may be very properly advanced for the adoption of a pusher grade.

In my opinion, however, the Commission should carefully consider with the Government the effect upon the minds of the public regarding this Transcontinental Railway, which has been widely advertised as being the only low grade line from the Atlantic to the Pacific, with definite statements to the effect that the maximum grade will be limited to four-tenths of one per cent east of the Rocky Mountains. If exception is made in this instance, will not the same arguments be used for adopting a 0.65 or even higher grade at other points, and would not then our proposed maximum of four-tenths have disappeared altogether?

Should you, after further consideration of the points I have raised, still feel that for the reasons given it is desirable to adopt the 0.65 pusher grade, you may consider the assent of this Company having been given thereto, provided it is understood, when the volume of traffic shall have reached a sufficient magnitude, to reduce the grade to four-tenths, then the cost of such expenditure shall be assumed by the Government and interest thereon at three per cent shall be paid by the lessors—the Grand Trunk Pacific Railway Company.

Yours truly,

(*Sgd.*) CHAS. M. HAYES
President.

HON. S. N. PARENT,
Chairman, National Transcontinental Railway Commission,
Ottawa.

Mr. Parent then wrote to Sir Wilfrid Laurier as follows:

OTTAWA, 28th August, 1906.

Dear Sir Wilfrid:—

In connection with the pusher grade question at La Tuque, you no doubt remember that during the course of our conversation in your office you stated that the Cabinet would be willing to reconsider the decision arrived at, asking me to communicate with the Grand Trunk Pacific Railway regarding this matter. I have without delay followed your suggestion, and after a long delay, for which reasons are given, I am now able to submit to you the answer of the Company. As there is no time to lose, I am forwarding you the original in case the Cabinet would desire to possess it in order to consider the subject. At our last conversation, Honourable Mr. Emmerson was present, and I would kindly ask you to pass it over to him before it shall be submitted to the Cabinet.

For our interest it would be desirable that the Government should not postpone its decision in the matter in order not to obstruct the progress of our work done at La Tuque, and if the Cabinet now thinks that the recommended Pusher Grade, favoured by all engineers, is preferable, we should be very happy to be informed of same without delay.

Awaiting for a definite decision, believe me,

Yours sincerely and truly,

(*Signed*) S. N. PARENT.

HON. SIR WILFRID LAURIER,
Prime Minister.

and a search of the records do not reveal any reply to this communication.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 31

Map and Profile showing Railway and Projected Line "A" around Chaudiere Cut.

(See Page 90 of Report)


THE NATIONAL
TRANS-CONTINENTAL RAILWAY
EASTERN DIVISION
DISTRICT "B" PARTY "4"
PLAN OF PROJECTED LINES "A" & "B"
B4 & HARVEY'S LOCATED LINES
FROM QUEBEC BRIDGE TO B4 FINAL LOCATION
SCALE 400' = 1 INCH
C. A. d'Abbadie
Engineer in charge Party B4
St Jean Chrysostome Sept. 1906
ST. ROMUALD
QUEBEC BRIDGE Co's
QUEBEC BRIDGE CO (Connection with Intercolonial Ry)
LINE A
PROPOSED LOCATION "A"
6° Curve = 32°
6° Curve = 78°0'
LINE "B"
PROPOSED LOCATION "B"
NATIONAL TRANSCONTINENTAL RAILWAY
HARVEY'S LINE
Proposed Line
B4 LOCATION "C"
ST JEAN
RIVER ETCHEMIN
INTERCOLONIAL RY
RANGE LINE
BEAULIEU
PARISH ST ROMUALD
PARISH ST JEAN
To St Henri
To Chaudière Curve
Station on Progress Profile and Junction of Lines A & B
Increased cost Line A owing to additional distance of 0.31 miles @ $26000. per mile 10 daily trains $8060.00
" " " A " " " curvature .. 107. degrees @ $40. .. degree " " $4280.00
" " " A " " " rise & fall .. 71. feet @ $350 .. foot " " $24850.00
$37190.00
Line A - 1.0% Grade ~ Estimated cost $94,689.50
" B ~ 0.4% " Cost to October 1912 $484,103.33
Plan accompanying Chief Engineers letter of 21st Oct. 1912 to Mr. Gutelius.
NOTE :- All bearings are astronomical.
17°54'
N.T.R. INVESTIGATING COMMISSION EXHIBIT No. 31


Constructed by Quebec Bridge Co. and used by N.T.R.
Constructed by Quebec Bridge Co (Not used by National Transcontinental Railway)
N.T.Ry.
PROFILE
Projected "Line A" - 1·0% Grade
From a point on the Quebec Bridge Companys constructed line to Station 240+00 on the constructed line of the National Transcontinental Railway, south of the St. Lawrence River
Scales:~ 400' = 1" Hor
20' = 1" Vert
← To Winnipeg
Profile accompanying Chief Engineers letter of October 21st 1912 to Mr. Gutelius.
Ottawa, 14th October 1912
Chaudiere River
Lumber Railway
Level
0.194
0.826
1·0
118·76
118·76
0.40
36" Concrete Pipe
Undercrossing, Intercolonial Railway
36" Concrete Pipe
146·76
117·76
600 yds. L.R
600 - C.E
100 yds. L.R.
100 - C.E
150 yds L.R
150 - C.E
550 yds. L.R.
550 - C.E..
6450 yds Train fill
35,200 yds.
6' Concrete Arch Culvert.
1·00
22850 yds. Rock
7230 yds.
4x4 Concrete Box
13550 yds Rock.
4x4 Concrete Box Culvert
13300 yds.
To be diverted.
22,950 yds. Train fill
Diversion { 700 yds L.R.
700 - C.E.
180·76
0·65
172·30
1·00
Junction with constructed line
To Moncton →
Constructed line N.T.R.
204.30
0.4.
205.90
3° Curve.
6° Curve
32° 0'
6° Curve 70° 0'
3° 30' Curve - 50° 30'
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230

N. T. R.

INVESTIGATING COMMISSION

Exhibit 32

(See Page 118 of Report)

Transl. C.R.D.

In the year one thousand nine hundred and eleven, on the nineteenth day of the month of August, before the undersigned JOSEPH G. COUTURE, Notary Public for the Province of Quebec, in Canada, residing and practising in the city of Quebec, has appeared Mrs. Laura Tousignant, wife, separated as to property by the marriage contract passed before Henri R. Dufresne, Notary, residing at St. Pierre-les-Becquets, on the tenth day of January in the year one thousand nine hundred and nine and registered at Quebec on May 14th of the same year under number 28563, of Mr. Napoleon Martineau, junior, merchant, of the said city of Quebec, duly authorized by her said husband also a party to the present deed and acting both to authorize his said wife and to contract for and his own personal name.

And the said Mrs. Laura Tousignant-Martineau has declared to have sold as by these presents she doth sell with guarantee against all mortgages and all troubles whatever, to *Raoul Rene Bergevin*, of the said city of Quebec, merchant, herewith present and accepting, that is to say:

The wooden buildings or structures used by her as an ice-house and a shed or stable, on their dependencies, erected on the lot and land known and designated under the number two thousand five hundred and twenty-five (2525) of the official cadastre for Champlain Ward of the City of Quebec; the said Mrs. Martineau declaring that this ice-house belongs to her by virtue of the terms of the marriage contract above quoted.

By these same presents the said Napoleon Martineau sells, makes over and transfers to the said Raoul R. Bergevin all the rights he may have as lessee of the part which he occupies of the said lot of land known under the number two thousand five hundred and twenty-five of the official cadastre for Champlain Ward, in virtue of a lease made in his favor by the Marchioness of Bassano, represented by Alfred C. Dobell, of Quebec, Advocate, dated at Quebec the twenty-fifth day of February, in the year one thousand nine hundred and eight, executed in the presence of witnesses, which lease is still of force up to the first day of May next 1912 by implied continued tenancy, and also in virtue of a lease in his favor by Adolphe Chevalier, executed in the presence of witnesses on the seventh day of December, in the year one thousand nine hundred and eight, for three years from the first day of May one thousand nine hundred and nine, the said Napoleon Martineau renouncing all his rights as lessee or occupant of the said piece of ground and pledging himself to give up its free possession and enjoyment to the said vender on or before the first day of May next. In consequence, the said Mrs. Martineau will be allowed to use the said ice-house until the first day of May next, without paying rent to the vender, but she shall pay all the municipal and school taxes imposable by the City of Quebec upon the said ice-house; in a like manner, the said Napoleon Martineau also pledges himself to pay the said taxes upon the other buildings erected on the lot of land which he thus occupies as lessee until the first of May next, the said Napoleon Martineau also pledging himself to pay to the proper person the rent for the land up to the first day of May next.

It is moreover agreed that if the said vendee should see fit to rent the said land after the first day of May next, the said Napoleon Martineau shall have the preference for renting it at the price which may be offered bona fide to the said vendee by any other person.

Lastly, this sale is made for the price of two thousand dollars, current money, which amount the said Napoleon Martineau and his said wife have declared to have received this day from the purchaser, for which receipt in full.

DONE AND PASSED AT QUEBEC under the number Twelve thousand and ninety of the minutes of the said Notary, and signed by the said parties with me the said Notary, after the same being read.

(Signed) "N. MARTINEAU, JR."
" "LAURA T. MARTINEAU."
" "RAOUL R. BERGEVIN."
" "J. G. COUTURE, N.P."

A true copy of the minute remaining in my office.

J. C. COUTURE.

On the 25th day of February in the year of Our Lord one thousand nine hundred and eight.

Before me the undersigned witness came and appeared Alfred C. Dobell, Advocate, in his capacity of Attorney for the Duchess of Bassano being so duly appointed by power of attorney signed before witnesses in the City of Paris in France on the 28th of March, 1906.

Who acknowledged and confessed to have demised and leased, and by these presents do hereby demise and lease, for the space of one year and seven months to be computed from the first day of the month of October, 1907, and which will end on the first day of May, 1909, unto Napoleon Martineau, Junior, of the City of Quebec, ice merchant, hereunto present and accepting thereof, that is to say a certain lot of land measuring 37 feet by 60 feet being part of that lot of land now known and designated upon the Cadastral plan and in the book of reference thereto for Champlain Ward in the City of Quebec under number two thousand five hundred and twenty-five (2525) no warranty as to exact measurement; whereof the Lessee is content and satisfied.

During all which time the said Lessor does hereby promise and engage to cause the said Lessee to enjoy the said premises peaceably and quietly, save and except by giving a six months' notice at the expiration of which the lease shall expire.

And the said Lessee does hereby promise and engage to submit and conform to all regulations of Police in regard to the said premises, now in force or which be hereafter established by competent authority, for maintaining the cleanliness of the City, and of the Streets, Lanes, Yards and Houses therein; not to make over or sub-let his right to the present lease without the consent in writing of the Lessor, and to surrender the said premises at the expiration of the present lease without any previous notice to quit being required, or to quit at the expiration of six months after receiving notice to that effect.

The present Lease is thus made for and in consideration of the sum of seventy-five dollars current money of this Province payable by the Lessee to the said Alfred C. Dobell in two equal payments of the sum of thirty-seven dollars and fifty cents each current money aforesaid each.

The first instalment of thirty seven dollars and fifty cents shall be paid on the first day of April, 1908, and the second instalment shall be paid on the first of September, 1908, or should the Lessor take advantage of her right to terminate the present lease before that date the said instalment shall be due and payable three months after the receipt of the notice to quit. The said Lessee binds himself to pay at the divers periods when the same is payable all taxes, water rates or other dues which now are or which may hereafter be imposed on the said property above leased by the City of Quebec.

And for the due execution of these presents, the said parties have made election of domcile irrevocable to wit: the Lessor at the office of the said Alfred C. Dobell in the City of Quebec where payment shall be made and the Lessee on the premises hereby leased.

DONE AND PASSED at the City of Quebec, and signed by the said parties these presents having been first duly read.

ALFRED DOBELL.
W. MARTINEAU, Jr.
Witness EDW. Z. STANLEY.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 33

(See Page 118 of Report)

Transl. C. R. D.

IN THE YEAR ONE THOUSAND NINE HUNDRED AND ELEVEN, on the thirtieth day of the month of September, BEFORE CHARLES EDWARD TASCHEREAU, Notary Public for the Province of Quebec, residing in the City of Quebec,

DID APPEAR:—

MR. RAOUL R. BERGEVIN, OF THE CITY OF Quebec, merchant tailor,

PARTY OF THE ONE PART,

AND THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY, a body politic and duly incorporated, having its head office in the city of Ottawa, in the province of Ontario, and here represented by the Honourable Simon Napoleon Parent, its President, duly authorized to the purpose of the presents,

PARTIES OF THE OTHER PART.

AND THE SAID PARTIES have made between themselves the following declarations and stipulations, that is to say:—

Whereas the said party of the one part is the owner of an ice-house built upon the consecutive number 96B and on the top number two thousand five hundred and twenty-five (2525) upon the official plan and book of reference of the cadastre for Champlain Ward of the said city of Quebec;

Whereas, further, that, on account of the construction of the Transcontinental Railway through the said lot, the said ice-house must be removed.

Whereas, lastly, that the said party of the one part is ready to accept an indemnity as a compensation for the damages which the demolition of the said ice-house will cause him;

Therefore the presents bear evidence that the said party of the one part, in consideration of the sum of three thousand and seven hundred dollars ($3,700.00) which he acknowledges to have received from the said parties of the other part, upon the execution of the presents, hereby gives the latter a full and final receipt for all the damages caused him by the demolition of the said ice-house.

DONE AND PASSED at Quebec, in the year and on the day above mentioned, under the number six thousand one hundred and fifty-five of the minutes of the said C. E. Taschereau.

IN WITNESS WHEREOF the parties have signed with the said Notary after the same being read.

(Signed) "S. N. PARENT"
"RAOUL R. BERGEVIN"
"C. E. TASCHEREAU, N. P."

A true copy of the minute remaining of record in my office.

(Signed) C. E. TASCHEREAU, N. P.

PROVINCE OF QUEBEC

REGISTRATION OFFICE, QUEBEC.

The twenty-second day of August, 1911.

In compliance with the demand now made me by C. E. Taschereau, N. P., I, the undersigned, registrar for the registration division of Quebec, do grant, by the presents, the following certificate of the registrations made in my office since the second day of October, 1871, date of the coming into force of the cadastre affecting the lot number two thousand five hundred and twenty five (2525) of the plan and reference book of the cadastre for Champlain Ward presently in the possession of J. B. Fradette.

1.—B94-452-42310.—Judiciary sale (par licitation) by the prothonotary of the District of Quebec to Marie-Anne Claire Symes of certain landed property situated near the St. Lawrence River, in the city of Quebec, described; subject to the payment of an annual rent of £57.10 to the Hotel-Dieu, and of another annual rent of £10, to the Harbour Commissioners. Sale price paid. The said sale dated December 4th, 1871.

PROTHONOTARY'S TITLE, April 9th, 1872.

REGISTERED————April 12th, 1872.

2.—D1-403-252.—Renewal by the above mentioned Marie-Anne Claire Symes of the registraiton of the real rights resulting from the sale mentioned in the preceding item, as affecting the said lot and other property,

JOHN STRANG, N. P., July 4th, 1872.

REGISTERED————August 14th, 1872.

3.—B 236-729-130216.—Guarantee sale (dotion) in payment by Jean-Baptiste Fradette to "Gagnon & Frère" for an ice-house built on part of the said lot. The said "dotion" granted as a collateral guarantee for the reimbursement of the sum of $400, with interest at 8%, which the said Fradette pledges himself to pay within 3 years from the present date.

JOS. ALLAIRE, N.P., November 2nd, 1909.

REGISTERED————November 3rd, 1909.

REMILLARD & ROY,
Deputy Registrar.

4.—B 251-137123.—Sale by Mrs. Laura Tousignant, wife of Napoleon Martineau, to Raoul Rene Bergiven, of the buildings erected on the said lot. Sale by Napoleon Martineau, aforesaid, of his rights as lessee of part of the said lot. Sale price paid.

J. G. COUTURE, N. P., August 19th, 1911.

REGISTERED————August 22nd, 1911.

REMILLARD & ROY,
Deputy-Registrar.

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY

To A. E. Doucet, on account of Right-of-Way, Dr.

Raoul R. Bergevin,
City of Quebec. 1911–12.

Sept. 23, 1911, for compensation for removal of ice-house, and damages, Cadastral No. 2525, Champlain Ward, City of Quebec, Province of Quebec.....$3,700.00 $3,700.00

Correct,
28 Sept. 1911.
A. Tremblay.

Date Sept. 30th, 1911. RECEIVED from the Commissioners of the Transcontinental Railway the sum of THREE THOUSAND SEVEN HUNDRED DOLLARS in full settlement of the above account.

RAOUL R. BERGEVIN.

Correct:
D. HOCTOR,
Chief Accountant.

Approved by Board:
Sept. 26, 1911.
P. E. RYAN,
Secretary.

No. 137,511. This Deed of Acte d'accord was entered and registered in the Registry Office for the Registration Division of Quebec, at ten minutes past two o'clock P.M., on the third day of October, nineteen hundred and eleven, as number one hundred and thirty-seven thousand five hundred and eleven, B vol. 253, page 57.

REMILLARD & ROY,
Dep.-Registrar.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 34

(See Pages 118 and 119 of Report)

On this day the First of October in the year one thousand nine hundred and eight.

Before me the undersigned William Noble Campbell, Notary Public for the province of Quebec in Canada, residing and practising in the City of Quebec.

Personally came and appeared Alfred Curzon Dobell of the said City of Quebec, Advocate, acting herein in his capacity of the duly appointed Attorney of the Duchess of Bassano of the City of Paris, in the Republic of France under her power of Attorney executed before witness at Paris aforesaid on the Twenty-eighth of March nineteen hundred and six, who in the presence of me the said Notary, did by these presents both lease and demise for the space and term of three years to begin and be computed from the first day of May next (1909) and fully to be completed and ended on the Thirtieth day of April in the year one thousand nine hundred and twelve, unto Adolphe Chevalier, of the said City of Quebec, Ship Carpenter, also present and accepting hereof for himself, his heirs and assigns, as follows, that is to say:

That certain lot of land or cove and premises now known and designated upon the plan and in the book of reference thereto of the Cadastre for Champlain Ward of the said City of Quebec under the number two thousand five hundred and twenty-five (2525) together with the buildings thereon circumstances and dependencies, save and except that portion of that said lot now occupied by N. Martineau, for an ice house measuring about thirty-seven feet by sixty feet, without any warranty as to the exact measurement of the property hereby leased.

All of which the said Lessee doth declare to have a perfect knowledge, having seen and visited the same, and is content and satisfied therewith.

To have and to hold the said premises hereby leased and demised, or intended so to be, unto the said Lessee his heirs, executors or curators, without let or hindrance for and during the said term, subject to his enjoyment thereof "en bon père de famille," and to the maintenance of the house on said lot in all small and internal repairs for which tenants are by law responsible, the said Lessor being holden to keep and maintain the house on said lots "clos et couverts" and in all "grosses réparations" according to law, also subject by the said Lessee to the observance of the "voyerie" and all rules and regulations of the Police, the City of Quebec, the Board of Health, and other constituted authorities, which may in any manner concern the said premises; that he shall not sublease or underlet the said premises or any part thereof without written permission in writing from the said Lessor; and that he shall and will, on the end and expiration of the present lease, and without any previous notice to that end, peaceably and quietly surrender and deliver up the said premises in as good order and repairs as the same may have been at the commencement of the present lease, reasonable allowance being made for wear and accidents by fire, and other fortuitous causes and events excepted, notwithstanding any presumption in law in favour of the Lessor in relation thereto.

The present lease is thus made and granted for and in consideration of the following rents or annual amounts, that is to say, 1. The sum of Three hundred and fifty dollars for the first year (expiring on the Thirtieth of April 1910) of the present lease, one half of which or the sum of One hundred and seventy-five dollars, the said Lessee doth hereby bind himself to pay unto the said Alfred C. Dobell, acting as aforesaid or the bearer of these presents on the Second of July next (1909

and the remaining half or a like sum on the Second of January following (1910), 2. The sum of Three hundred and seventy-five dollars for the second year of the present lease (expiring on the Thirtieth of April 1911) one half of which or the sum of one hundred and eighty seven dollars and fifty cents, the said Lessee doth hereby bind himself to pay unto the said Alfred C. Dobell acting as aforesaid or the bearer of these presents on the Second of July nineteen hundred and ten, and the remaining half or a like sum, on the second of January following (1911), 3. The sum of Four hundred dollars for the third year of the present lease (expiring on the Thirtieth of April 1912), one half of which or the sum of Two hundred dollars, the said Lessee doth hereby bind himself to pay unto the said Alfred C. Dobell acting as aforesaid or the bearer of these presents on the Second of July nineteen hundred and eleven, and the balance or a like sum, on the Second of January following (1912). The said rents shall include all taxes, dues and assessments in each of the current years thereof.

Should the said Lessee fail to pay the rent on any of the above stipulated dates when it shall become due as aforesaid, then and in that case the said Lessor shall have the right forthwith of cancelling and resiliating the present lease and of entering into and taking possession of the premises hereby leased.

It is further agreed that the said Lessor shall at all times have the right of cancelling the present lease by giving six months clear notice in writing unto the said Lessee, of his intention so to do, in which case the said Lessee hereby agrees to vacate the said premises so soon as the said period of six months shall have expired.

And it is further and lastly agreed by and between the said parties that the said Lessor shall and will have the right and liberty of causing to be made any repairs or ameliorations to the said premises that may be found necessary during the said term, without being liable to damages or any deduction from the rent aforesaid. And for any execution of these presents the said Lessee hath made election of domicile irrevocable at the premises above leased and the said Lessor at the office in Quebec of her said Attorney.

Thus done and passed at the said City of Quebec, these presents recorded in the office of me the said Notary, under the number Six thousand nine hundred and fourteen.

In witness whereof the said parties have signed these presents with me the said Notary, the same being first duly read according to law.

Signed) ALFRED C. DOBELL, *Attorney*
" ADOLPHE CHEVALIER
" W. NOBEL CAMPBELL, *Not. Pub.*

A true copy of the orginial remaining of record in my office.

(*Signed*) W. N. CAMPBELL, *Not. Pub.*

N. T. R.

INVESTIGATING COMMISSION

Exhibit 35

(See Page 119 of Report)

In the year One Thousand nine hundred and eleven, on the twenty-sixth day of August, before the undersigned JOSEPH ALLAIRE, Notary Public, for the Province of Quebec, residing in the City of Quebec, DID APPEAR:

Mr. ADOLPHE CHEVALIER, ship-carpenter, of the City of Quebec.

Who has, by these presents, sold with guarantee against all mortgages and all troubles whatever to Mr. Raoul Rene Bergevin, merchant of the said City of Quebec, herewith present and accepting, vendee, that is to say:

All his rights and interests whatsoever in the occupation of a certain lot of land and cove known and designated upon the official plan and book of reference for Champlain Ward of the City of Quebec under the number Two thousand five hundred and twenty-five (2525) and all the damages resulting and caused by the expropriation by the Transcontinental, save and except that portion of the said lot now occupied by N. Martineau, junior, for an ice-house, measuring about thirty-seven feet by sixty feet, without any warranty as to the exact measurement of the lot above mentioned.

The said rights and interests in the occupation of the said lot belong to the vendor in virtue of a lease to him consented by Alfred Curzon Dobell, acting in his capacity of attorney of the Duchess of Bassano, of the City of Paris, France under a power of attorney executed before witness at Paris aforesaid, on the Twenty-eighth day of March, nineteen hundred and six, and passed, the said lease, before W. Noble Campbell, notary, at Quebec, on the first of October, in the year One Thousand nine hundred and eight.

It is agreed that the said Vendor shall give possession of the said lot the First of May next to the said vendee, and that he, the said vendor, shall pay until the said first of May next, the municipal and school taxes and other public contributions affecting the property, as well as the rent to the lessor mentioned in the aforesaid lease, due and to become due or by reason of his occupation of the property up to the First of May next.

This sale is made for the price of four thousand dollars ($4,000.00) which the vendor has acknowledged to have received from the vendee, upon the execution of the presents, of which receipt in full.

DONE AND PASSED at Quebec, in the office of Joseph Allaire, Notary, on the day and in the month and year aforesaid, under the number fifteen thousand three hundred and fifteen of the minutes of the said Joseph Allaire and, after its reading, the parties have signed in the presence of the said notary.

(*Signed*) "ADOLPHE CHEVALIER"
" "RAOUL R. BERGEVIN"
" "JOSEPH ALLAIRE, N. P."

A true copy of the minute remaining in my office.

JOS. ALLAIRE, N. P.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 36

(See Page 119 of Report)

IN THE YEAR ONE THOUSAND NINE HUNDRED AND ELEVEN, on tenth day of the month of October.

BEFORE CHARLES EDMOND TASCHEREAU, Notary Public for the Province of Quebec, residing and practising in the City of Quebec.

APPEARED:—

MR. RAOUL R. BERGEVIN, of the City of Quebec, Merchant Tailor,

PARTY OF THE ONE PART, AND THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY, a body politic duly incorporated, having its head office in the city of Ottawa, in the Province of Ontario, and here represented by the Honourable S. N. Parent, its President, duly authorized,

PARTIES OF THE OTHER PART.

And the said parties have made between themselves the following stipulations and declarations, that is to say:—

Whereas the said parties of the other part, for the ends of their railway line, require the demolition of a Graving Dock belonging to the said party of the one part situate upon the lot number two thousand five hundred and twenty-five (2525) on the official plan and book of reference of the cadastre for Champlain Ward, in the City of Quebec, which is the property of the said R. R. Bergevin, he having purchased it from Adolphe Chevalier, by deed of the twenty-sixth day of August, 1911, before Jos. Allaire, N.P.;

Whereas, moreover, that the said party of the one part is ready, in consideration of a certain indemnity to remove the said Graving Dock;

Therefore the presents bear evidence that the said party of the one part in consideration of the sum of four thousand two hundred and fifty dollars ($4,250.00) which he acknowledges to have received from the said parties of the other part, upon the execution of the presents, gives the latter a full and final receipt for the damages caused him by the demolition of the said Graving Dock and by its removal.

DONE AND PASSED at Quebec, on the day and in the year aforesaid, under the number six thousand one hundred and sixty-two of the minutes of the said C. E. Taschereau.

IN WITNESS WHEREOF, the parties have signed with the said Notary, after the same being read.

(Signed) "S. N. PARENT."
" "RAOUL R. BERGEVIN."
" "C. E. TASCHEREAU, N.P."

A true copy of the minute remaining of record in my office.

(Signed) C. E. TASCHEREAU, N.P.

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY.

To A. E. DOUCET, on % of Right-of-Way, DR.

RAOUL R. BERGEVIN,
Quebec City.

1911-12.

1911

Oct. 3 For Compensation for demolition of Graving Dock-
Cadastral No. 2525, Champlain Ward, City of
Quebec.....$4,250.00
$4,250.00

Correct:
5 Oct., 1911.
A. TREMBLAY.

Date Oct. 6th, 1911.

RECEIVED from the Commissioners of the Transcontinental Railway the sum of FOUR THOUSAND TWO HUNDRED AND FIFTY DOLLARS, in full settlement of the above account,

RAOUL R. BERGEVIN.

Correct.
D. HOCTOR,
Chief Accountant.

Approved by Board.
Oct. 4, 1911.
P. E. RYAN,
Secretary.

No. 137,693. This deed of Acte d'Accord was entered and registered in the Registry Office for the Registration Division of Quebec, at forty minutes past two o'clock p.m., on the twentieth day of the month of October, nineteen hundred and eleven, under the number One hundred and thirty-seven thousand six hundred and ninety-three, R. vol. 253, page 68.

RÉMILLARD & ROY,
Dep.-Registrar.

N. T. R.

INVESTIGATING COMMISSION

Exhibit 37

(See Pages 551 to 598 of Report)

On the 17th of February, in the year of our Lord one thousand nine hundred and nine.

Before me Alfred C. Dobell the undersigned witness personally appeared, Adolph Chevalier, of the City of Quebec, laborer; who acknowledged and confessed to have demised and leased and by these presents do demise and lease for the space of three years to be computed from 1st January 1909 and which will end on the 1st day of January 1912 unto J. B. Fradette of the city of Quebec, ice Merchant, hereto present, that is to say a piece of land m asuring forty five by ninety-six feet together with a piece of land of thirty feet by sixteen feet on the property already leased by the said Adolphe Chevalier from Duchess Bassano, the whole of the land being a part of that lot known on the Cadastral plan and in the book of reference thereto for Champlain Ward in the City of Quebec under number two thousand five hundred and twenty five (2525) no warranty as to exact measurement, whereof the lessee is content and satisfied.

During all which the said lessor does hereby promise and engage to cause the said lessee to enjoy the said premises peaceably and quietly, save and except by giving a six months notice at the expiration of which the lease shall expire.

And the said lessee does hereby promise and engage to submit and conform to all regulations of Police in regard to the said premises, now in force or which be hereafter established by competent authority, for maintaining the cleanliness of the City, and of the streets, Lanes, Yards, and Houses built therein, not to make over or sub-let his right to the present lease without the consent in writing of the Lessor, and to surrender the said premises at the expiration of the present lease without any previous notice to quit being required, or to quit at the expiration of six months after receiving notice to that effect.

The present lease is thus made for and in consideration of the sum of Ten hundred and twenty five dollars current money of this Province per year making a total of four hundred and twenty-five dollars current money as aforesaid, payable by the Lessee to the said Adolph Chevalier, the first instalment of seventy five dollars to be paid on the first of May 1909 and similar payments to be made on the same date of each year during the present lease and another instalment of fifty dollars current money as aforesaid to be paid on the 1st September 1909 and each subsequent year during the present lease, should the Lessor take advantage of his rights to terminate the present lease before the end of three years then the lessee shall pay the balance due within three months from the date of receiving notice to quit the premises.

And for the due execution of these presents, the said parties have made election of domicile irrevocable to wit the Lessor at his house in Champlain street in the City of Quebec where payment shall be made and the lessee on the premises hereby leased.

Done and passed at the city of Quebec, and signed by the said Parties, these presents having been first duly read.

(*Signed*) ADOLPHE CHEVALIER,
(*Signed*) J. B. FRADETTE,
Witness (*Signed*) ALFRED C. DOBELL

Lease mentioned in a deed of sale by J. B. Fradette, Esq., to Jules Grenier, Esq., before the undersigned Notary, on the Second day of the month of October, in the year One thousand nine hundred and ten, under number four hundred and fifty of his minutes.

(*Signed*) "J. B. FRADETTE,"
" "JULES GRENIER,"
" "ADOLPHE CHEVALIER,"
" "ALFRED C. DOBELL,"
" "Chas. J. BAILLARGEON, N. P."

A true certified copy.

CHAS. J. BAILLARGEON, N. P.

Before Charles Jules Baillargeon, Notary Public, residing and practising at Quebec,

APPEARED:—

Mr. Jean Baptiste Fradet, of the City of Quebec, former Ice Dealer.

Who by these presents has sold with all guarantee of right to Mr. Jules Grenier, of the Parish of Beauport, Joiner, herewith present and acceptor.

A building erected of wood, covered with tar-paper and used as an ice-house, forty feet wide by ninety feet long, located on the old Denning Yard.

Champlain Ward, in the City of Quebec, on a part of lot No. Two thousand five hundred and twenty five (2525) in the Official Cadastre of the said Ward, with besides all tools to cut ice and others having served the said Fradet for the operation of said ice-house, as enumerated on the list annexed to the presents as being part of it after it has been acknowledged and signed by the parties.

In addition to this, the said Fradet gives to the said J. Grenier all his rights as lessor of the land on which is erected the said ice-house; the said rights are specified by private deed made between the said Fradet and Mr. Adolphe Chevalier, of the City of Quebec, Laborer, dated the seventeenth February 1909, signed in presence of Mr. Alfred C. Dobell; the said Grenier agreeing on his side to all conditions, restrictions and rent of the said lease. Copy of the said lease is also annexed to the minutes of the presents after it had been acknowledged and signed by the parties.

The present sale is made on the following conditions:—

1. The said Grenier will pay from date of the presents all taxes and costs which might be imposed on the said ice-house or to which he might be bound in consequence of the said lease and also, from the date of the presents, the rent agreed upon in the lease dated the seventeenth of February 1909.

2. In case that, during the first year of the presents, the said J. Grenier would abandon ice trade by selling or otherwise, he will be bound to remit to the said Fradet all the tools bought from him as indicated in the annexed list. After the first year is passed, whatever happens, the said J. Grenier will be released from this obligation.

The said J. B. Fradet also sells to the said J. Grenier, acceptant, the following vehicles:—A vehicle called express, two vehicles called ice wagons, and three sleighs.

The present sale is made for and in consideration of the price and sum of eight hundred and five dollars ($805.), six hundred dollars ($600.) for the ice-house and two hundred and five dollars ($205) for the said vehicles.

The said selling price is payable as follows:—One hundred and fifty dollars ($150.) cash, receipt whereof is hereby acknowledged; Four hundred dollars ($400.) to be applied to the payment of a note due by the said J. B. Fradet to Mr. Antoine Gagnon, of Quebec, that the said purchaser promises and acknowledges

to pay when due, and the balance Two hundred and fifty five dollars ($255.) in four payments;—1, Fifty dollars ($50.00) on the fifteenth of July nineteen hundred and ten; 2, Fifty ($50) on the fifteenth of October nineteen hundred and ten; 3, Fifty ($50) on the fifteenth of January nineteen hundred and eleven; 4, Hundred and five dollars ($105.) on the fifteenth of July 1911. The said purchaser has signed in favour of the said vendor four notes representing each one of the payments hereinbefore mentioned, the said notes bearing interest at three per cent per annum.

Messrs. Alfred C. Dobell, Advocate, and Adolphe Chevalier, Contractor, both of Quebec have agreed to these presents; both declare after perusal of these presents, one as owner of the hereinbefore mentioned land and the other as lessor, that they agree to accept the said J. Grenier as subtenant of the said land in the stead and place of the said Jean B. Fradet, and bind themselves to continue in favour of the said J. Grenier on the same conditions, restrictions and rent the lease dated the 17th February 1909.

Made and passed at Quebec for the said H. B. Fradet the thirty-first day of December one thousand nine hundred and nine, for the said Jules Grenier the seventh day of January one thousand nine hundred and ten and for the said Alfred C. Dobell the twelfth day of October one thousand nine hundred and ten under number four hundred and fifty of the minutes of said notary.

In testimony whereof, the parties herein concerned have signed with said Notary after due reading.

(*Sgd.*) "J. B. FRADETTE"
" "JULES GRENIER"
" "ADOLPHE CHEVALIER"
" "ALFRED C. DOBELL".
" "CHAS. J. BAILLARGEON"

True copy of the minute deposited of record in my office.

CHAS. J. BAILLARGEON.

IN THE YEAR ONE THOUSAND NINE HUNDRED AND ELEVEN, on the Thirtieth day of the month of September.

BEFORE CHARLES EDWARD TASCHEREAU, Notary Public for the Province of Quebec, residing and practising in the City of Quebec.

DID APPEAR:—

Mr. JULES GRENIER, of the city of Quebec, ice dealer

PARTY OF THE ONE PART

AND THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY, a body politic duly incorporated, having its head office in the city of Ottawa, in the Province of Ontario, and here represented by the Honourable Simon Napoleon Parent, its president, duly authorized to the purpose of these presents,

PARTIES OF THE OTHER PART.

AND THE SAID parties have made between themselves the following declarations and stipulations, that is to say:—

Whereas the said party of the one part is the owner of an Ice-House built upon the lot number Two thousand five hundred and twenty-five (2525) upon the official plan and book of reference of the cadastre for Champlain Ward of the city of Quebec;

Whereas, moreover, that on account of the construction of the Transcontinental railway through the said lot, the said ice-house must be removed;

Whereas, lastly, that the said party of the one part is ready to accept an indemnity as a compensation for the damages caused him by the demolition of the said ice-house;

Therefore, the presents bear evidence that the said party of the one part, in consideration of the sum of Two thousand five hundred dollars (2,500.00) which he acknowledges to have received from the said parties of the other part, upon the execution of the presents, hereby gives the latter a full and final receipt for all the damages caused him on account of the demolition of the said ice-house, and the said party of the one part further pledges himself to demolish the said ice-house at his own expense between now and the first day of December next, and he may keep the materials of the said building.

At these presents have also appeared:—

Mr. THOMAS GAGNON, acting at the presents as sole representative of "Gagnon & Frère,"

WHO, after having had communication of the present deed, declared himself satisfied and consented that it be executed according to its form and purport.

The present ratification is thus agreed by which the said Jules Grenier has agreed to a guarantee sale (dotière) in payment to the appearing for the said ice-house according to the terms of a deed passed before Jos. Allaire, Notary, on the second day of November, 1909, and registered at Quebec, under number 130216.

DONE AND PASSED at Quebec, on the day and in the year aforesaid, under number six thousand one hundred and fifty-four of the minutes of the said C. E. Taschereau.

In WITNESS WHEREOF, the parties have signed with the said Notary, after the same being read.

(Signed) "S. N. PARENT."
" "THOS. GAGNON."
" "JULES GRENIER."
" "C. E. TASCHEREAU, N.P."

A true copy of the minute remaining of record in my office.

(Signed) C. E. TASCHEREAU,
N.P.

(VOUCHER.)

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY.

To A. E. DOUCET, on % of Right-of-Way,

DR.

JULES GRENIER,
Quebec.

1911-12.

1911			
Sept. 23	For compensation for removal of Ice House, and damages—Cadastral No. 2525, Champlain Ward, City of Quebec, Province of Quebec....	$2,500.00	$2,500.00

Correct,
28 Sept., 1911.
(Sgd.) A. TREMBLAY.

Date, Sept. 30th, 1911. RECEIVED FROM The Commissioners of the Transcontinental Railway the sum of Two Thousand Five Hundred..... .....Dollars, in full settlement of the above account.

(Sgd.) JULES GRENIER.

Correct, Approved by Board,

Sept. 26, 1911,

D, HOCTOR. P. E. RYAN,
Chief Accountant. *Secretary.*

No. 137512. This Deed of Acte d' Accord was entered and registered in the Registry Office for the Registration Division of Quebec, at ten minutes past two o'clock p.m., on the third day October, nineteen hundred and eleven, as number one hundred and thirty thousand five hundred and twelve, in Vol. 253, page 58.

(Sgd). REMILLARD & ROY,
Dep. Registrar.

IN THE YEAR ONE THOUSAND NINE HUNDRED AND ELEVEN, on the second day of the month of October.

BEFORE CHARLES EDMUND TASCHEREAU, Notary Public for the Province of Quebec, residing and practising in the City of Quebec,

APPEARED:—

MR. RAOUL R. BERGEVIN, of the City of Quebec, merchant tailor,

PARTY OF THE ONE PART,,

AND THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY, a body politic duly incorporated, having its head-office in the City of Ottawa, in the Province of Ontario, and here represented by the Honourable S. N. Parent, its President, duly authorized,

PARTIES OF THE OTHER PART.

And the said parties have made between themselves the following declarations and stipulations, that is to say:—

Whereas the said parties of the other part, for the ends of their railway line, require the demolition of a certain ice-house belonging to the said party of the one part, and situate on the lot number Two thousand four hundred and sixteen (2416) on the official plan and book of reference of the cadastre for Champlain Ward, in the City of Quebec;

Whereas, moreover, that the said party of the one part is ready, in consideration of a certain indemnity, to consent to the demolition of the said ice-house;

Therefore the presents bear evidence that the said party of the one part in consideration of the sum of Two thousand five hundred dollars ($2,500.00) which he acknowledges to have received from the said parties of the other part, upon the execution of the presents, gives the latter a full and final receipt for the damages caused him by the demolition of the said Ice-House.

DONE AND PASSED at Quebec, on the day and in the year aforesaid, under the number six thousand one hundred and fifty-nine of the minutes of the said C. E. Taschereau.

IN WITNESS WHEREOF, the parties have signed with the said Notary, after the same being read.

(Signed) "S. N. Parent."
" "RAOUL R. BERGEVIN."
" "C. E. TASCHEREAU, N.P."

A true copy of the minute remaining of record in any office.

(Signed) C. E. TASCHEREAU, N.P.

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY.

To A. E. DOUCET, on % of Right-of-way,

DR.

RAOUL R. BERGEVIN,
Quebec City. 1911–12.

1911

Sept. 28 For compensation for removal of Ice House, and damages—Cadastral No. 2416, Champlain Ward, Quebec City.....$2,500.00 $2,500.00

Correct,
2 Oct., 1911.
A. TREMBLAY.

Date Oct. 2nd, 1911. RECEIVED from the Commissioners of the Transcontinental Railway the sum of TWO THOUSAND FIVE HUNDRED DOLLARS in full settlement of the above account.

RAOUL R. BERGEVIN.

Correct,

D. HOCTOR,
Chief Accountant.

Approved by Board,
Sept. 29, 1911,
P. E. RYAN,
Secretary.

No. 137,694. This deed of Acte d'Accord was entered and registered in the Registry Office for the Registration Division of Quebec, at forty minutes past two o'clock, p.m., on the twentieth day of the month of October, nineteen hundred and eleven, under the number One hundred and thirty-seven thousand six hundred and ninety-four, B. vol. 253, page 69.

REMILLARD & ROY,
Dep.-Registrar

On the seventh day of December in the year of Our Lord one thousand nine hundred and eight. Before me Alfred C. Dobell the undersigned witness personally appeared:

Adolph Chevalier of the City of Quebec, labourer:

Who acknowledged and confessed to have demised and leased, and by these presents do demise and lease for the space of three years, to be computed from the 1st May, 1909, and which will end on the 1st day of May, 1912, unto Napoleon Martineau, Junior, of the City of Quebec, ice merchant, hereto present, that is to say, a piece of land measuring forty five feet by fifty feet on the east side of the ice house built on the property already leased by the said Napoleon Martineau from Duchess Bassano, the whole of the land being part of that lot known on the Cadastral plan and in the book of reference thereto for Champlain Ward in the City of Quebec under number two thousand five hundred and twenty five (2525) no warranty as to exact measurement, whereof the Lessee is content and satisfied.

During all which the said Lessor does hereby promise and engage to cause the said Lessee to enjoy the said premises peaceably and quietly, save and except by giving a six months notice at the expiration of which the lease shall expire.

And the said Lessee does hereby promise and engage to submit and conform to all regulations of Police in regard to the said premises, now in force or which be hereafter established by competent authority, for maintaining the cleanliness of the City, and of the streets, lanes, yards and houses therein; not to make over or sub-let his r ght to the present lease without the consent in writing of the Lessor, and to surrender the said premises at the expiration of the present lease without any previous notice to quit being required, or to quit at the expiration of six months after receiving notice to that effect.

The present lease is thus made for and in consideration of the sum of one hundred and fifty dollars current money in three equal payments, the first payment to be made on the first of May, 1909, of the sum of fifty dollars, the other two payments to be made on the first of May, 1910 and 1911, of the sum of fifty dollars each; should the Lessor take advantage of his right to terminate the present lease before the end of three years then the Lessee shall pay the balance due within three months from the date of receiving notice to quit the premises.

And for the due execution of these presents, the said parties have made election of domicile irrevocable to wit: the Lessor at his house in Champlain Street in the City of Quebec, where payment shall be made and the Lessee on the premises hereby leased.

Done and passed at the City of Quebec, and signed by the said parties these presents having been first duly read.

ADOLPHE CHEVALIER,
N. MARTINEAU, JR.

ALFRED C. DOBELL,
Witness.

On this day the first of October in the year one thousand nine hundred and eight.

Before me the undersigned William Noble Campbell, Notary Public for the Province of Quebec in Canada, residing and practising in the City of Quebec.

Personally came and appeared Alfred Curzon Dobell, of the said City of Quebec, Advocate, acting herein in his capacity of the duly appointed Attorney of the Duchess of Bassano of the City of Paris in the Republic of France under her Power of Attorney executed before witnesses at Paris aforesaid on the twenty-eighth of March nineteen hundred and six, who in the presence of me, the said Notary, did and by these presents doth lease and demise for the space and term of three years to begin and be computed from the first day of May next (1909) and fully to be completed and ended on the thirtieth day of April in the year one thousand nine hundred and twelve, unto Adolphe Chevalier, of the said City of Quebec, ship carpenter, also present and accepting hereof for himself, his heirs and assigns, as follows, that is to say:

That certain lot of land or cove and premises now known and designated upon the plan and in the book of reference thereto of the Cadastre for Champlain Ward of the said City of Quebec under the number two thousand five hundred and twenty-five (2525) together with the buildings thereon circumstances and dependencies, save and except that portion of the said lot now occupied by N. Martineau, Junior, for an ice-house measuring about thirty-seven feet by sixty feet, without any warranty as to the exact measurement of the property hereby leased.

And of all which the said Lessee doth declare to have a perfect knowledge, having seen and visited the same, and is content and satisfied therewith.

To have and to hold the said premises hereby leased and demised, or intended so to be, unto the said Lessee his heirs, executors or curators, without let or hindrance for and during the said term, subject to his enjoyment thereof "en bon père de famille," and to the maintenance of the house on said lot in all small and internal repairs for which tenants are by law responsible, the said Lessor being holden to keep and maintain the house on said lot "clos et couverts" and in all "grosses reparations" according to law, also subject by the said Lessee to the observance of the "voyerie" and all rules and regulations of the Police, the City of Quebec the Board of Health and other constituted authorities, which may in any manner concern the said premises; that he shall not sublease or underlet the said premises or any part thereof without permission in writing from the said Lessor; and that he shall and will, on the end and expiration of the present lease, and without any previous notice to that end, peaceably and quietly surrender and deliver up the said premises in as good order and repair as the same may have been at the commencement of the present lease, reasonable allowance being made for wear and accidents by fire, and other fortuitous causes and events excepted, notwithstanding any presumption in law in favour of the Lessor in relation thereto.

The present lease is thus made and granted for and in consideration of the following rents or annual amounts, that is to say, 1. The sum of three hundred and fifty dollars for the first year (expiring on the thirtieth of April (1910) of the present lease, one half of which or the sum of one hundred and seventy-five dollars, the said Lessee doth hereby bind himself to pay unto the said Alfred C. Dobell acting as aforesaid or the bearer of these presents on the second of July next (1909) and the remaining half or a like sum, on the second of January following (1910), 2. The sum of three hundred and seventy-five dollars for the second year of the present lease (expiring on the thirtieth of April, 1911) one half of which or the sum of one hundred and eighty-seven dollars and fifty cents, the said Lessee doth hereby bind himself to pay unto the said Alfred C. Dobell acting as aforesaid or the bearer of these presents on the second of July, nineteen hundred and ten, and the remaining half or a like sum, on the second of January following (1911). 3. The sum of four hundred dollars for the third year of the present lease (expiring on the thirtieth of April, 1912), one half of which or the sum of two hundred dollars, the said Lessee doth hereby bind himself to pay unto the said Alfred C. Dobell, acting as aforesaid or the bearer of these presents on the second of July, nineteen hundred and eleven, and the balance or a like sum, on the second of January following (1912). The said rents shall include all taxes, dues and assessments in each of the current years thereof.

Should the said Lessee fail to pay the rent on any of the above stipulated dates when it shall become due as aforesaid, then and in that case the said Lessor shall have the right forthwith of cancelling and resiliating the present lease and of entering into and taking possession of the premises hereby leased.

It is further agreed that the said Lessor shall at all times have the right of cancelling the present lease by giving six months clear notice in writing unto the said Lessee of his intention so to do, in which case the said Lessee hereby agrees to vacate the said premises so soon as the said period of six months shall have expired.

And it is further and lastly agreed by and between the said parties that the said Lessor shall and will have the right and liberty of causing to be made any repairs or ameliorations to the said premises that may be found necessary during the said term, without being liable to damages or any deduction from the rent aforesaid. And for any execution of these presents the said Lessee hath made election of domicile irrevocable at the premises above leased and the said Lessor at the office in Quebec of her said Attorney.

Thus done and passed at the said City of Quebec, these presents recorded in the office of me, the said Notary, under the number six thousand nine hundred and fourteen.

In witness whereof the said parties have signed these presents with me the said Notary, the same being first duly read according to law.

(Signed) ALFRED C. DOBELL, Attorney.
ADOLPHE CHEVALIER.
W. NOBLE CAMPBELL, Not. Pub.

A true copy of the original hereof remaining of record in my office.

W. NOBLE CAMPBELL,
Not. Pub.

IN THE YEAR ONE THOUSAND NINE HUNDRED AND ELEVEN, on the Twentieth day of September, before Joseph Allaire, Notary Public, for the Province of Quebec, residing in the city of Quebec, undersigned:

APPEARED:—

MRS. MARGUERITE LEBEL, of the city of Quebec, widow of Thomas Chevalier, in his life-time, a boat-man.

Who has, by these presents, sold with warranty against all seizures and claims whatsoever, to Mr. Raoul R. Bergevin, merchant, of the city of Quebec, here present and accepting, vendee, that is to say.

All her rights of property, claims and interests she has on a slip and all its appurtenances presently situated on the lot of land known under the number Two thousand five hundred and twenty-five (2525) of the official Cadastre of Champlain Ward of the city of Quebec.

The said slip and its appurtenances belong to the said Mrs. Chevalier, widow, as the residuary legatee of the property of the said late Thomas Chevalier, her husband, by virtue of the latter's will received before Louis Parant, Notary, on the tenth day of January, nineteen hundred and eight.

For the said Raoul R. Bergevin to acquire, enjoy do and dispose of the said slip and its appurtenances in full and entire possession from this day and always and with immediate possession, the said lady vendor making by these same presents the real delivery of the said slip and its appurtenances.

The present sale is made for the sum of five hundred dollars ($500.00) which the said vendor acknowledges and confesses to have received from the said vendee to her full satisfaction, receipt whereof.

DONE AND PASSED at Quebec, in the office of the said Jos. Allaire, Notary, on the day and in the month and year aforesaid, under the number fifteen thousand three hundred and forth-six of the minutes of the undersigned notary, and after the same being read; the vendor declared she could not sign in presence of Joseph Chevalier, carpenter, of this city, witness required and who has signed in presence of the said notary and of the said vendee.

(*Signed*) "JOSEPH CHEVALIER"
" "RAOUL R. BERGEVIN"
" "JOS. ALLAIRE, N. P."

A true copy of the minute remaining in my office.

JOS. ALLAIRE, N. P.

IN THE YEAR ONE THOUSAND NINE HUNDRED AND ELEVEN, on the Eleventh of October.

Before LOUIS PARANT, Notary Public for the Province of Quebec, residing and practising in the city of Quebec, undersigned,

Appeared MR. RAOUL BERGEVIN, mechant, of the city of Quebec;

Who has, by these presents, reconveyed, with warranty, to MRS. MARGUERITE LEBEL, of the said city of Quebec, WIDOW OF THOMAS CHEVALIER, in his life time also of Quebec, boat-man, here present and accepting, transferee, that is to say:

All his rights of property, claims and interests which he has upon a slip and its appurtenances, presently situate on the lot of land known under the number Two thousand five hundred and twenty five (2525) of the official Cadastre of Champlain Ward of the city of Quebec.

The said slip and its appurtenances belong to the said Raoul R. Bergevin by his having purchased them from the said Mrs. Chevalier as shown by a deed of sale agreed to by the said Mrs. Chevalier in favour of the said Mr. Bergevin, before Joseph Allaire, Notary, at Quebec, on the twentieth day of September, one thousand nine hundred and eleven last.

For the said Mrs. Thomas Chevalier, widow, to enjoy, do and dispose of the said slip and its appurtenances in full and entire property from this day and always, just as if she had never sold them to the said Raoul R. Bergevin, and with immediate possession in favour of the said Mrs. Chevalier, the said vendor reconveying to her by these same presents the real delivery of the said slip and its appurtenances.

The present retrocession is made for the sum of five hundred dollars ($500.00) which the said Mrs. Bergevin acknowledges and confesses to have received, this day, from the said vendee to his entire satisfaction, receipt whereof.

Done and passed at Quebec, under the number one thousand two hundred and eighty-six of the minutes of the said Louis Parant.

In witness whereof, the said Mr. Bergevin has signed with the said Notary, the said Mrs. Chevalier, being required to do so, declared she could not sign, in the presence of Arthur Belanger, of Quebec, advocate, who has signed as a witness with the said Notary, after the same being read.

(*Signed*) "ARTH. BELANGER"
" "RAOUL. R. BERGEVIN"
" "LOUIS PARANT, N. P."

A true copy of the minute remaining in my office.

LOUIS PARANT, N. P.

IN THE YEAR ONE THOUSAND NINE HUNDRED AND ELEVEN, on the Eleventh of October.

Before LOUIS PARANT, Notary public for the Province of Quebec, residing and practising at Quebec, undersigned:

APPEARED Mrs. Marguerite LeBel, of the city of Quebec, widow of Thomas Chevalier, in his life-time also of Quebec, Boatman.

Who has, by these presents, sold with all ordinary guarantees and of right, to MR. ADOLPHE CHEVALIER, of the said city of Quebec, Contractor, here present and accepting, vendee, that is to say:—

All her rights of property, claims and interests, which she has on a slip and its appurtenances, presently si uated on the lot of land known under the number Two thousand five hundred and twenty-five (2525) of the official Cadastre of Champlain Ward of the City of Quebec.

The said slip and its appurtenances belonging to the said Mrs. Chevalier by virtue of good and legal titles.

For the said Mr. Adolphe Chevalier to enjoy, do and dispose of the said slip and its appurtenances in full and entire property from this day and always with immediate possession, the said Mrs. Chevalier transferring to him by these same presents the real delivery of the said slip and its appurtenances.

The present sale is made for the sum of four hundred dollars ($400.00) which the said Mrs. Chevalier acknowledges and confesses to have received, this day, from the said vendee to her full satisfaction, receipt whereof.

Done and passed at Quebec, under the number one thousand two hundred and eighty-seven of the minutes of the said Louis Parant.

In witness whereof the said Mr. Adolphe Chevalier has signed with the said notary, the said Mrs. Chevalier, required to do so, has declared that she could not sign, in the presence of Arthur Doré, of Quebec, labourer, who has signed as a witness, with the said notary, after the same thing being read.

(*Signed*) "ARTHUR DORE."
" "ADOLPHE CHEVALIER."
" "LOUIS PARANT, N. P."

A true copy of the minutes remaining in my office.

LOUIS PARENT, N. P.

QUEBEC, July 26th, 1911.

ADOLPHE CHEVALIER, ESQ.,
Grand Union Hotel,
Ottawa.

DEAR SIR:—

I send you to-night a telegram asking you to call me up by telephone; I have something important to tell you before you see your man. It is preferable to call me either at my private residence, 3083, or at my office, 1951. When you return to Quebec, please come and see me as I have a cheque for you and what I have to tell you is most important.

Yours truly,

O. MORENCY.

Mr. Scott, one of our valuators, is of opinion that the estimate of $3,000.00 for damages to Chevalier Ship repairing plant is insufficient. Chevalier repairs a great number of vessels there every year and he says that his profits amount to $4,500.00 per annum. This may be an exaggeration but he will be deprived of his business and $6,000.00 would not seem to be an excessive compensation.

La Marquise de Bassano	$59,764.94
Grenier	3,231.36
Martineau	3,703.52

T.D. Form 1B.

CANADIAN PACIFIC RAILWAY COMPANY'S TELEGRAPH.

QUEBEC, 26th July, 1911.

a267 ra fe x 6

ADOLPHE CHEVALIER,
Care Grand Union Hotel, Ottawa, Ont. Please call me on phone immediately.

O. MORENCY.

5.46 p.m.

On the seventh day of December in the year of Our Lord one thousand nine hundred and eight. Before me, Alfred C. Dobell the undersigned witness personally appeared

Adolph Chevalier of the City of Quebec, laborer.

Who acknowledged and confessed to have demised and leased, and by these presents do demise and lease for the space of three years may be computed from the 1st May, 1909, and which will end on the 1st day of May, 1912, until Napoleon Martineau, Junior, of the City of Quebec, Ice Merchant, hereto present, that is to say a piece of land measuring forty-five feet by fifty-five feet on the east side of the ice house built on the property already leased by the said Napoleon Martineau from Duchess Bassano, the whole of the land being part of that lot known on the Cadastral plan and in the book of reference thereto for Champlain Ward in the City of Quebec under number two thousand five hundred and twenty-five (2525) no warranty as to exact measurement, whereof the Lessee is content and satisfied.

During all which the said Lessor does hereby promise and engage to cause the said Lessee to enjoy the said premises peaceably and quietly, save and except by giving a six months notice at the expiration of which the lease shall expire.

And the said Lessee does hereby promise and engage to submit and conform to all regulations of Police in regard to the said premises, now in force or which be hereafter established by competent authority, for maintaining the cleanliness of the City, and of the streets, lanes yards and houses therein not to make over or sub-let his right to the present lease without the consent in writing of the Lessor, and to surrender the said premises at the expiration of the present lease without any previous notice to quit being required, or to quit at the expiration of six months after receiving notice to that effect.

The present lease is thus made for and in consideration of the sum of one hundred and fifty dollars current money in three equal payments, the first payment to be made on the first of May, 1909, of the sum of fifty dollars, the other two payments to be made on the first of May, 1910 and 1911 of the sum of fifty dollars each, should the Lessor take advantage of his right to terminate the present lease before the end of three years then the Lessee shall pay the balance due within three months from the date of receiving notice to quit the premises.

And for the due execution of these presents, the said parties have made election of domicile irrevocable, to wit: the Lessor at his house in Champlain Street, in the City of Quebec, where payment shall be made and the Lessee on the premises hereby leased.

DONE AND PASSED at the City of Quebec, and signed by the said parties, these presents having been first duly read.

ADOLPHE CHEVALIER,
W. MARTINEAU.

ALFRED C. DOBELL,
Witness.

This agreement witnesseth that Dame Mary Ann Lampson, widow of the late William Godfrey Wurtele, Esquire, Merchant, now deceased, Miss Caroline Lampson, Spinster, and Frederick Lampson, Esquire, Advocate, all of the City of Quebec, did and by these presents do demise and lease for the term of four years, to commence and be computed from the first day of October, one thousand nine hundred and eight, and fully to be completed and ended on the last day of September, one thousand nine hundred and twelve, unto Mr. Alfred Miller of the City of Quebec,

Carter and Ship Laborer hereunto also present and accepting hereof for himself, his Heirs and Assigns. That is to say: A Lot of Ground situated on, and adjoining the river side of Champlain Street at the place called *l'ans. dès Méres*, in the City of Quebec, being sixty feet, English measure in front on Champlain Street by forty feet also English measure in depth, said lot to commence from a point on Champlain Street forty five and a half feet from the south west corner of the house now occupied by Messrs. James O'Neill and A. P. Fortier (*No.* 555–57 *Champlain Street*) and to run thence in a south westerly direction along Champlain Street aforesaid, said lot of ground hereby leased forming part of Lot number Two thousand four hundred and sixteen (*No.* 2416) of the *Cadastre* for Champlain Ward of the City of Quebec, and with all which the said Lessee is content and satisfied, having seen and visited the same.

TO HAVE AND TO HOLD the premises above described and leased with all and every the rights, privileges and appurtenances thereof unto the said Lessee, his Heirs and Assigns for and during the aforesaid term thereof, during all which time the Lessors do hereby promise and bind themselves to cause the said Lessee to enjoy the premises hereby leased peaceably and quietly, it being specially agreed that the said Lessors shall not be bound to make or cause to be made, any repairs whatsoever either *grosses* or *menues réparations* to the said premises, nor to keep the same wind or water tight.

And on his part the Lessee doth hereby promise and bind himself to use and enjoy the said premises hereby leased peaceably and quietly, *en bon père de famille*, to maintain the same in all repairs, to submit and conform to all rules and regulations of police with respect to the said premises, to cause the chimnies in the said premises to be regularly swept during the said term at cost and expense, not to assign or make over his rights to the present lease to any person or persons whomsoever or to sublet the premises hereby leased without the actual consent in writing of the said Lessors under pain of all costs losses and damages and of nullity of the present lease at the option of the Lessors; And finally to surrender the said premises at the expiration of the present lease without notice in good order and condition (reasonable wear and tear always excepted), It is also expressly understood and agreed that should the said Lessors, their Heirs or Assigns, at any time before the expiration of the present Lease sell or let the wharf or Yard of which the Lot of ground hereby leased forms part, they the said Lessors, their Heirs or Assigns shall have the right to terminate the present Lease, by giving to the said Lessee his Heirs or Assigns one month's notice in writing to that effect,—but without any indemnity whatever to be paid by the said Lessors, their Heirs or Assigns to the said Lessee his Heirs or Assigns, for any loss, damage or injury caused by such termination of the present Lease.

The present lease is thus made for and in consideration of the rent or sum of—sixty-six dollars and sixty-six cents (Assessments and Water Rates to be paid by the Lessee, including the proprietors' portion thereof which the said Lessee doth bind and oblige himself to pay to the Lessors or to their order on the first day of September in each year. Said assessments and taxes, including the proprietors' portion thereof as aforesaid, to be so paid by the said Lessee either to the City of Quebec, or to the Lessor, on or before the first day of December in each current Fiscal Year.

And for the due execution of these presents the said parties made election of their domiciles irrevocable, to wit, the Lessors at the actual residence of the said Frederick Lampson where, or at such other place in the City of Quebec as the said Lessors shall designate, the payments shall be made, and the Lessee on the premises hereby leased.

THUS DONE AND PASSED, in Duplicate, at the City of Quebce, on the twelfth day October one thousand nine hundred and eight.

In faith and testimony whereof the said parties have to these presents, first duly read according to Law, set and subscribed their names and signatures.

M. WURTELE.
CAROLINE LAMPSON
FREDK. LAMPSON.
ALFRED MILLER.

An additional piece of ground to enlarge the Ice House being 60 x 24 feet, was taken from the 1st December, 1909, at the same rent in proportion to size of ground making forty dollars a year payable on the 1st September each year.

Quebec, 23rd August, 1911.

FREDK. LAMPSON,
for Heirs WM. LAMPSON.
ALFRED MILLER.

To.....
.....
.....
of the.....of.....
.....
.....
and to all to whom these presents shall come or to whom the same may in any wise concern.

WHEREAS the lands shown upon and described in the annexed plan and description have under the provisions of The National Transcontinental Railway Act 3, Edward VII, Cap. 71, section 13, been taken by His Majesty the King, acting through "The Commissioners of the Transcontinental Railway" for the purposes of a public work known as the National Transcontinental Railway, the construction of which public work is under the charge and control of the said "The Commissioners of the Transcontinental Railway" by the depositing of record in the office of the Registrar of Deeds for the.....
of .....in the Province of Quebec on the.....day of.....19....
of a duplicate of the said plan and description of the said lands.

AND WHEREAS no compensation money has yet been paid by or on behalf of His Majesty for the said lands.

AND WHEREAS the said lands have been found to be unnecessary for the purposes of the said public work and the undersigned have decided not to take the said lands for the purposes of the said Railway.

NOW, THEREFORE, pursuant to and by virtue of the provisions of section 23 of the Expropriation Act R. S. C. 1906, Cap. 143 and of section 207 of the Railway Act R. S. C. 1906, Cap. 37 and section 15 of the National Transcontinental Railway Act 3, Edward VII, Cap. 71 and in pursuance of any other authority in this behalf vested in the undersigned, the undersigned do hereby declare and notify you that the said lands are not required for the purposes of the said Railway and that the said lands and the proceedings aforesaid are hereby abandoned by the Crown and by the said "The Commissioners of the Transcontinental Railway."

IN WITNESS WHEREOF the Minister of Railways and Canals has hereunto set his hand and "The Commissioners of the Transcontinental Railway" have caused these presents to be executed and the corporate seal of the Commissioners to be affixed under the hand of the Commissioner and Secretary this..... day of.....1912.

Minister of Railways and Canals.

Exhibit referred to in evidence as No. 6 is large photograph of Skidway—on fyle with Investigating Commission.

N .T. R.

INVESTIGATING COMMISSION

Exhibit 40

Statement of Gravity Water Supplies.

(See Page 138 of Report)

N. T. R.

GRAVITY WATER SUPPLIES

Districts A. B. and F.—Statement showing cost, etc., and where saving might have been effected by use of pumps in place of gravity supplies (values capitalized at 4%)

Mileage	Location	Pump or Gravity	Dia. of Supply Pipe	Length of Pipe Line	Head to centre of tub.	Discharge per 24 hours	Maximum Consumption per 24 hrs.	Cost of Installation	Cost per 1,000 galls of water used	Cost of pump in lieu of Gravity	Cost per 1,000 galls pumped	Saving per annum	Saving	Remarks
11.0	.....	Gravity...	4". C.I.	4600'	19'	62,000	40,000	$7,659.90	2.1c					
40.0	Pangburn....	" ...	6". C.I.	10,606	5'	61,300	40,000	21,703.16	5.9c	$4,000.00	4.66c	.....	$17700.00	.....
56.5	Chipman.....	" ...	4". C.I.	8,100	44'	72,600	40,000	12,622.54	3.4c	.....	.....	.....	.....	.....
80.0	Bantalorum..	" ...	6". C.I.	6,768	25'	169,000	40,000	15,166.37	4.1c	.....	.....	.....	.....	.....
118.0	Napadogan...	" ...	4". C.I.	5040	56'	.....	125,000	11,885.71	1.04c	.....	.....	.....	.....	Divisional Point
146.0	Summit.....	" ...	6". C.I.	1,068	7'	129,000	40,000	2,191.67	0.6c	.....	.....	.....	.....	.....
159.0	Beaver Brook	" ...	6". C.I.	12,298	39'	156,400	40,000	22,326.13	6.1c	5,000.00	4.94c	.....	17,300.00	.....
177.0	Blue Bell....	" ...	6". C.I.	10,000	40'	175,400	40,000	17,526.88	4.8c	3,000.00	4.39c	.....	14,500.00	.....
205.6	St. Leonards.	" ...	6". C.I.	12,002	15'	101,400	40,000	22,725.62	6.2c	4,000.00	4.66c	.....	18,700.00	.....
252.0	Baker Lake..	" ...	4". C.I.	2,227	113'	220,000	40,000	6,783.32	1.8c	.....	.....	.....	.....	.....
B														
85.0	Roberge.....	" ...	6". Cl..	2,870	61'	.....	40,000	11,375.21	3.2c	.....	.....	.....	.....	.....
141.0	Ludger Noel..	" ...	6". C.I.	780	15'	.....	40,000	2,512.80	0.7c	.....	.....	.....	.....	.....
154.5	Lac-à-Shea...	" ...	6". C.I.	500	11'	.....	40,000	1,124.91	0.3c	.....	.....	.....	.....	.....
F														
19.0	Webster.....	" ...	.....	10,428	38'	.....	40,000	12,771.35	3.6c	.....	.....	.....	.....	.....
	Reddit.....	" ...	.....	3,220	21'	.....	125,000	13,015.31	1.2c	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Divisional Point
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
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													$68200.00	