EXHIBIT No. 73h.

(Letterhead Phœnix Bridge Co.)

PHŒNIXVILLE, Pa., August 12, 1905.

THEODORE COOPER, ESQ.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—We send you to-day in duplicate shop drawing of upper section sub-post S. P. 5, and also shop drawings of side struts.

Please notice that the section of the sub-post is increased owing to the manner in which theseveral truss members will be placed in position during erection.

We find that this sub-post receives its stress during erction of 1,200,000 pounds for which we provided 74·7 sq. in., using formula p=27-112l/r

Hoping you will return with your approval,

Yours truly,

The PHOENIX BRIDGE COMPANY,
Per P. L. SZLAPKA.

EXHIBIT No. 73i.

PHŒNIXVILLE, April 6, 1907.

THEODORE COOPER, C. E.,
Consulting Engineer for the Quebec Bridge Co.,
New York.

DEAR SIR.—Beg to acknowledge receipt of your favour of April 5, in reference to post sections C. P1 (R. and L.) C. O. 613.

These post sections I believe are satisfactory in every other respect, but we will make another inspection of them before shipment, as they have laid around the yard for quite a long time.

In reference to chord 10 LCO 622 which had been injured here in handling, would report that the ribs have now been straightened to our satisfaction. It was deemed best by the shop to heat some of the angles slightly at two points where outstanding legs were bent a little. After all work was done we examined the angles and ribs with magnifying glass and discovered no cracks. We have therefore accepted the chord as per your instructions.

Yours truly,

E. L. EDWARDS,

EXHIBIT No. 73j.

August 9, 1907.

JOHN STERLING DEANS, Esq.,
Chief Engineer, Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR.—Your telegram regarding chord joint at hand. The method proposed as sketched by Mr. McLure is not satisfactory as I telegraphed yesterday. These bent

webs can be pulled back by use of about 15 to 20 one inch bolts (in one and one sixteenth holes) threaded at both ends for nuts, passing from the outer to the inner bent webs. The outer straight web being stayed in some manner against its bending.

If the bent webs, after being pulled into line, tend to go back when released from the bolts, stays must be introduced to hold them in position. Possibly it may be necessary to permanently rivet in some of these one inch bolts.

Please let me know what method you propose to use.

It is a mystery to me how both these webs happened to be bent at one point and why it was not discovered sooner.

Yours truly,

THEODORE COOPER,

EXHIBIT No. 73k.

August 13, 1907.

N. R. McLURE, Esq., Insp. for
erection Quebec Bridge,
New Liverpool, P. Q., Can.

DEAR SIR,—Mr. Deans writes me that only one rib at joint 7 and 8 L is bent and that there is a full and complete bearing. That the bend was no doubt put in the chord in the shop before facing.

I have asked him to instruct his resident engineer to join with you in making an exact report, with dimensions, of the condition of this joint; with amount of bearing and if it is a square bearing or askew.

In reference to the splicing of T5 and T50 mentioned in your letter of 10th, I do not care to interfere with the regular programme as I have not followed the various actions of the loadings at different stages. Without going into it carefully, I think there will be more compression at these points, with more of the suspended span in place.

Please report promptly respecting joints 7 and 8 L with all the facts,

Yours truly,

THEODORE COOPER,

EXHIBIT No. 731.

August 21, 1907.

JOHN STERLING DEANS, Esq.,
Chief Engineer, Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—I received copy of sketch of joint 7 and 8 L a few days ago.

I wrote Mr. McLure last week telling him none of the theories as to how this bending occurred were logical. That my theory was a blow on this rib after the two sections were in contact and that it probably was done in moving those suspended beams used in covering. To examine carefully to see if he could find any evidence of this. He has not yet reported. He did report a similar bend at L 8 and 9 west truss in same rib but of less amount.

I still believe this bend can be partly removed by use of long bolts with threads

at each end, outer rib being properly stiffened to prevent its bending. If it can be pulled nearer straight stays or bolts must be provided to hold it against future movement.

I cannot consent to let it go without further action, as the rivets in the cover splices would not satisfy the requirements to my mind.

Yours very truly,

THEODORE COOPER.

EXHIBIT No. 73m.

August 26, 1907.

JOHN STERLING DEANS, Esq.,
Chief Engineer, Phœnix Bridge Company,
Phœnixville, Pa.

DEAR SIR,—Mr. McLure reports he can find no evidence of the bent ribs having been hit, and does not think they could have been struck. This only makes the mystery the deeper, for I do not see how otherwise the ribs could have been bent.

When convenient I would like to discuss with Mr. Szlapka the best means of getting these ribs into safe condition to do their proper work.

Yours truly,

THEODORE COOPER.

EXHIBIT No. 73n.

August 31, 1907.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge Co.,
Quebec, Canada.

DEAR SIR,—Mr. Cooper has directed me to send to you the enclosed copies of letters and telegrams in regard to condition of chord joint 7-L and 8-L, south cantilever arm, Quebec bridge, etc., that all evidence in Mr. Cooper's possession will be in your hands, this in connection with Mr. McLure's letters, copies of which are in his possession.

Mr. Cooper takes the trouble very seriously, and is not in condition to write.

Yours very truly,

BERNT BERGER,
Asst. to Mr. Cooper.

EXHIBIT No. 73o.

Sept. 2, 1907.

MY DEAR MR. HOARE,—If I were a well man I feel it would be my duty to be with you, accepting all the responsibility of my position. But I know I should be of no use if there, as I could not stand the physical test.

I believe I can be of more use by staying here and keeping what strength is left me. There is nothing to be hidden in my position. Regardless of how it may affect me or my reputation, you shall have every assistance and any record or knowledge I have.

In my own depression I have not forgotten that sympathy is due to you all. May we get the truth regardless of whom it may affect. The cause of mankind is greater than any individual.

Yours sincerely,

THEODORE COOPER.

This is the first letter I have been able to write to any one.

EXHIBIT No. 73p.

Oct. 4, 1907.

Mr. C. SCHNEIDER,
Consulting Engineer,
Pennsylvania Building,
Philadelphia, Pa.

DEAR SIR,—Mr. Cooper has directed me to inform you that in addition to the instructions as to the wind strains laid down in Mr. Cooper's modifications of the load and strain specification for the Quebec bridge, he ordered, in a letter to Mr. P. L. Szlapka, of the Phœnix Bridge Company, dated June 13th, 1905, that for the cantilever arms the full wind on the suspended span should be considered, as a tornado might strike over this area.

Also, Mr. Cooper has made a note on his first copy of the modifications of strain and load specifications that he had directed that 1,600 lbs. of snow per foot of bridge should be used.

Yours very truly,

BERNT BERGER.

EXHIBIT No. 74a.

Feb. 4, 1901.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge Co.,
Quebec, Canada.

DEAR SIR,—I acknowledge receipt of your favour of Jan. 31st, giving us final elevation of viaduct piers, length of approach spans, etc., for your bridge, and we will arrange our diagrams and details accordingly. We hope to get off to you, either to-day or to-morrow, copies of these trial diagrams and estimates as you request, so that you can fix final units.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74b.

Feb. 25, 1901.

(Personal.)

DEAR MR. HOARE,—In checking over the proposed form of formal contract for the main structure at Quebec, we find some little trouble in meeting the wishes of your people and the requirements thrown around payments of subsidies. In work of this

magnitude it is not only usual, but necessary, to have arrangements made for *progress monthly* estimates, as we have outlined in our proposed form of agreement. Will you kindly advise me the present status of all subsidies, whether they are all operative and whether payments have been made for substructure under any or all of them; and if so, how and when these payments were made. Were they made on materials at quarry or at site, simply delivered or actually in place? Information of this kind will assist us. Please write me promptly, and oblige,

Yours,

JNO. STERLING DEANS.

Mr. E. A. HOARE,
Quebec, Canada.

EXHIBIT No. 74c.

March 26, 1901.

(Personal.)

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge Co.,
Quebec, Canada.

DEAR MR. HOARE,—I have your personal letter of March 22nd. Mr. Szlapka tells me that only yesterday, while working over the second or third plan for the short approach spans, he was discussing with one of his assistants the advisability of making these approach spans in one length as probably the most satisfactory solution, and we are therefore very glad to receive your letter on the same subject. Mr. Szlapka will prepare now a complete design and close estimate for making these approach spans in one length and will send same to you as soon as possible. It will of course, take a few days, and you will then have all the figures before you to come to a conclusion.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74e.

(Personal.)

May 11, 1901.

Mr. E. A. HOARE, Chief Engineer,
Quebec Bridge Company
Quebec, Canada.

DEAR MR. HOARE,—Mr. Szlaptka returned home yesterday and I was pleased to receive his report that he had agreed fully with you as to the length of both approaches and has all the necessary information to prepare stress sheets to submit to you for the government's approval. This will be done promptly and when these stress sheets are returned we understand that we are to prepare shop drawings and send same to Mr. Cooper for approval.

Mr. Szlaptka also reports that the caisson for the first main pier is rapidly nearing a stage when it will be launched and placed in position. In this connection I believe

you will agree with me that the work is of such magnitude and of such importance as to make it absolutely necessary that all parts of the work should be passed upon by an independent engineer of acknowledged great ability. This should be done without questioning the ability and the conscientiousness of the contractor and his engineers, which are in this instance conceited. We expect therefore that you will have all details of construction of the foundation work, both the caisson, pier and its final depth of foundation, all passed upon by your consulting engineer, Mr. Theo. Cooper, and I would thank you to send me plans of the caisson and pier as soon as they are approved by him. I do not think it is necessary to indicate to you the great importance of this latter, and as the caisson is nearing completion, if it has not already been attended to, it should be done at once.

Will you kindly let me hear from you on the subject and oblige,

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74g.

August 9, 1901.

(Personal.)

E. A. HOARE, Esq., Chief Engineer,
Quebec Bridge Company,
Quebec, Canada.

Dear Mr. HOARE,--I have your letter of August 6 and am now trying to arrange to be in Quebec next Wednesday or Thursday, August 14th or 15th, and will remain until Saturday evening or Sunday evening.

I can see you on Thursday and Friday and Mr. Parent on Saturday.

While I do not specially care to take up the question of formal articles of agreement with Mr. Parent on this trip, I have prepared a revised copy to agree with the alterations suggested at our interview at the Waldorf last January and I beg to inclose you a copy, thinking you might wish to look it over and discuss same with me during my present trip. I also enclose extracts from three of our late important contracts, indicating the manner in which progress estimates are prepared. The case of the 'Brooklyn Bridge' and the contract with the 'United States Government at Rock Island' are particularly in line with present contract.

I am making trip at this time particularly to ascertain in detail how we are to prepare our estimates and how we are to be paid for the approach spans which we are just about constructing. If you can secure any information on this line in advance, it will probably give me more time to devote to other matters.

I am taking our Mr. Schenck with me, who will make the necessary sketches for preparing a perspective view of the completed bridge. We will wish to go out directly to the bride site, the day we arrive, to look over the Quebc side of the structure.

I am very sorry to learn of the illness of your daughter and trust she is much better. Hoping to see you soon and in good health,

I remain,
Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74h.

August 23, 1901.

Mr. ULRIC BARTHE,
Secy. Quebec Bridge Company,
Quebec, Canada.

MY DEAR SIR,—At my last visit to Quebec and in the limited time which could be given me by your president, the Hon. S. M. Parent from his usually crowded time, I was advised that we should prepare our estimates for the approach spans we are constructing, the same as was done in the case of the anchorage metal, and further that we would be paid in the same manner through checks of Mr. M. P. Davis. Under this arrangement there will become due us on or about November 15, 1901, for the erection of one approach about $50,000, and as the south approach span cannot be erected during the present season, there will be due on or before January 15, 1902, for the delivery of the metal work of this approach span at site about $32,500. I send this understanding to you direct that you may verify same and also write us should there be any action to be taken on our part different from that outlined above.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74p.

October 22, 1902.

Mr. A. E. HOARE.
Quebec, Canada.

DEAR MR. HOARE,—Mr. Tretter has returned from Quebec and reports that foundation of south river pier has been passed upon by government engineer and consulting engineer, and pronounced satisfactory, and that pier is now being sealed up and completed. This must be a great relief to you and Mr. Davis as well as all others interested in this great enterprise. I have instructed our treasurer, Mr. Davis, to send bill for the north approach span at this time, thinking you would wish to place the amount in this month's estimate—thereby dividing the total amount which will be due us on completion of both approaches. We will arrange to complete both this season as that appears to be the better plan. Please write me at your convenience.

Yours truly,

JNO. STERLING DEANS.

EXHIBIT No. 74q.

December 1, 1902.

E. A. HOARE, Esq., Chief Engineer,
Quebec Bridge Company,
Quebec, Canada.

DEAR SIR,—Replying to your letter of Nov. 6, asking a 'reasonably close estimate for talking finances,' of the several items to complete your Quebec Bridge, these prices to be what we 'think will prevail during the present winter.'

Growing out of the necessities of construction and particularly of the requirements in the field work, it will be impossible to divide the work and order same ahead, in as many items as you suggest, and I have therefore divided the work into three principal items, and even this division will be disturbed somewhat, as a very considerable portion of the cantilever arms must be erected at the same time as the anchor arms in order to make the anchor arms self-supporting. I can, however, discuss this matter more in detail with you, when you come to New York with Mr. Parent.

Item No. 1—

2 anchor arms.
2 towers on main piers.
2 towers on anchor piers.
Floor for anchor arms.

29,742,000 lbs. Price	$1,475,900
Wooden floor for this item, including railing, screens bolts, etc	51,732
Total	$1,527,632

Item No. 2—

2 cantilever arms.
Floor for same.

22,780,000 lbs	$1,126,400
Wooden floor for this item, including railing, screens, bolts, etc	40,500
Total	$1,166,900

Item No. 3.—

Suspended span.
Floor for same.

7,335,000 lbs. Price	$ 359,190
Wooden floor for this item, including railing, screens, bolts, &c	24,300
Total	$ 383,490

NOTE.

Void: See letter Jan. 20, 1903.—D.

December 1, 1902.

E. A. HOARE, Esq.,
Chief Engineer.

In item No. 1, under the item of wooden floor, etc., we have included the wooden floor, etc., of the approach spans, as it would be necessary to put these floors in at the same time the anchor arm floors are put in place.

As far as change in price is concerned, there is nothing in sight in our particular business which would indicate that there will be any change in prices within the next year or eighteen months—this is about as far as one can see ahead; certainly they will not be lower; unless there is some great financial disturbance which cannot be foreseen. General business, and particularly the railways, are prosperous, as indicated by their increased earnings, beyond any previous record.

As far as I can learn from those best informed, everyone looks to next year as a year which will show, if anything, increased prosperity and business, and this is my own opinion.

As I have frequently expressed to you, it seems to me there is no time so well suited to launch a large enterprise as a time of activity, with business on a sound basis and a prospect of a continuance of these conditions. It is true that possibly your company might be called upon to pay slightly increased price for metal at such times, but this would be much more than offset by the ease in making your financial arrangements.

On the present basis, this increase in price of metal is only some $150,000 above the original figures. The remaining portion of increase in total price is due to the fact that we are now providing two sidewalks over the entire bridge at your request, and this appears to us to be a wise conclusion; and further, we are using the increased loads you mentioned in arriving at the sections of the floor system. These items of sidewalks and specifications increase the original estimate about 10 per cent.

One hesitates necessarily to discuss the future and I do not wish to be a party to mislead you or the people you represent in any way, but I firmly believe that nothing but a financial crash, which no one can foresee, and of which we have no evidence whatever at present, can affect the great prosperity now existing for at least eighteen months.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

P.S.—Please advise me early whether you will wish to discuss this matter with me in New York or in Philadelphia and time when you expect to reach either place. I am often away, as you know, and should have this information as long in advance as possible. I trust we will see you soon.

J. S. D.

EXHIBIT No. 74r.

May 20, 1903.

THEO. COOPER, ESQ.,
Consulting Engineer,
New York, N.Y.

DEAR SIR,—We return herewith, by registered mail, your proposed specifications for loading and unit stresses, main span Quebec bridge.

I wish to make the following remarks in reference to these specifications.

1st. I assume that only one engine E—40 will be used on each railway track.

2nd. I find that the proposed 48,000 lbs. on two axles 10 ft. centre to centre on trolley stringers produce larger bending moment in centre than the 40,000 lbs. on two axles 7 ft. apart centre to centre originally used.

3rd. E-33 on each railroad track to be used for chords and main diagonals for the suspended span, is equivalent to 4,200 lbs. per lin. ft. on one track and almost 2,000 lbs. per lin. ft. on the second track.

4th. I tried formulæ proposed for main members and find in each case there will be a slight saving of material and that the unit stresses come within the limit of about ⅓ of the elastic limit for live and dead load stresses.

5th. On page two of your specifications there should be added the same remark as on page 3 written *by you in pencil* and marked by me with red *asterisk.*

6th. I examined the values of the permissible unit stresses for reversed strains and I find in some cases there are slight errors, as indicated by me in red.

After you have these specifications rewritten and printed complete, I would be glad once more to have the opportunity of looking over them before they are sent to Canada for adoption.

Yours respectfully,

THE PHŒNIX BRIDGE CO.,
Per P. L. SZLAPKA.

P.S.—I have retained a copy of your papers.

EXHIBIT No. 74s.

May 22, 1903.

Mr. THEO. COOPER, ESQ., C.E.,
35 Broadway, New York, N.Y.

DEAR MR. COOPER,—I returned from Ottawa yesterday and you will be pleased to learn there is every evidence to believe that the programme as outlined by Mr. Parent in your office recently, will be carried out.

I was requested by the Ottawa officials to urge upon you to act as promptly as possible in the matter of completing the specifications and to forward same to Mr. Hoare without delay. There is urgent necessity of their taking prompt action. Will you kindly write Mr. Hoare when he may expect to receive copy of the revised specifications.

I will stop and see you the next time I am in New York, which will undoubtedly be within a few days, and give you more details.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74t.

May 28, 1903.

THEO. COOPER, Esq.,
Consulting Engineer,
Quebec Bridge Company,
35 Broadway, New York, N.Y.

DEAR SIR,—We were very sorry to learn by Mr. Berger's letter of May 25th that the grippe had hold of you, and trust by this time you have been able to knock it off.

Mr. Szlaptka has carefully examined the proposed revised specifications as to loads and strains Quebec bridge and same is returned herewith, with several notes in red, which we will believe you will add as agreeing with original understanding.

We would further suggest, that the last clause under the head of 'Future Increase of Railroad Live Load,' be added immediately after the live load clauses and before the wind clause.

As you undoubtedly well appreciate, it will be necessary for you to explain to Mr. Hoare, how the live load proposed in these specifications will easily take care of any possible increase in live load without overstraining the material. I know personally that Mr. Hoare and his people feel that the bridge should be designed to provide for a considerably heavier load than originally intended.

It has occurred to us that it might be well to add after the second paragraph in live load clause, the following:—'This loading being equivalent to engine E-40 with train load of 4,000 lbs. per lin. ft. on one track and engine E-40 with train load of 2,000 lbs. per lin. ft. on other track.' We simply make this to you as a suggestion, that parties examining specifications, may have it directly before them, that ample provision is made for heavy loading.

We notice you omit to add that the workmanship and material is to be in accordance with 'Cooper's specifications.' Please add this clause:—

Knowing the people in Canada are very anxious to have the matter settled, we understand you will forward to Mr. Hoare at once these revised specifications. Kindly send a copy to us.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74u.

June 15, 1903.

E. A. HOARE, Esq.,
Chief Engineer,
Quebec Bridge Co.,
Quebec, Canada.

DEAR MR. HOARE,—I received your letter of June 13th this morning and felt that we should not attempt to explain in detail the working of Mr. Cooper's revised specifications. He had his own reasons why these specifications should be adopted, and while we are acquainted with his views and approve of same, we believe the explanation should come from him, and especially so, as he wrote you direct on the subject and did not send the specifications or letter through this office.

I think you should see Mr. Cooper in New York or have Mr. Cooper meet you in Ottawa. If it is attempted to conclude this matter by correspondence it will certainly take a long time.

Mr. Parent should know, that we are not able to make a move until the question of specification is clearly and definitely settled and approved by the government. I have no doubt that Sir Wilfrid Laurier thinks we are working on our final stress sheet and details now.

You know I will be glad to assist personally in having these revised specifications approved and clearly explained to Mr. Douglass, but think it should be done in connection with Mr. Cooper. I will not advise Mr. Cooper that I have heard from you on the subject, but will be prepared to meet you in New York or elsewhere upon advice that you have arranged with Mr. Cooper for such a meeting.

I am glad that the Bill for making the Bridge & Railway Co. one, has been passed. Does this affect our contract—should the name of the party to the contract, with whom we have our agreement, be changed?

I notice the grant will come up shortly and I trust it will be on the lines of guarantee of the principal and interest of necessary bonds, as was proposed in our last visit to Ottawa.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74v.

July 24, 1903.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge Co.,
Quebec, Canada.

DEAR SIR,—We acknowledge receipt of your favour of July 22, enclosing a letter from Mr. Fitzpatrick to Mr. Parent advising that order in council was passed July 16th giving Mr. Cooper the necessary authority to act as required by you in your letter to Mr. Schreiber.

We have no doubt you have advised Mr. Cooper and he will immediately send us his instructions with copy of his modified specifications.

As I advised you yesterday by wire, we have started work on the floor and when we receive the above advice from Mr. Cooper, will be in full swing on the details of the entire bridge.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

P.S.—Please send me by return mail plan showing exact distance centre to centre of main piers and exact *elevation* of all main bridge seats, as determined since the construction of the piers.

(Signed) J. S. D.

EXHIBIT No. 74w.

July 31, 1903.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge Co.,
Quebec, Canada.

DEAR MR. HOARE,—I was greatly exercised this morning upon receiving a letter from Mr. Cooper under date of July 30th, stating that he had received from Mr. Schreiber copy of the 'Order in Council' and also a letter from Mr. Schreiber. In this letter Mr. Schreiber states he has asked for authority to employ a competent bridge engineer to examine from time to time the detail drawings of each part of the bridge as prepared and to *approve of or correct them* as to him may seem necessary, *submitting these for final acceptance* to the Chief Engineer of Railways and Canals. Mr. Schreiber further says, 'I have not yet named an *engineer in New York to consult with you*, but will do so without unnecessary delay and in the meantime I think you may safely go to work on the plans.'

The seriousness of this action I have not the least doubt you will appreciate immediately. It leaves the entire matter 'up in the air' and much worse than the condition we were all trying to avoid—which was to save most important time and that when Cooper once aproved our designs and details it would be final and accepted by the department. This is why I understand you secured the 'Order in Council.' It practically brings all matters to a standstill as neither Mr. Cooper or ourselves would know where we stand until this new hand could be consulted with, and even then we would only know as each plan was passed upon.

I cannot impress upon you too strongly the necessity of taking immediate action to stop any such plan as suggested by Mr. Schreiber.

When you consider that the entire feeling and action of Mr. Cooper's was to save the Quebec Bridge Company needless expense, without the least sacrifice in the design

or efficiency of the structure, it has certainly proven a thankless task for all concerned, and unless this present action upon Mr. Schreiber's part is immediately stopped the entire business will be in a worse condition than if it had been left entirely alone.

I am trying to reach you by phone, as I appreciate the necessity of immediate action.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74x.

Sept. 22, 1903.

THEO. COOPER, Esq.,
Consulting Engineer,
New York, N.Y.

DEAR SIR,—Quebec Bridge Floor System—Replying to your letter of Sept. 18th in connection with bracing between flanges of trolley and highway stringers, we call your attention to the fact that the Quebec specifications require flanges to be supported at points twelve times the width. Dominion specifications fifteen times the width. Cooper, sixteen times the width. These requirements would necessitate bracing in present instance. Aside from this we are strongly of the opinion that this entire live load floor should be thoroughly braced in its entire width, to insure the least possible effect upon the trusses.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74y.

Sept. 26, 1903.

THEO. COOPER, Esq.,
Consulting Engineer,
35 Broadway, New York, N.Y.

DEAR SIR,—We have your letter of Sept. 25th and notice you have approved the detail of floor beam and also the detail of track stringers and bracing with modifications.

We do not wish to insist upon our own views in the matter of stringer bracing and will be glad to confer with you again on this subject, as we are interested in saving every pound of dead load possible, without injuring the efficiency of the structure. As soon as our estimating department has checked over your estimate of weights, we will confer with you again.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74z.

June 11, 1904.

THEO. COOPER, Esq.,
Consulting Engineer,
New York, N. Y.

DEAR SIR,—We send you herewith a blue print showing camber lengths of truss members of anchor arms—Quebec bridge.

In arranging lengths of track stringers, we have to be governed by the following consideration. As underscored in red, the panel lengths decrease about ⅛ in. due to live load on the central span, while the same panel lengths increase about ⅛ in. as due to the live load on anchor arm.

Providing expansion over floor beam 6 only, floor beam 5 would bend out ¾ in. either way and floor beam 7 slightly less. We therefore are inclined to adopt the following arrangement.

Fix stringers at floor beam 1. Fix stringers at floor beam 2. Expand both stringers at floor beam 3. Fix both stringers at floor beam 4. Expand both stringers at floor beam 5. Fix both stringers at floor beam 6 and 7. Expand both stringers at floor beam 8. Fix both stringers at panels 9 and 10. Expand stringers at centre posts.

Please advise us at your earliest convenience which arrangement you prefer, viz.; the latter or the arrangement with one intermediate expansion only at floor beam 6 and oblige.

Yours truly,

THE PHŒNIX BRIDGE CO.,
Per P. L. SZLAPKA.

EXHIBIT No. 74aa.

June 22, 1904.

THEO. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—Referring to the packing of eyebars I find that as far as we can see by hasty examination, there is no reason why you should not add a single bar in panels A & B as you suggest. In rearranging packing of eyebars, you of course are bearing in mind that the full width of the truss cannot exceed 5 ft. otherwise it will encroach on the clearance and further, that the width of lower chord and end posts are fixed and also the location of the ribs, which cannot be disturbed. I trust you will let us have your conclusions at an early date.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74bb.

July 13, 1904.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge & Ry. Co.,
Quebec, Can.

DEAR SIRS,—We sent you July 11th, five blue prints of stress sheet of anchor arm as approved by Mr. Cooper, for examination and approval by the government engineers.

On July 1st five copies of this stress sheet were sent to you erroneously instead of being sent to Mr. Cooper for his approval. Kindly have the drawings approved by Mr. Cooper handed to the engineers and destroy the copies previously sent.

Yours truly,

THE PHŒNIX BRIDGE CO.,
Per P. L. SZLAPKA.

EXHIBIT No. 74cc.

July 13, 1904.

THE. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—We send you herewith in duplicate plan showing variation between lower chords and stringers for different condition of loadings anchor arm, St. Lawrence river bridge. After looking more carefully over these additional stresses due to bending of floor beams on account of fixed ends of the stringers, we revised the points at which the stringers are fixed. We find that owing to a deflection of the lower floor beam of 1/64 in. the corresponding additional stress of the floor beam upper flange for one-half of the deflection amounts to 380 pounds. The maximum deflection of the upper flange of any of the plate floor beams on our plans being 3/64 in., the additional flange stress amounts to 1,140 lbs., or only about 8 per cent of the live and dead load stress, which is certainly permissible. We hope this rearrangement of the expansion of the stringers will be satisfactory to you and that you will approve our method of providing for same.

We send also you in duplicate shop drawings of stringers which were formerly approved by you, except the connections at ends.

We return to you one approved copy of end bottom chord erroneously returned to this office.

Yours truly,

THE PHOENIX BRIDGE CO.,
Per P. L. SZLAPKA.

EXHIBIT No. 74dd.

August 9, 1904.

THEO. COOPER, ESQ.,
Consulting Engineer,
New York, N.Y.

DEAR SIR,—I have your kind letter of August 6 in reference to increase of section of members 'TLooooo' and 'TBooooo' for combination of stresses due to dead load plus 1½ live load plus wind.

I will gladly comply with your request and will also apply the same combination to all other members to satisfy myself that the unit stresses are in proportion not higher than those on the two above-mentioned members.

Yours respectfully,

P. L. SZLAPKA.

EXHIBIT No. 74ff.

August 19, 1904.

E. A. HOARE, Esq.,
Chief Engineer,
Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—I have your letter of August 17 and have asked Mr. Norris for report on the analysis of iron ore and hope to enclose same with this letter. (Will be ready on Monday, August 22-4.)

It is very unfortunate there has been delay in our reaching our storage yard at Chaudiere—it congests the work at all points, and of course entails additional delays, which are most serious in the short time at our disposal. We will be prepared to enter the yard the moment connection is made.

Regarding forwarding plans to you, I notice you desire us to follow the advice of the advice of the post office o cials here and let the prints go out as second-class matter unsealed. We will allow this until we are further instructed by you. A number of prints go to you to-day for approval of government engineer.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74gg.

Sept. 5, 1904.

A. B. MILLIKEN,
St. Romuald, Province Quebec,
Canada.

See Mr. Hoare and give particular attention to hurry connection with Chaudiere yard. We must get relief at this point and get in shape to ship and store material.

JNO. STERLING DEANS,

EXHIBIT No. 74hh.

Sept. 6, 1904.

Mr. THEO. COOPER,
Consulting Engineer,
New York, N.Y.

DEAR SIR,—We send you in duplicate for your examination and approval drawings No. 21 and No. 25 and we send you five copies of drawing No. 1 for your siguature.

We send to you also a general plan and most of the typical drawings and connections of the steel traveller to be used in the erection of the superstructure for the Quebec bridge, the latter drawings are for your inspection and file.

Yours truly,

THE PHŒNIX BRIDGE CO.,
Per P. L. SZLAPKA.

EXHIBIT No. 74ii.

Sept. 7, 1904.

A. B. MILLIKIN,
St. Romauld, P.Q.,
Canada.

Birks will reach Quebec Friday afternoon. I assume you can rent instruments from Hoare.

JNO. STERLING DEANS,

EXHIBIT No. 74jj.

Sept. 8, 1904.

Mr. E. A. HOARE,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—I have not received the copies of specifications for Quebec Bridge which you promised to send me for our records. Will you kindly send me three or four copies of same, and oblige,

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74kk.

Sept. 12, 1904.

Mr. E. A. HOARE,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—We send you herewith in duplicate complete calculations of the anchor arm, Quebec bridge, except the main posts and their bracing over the main piers which will be supplied later.

These two sets of calculations are for the use of the government engineer in checking our stress diagrams and need not be returned to this office.

We send these stress sheets in answer to your letter of August 22nd and in answer to Mr. L. K. Jones' letter of August 6, addressed to Ulric Barthe, secretary.

Yours truly,

THE PHOENIX BRIDGE COMPANY,
Per P. L. SZLAPKA.

EXHIBIT No. 74ll. Sept. 19, 1904.

Mr. E. A. HOARE,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—Referring to your letter of Sept. 14th to our Mr. Szlapka we regret we have not completed the stress sheets of suspension span and cantilever arms, it being necessary to revise our present stress sheets to agree with the final details of the permanent structure and also details of the traveller. As soon as these stress sheets have been revised we will send you a duplicate set.

Yours truly,
JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 74nn. October 8, 1904.

Mr. E. A. HOARE,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—We find we have not received from the government engineer the approval of any main chord sections. As explained to you some time ago we have been working at great disadvantage to ourselves in being compelled to confine our office work to the anchor arm, in order that everything might be done that it is possible to do, to be ready early next spring to start the erection of the anchor arm. There was too much work to do in the time allotted after the financial arrangements were made and work ordered ahead. We have not, therefore, been able to complete our stress sheets for the cantilever arm and for the suspended span, it being necessary to await the completion of all details, not only of the permanent structure, but also the details and rigging of the main traveller, that we may know exactly the total weight coming at each panel point.

We have, as you know, sent to the Canadian engineers, through your office, the stress sheets for the anchor arm, covering the chords which have not been approved, and we would kindly ask that they be examined and prints sent to us with their approval as soon as possible. The engineers have everything that is necessary to check these chords, although we thoroughly appreciate they would like to have before them these stress sheets of the entire bridge and these will be sent with the least possible delay.

Yours truly,
JNO. STERLING DEANS,
Chief Engineer.

December 3, 1904.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR MR. HOARE,—I have not as yet received any copies of your printed specifications for the Quebec bridge. Will you kindly see that I receive two copies promptly, as they are necessary for our records.

Yours truly,
JNO. STERLING DEANS,
Chief Engineer.

SESSIONAL PAPER No. 154

EXHIBIT No. 74oo.

Mr. T. P. SAGE.

Herewith find sketch in triplicate of centre post foot—C. O. 612, 613. Please advise if same can be shipped to storage yard.

C. E. C.

EXHIBIT No. 74rr.

Jan. 31, 1905.

Mr. THEO. COOPER,
Consulting Engineer,
New York, N.Y.

DEAR MR. COOPER,—Quebec Eyebars—I beg to enclose copy of record of interview in New York yesterday in connection with the additional tests which you require. I trust I have properly stated your wishes. If there is anything you desire to be added, please let me know. We are making the first test this afternoon and the others will be made as fast as bars can be prepared, and after all tests have been made and tabulated, we will make a full report to you.

I have just wired that Mr. Szlapka will be over to see you to-morrow.

I sincerely trust you feel much improved.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

January 31, 1905.

Interview with Mr. Theo. Cooper at his New York office, January 30, 1905, in connection with Eyebars, Quebec bridge.

For his additional information Mr. Cooper desires to have the following tests:

One test of Standard 15 in. bar, with pin hole bored ½ in. nearer the centre of bar, tested from 12,000 to 24,000 lbs. and note results and then test to destruction.

One test with pin hole bored 1 in. nearer centre of bar, tested from 12,000 to 24,000 lbs. and note results and then test to destruction.

One test of 15 in. bar with enlarged head, say 36 in. tested from 12,000 to 24,000 lbs. and note results and then test to destruction.

One test of 15 in. bar, 36 in. head, pin hole bored 1 in. nearer centre of bar, tested from 12,000 to 24,000 lbs. and note results, and then test to destruction.

One test of standard 15 in. bar, stressed to 24,000 lbs. per sq. in. and then load held on bar for a considerable time, say two hours, and note results and then test to destruction.

One test of any bar in stock, drift the pin hole ⅛ larger than bored, then shape pin hole to bear evenly on the semi-circumference of test pin, stress this bar to 24,000 lbs. per sq. in. and note result and then test bar to destruction.

(Sgd.) JNO STERLING DEANS.

P.S.—Both heads of bars to be tested to be laid off in in 2 in. squares from centre line and before making test.

J. S. D.

EXHIBIT No. 74ss.

February 2, 1905.

Interview with Mr. Theo. Cooper at his New York office, Jan. 30th, 1905, in connection with Eyebars, Quebec Bridge, and the modifications suggested by Mr. Cooper to Mr. P. L. Szlapka Feb. 1, 1905.

For his additional information, Mr. Cooper desires to have the following tests:

1. One 15 in. bar, with pin hole at one end only bored ½ in. nc. r centre of bar, to be tested from 12,000 to 24,000 lbs. Note results, leave bar at 24,000 lbs. per sq. in. for say two hours in testing machine, then note results and finally test bar to destruction.

2. If moving pin hole ½ in. proves advantageous, test one bar with pin holes bored 1 in. and ½ in. nearer centre of bar from 12,000 to 24,000 lbs. Note results, etc. as above in No. 1. (If No. 1 gives no better results than pin hole bored in centre eye, then omit test No. 2.)

3. Test one 15 in. bar, with enlarged head, say 36 in. from 12,000 to 24,000 lbs. Note results, etc., as above in No. 1.

4. If No. 1 and No. 3 prove advantageous, test one 15 in. bar, 36 in. head, pin hole at one end only, bored 1 in. nearer centre of bar, from 12,000 to 24,000 lbs. Note results, etc., as above in No. 1. (If No. 1 and No. 3 do not improve eyebar. then omit test No. 4.)

One 15 in. b[illegible] with pine holes bored in centre of eyes, to be tested as in No. 1.

6. In any bar in stock drift one pin hole ⅛ in. larger than bored, shape pin hole to bear evenly on the semi-circumference of test pin, and test bar as in No. 1.

7. Repeat No. 6 with 28,000 lbs. per sq. in. in machine for two hours.

JNO. STERLING DEANS,

P.S.—Both heads of bars to be tested, to be laid off in 2 in. squares from centre line.

EXHIBIT No. 74tt.

February 22, 1905.

F. B. NORRIS, Esq.,
Mgr. Phœnix Iron Company,
Phœnixville, Pa.

DEAR SIR,—In a letter received from Mr. Cooper to-day he refers to the tests on eyebars as follows:

'The results of the tests on eyebars are very gratifying.'

He would like, however, to have 'samples cut from the worst heads, viz.: 706 A and 705 B, and also from the better heads to see if they show any marked difference in heat indications.' Will you kindly have these samples cut from heads and carefully examined and let us have your report as soon as possible

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 75.

Extracts from letter books of the Phœnix Bridge Company, numbered from 64 to 77, inclusive, being prior to letter book 'No. 1, Quebec bridge.'

EXHIBIT No. 75a.

July 7, 1897.

E. A. HOARE, Esq.,
Quebec & Lake St. John Ry.,
Quebec, Canada.

MY DEAR SIR,—I did not have the pleasure of seeing you after our entertainment at Mr. Dobell's. I handed Mr. Dobell your letter and also had a very short conversation with him in connection with the bridge. He had the steamer run up to the site of the structure and invited a number of the prominent bridge engineers on the upper deck to do the work. I had previously talked with Mr. Theo. Cooper on the subject, so that he was posted, and should the matter take the form of our submitting a plan and estimate for the work, Mr. Cooper will be glad to pass upon these plans and give your people the benefit of his extended experience, I hope you will soon send me the necessary data to prepare figures.

Both Mrs. Deans and myself greatly enjoyed our trip to Quebec and are much indebted to you for your kind attentions.

JNO. STERLING DEANS.

EXHIBIT No. 75b.

November 8, 1897.

Personal.

Mr. E. A. HOARE,
Chief Engr., Quebec & Lake St. John Ry. Co.,
Quebec, Quebec.

DEAR SIR,—Replying to your letter of November 4, we are working on the plans now and I believe we will have all matters ready to refer to you by the latter part of this month. We are assuming that 1,600 ft, is the minimum span that should be used and will make the anchor spans of length called for by the most economical design.

For what purpose do you require the 'total loads on main pier and weight on anchor pier and top of bridge seat dimensions'? We could give you the weights at once, but thought possibly you might wish to have a complete design of the pier in order to arrive at clearances. We have intended to allow Sooysmith & Co., to design these piers after giving them exactly what we require for the metal work. If you will wire me, however, just what you wish the information for, I might be able to give what you require without referring same to Sooysmith & Co. For the present, at least, I think it much better to conduct all the correspondence with one party, therefore kindly send all your letters to me direct. I make this suggestion thinking possibly that you might write or wire Sooysmith & Co.

I am glad to learn that you have plans to suggest in connection with some construction company.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

P.S.—I will wire you should I go to Montreal within the next few days.

J. S. D.

EXHIBIT No. 75c.

November 30, 1897.

E. A. HOARE, Esq.,
Chief Engr., Q. & L. St. J. R.R. Co.,
Quebec, Quebec.

DEAR SIR,—Replying to your letter of November 27, we are making plan of bridge with straight chord, understanding that this is in accordance with the wishes of the government engineer, and from sketches we have made we believe it will also be the handsomest in appearance. Further, as the chord can only be curved for 100 ft. from each pier, there will be but little saving in cost; we will, however, be prepared to state just what this saving will be. We certainly do not believe there would be any saving which would warrant antagonizing the government in the least. It will be very important to ascertain, if possible, what 'our friend' makes the estimated cost, both for the straight chord and curved chord. Please try and have this information before meeting.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 75d.

April 14, 1899.

Personal and Private.
Mr. E. A. HOARE,
Chief Engr., Quebec Bridge Co.,
Quebec, Quebec.

DEAR MR. HOARE,—Mr. Szlapka and I were with Cooper the greater part of yesterday and you will be glad to learn there was not a single vital or important criticism or mistake found in our plans. All the slight differences, such as dead load anchor arms, reverse stresses in one or two members, thickness of some detail plates, &c., were all thoroughly discussed and satisfactorily settled and not a single one would *affect in any way our price or our proposition.* It was especially gratifying for us to learn this.

Mr. Cooper, however, somewhat upset me, by making the following remark which of course I understood was entirely personal and without any full knowledge of the situation. He said—'Well, Deans, I believe that all of the bids will probably overrun the amount which the Quebec Bridge Co. can raise and that the result will be as is usually the case that all of the bids will be thrown out and a new tender asked on revised specifications and plans.'

I told Mr. Cooper that while this might be the usual procedure that in the present case it was distinctly understood that whoever was the lowest bidder under the present specifications and plans would be awarded the work, *and if any modification were made their bid would be altered accordingly,* as this could readily be done to a conference with the bridge company's engineers and ourselves; as we could undoubtedly build as cheap a structure as any other company and that unless this plan was carried out as understood and agreed upon, the present bidders would be placed in a very unfair position after the expenditure of great time and expense.

I finally succeeded in convincing Mr. Cooper that this was the only fair method, but I think it will take the greatest care on our part to see that his report is not worded in such a way as to give the directors an opportunity of following this suggestion. Mr. Cooper undoubtedly desires to be perfectly fair, but not having been through this

whole matter like ourselves, does not fully understand the situation. I trust therefore that you will give his report the most careful scrutiny and get it in the right shape before it is submitted, as far as this suggestion is concerned. It would simply be just what our competitors and particularly the Dominion Bridge Company would like or the Union Bridge Company ,in fact, and I shall be much itnerested to hear from you on this point.

You have not advised me to whom I shall send the revised price of including delivery of the material from Quebec and Lévis to site.

Mr. Lindenthal and I have an appointment with Mr. Cooper next Tuesday to discuss the suspension plan.

Kindly advise me when you will desire the revised propositions of the suspension design.

I remain,
Yours truly,

JNO. STERLING DEANS.
Chief Engineer.

EXHIBIT No. 75e.

April 19, 1899.

(Personal.)
E. A. HOARE, Esq.,
Chief Engineer Quebec Bridge Co.,
Quebec, Que.

DEAR MR. HOARE,—I spent most of yesterday in New York in consultation with Mr. Cooper and Mr. Lindenthal, and found that Mr. Cooper had no serious complains to make in connection with Mr. Lindenthal's plan, in fact he expressed himself as much interested in the ingenious design.

It developed, however, in conversation, and Mr. Cooper so expressed himself to Mr. Lindenthal, that in view of the amount of the bid under his design, he would not give Mr. Lindenthal's plan careful and detailed consideration and would so report. This rather exasperated Mr. Lindenthal and for a time I feared he might withdraw his bid but it was smoothed over and I think will be permitted to stand. Mr. Lindenthal thought that Mr. Cooper should report solely and wholly *on the merits of the several designs,* without any regard to cost, and each design should have the same careful consideration, and that you and your company alone should consider the question of price. I know this is entirely different from Mr. Cooper's instructions, and that it would be useless to spend detailed investigation upon plans which are very expensive in price, but Mr. Lindenthal reviewed the matter from an engineer's standpoint, and having taken such unusual pains with the design and estimate felt that he was in a measure being slighted.

Mr. Cooper advises that he will finish about May 1st.

I think it of the utmost importance to see you some time before that date, and write to ask if you will not come to New York. Cooper also advised me that he had no authority to receive any revised bids for possible reduction in suspension bridge wire and I think this entirely proper. It seems to me, however, *that you should have all of these bids in your hands at once* and *I will be prepared to submit ours when you come to New York.*

Please let me know at once and by *wire* when you will be in New York.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 75g.

Sept. 14, 1899.

Hon. S. N PARENT,
President the Quebec Bridge Co.,
Quebec, Que.

MY DEAR SIR,—We have had repeated interviews with bankers. Drexel & Co., of Philadelphia, and they have evinced such an interest in the Quebec bridge, and the business has reached such a stage that we felt it necessary, in order to come to a final understanding, to have you meet them in Philadelphia to-day to discuss details, with which we were not familiar, and which it was necessary to discuss with some one in authority from your board. I therefore wired you asking for such an interview, and received reply from Montreal as follows:—

'Jno. Sterling Deans,—Just received telegram repeated by Secretary Barthe. If you think there is hope for understanding with bankers interview may be held Philadelphia Tuesday next if agreeable; will extend option accordingly. Meanwhile wire me Place Viger Hotel, Montreal, what banker desire, about the amount of bonds to issue, rate of interest and period of maturity of same.—S. N. PARENT.'

To this I replied as follows:—

'Hon. S. N. Parent, Montreal, Canada: As you could not attend meeting to-morrow, have arranged for meeting with bankers next Tuesday, September 19, understanding our option will be extended accordingly. Have written you details at Quebec. —JNO. STERLING DEANS.'

We had a meeting with Drexel & Co. yesterday and arranged for a meeting with you next Tuesday, September 19. We trust you can reach Philadelphia about noon on that day. If you will wire me the train you will take from New York, I will meet you at the station in Philadelphia and take you direct to our office at 410 Walnut street.

We understand from your message that our option is extended, in order that interview with bankers can take place and the details which will then be discussed finally considered.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 75h.

November 28, 1899.

Hon. S. N. PARENT,
President the Quebec Bridge Co.,
Quebec, Canada.

DEAR SIR,—As I wired you briefly this morning, we have been in communication with the bankers, both Drexel & Co., Philadelphia, and J. P. Morgan & Co., New York, and find there is no change in their original purpose to visit Quebec at the earliest possible date. Mr. Spencer, formerly the engineer and railroad expert of J. P. Morgan & Co., and now the president of the Southern Railway, was absent in the South when you had your interview with Mr. Coster in New York; he is still absent, but is expected home about December 1. You will agree with us that these bankers are undoubtedly the best and most reliable in the United States, and it appeared to us it would best conserve the interests of the Quebec Bridge Co., as well as our own, to deal strictly and solely with them; we have therefore made no effort to place the business elsewhere. It is quite impossible for concerns of this

magnitude to so arrange their varied interests as to permit important members to be absent for several days on short notice. We have not thought it wise to show any undue anxiety on our part or on the part of the Quebec Bridge Co., but have been constantly on the watch to urge prompt action where (when?) we thought it advisable. I appreciate fully the urgency, from your standpoint—but think the government should appreciate that through their insistence we lost at least two months' time and received a setback which has taken much labour and time to overcome. Considering the time our whole force has been at work we have accomplished considerable and I have no reason to change my opinion that if the business is left with us we will arrange to build your bridge in a satisfactory manner to all concerned. I am willing to go to Quebec or Ottawa with a representative of the Engineering Contract Co., and explain our present position more fully if you so desire. I trust you will find it possible to wait until Drexel & Co. visit Quebec. We can then decide immediately.

Yours truly,

JOHN STERLING DEANS.

EXHIBIT No. 75i.

(Personal). February 2, 1900.

DEAR MR. HOARE.—Yesterday Mr. Geo. B. Burbank, engineer of the National Contracting Company, called at our Philadelphia office. He stated he had just returned from Quebec, where he had spent a week in connection with the Quebec bridge. He said he had discussed the business with Mr. Parent, Price, Dobell and others; had dined with them, &c. Mr. Parent advised him that the Phœnix Bridge Company had the contract for the construction of the bridge, and he must see us. He appears to wish to assist in the financing and attend to the substructural part. Mr. Reeves thought possibly it would be advisable for me to make a trip to Quebec; in meantime I thought I would write you a personal letter and inquire whether Mr. Burbank made any special offer or suggestion, whether he is well known to any of the directors and whetner it would be advisable to cultivate him. Please write me a *personal* giving me any information you may obtain.

Yours, &c.,

JOHN STERLING DEANS.

EXHIBIT No. 75j.

(Letter headed Quebec Bridge Co.)

QUEBEC, April 21, 1900.

MR. J. S. DEANS,
Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—I am instructed to confirm you the telegram which was sent this morning by the president, as follows:—

'April 21st, 1900.

J. S. DEANS,
Phœnix Bridge Co.,
Phœnixville, Pa.

Agreement made in New York April 12th, approved by board. Proceed with plans immediately so as to enable us to order steel for anchorage piers upon approval

of same. Arrangements made with Davis. You can confer with Cooper and Hoare re plans.—(Signed) S. N. PARENT, Pres. Q. B. Co.

I also beg to enclose copy of resolution adopted by the board of directors this morning.

Yours truly,

ULRIC BARTHE,
Secretary.

EXHIBIT No. 75k.

April 14, 1900.

Hon. S. N. PARENT,
President, Quebec Bridge Co.,
Quebec, Canada.

DEAR SIR,—In view of the extreme importance of avoiding delay on your work, which we all appreciate, I write to ask you to kindly wire us when our recent agreement has been approved by your board and they have decided to order the metal work of anchorages.

We understand that in all engineering matters we are to receive our instructions from Mr. E. A. Hoare, your engineer, and that he works under authority from your board. Please advise if we are correct in this.

Further, we understand that all of our detailed plans of the structure, including sections, &c., must have the approval of Mr. Theo. Cooper, consulting engineer, 35 Broadway, New York, N.Y. Please advise us if we are correct in this.

I write you on these matters in advance of receiving your instructions to proceed, that there may not be the least delay in knowing how to proceed.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76.

Extracts from Phœnix Bridge Company's letter book No. 2, Quebec Bridge Company, February 23, 1905, to July 19, 1907.

EXHIBIT No. 76a.

July 8, 1905.

Mr. C. W. HUDSON,
Assistant Engineer, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—We are sending to-day to Mr. Shoemaker complete instructions and plans for repairing the chord which was damaged in unloading at storage yard. You

will please read over carefully these instructions, and after becoming familiar with same explain to Mr. Hoare what we propose to do to put this chord in first class shape. You will please say to Mr. Hoare that both Mr. Szlapka and yourself have carefully looked into the matter, and when the repairs are made the chord will be entirely satisfactory. We have no doubt Mr. Hoare will have no objection to the method, but think best to have it explained to him in careful detail before the work is done.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76b.

July 21, 1905.

Mr. E. A. HOARE,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—Mr. Szlapka saw Mr. Cooper yesterday, and he is entirely satisfied with our method of splicing angles of chord 9 in Chaudière yard, and I have to-day so advised our foreman and have instructed him to exercise care to see that the work is done in a thorough and careful manner.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76c.

July 21, 1905.

C. W. HUDSON, Esq.,
Assistant Engineer, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—Referring to your letter of July 19, and that portion of it covering the handling of chords 7, 8 and 9. We have noticed that the lines in one position of handling bear against the strut, but have not figured that it was of very serious moment. We will be pleased to hear from you after you have looked into the matter further.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76h.

August 18, 1905.

A. B. MILLIKEN, Esq.,
Superintendent Erection, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—Replying to your letter of August 16.

We wired you this morning, 'Upper connection plates for laterals not required at present. Fill two-thirds of the holes with bolts whenever possible.'

Please understand that while the anchor arm is supported by falsework, the lower laterals do not carry any wind stresses whatever, all these stresses travelling from trusses direct to wooden and steel falsework. It is, therefore, only a matter of convenient erection when you put these laterals in before you commence to erect the cantilever arms.

As regards the number of bolts for connections, we will not send you a diagram, as in all cases whenever possible it will be satisfactory to fill two-thirds of the holes with bolts. But in the connection of stringers to floorbeams this number should not be decreased, always remembering that the bolts when entered should only be driven so as to leave the *lower chord sections in their final camber position* without closing the gaps in chord sections shown on our erection diagram.

We understand that you will confer with Mr. Deans regarding elevations for north anchor arm falsework, and the advisability of having an outside party take these measurements.

We have advised Mr. Davis as regards return of check from Grand Trunk, forwarding Mr. Pullum's letter to him, with the request that same be returned to you.

Yours truly,

THE PHŒNIX BRIDGE CO.

EXHIBIT No. 76i.

QUEBEC, CANADA, 8-19-'05.

HON. S. N. PARENT,
Pres. the Q.B. and Ry. Co.,
Quebec, Canada.

DEAR SIR,—The progress we are now making on the erection of permanent metal of the bridge is such, that it will reach a stage by the middle of next summer when it will be absolutely essential to the further progress of the work, we be ready to deliver material at storage yard, at grade, at north approach to the bridge.

To be able to do this it will be necessary that the short connection between the north end of bridge and the Canadian Pacific Railway be started immediately.

While the length of this connection is short, it involves much heavy work, which will take time to construct. The matter is so serious I have felt it necessary to bring it to your particular attention.

If this connection is not completed by the above time, say about July, 1906, it will undoubtedly result in delaying the completion of the bridge a year, and this will involve large interest charges and the disorganization of our forces, which would take months to get in efficient shape again.

I sincerely trust it will be possible to get the approach work under way at once.

I remain,
Sincerely yours,

J. S. DEANS.

EXHIBIT No. 76j.

(Telegram.)

QUEBEC, QUE., 10-24-'05.

J. S. DEANS.—Intended writing you about riveting lower chords anchor arm but overlooked it. Amended erection instructions from your office states that lower chords are to be riveted before work is carried beyond main pier; this is contrary to first instructions; it is a puzzle to us. We have referred it to Cooper. Please reply.

E. A. HOARE.

(Telegram.)

October 25, 1905.

E. A. HOARE,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

The field has authority to rivet chords when the bearing surface are in perfect contact.

JNO. STERLING DEANS,

EXHIBIT No. 76k.

October 25, 1905.

Mr. E. A. HOARE,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—Confirming telegram of this morning as follows :—

The field has authority to rivet chords when the bearing surfaces are in perfect contact.'

You will readily appreciate that the action of the several sections composing the lower chords in the anchor arm, will fix the time when riveting can take place and when each pair of chords are in complete contact over the entire surface of the bearing, it will then be a proper time to do the riveting. We will have the opportunity of discussing this matter with you personally before any material amount of riveting is done and certainly before any riveting is done outside of the end horizontal chords.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76 l.

(Telegram.)

ETCHEMIN, QUE., 11-22-'05.

JNO. S. DEANS,—We have closed this year's erection at 3 o'clock this p.m. by completing the erection of the third double panel of south anchor arm.

A. B. MILLIKEN.

EXHIBIT No. 76m.

November 24, 1905.

Mr. E. A. HOARE,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—I beg to advise you that Mr. Cudworth has finally agreed to remain with us during the winter, we giving him a certain time off at the beginning and a certain time off at the end of the winter when you will have one of your representatives remain at site. This time will be arranged between Mr. Cudworth and your representative.

Mr. Milliken has wired me since my return to Phœnixville that the 6th panel of south anchor arm was erected, complete and the work stopped for the winter, on the afternoon of November 22. I know from your expressions to me, that you feel we worked as long as it was possible to conduct it with safety.

Since the approach reached the south side of the bridge on July 8, 1905, we have pushed the erection with all possible energy and have not been delayed by the want of any material, or the want of any labour. We, therefore, feel we have accomplished everything it was possible to do in the remaining portion of the season of 1905. What we did accomplish indicates clearly, that if we had had the full season for work, we could have erected, at least, this season, the metal work complete to the south main pier, including the centre posts, which was in accordance with our original programme for erection.

As I have written you before, I fear this delay will prevent us completing the south half of the entire structure next season, although we shall make an earnest effort to do this. If we do not accomplish it, as you undoubtedly understand, it will mean an additional working season at great additional expense to us, and of course additional expense to your company in interest charges, &c.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76n.

November 24, 1905.

Hon. S. N. PARENT,
Chairman Transcontinental Railway Commission,
Ottawa, Canada.

DEAR SIR,—I was very sorry to miss you during my recent trip to Quebec. I desired particularly to talk with you in connection with the approach to the north side of the bridge. This is a most important matter. I have had no word from you since my letter on this subject of August 19, 1905. There should not be any delay in starting the construction of this north approach. I understand a portion of this approach will consist of a large metal viaduct, and I know from the present congested state of the metal market that it will need all the time between now and next summer to design, construct and erect this structure. Will you kindly advise me what progress is being made in this connection. I can call to see you at Ottawa to discuss the matter personally at any time you may name.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76p.

December 26, 1905.

E. A. HOARE, Esq.
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR MR. HOARE.—Referring again to the north approach to the bridge and the metal viaduct which will be required, I desire to impress upon you the necessity of placing the order for this material. I know personally that all of the important bridge companies in the United States are sold out completely for 1906, and all of the steel mills are practically in the same condition. We have kept ourselves in control to take care of just such urgent pieces of construction. If you think there is any prospects of our doing the work, we should know it promptly. Will you kindly let me hear from you by return mail. When Mr. Davis was last here, here he asked me to send him a price, but I have not done this, as I wanted the matter to get into more definite shape.

Wishing you the compliments of the season,

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76s.

(Telegram.)

QUEBEC, February 10, 1906.

MR. D. REEVES.

The Dominion government may call upon this company at any moment for the final estimates to complete the bridge over the St. Lawrence river, as a reorganization may take place very soon. Figures of this kind must be correct and cover everything required to complete the bridge ready for traffic, because after the next deal there will be no second opportunity to ask for funds. Your estimated weight of metal omitting the short end spans amounted to 29,736 tons, which figures were given to the government as being sufficient to cover the entire bridge, which at the time I thought insufficient. I was, however, assured that the figures were ample. To show that they were not I have already returned for payment over 29,000 tons, which do not include suspended span and some portions of cantilever arms. Will you please have this thoroughly investigated and the correct tonnage figured out to complete the bridge subdivided according to schedule prices.

E. A. HOARE.

For Mr. W. H. R. and P. B. Company—2/12/06.

EXHIBIT No. 76t.

February 17, 1906.

THEO. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—As reported to you by Mr. Edwards, chord 8R on cantilever arm was faced at long end 7/64" out of square, so that while one rib is of the exact length, the other three are short, the outer rib being short 7/64".

There are two methods of correcting this error:—

1st.—We might reface the chord, so that the end will be square and the long section will be 7/64" short. This method would cause bending on the hanger to the amount of 7/64", as the stringers in this panel are fixed at both ends. The end of the cantilever arm would drop about 1/4" owing to the short panel.

2nd.—We might reface the chord, making the section say 1/2" short, and replace this material by a filler securely doweled to each rib and to the exact shape of each rib. This would preserve the panel of the exact length.

I am inclined to believe that the second method is preferable, and if you agree with me, I will permit the shops to proceed with this method of correction. Please advise us as early as possible, as the shops are anxious to finally complete the chord.

Yours truly,

THE PHŒNIX BRIDGE CO.,
Per P. L. SZLAPKA.

EXHIBIT No. 76u.

(Telegram.)

QUEBEC, Mar. 28/06.
Mr. DAVID REEVES—P. B. Company.

When will you be able to let me have the figures of the total weight of metal for Quebec bridge when finished, as requested in my letter of February 10? I fear I may be called upon any day for this information.

E. A. HOARE.

EXHIBIT No. 76v.

April 28, 1906.

Hon. S. N. PARENT,
President, Quebec Bridge and Railway Co.,
Care Transcontinental Railway Commission,
Ottawa, Canada.

DEAR SIR,—I understand the Cap Rouge viaduct has been finally awarded to the Dominion Bridge Company. I trust this contractor, and also the contractor for the rock-cut and grading on the approach to the bridge will be impressed with the great importance of the early completion of this approach. Unless it is put in shape to receive materials this year, it will undoubtedly mean a year's delay in the construction of the bridge. Our own field programme will be so seriously affected by the date of completion of this approach that it will be necessary for us to have a conference with you at an early date. If you do not find it possible to visit us in the meantime, I will arrange to see you, with our Mr. Milliken, about May 15. Kindly advise if you will be in Ottawa or Quebec at that time.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 76x.

(Telegram.)

June 8, 1906.

A. B. MILLIKEN,
Etchemin, Quebec, Canada.

Adviso Mr. Scheidl to remain at bridge until centre posts fully connected. I assume you have come to agreement with him regarding riveting and discussed present elevation of panel points and open joints of all members as far as erected and the final plans for temporarily holding points at main strut connection, answer.

JNO. STERLING DEANS.

A. B. MILLIKEN,
Etchemin, Quebec, Canada.

Referring to Norris' personal letter to you, have drillings sent him immediately and match mark each package of drillings and rods so there will be no uncertainty about identification. Answer.

JNO. STERLING DEANS.

EXHIBIT No. 76y.

May 9, 1906.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—Field painting—I am rather surprised at your letter of May 7 in connection with painting. The matter has been referred to Mr. Milliken, and when we come to Quebec within the next week we will take the matter up and settle it properly at that time. I wish you would have your inspectors be prepared to point out in detail the parts which have not been cleaned and painted properly by our men.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77

Being a continuation of extracts from Phœnix Bridge Company's letter book No. 2, Quebec Bridge Company, covering the period from July 3, 1906, to January 2, 1907.

EXHIBIT No. 77a.

July 3, 1906.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—Painting inaccessible parts—Replying to your letter of June 29th, as I understand the consulting engineer's wishes he desires that we arrange for those

parts of the work which are not readily accessible for hand-painting, a proper size hole to receive a nozzle of a paint spraying machine and this we will arrange to do. It would seem advisable not to locate this hole definitely until after the erection, as it can then surely be placed in the most desirable location. If your representative will keep a diagram, indicating at each point where a special provision for painting must be made and hand this diagram to our representative at site, it will surely receive attention and you may give yourself no further anxiety on this point.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77b.

E. A. HOARE, Esq., July 9, 1906.
Chief Engineer, Quebec Bridge and Ry. Co.,
Quebec, Canada.

DEAR SIR,—Yesterday, July 8th, was the anniversary of the completion of the track to the south end of the Quebec bridge, making it possible for us to deliver material and start the erection. We have therefore completed one full working season on the erection.

Last Saturday we had the complete south anchor arm erected, and the first panel of chords with the first story of web members in place in the cantilever arm ; demonstrating that our original estimate that the bridge could be erected in four full working seasons was correct.

The loss of the time up to July 8th of last year it is now plainly seen was very serious. We are hoping to make up for at least a portion of this loss, by using an additional traveller for erecting the last single panel of the south cantilever arm, and the south half of the suspended span. By using this additional traveller, although it means much additional cost to us, we will be able to be working on both sides of the river at the same time.

If we are able to keep our present program, we should have the south cantilever arm erected, with the exception of the last single panel, and the new traveller in place ready to erect the balance of the material, and the large traveller at least partly removed and transferred to north shore, before we are compelled to close down this season.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77c.

August, 20, 1906.

A. B. MILLIKEN, Esq.,
Supt. Erection, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—Field corrections—I have your letter of August 17, and I quite agree with your criticisms in connection with the replies which you receive from these

reports. It is distinctly understood with the Engineering Department and your own department here, that each department must reply direct to the corrections for which they are directly responsible. You will have to allow for the next several weeks some delay in the engineering department in passing upon and replying to your field corrections. They will not eventually be neglected and they will be taken up in order and answered in detail, but now every moment of Mr. Scheidl's time is demanded by the urgency of the shop plans of the end of the cantilever arm and the small traveller. As soon as these are out of the way you will hear from all field corrections which have not been replied to. I trust this is satisfactory.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77d.

A. B. MILLIKEN, Esq., August 22, 1906.
Supt. Erection, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—Steel bents—I am at last able to write you definitely in connection with the release of the first tower, or two complete bents adjoining the anchor pier. The designing office has carefully checked over the reactions from actual weights of members and find that these two complete bents may be removed when six single panels of cantilever arm are erected and the traveller standing in position ready to raise the 7th single panel.

We figure therefore that you will be able to take down these bents the latter part of September or early in October, provided you have reasonably good weather. It would appear therefore as if you could rush the work on the north shore. You will receive this advice as to the removal of the towers in the regular way from Mr. Scheidl, as a page in his blue print book of erection notes.

I send the above in advance for your information.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77e.

(Personal.) August 23, 1906.

E. A. HOARE, Esq.
Chief Engineer, Quebec Bridge & Ry. Co.,
Quebec, Canada.

DEAR MR. HOARE,—I thank you for your letter of August 15th, giving me some information in connection with the C.P.R. viaduct. I will look into this matter further.

Concerning our monthly estimates, the officials in Ottawa evidently do not clearly understand our contract. From an examination of the schedule in contract, it is quite clear that the item for *metal erected* meant metal erected and bolted. The

last item *metal erected and painted complete,* means riveting and painting, finishing our contract.

The 15 cents or $3 per ton in this last item is more than sufficient to paint and rivet the entire structure.

When you bear in mind that we are now painting a very considerable portion of the structure and are also following up the riveting and are making no claim for either of these two items month by month, you will see that the government is amply protected and without any consideration of the reserve of $100,000, &c.

We cannot, therefore, accept this deduction of $1.50 per ton, as it would be a distinct departure from the terms of our contract.

Yours truly,

JNO. STERLING DEANS.
Chief Engineer.

EXHIBIT No. 77f.

August 23, 1906.

THEODORE COOPER Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—Drawings sent you this morning for your examination and approval complete panel No. 9 cantilever arm, Quebec bridge. The writer will call on you in the course of the next few days to explain some of our details based on the different method of erection lately decided upon. As shown on one of our blue prints sent to you, we expect to take down the large traveller in its position on plan, and finish the remainder of the south half of the bridge with a small traveller, supported on the top chord. This small traveller is by far lighter than the large traveller, consequently the total stress in the two end upper panels of the cantilever arm are only 5,000,000 pounds instead of about 7,000,000 lbs., as originally shown on our stress sheet. This explanation will, no doubt, enable you to check our detailed drawings and return same with your approval.

Yours truly,

THE PHŒNIX BRIDGE CO.,
Per P. L. SZLAPKA.

EXHIBIT No. 77g.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge & Ry. Co.,
Quebec, Canada.

DEAR SIR,—Your letter of August 27th is scarcely reassuring. When we were last in Quebec we understoc you to say that you were receiving reports from your inspectors weekly, indicating that the Dominion Bridge Company were receiving their materials regularly and satisfactorily, and that they had started the shop work. We had supposed with these reports before you, you could judge as to the progress which had been made and also as to the probable progress which would be made in the future. Your letter also does not advise that you have come to a definite con-

clusion in connection with the character of the foundations of Cap Rouge viaduct, and that the work on these foundations is actually under way. The trouble which you speak of in connection with the cement we assume refers to the pedestals of the viaduct and not to the river piers.

Will you not kindly advise us more in detail, so that our people will be better assured that the money which we are now expending will not be put out unnecessarily. Kindly let me hear from you promptly and oblige.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77h.

September 20, 1906.

A. B. MILLIKEN, ESQ.,
Supt. Erection The Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—Referring to your telegram advising that the blocking was still tight under trusses of anchor arm adjoining main river pier, we beg to advise that this condition is probably due to the fact that the points in general toward the anchor pier are low and this you will see has a tendency to increase the weights on bents adjoining the main river pier. It would be well to block up all points *toward anchor pier up to or even slightly above the elevations fixed for connection.* If this is done we believe you will find that the bent immediately adjoining the river pier has been released of its weight, even in the present condition of erection of the cantilever arm.

Please report promptly as possible.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77i.

September 21, 1906.

A. B. MILLIKEN, Esq.,
Superintendent Erection, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—At the meeting in Philadelphia yesterday, I was requested by Mr. Reeves to ask you for a particular and detailed report in connection with the bolting of joints for trusses, laterals and floor. Mr. Reeves has felt that in view of the riveting being done at various points it is possible that some joints have not been left in the exact condition required by the instructions from the office. Will you therefore have Mr. Birks go over the joints, beginning with the anchor arm end of truss and up to and including last cantilever panel erected, and report in detail, that he has examined and found joints and connections bolted and riveted in exact accordance with the instructions of the office. Do not wait in sending this report until all connections have been examined, but make reports as fast as any complete panels have been inspected.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77j.

September 29, 1906.

A. B. MILLIKEN,
Etchemin, P.Q., Canada.

Blocking up falsework to fixed elevations will certainly release weight from steel bents ten, nine and eight, and, if so, they can be removed in order, and before bent seven is clear. This would advance your securing grillage, at least, ten days.

JNO. STERLING DEANS.

EXHIBIT No. 77k.

(Telegram.)

ETCHEMIN, QUE., October 3, 1906.

JOHN STERLING DEANS.

Bent ten clear of anchor arm; could not complete jacking to-day for releasing bent nine and eight; will wire to-morrow; hurry bridgemen here.

A. B. MILLIKEN.

EXHIBIT No. 77l.

(Telegram.)

ETCHEMIN, QUE., October 4, 1906.

A. B. MILLIKEN,
Quebec, Canada.

Remove camber plates from bents nine and eight until points swing clear; we think this will require about three-quarters inch more.

PHŒNIX B. C.

ETCHEMIN, QUE., October 4, 1906.

P. B. Co.

Bent ten free, nine and eight lowered three-eighths below grade elevation for erecting and are still very tight; shall we take out camber plates until trusses swing clear on bent nine and eight. Answer.

A. B. MILLIKEN.

EXHIBIT No. 77m.

October 6, 1906.

Mr. A. B. MILLIKEN,
Superintendent of Erection, the Phœnix Bridge Co.,
New Liverpool, P.Q., Canada.

DEAR SIR,—Mr. McLure has reported to Mr. Cooper some matters in connection with 'Up-3' post. He finds it bent out of line in one or two places. Mr. Edwards

learned of this through Mr. Cooper, and then wrote Mr. McLure to ask why the P. B. Co. did not report this matter to their office. Mr. McLure has written that, 'the P. B. Co. knew nothing about it.' It seems strange that any serious matter would be overlooked by our men, and we would like to have a report from you.

We are very much pleased to learn that panel points 10, 9 and 8 are swinging clear. We assume that you have a record of the amount of packing which you took out of these points before the truss swung clear. We wired you this morning, asking that you take the elevation of the lower chord points at these panel points, and also the leaning of the top main post, before the traveller is moved ahead. We think that this information, in connection with the amount of packing which was removed and your last field report, will give us some valuable information and probably be of advantage to us in arranging the blocking elevations on north side.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77n.

October 8, 1906.

A. B. MILLIKEN, Esq.,
Superintendent of Erection, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—Replying to your letter of October 6, enclosing a communication to you from Mr. McLure of October 5, 1906.

I was not in the least surprised at your astonishment in receiving such a letter as the proposed supervision of your actions does not carry with it a single atom of responsibility.

The instructions sent from this office, which are referred to as the 'original instructions,' were decided upon, as you know, after the most careful consideration of each department of the company interested. We cannot hope in work of this unusual character to avoid the necessity of changing these 'original instructions.' I shall expect you to act upon instructions received from this office with the same alacrity and without question as you do on any other work in the field. In fact at Quebec it is even more necessary there should be only one source of these instructions.

If at any time you are doing what is not considered proper, the request for the change must come through Phœnixville. We know that Mr. Cooper did not intend that any instructions in connection with erection should be given to you from his office, and that his letter to Mr. McLure was simply giving his views and ideas as to how the work should proceed, which views were no doubt given in considerable detail, in view of Mr. McLure's lack of experience.

I return Mr. McLure's letter.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77o.

October 16, 1906.

(Telegram.)

A. B. MILLIKEN,
Etchemin, P.Q., Canada.

'Relieve points four, five, six and seven, so they just bear, then relieve and remove tower adjoining anchor pier and report. Your letter thirteenth.—PHŒNIX BRIDGE CO.

EXHIBIT No. 77p.

October 22, 1906.

N. R. McLURE, ESQ.,
New Liverpool, P.Q., Canada.

DEAR SIR,—I am much pleased to receive your letter of October 17th.

The letter which Mr. Milliken forwarded to me was worded in such a manner as to lead Mr. Milliken to believe that you were giving him definite instructions and orders. I now see that this was not the case. It is our intention and desire that you should be posted as to every move which we make in connection with the erection of this bridge and that every facility be given you to make proper reports to your superiors, and I have never understood before, that you had experienced any trouble in securing this information and in being posted as to what we proposed to do. If at any time you feel you are not being properly advised, or have the least trouble in securing desired information, if you will kindly take up the matter with Mr. Milliken, I believe you will be entirely satisfied and secure what you desire. I expect to be in Quebec the latter part of this week and will be pleased to discuss the matter further with you.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77r

(Telegram.)

November 7, 1906.

B. A. YENSER,
Etchemin, P. Quebec,
Canada.

If bents four and five are not clear cut out blocking and lower them until they swing clear as soon you can spare men; answer.—JNO. STERLING DEANS.

(Telegram.)

November 7, 1906.

B. A. YENSER,
Etchemin, P. Quebec,
Canada.

Until cantilever arm is connected wire us every night progress made and condition work and weather; answer.—JNO. STERLING DEANS.

EXHIBIT No. 77s.

(Telegram.)

November 8, 1906.

B. A. YENSER,
Etchemin, P. Q., Canada.

Your message to-day lower panel points four and five to swing entirely clear.

PHŒNIX BRIDGE COMPANY.

SESSIONAL PAPER No. 154

ETCHEMIN, QUEBEC, 11-8-'06.

P. B. Co.

Panel points anchor arm four R and L and five L has a slight bearing; all other points are swinging klear; shall we lower points to swing entirely clear.—B. A. YENSER.

EXHIBIT No. 77t.

(Telegram.)

ETCHEMIN, QUE., November 12, 1906.

Phœnix Bridge Company.

Wind sixty miles east deflections P' one cantilever post two inches west from normal.—B. A. YENSER.

EXHIBIT No. 77u.

(Statement.)

November 14, 1906.

On October 28, 1906, the undersigned visited Mr. E. A. Hoare, chief engineer Quebec Bridge and Railway Company, and discussed with him the probability of the north approach to bridge being ready to handle our metal in the early spring of 1907 as promised. He advised it was his opinion that the approach would not be ready until the latter part of 1907, and suggested that we see Mr. M. P. Davis, the contractor.

We then drove out to see Mr. M. P. Davis, and had a long talk with him on the subject, and he finally advised us that in his belief the masonry of Cap Rouge viaduct would not be ready before September 1, 1907, and after that date it would be necessary for the Dominion Bridge Company to erect the two towers and river span of this viaduct, and this would make the date when approach would be ready to handle our materials not earlier than October 15, 1907.

We expressed our sincere regret at this condition of affairs and advised him that it entirely upset our plans and would put us to much expense as we had been working toward starting the erection of the north anchor arm early in the spring of 1907, based on the promises made to us by himself and Mr. Parent that the north approach would be ready to handle materials not later than May 1, 1907. The present condition of our work was sufficient evidence that we were in a position to do this.

After leaving Mr. Davis we saw Mr. Hoare later in the evening and explained to him the result of our interview. We told him it would be necessary for some one to put the Phœnix Bridge Company right before Sir Wilfrid Laurier and Mr. Parent as we had given them our promise to exert every effort to complete the bridge in 1908, and had spared no expense to this end and were in a position to do so. Mr. Hoare expressed himself as entirely agreeing with us in this particular and that the delay would be one for which we were not responsible and he would have it clearly understood with above parties.

JNO. STERLING DEANS
A. B. MILLIKEN.

EXHIBIT No. 77v.

November 14, 1906.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—When last in Quebec you advised you expected to visit Phœnixville during the present month. As it is necessary for us to have a conference with you on several important matters, I write to ask when we may expect you here. Mr. Parent, you will remember, promised to make us a visit during this fall, and we trust he will be able to accompany you. It is specially desirable that he should see the present condition of our works here.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 77w.

(Telegram.
JOHN S. DEANS.

ETCHEMIN, QUE., November 26, 1906.

All metal panel no. one placed for this season removing (rigging) from traveller one lower section yet to remove bents eight and nine.

A. B. MILLIKEN.

EXHIBIT No. 77y.

December 27, 1906.

Mr. THEODORE COOPER,
Consulting Engineer,
New York, N.Y.

DEAR SIR,—We send you herewith in duplicate shop drawings of top chord section 'A' and of top laterals of the same panel.

The ties carrying the rails for the top chord traveller will be fastened to the top chord with hook bolts, so that no extra holes are necessary in the cover plates for any fastening of the track.

Kindly return one print with your approval, and oblige,

Yours truly,

THE PHŒNIX BRIDGE CO.
Per P. L. SZLAPKA.

EXHIBIT No. 77z.

January 2, 1907.

S. N. PARENT, Esq.,
President Quebec Bridge and Railway Co.,
Ottawa, Canada.

DEAR SIR,—Mr. Hoare left for home last Saturday, with full information as requested by you, covering the tonnage which must be temporarily stored near Belair

Your visit here will show to you the necessity of immediate action, and we ask that you will kindly wire us your instructions. After the receipt of your instructions it will take from one month to six weeks of earnest effort on our part to be ready to receive the material, and in the meantime the congestion here at our works is increasing.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78.

Extracts from Phoenix Bridge Company's letter-book No. 2, Quebec bridge, covering the period from January 2, 1907, to July 19, 1907.

EXHIBIT No. 78a.

(Telegram.)

January 18, 1907.

E. A. HOARE,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

The statement you have covering cost of storing 6,000 tons we believe is under estimated, especially doing the work at this season. No material is included that can be used elsewhere. The intention being the Quebec Bridge Company is to pay only actual dead extra cost of this temporary storage. Would Tuesday afternoon be as convenient for meeting your committee as Monday afternoon? Answer quick.

JNO. STERLING DEANS.

EXHIBIT No. 78b.

March 6, 1907.

E. A. HOARE, Esq.,
Chief Engineer, the Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—We wired you yesterday as follows:—

'Weight of main bridge, 72,800,000 lbs., exclusive of anchorages. Anchorages weigh 2,200,000 lbs.'

This weight of course you will understand is exclusive of the weight of the small approach spans.

As the drawings are practically complete, and figured weights were made of nearly every member, the above should be very close to the actual total weight of the bridge, and this is the first time that we have been able to make such a close estimate. All estimates heretofore have been, as you understand, simply estimated weights made before details were prepared and drawings approved by your consulting engineer.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78o.

(Telegram.)

RUSH—RUSH.

March 18, 1907.

THEO. COOPER,
Consulting Engineer,
45 Broadway, New York.

Mr. Szlapka will be in your office about 12.30 to-day with last drawing of Quebec —Hurrah.

JNO. STERLING DEANS.

EXHIBIT No. 77d.

March 18, 1907.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—Mr. Szlapka went to New York to-day and took with him for Mr. Theodore Cooper's approval the last drawing of the Quebec bridge. I firmly believe that few people appreciate what our engineering office has accomplished in connection with the detailing of the Quebec bridge. I believe you are among the few who *do* appreciate the magnitude of the work, and I also believe that you will be much interested in learning that the last drawing is now in the consulting engineer's hands.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78e.

March 19, 1907.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—We have arranged our programme for starting the work at Quebec, and Mr. Milliken will soon visit the site and determine when the work can actually begin. We will probably start the riveting first, and then follow with the removal of falsework on south side and the erection of the falsework on the north side, and later start the erection of the suspension span. We hope that the season will be such that we can make an early start.

We are all much interested in the progress which is being made on the Cap Rouge viaduct and the approach to the north end of the bridge. Will you not kindly advise us how this is progressing and when they expect to actually start on the caissons.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78f.

April 3, 1907.

Mr. F. P. NORRIS,
Manager, Phœnix Iron Co.,
Phœnixville, Pa.

DEAR SIR,—At an interview with Mr. Theo. Cooper, consulting engineer, by Mr. Szlapka, Quebec bridge, on April 1, his permission was obtained to moderately heat the injured ends of the chord section No. 10 cantilever arm. Should it be found that this heating is necessary kindly arrange to have the heating and repairing of the chord done in the presence of Mr. Morris and the Quebec Bridge Company's inspectors so that favourable and complete report may be made to the consulting engineer about the method used in repairing the chord.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78g.

April 20, 1907.

A. B. MILLIKEN, Esq.,
Supt. of Erection, the Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—The time has arrived when I think some definite steps must be taken in connection with starting of the work at Quebec, and while there is still some uncertainty surrounding the actual dates when shipments will be completed, I think you can depend upon the following and you will please arrange accordingly.

I understand you will leave for Quebec next Tuesday, April 23, and on your way will stop to see Mr. MacMartin at Albany, inquiring particularly of him as to any new work which is coming up and also discuss with him the bridges on the Quebec Southern, for which we recently tendered.

As you were advised all the riveting can now be done at Quebec and it would seem advisable to start this part with full forces any time after May 1, making special arrangements with Mr. Barton for the power you require for this part of the work.

North side—The north side work may be started at any time the river and weather conditions permit.

You may expect the small traveller to be delivered to you complete not later than June 1, and you will please arrange your erection so as to be ready for it on that date. I do not think that you will be delayed after that date for the want of any material, either for the traveller or for the suspended span, and you will arrange your forces to push the work in the most economical manner.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

P.S.—Please note letter to Mr. Barton, Can. E. L. Co. of April 20-'07, attached hereto.—(Sgd.) J. S. D.

EXHIBIT No. 78i.

April 30, 1907.

Mr. N. R. McLURE,
New Liverpool, P.Q., Canada.

DEAR MR. MCLURE,—I was very much interested and amused at your letter of April 28 in connection with the remarks made regarding Quebec bridge. It is in line with what we have heard from the beginning and I would not be surprised if there are many people in St. Romuald who would not care to walk over the bridge when finally connected until they had seen it carry trains safely for several weeks.

I suppose you have seen Mr. Milliken by this time and know that we will soon be organized and at work again.

I trust the season will keep open and pleasant.

With kind regards, I remain,
Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78j.

May 4, 1907.

A. B. MILLIKEN, Esq.,
Supt. Erection, the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—Field riveting—It has taken some time to carefully consider your message of May 2 in connection with riveting. You will bear in mind that the field report made by Mr. Birks at the close of last year's work, indicating that all joints were tight and that riveting could proceed. As a matter of fact the upper laterals and the lower laterals are about ¼th from their normal relation under present conditions and to rivet up now would put an extra stress in these members. The main diagonals running from the top of the centre post are also not in their normal condition at present and should not be riveted. This question of riveting and also the great variety of details surrounding the adjustment panel we believe warrants sending Mr. Scheidl to Quebec and he will arrange to be there on May 14 or 15, when he will discuss with you and settle all these matters. We trust this will be satisfactory and enable you to arrange your work economically.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78k.

May 9, 1907.

E. A. HOARE, Esq.,
Chief Engineer, the Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—Replying to your recent letter in connection with prints for the approval of the government engineers, I beg to advise you that we are forwarding the

sets as fast as they are received and have the approval of the consulting engineer. You will understand that nothing has been constructed without the approval of the consulting engineer, but it takes some time after this original approval for the sets of prints, which foot up a large number, to receive the attention and signature of the consulting engineer. Immediately on receipt of your letter, we called up Mr. Cooper's office and urged upon them the importance of returning prints promptly, and advised him of the receipt of your letter on the subject. You will no doubt be receiving sets of prints promptly until the whole list is cleaned up.

For your personal use we are sending you to-day three copies each of anchor, cantilever arms and suspended span stress sheets. If there are any other prints which you specially desire, please advise.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 781.

May 20, 1907.

Mr. N. R. McLURE,
New Liverpool, P.Q., Canada.

DEAR SIR,—We have your letter of May 17 in connection with riveting. Mr. Scheidl's trip to Quebec has been delayed on account of not starting the erection of main material until about June 1. In the meantime full revised riveting instructions were sent to the field, and we supposed you had copies. If you have no copies please confer with Mr. Milliken or Mr. Yenser and they will show you their copies until your set arrives. I will also see that you have full sets of erection drawings sent promptly, particularly drawing (C.O. 621, 622, No. 120).* There are such enormous number of prints passing through at present, including seven sets of all for Mr. Hoare, that we are swamped temporarily.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

* Since writing above I find you receipted for this drawing on May 14, 1907, and I will send another copy to-day.—J. S. D.

EXHIBIT No. 78m.

(Telegram.)

QUEBEC, QUE., May 20, 1907.

J. S. DEANS,
Phœnix Bridge Co.

All plans must be according to contract submitted to government engineer for approvals before any work is done or estimate paid. Department complains that some of the plans are not submitted soon enough. Will write and explain.

E. A. HOARE.

EXHIBIT No. 78o.

May 24, 1907.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge and Railway Co.,
Quebec, Canada.

DEAR SIR,—I have your letter of May 21 in connection with delay in send-(ing) to you, for the department, the certified copies of approved plans.

I believe you understand that no material or finished work was included in any estimates that had not been approved by your consulting engineer, and you will remember that the consulting engineer, by order in council, was given the authority to make changes in specifications and finally approve plans, and we were advised to carry out the consulting engineer's instructions.

The Quebec Bridge and Railway Company have therefore paid no estimates for any work or material which was not finally approved by the consulting engineer, and we on our part have forwarded to you as promptly as possible the certified copies of plans as received from the consulting engineer.

We have been working so close to the actual field work, which, of course, could not under any circumstances be delayed, that it has been impossible to keep your principals supplied with prints as promptly as desired. We have made another urgent request on the consulting engineer to forward the remaining prints in his office, which now number about six hundred copies.

You have received certified copies for everything up to the detailed drawings of second main panel of suspended span, and you have received the approved stress sheet of this span.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78p.

May 31, 1907.

Mr. A. B. MILLIKEN,
Superintendent of Erection, the Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—Referring to the instructions given you last year, in connection with the touching up of painting at Quebec, you will please continue to act under these instructions during the present season, that is, you will please put in proper shape any poor shop-coating, or any parts which are rubbed off during erection, and which may be brought to your attention by the representatives of Mr. Hoare or Mr. Cooper. I understood, when discussing this matter with you, that you personally considered such painting necessary. If at any time you have any question of the necessity of correcting any particular painting as may be requested by above, you will please bring the matter to my attention.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78q.

Hon. S. N. PARENT, May 31, 1907.
President, the Quebec Bridge and Ry. Co.,
Ottawa, Ont., Canada.

DEAR S.R,—We have just had a visit from Mr. Hoare, chief engineer, and among many other matters discussed with him, we took up the very important question of the north approach to the bridge.

We gathered from Mr. Hoare, as his best opinion, that we could not depend upon receiving material over this north approach via the Cap Rouge viaduct, to be of any service to us this year. Mr. Hoare suggested that possibly the Great Northern could have their connection completed much earlier, and, if so, the material for the north end of bridge could be delivered at our permanent yard via this line, in connection with the regular approach east of the Cap Rouge.

If we are to complete the erection of the metal work during the season of 1909, as now arranged, it is absolutely essential that material for erection be delivered at our permanent yard, near the north end of bridge, not later than September 1, 1907. We must erect, this season, the chords and main shoes for the north anchor arm, if we are to erect complete in 1909, and, even with the chords and pedestals erected this year, it will require two full and good seasons to carry out this plan.

We write you, not alone for the increased risk, anxiety and expense to us, which another working season would involve, but also owing to the serious effect on your interests growing out of another years delay.

Can you not do something to help this situation, and to insure delivery of the metal at our permanent yard by September 1?

I shall be glad to confer with you at any time or place in this connection.

Yours truly,

JNO. STERLING DEANS.
Chief Engineer.

EXHIBIT No. 78s.

B. A. YENSER, Esq., June, 15, 1907.
New Liverpool, P.Q., Canada.

DEAR SIR,—We have noticed in one or two of your reports reference to the sagging of bottom laterals anchor arm. We would like to have Mr. Birks look into this question and write us in detail concerning this sagging, why he thinks it occurs and how it is corrected.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78v.

Hon. S. N. PARENT, July 3, 1907.
President, Quebec Bridge & Railway Co.,
Ottawa, Canada.

DEAR SIR,—In accordance with my promise, I beg to give you below the results of my investigation in connection with the north approach to the Quebec bridge.

1st. We find no dependence can be placed on the Canadian Northern connection for service this year. We were advised that part of the right of way had not been secured, and their methods of working absolutely preclude any possibility of completing the connection before very late this year.

2nd. The connection between Belair and the bridge via Cap Rouge may possibly be completed this year, if the present programme of Mr. M. P. Davis can be carried out. (He expects to complete all substructure by August 15, 1907), and the Dominion Bridge Co. are instructed to increase their forces and duplicate their erection plant and keep close up to the foundations. If this latter is not done, the work on the approach will run over until next year.

3rd. We cannot hope to receive any benefit from north approach to the bridge this year, although this was necessary to absolutely insure the connection of bridge during the season of 1909. We will be ready to erect metal of north anchor arm by September 15, 1907, even working along moderately with our present forces. As we cannot bring material in over the north approach this year, it will be necessary for us to shut down on the north side and lose the two remaining months of present season.

4th. Under these circumstances the greatest effort must be put forth to absolutely complete line from Belair to bridge, ballasted ready to handle the heaviest loads this year, so that we may start erection the first favourable day of 1908.

5th. To insure every member being on the ground, preventing any possibility of delay, the entire north side must be delivered and stored at Belair this year. This will demand the increasing of the length of yard there, and we would like to have your formal instructions covering this extra expense for yard and the unloading and reloading of the material. The exact length of yard required, or the exact cost cannot be determined in advance—it will depend on how closely we can pack and store the material. We will do this extra work for actual net cost to us.

6th. The early part of next year, 1908, we must be given the use of track between Belair and bridge, so that we may temporarily operate our erection from Belair storage yard and have this track until our permanent yard, near the bridge, is in order.

Kindly let me have word from you promptly and oblige.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78w.

July 6, 1907.

A. B. MILLIKEN, ESQ.,
Supt. Erection the Phœnix Bridge Co.,
Quebec, Canada.

DEAR SIR,—You will undoubtedly appreciate the feeling of Mr. Reeves when I explained to him the situation in connection with the completion of north approach. He still feels it quite uncertain whether we will get this approach finished this year or not and sees of course the very serious results to every one if it is further delayed. He specially requests that you do what you can to keep every one interested in this matter—Mr. Davis, Hoare, Dominion Bridge Co., and others and asks that you be able to report on your next trip to Phœnixville the exact situation and what we may expect. Please, therefore, see Mr. Hoare *just before you leave* and impress upon him the feelings of Mr. Reeves in this connection.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 78y.

July 12, 1907.

B. A. YENSER, Esq.,
New Liverpool, P.Q.,
Canada.

DEAR SIR,—Referring to your letter of July 5 where you speak of using 3,600 ram in driving the square pin between end floor beams of cantilever arm and suspended span. We assume that this trouble in driving was caused by a slight difference in the position of the two floor beams, and that when they are finally adjusted after the erection of the first panel, it will be found that expansion can take place readily at end of suspended span. Will you please have Mr. Birks examine this detail carefully and report.

We understand Mr. Cooper has been advised that the end pin holes of cantilever arm are $\frac{1}{8}$" out of square, instead of being exactly in line as you reported. Please advise.

We also understand that Mr. Cooper has been advised that the cantilever arm deflected an additional 5 inches after the small traveller was erected. Please report on this.

We wired Mr. Milliken yesterday asking him to have Mr. Cudworth send us the revised print covering elevations promptly. We should have this information promptly after any new elevations are taken or any check elevations are taken. We certainly should have the information as early as Mr. Cooper, otherwise we cannot intelligently discuss the points which he raises from time to time.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79a.

July 24, 1907.

B. A. YENSER, Esq.,
New Liverpool, P.Q.,
Canada.

DEAR SIR,—Your letter July 22. Please advise Mr. Cudworth that 'full live load means 3,000 lbs. per lineal foot per track from anchorage to anchorage. No live load on the roadways or sidewalks.

Regarding specifications, it would be difficult for us to send Mr. Cudworth copy of the specifications, as there have been many modifications from the original. We will however, be glad to give him any information on any special point. Please have write us.

Yours truly,

JOHN STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79b.

July 26, 1907.

B. A. YENSER, Esq.,
New Liverpool, P.Q.,
Canada.

DEAR SIR,—Your letter of July 24 panel 'O' suspended span. We notice your remark that 'fully 50 per cent of holes in chord splices must be reamed before a $\frac{1}{4}$"

bolt can be put in.' Will you please send us a diagram of the truss at this panel, showing which chord splices were found in this condition and also give us a little more in detail, if possible, the grouping of the holes which were bad. We must try to locate how this occurred to avoid such trouble in the future. Do the holes appear to be out of line in a vertical direction, or out of line in a horizontal direction or do they vary? Have you or Mr. Birks any idea how this might have occurred in the shop?

JOHN STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79c.

August 8, 1907.

Hon. S. N. PARENT, President,
The Quebec Bridge and Railway Co.,
Ottawa, Canada.

DEAR SIR,—Temparary storage yard, Belair, Que. In January last, when arrangements were made with your company for the temporary storage at Belair, of 6,000 to 7,000 tons of material to relieve the yards here and to advance your work, it was thought that the north approach to the bridge would be completed in October, enabling us to arrange our permanent yard near the bridge and store there the remaining material and particularly that portion of the work necessary for the first part of the season of 1908.

It is now evident that this approach, even if completed this year, will not be ready in time to transport any material to the permanent yard and even make a start toward carrying out the above programme.

To absolutely insure that there shall be no delay in the erection in the spring of 1908, it is essential that all of the remaining material at Phœnixville be shipped to Canada and safely stored in the temporary yard at Belair, in close proximity at the bridge site, and to arrange for this the present yard must be correspondingly extended immediately and we ask the authority of your board for the actual extra expense involved, as covered by vouchers which we would submit as per our present arrangement for the 5,000 to 7,000 tons,

It is needless for me to go into greater detail, as to the necessity of this action and what it means to both your company and to us if this great work, through further delays, is extended another season.

We may add the entire capacity of the present yard, 6,000 to 7,000 tons, has been shipped and nearly all of it has reached site and stored.

Asking that you give this matter the earliest possible attention, we remain,

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79e.

(Telegram.)

August 8, 1907.

A. D. MILLIKEN,
Etchemin, Quebec, Canada.

Mr. Cooper disapproves splicing joints lower chords 7 and 8 as proposed by Birks—have Szlapka look into this carefully.

PHŒNIX BRIDGE COMPANY.

EXHIBIT No. 79f.

(Telegram.)

August 8, 1907.

PHŒNIX BRIDGE COMPANY,—Method proposed at Quebec for splicing joints in lower 7 and 8 chords is not satisfactory. How did bend occur in both chords ?

THEO. COOPER.

EXHIBIT No. 79g

(Telegram.)

August 9, 1907.

THEODORE COOPER, Consulting Engineer,
45 Broadway, New York.

Mr. Szlapka happened to be at bridge site yesterday. Expect him home to-morrow with full information concerning chord joint. Will then write you fully.

JOHN STERLING DEANS.

EXHIBIT No. 79h.

August 9, 1907.

A. B. MILLIKEN, Esq.,
Supt. Erection, The Phœnix Bridge Company,
Quebec, Canada.

DEAR SIR,—In view of the conditions now at Quebec, you will probably have enough to attend to for the present, but having made the following notes, I record them for your information, as soon as you find the time and opportunity.

Main Traveller.—The removal of this traveller certainly has been much slower than you expected and I have no doubt Mr. Szlapka spoke to you regarding this when in Quebec.

End Adjustment.—We will be much interested to learn how the jacks work in making this adjustment—what trouble was found from the 'spring' of plates, etc.

Riveting.—For some reason the price of riveting has kept tie for the past week or two. Can this not be reduced?

North Side Shoes.—We assume Mr. Szlapka advised you that Canadian Pacific will not receive these shoes for shipment until certain bridges are renewed 'early in the spring.' We think this should be kept *private* for the present, as it might have some effect on the question of increasing the Belair yard. Have you any suggestion to make regarding handling these shoes from the river ?

Belair Yard.—We have now shipped about 6,500 tons of material to this yard and have made formal application to the Quebec Bridge Company, at the suggestion of Mr. Parent, for their authority to increase this yard to receive *all* the material at Phœnixville. As you have the opportunity, please urge upon Mr. Hoare and other officers of the company the necessity of this.

Elevations.—The advanced 'elevations' sent with field report, August 7th, for the panel points suspended span erected to date, agree very closely with office figures here, and you will hear from us again after Mr. Szlapka returns. The information sent was exactly what we require upon the erection of each panel point and in advance of the movement (illegible).

Yours truly,

JNO. STERLING DEANS.

EXHIBIT No. 79i.

August 10, 1907.

(Telegram.)
THEO. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—Splice cantilever chords 7 and 8.

Mr. Szlapka did not return to-day as expected, but will no doubt be here Monday, when we will write you at once.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79j.

August 12, 1907.

THEO. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—Chord splice, south cantilever arm, 7-L and 8-L.

Mr. Szlapka reached the office this morning, and I am able to give you information in connection with this one joint.

All ribs of the chord 7-L have a complete and full bearing on all ribs of 8-L. The bend was no doubt put in the rib in the shop before facing, and was probably done when pulling the ribs in line to make them agree with spacing of these ribs and the clearance between ribs called for on the drawing. The bend being on only one rib of one chord, there being a full bearing over the entire rib, all splice plates being readily put in position, we do not think it is necessary to put in the diaphragm suggested by our erection department.

Please let us hear from you promptly on this subject, and oblige,

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79k.

August 14, 1907.

B. A. YENSER, Esq.,
New Liverpool, P.Q.,
Canada.

DEAR SIR,—Enclosed please find copy of letter just received from Mr. Cooper in connection with bearings cantilever chord splice 7-L and 8-L, also our letter to Mr. Cooper of August 12th.

I wish you would have Mr. McClure and Mr. Birks examine this joint carefully and come to some understanding between themselves as to exactly the condition at this point. It is unfortunate that Mr. Cooper often receives quite different information from that reported to this office. I think it is quite necessary to avoid misunderstanding, that Mr. McClure and Mr. Birks understand each other before reports are made in future.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.....

EXHIBIT No. 791.

August 14, 1907.

(Telegram.)

THEO. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—Splice chord 7 and 8-L—your letter August 13th.

I will have a full and complete report made of this joint by Mr. McClure and Mr. Birks and submit it to you earliest possible moment.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79m.

August 16, 1907.

B. A. YENSER, Esq.,
New Liverpool, P.Q.,
Canada.

DEAR SIR,—Your letter of August 8th. Referring to your question as to whether diagonals T-5 and T-50, south side anchor and cantilever arms, may be riveted, we beg to advise that calculations have been made and it has been found that it will not be advisable to rivet these joints before the fifth panel of suspended span is erected complete. Of course, if any of the joints should be tight, either now or as erection progresses, they may then be riveted, but until the fifth panel is erected there is considerable tension in these diagonals.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79n.

August 20, 1907.

THEO. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—We have advice from our field that you have received copy of sketch No. 28, giving further details in connection with cantilever chord splice 7-L and 8-L. You will notice that the two chords have a perfect bearing with each other at all ribs, both chords having one bent rib, and not one chord only, as we first understood.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79o.

August 23, 1907.

THEO. COOPER, Esq.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—Joint 7-L and 8-L, south cantilever arm.

Referring to your letter of August 21st, I notice you expect to hear again from Mr. McClure. As soon as you have his report kindly let us hear from you again, and oblige,

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79p.

August 24, 1907.

Mr. F. P. NORRIS, Mgr.,
Phœnix Iron Company,
Phœnixville, Pa.

DEAR SIR,—Belair yard—up to August 23 there has been shipped to the north side about 14,100,000 lbs. This leaves about 22,000,000 lbs. remaining to be shipped. Can you not do something to hurry this out? South side now being finished, we sincerely hope you can do better on the north. Winter arrives early in Canada.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79q.

August 26, 1907.

B. A. YENSER, Esq.,
New Liverpool, P.Q.,
Canada.

DEAR SIR,—Referring to your field report, No. 19, we know you will be interested in learning the check figures of the office.

The field make the elevation—		Office.
bottom of P 1	average 19⅛"	18¾"
foot of T O O	average 25⅛"	24 7/16"

There must necessarily be some discrepancy between the office figures and the actual facts existing in the field. In the single case of weight of the wooden floors assumed by the office, at 1,500 lbs. per lin. ft, for entire floor. up to and including last panel erected, is no doubt too much and therefore it is natural that the office results should be lower than the actual figures found in the field. This all is a very satisfactory check.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

P.S.—We will not need any further measurements for longitudinal positions until we come to the centre post.

J. S. D.

EXHIBIT No. 79r.

August 27, 1907.

THEO. COOPER, ESQ.,
Consulting Engineer,
45 Broadway, New York, N.Y.

DEAR SIR,—Chords splice 7 and 8 cantilever arm south side.

Replying to your letter of August 26, I will have Mr. Sziapka call to see you first opportunity, to discuss this question. He will wire you later the day he will be in New York.

Yours truly,

JNO. STERLING DEANS,
Chief Engineer.

EXHIBIT No. 79s.

ETCHEMIN, P.Q., CANADA, August 28, 1907.

(Telegram.)

PHŒNIX BRIDGE CO.,
Phœnixville, Pa.

McLure will call to-morrow to explain Birk's letter *re* anchor arm chord. Will see Cooper first.

E. A. HOARE.

EXHIBIT No. 79t.

(Telegram.)

August 29, 1907.

E. A. HOARE,
Chief Engineer, Q. B. Co.,
Quebec, Canada.

McLure has not reported here. The chords are in exact condition they left Phœnixville in and now have much less than maximum load.

JNO. STERLING DEANS.

EXHIBIT No. 79u.

(Telegram)

1.12 p.m., August 29, 1907.

PHŒNIX BRIDGE CO.,
Phœnixville, Pa.

Add no more load to bridge till after due consideration of facts. McLure will be over at five (5) o'clock.

THEO. COOPER.

EXHIBIT No. 79z.

ETCHEMIN, P.Q., CANADA, August 30, 1907.

(Telegram.)

PHOENIX BRIDGE CO.,

Entire anchor and cantilever arm collapsed at 5.30 this P.M. with workmen. Number lost unknown. Yenser, Birkes, Worley and Aderhoit not accounted for. Work of rescue going ahead. Wickeizer in charge.

W. W. WAITNEIGHT.

EXHIBIT No. 79bb.

September 14, 1907.

F. T. DAVIS, Esq., Treas.,
The Phœnixville Bridge Company,
Philadelphia, Pa.

DEAR SIR,—We sent yesterday by the hand of Mr. Wm. H. Reeves a number of Quebec Bridge papers for the use of Mr. Barnes.

We understand from Mr. Reeves you have now in your safe the three blue print stress sheets. These blue prints are the original copies, signed by Mr. Cooper and the Canadian government and are very important records. Please see they are kept in good order and so you can lay your hands on them at any time, and oblige.

Yours truly,

THE PHOENIX BRIDGE CO.,
Per CHAS. E. CONNARD.

EXHIBIT No. 79cc.

(Telegram.)

QUEBEC, QUE., September 16, 1907.

CHARLES E. CONNARD,

Send me print of general plan attached to our contract, also look over correspondence and advise by letter when and how we were first advised original specifications would be modified.

JNO. STERLING DEANS.

EXHIBIT No. 79dd.

September 16, 1907.

Mr. JOHN STERLING DEANS:
Chief Engineer,
The Phœnix Bridge Company,
Quebec, Canada.

DEAR MR. DEANS.—I have your message to-day regarding 'when and how we were first advised original specifications would be modified.' Beg to state, Mr. Szlapka understood you had several conferences with Mr. Cooper in New York and he talked about changes in specifications and had given the matter considerable thought and he

requested you to ask Mr. Szlapka to meet Mr. Cooper in New York with any suggestions of his own. Mr. Szlapka went to New York on May 14th, 1903, where the question of specifications was further discussed and Mr. Szlapka secured a copy of changes in the specifications (6 pages) which Mr. Cooper had already prepared headed 'Specifications for loads and strain on Main Spans.' The final changes made by Mr. Cooper in the specifications are dated June 2nd, 1903. Later when the detail drawings were worked out and strain sheets prepared for trussed floor beams, a new clause was added to the specifications on March 2, 1904, giving unit stresses for trussed floor beams.

Regarding general plan attached to contract, we called Mr. Davis on 'phone and he advised no plan was attached to his contract and never had been.

From our records we find we sent to Mr. Hoare on October 12th, 1900, three sets of general plans correcting final 1 per cent grade and correcting length of approach spans and on October 25th, 1900, we sent one copy to Mr. Barthe.

We enclose herewith one copy of this plan No. 902 and the office here believe this is the copy attached to the contract, you will notice it calls for an 1,800 ft. span. Can you not get this confirmed from Mr. Hoare or Mr. Barthe.

In looking over our files we find we received a general plan of the 1,600 ft. span December 9th, 1898, which plan is dated Jan. 13th, 1898, and signed by Mr. Parent and Mr. Hoare.

Mrs. Deans is phoning you this evening and we will include a message.

Yours truly,

THE PHOENIX BRIDGE CO.,
Per CHAS. E. CONNARD.

EXHIBIT No. 79gg.

QUEBEC, CANADA, September 26, '07.

(Telegram.

P. L. SZLAPKA:

In case Mr. Deans forgets, please mail me immediately blue prints of calculations of strains, revised for the whole bridge. Those filed with government only for anchor and cantilever arms unrevised. Must have complete set immediately.

E. A. HOARE.

EXHIBIT No. 79hh.

(Telegram.)

September 27, 1907.

E. A. HOARE,
Chief Engineer,
Quebec Bridge & Rwy Co.,
Quebec, Canada.

Will send blue prints of calculations as soon as copies can be prepared.

THE PHŒNIX BRIDGE CO.

EXHIBIT No. 80a.

NEW YORK, January 26, 1905.

PHŒNIX BRIDGE COMPANY,
Phœnixville, Pa.

GENTLEMEN,—The tests showing the elongation of the eyes of eyebars under the usual working strains open up a very grave problem, upon the solution of which the interests of your company and of the Quebec Bridge Company are involved.

Before any decision can be made as to the proper future action, an exhaustive investigation of the whole question must be made. Best form and size of head to reduce this action to a minimum, how to insure uniformity of action of the different bars forming one set, &c.

Its solution has such an important bearing not only on the problem of the Quebec bridge but all future long spans, I feel that it would be wise to enlist the American Bridge Company to assist in the investigation and that I should have the aid of counsel (engineering) before a final decision can be had.

Yours very truly,

THEODORE COOPER.

EXHIBIT No. 80b.

January 25, 1905.

PHŒNIX BRIDGE COMPANY,
Phœnixville, Pa.

DEAR MR. DEANS,—Yours of 27th at hand. I am not able to come to Phœnixville nor in condition for serious work. If you could come over here I would like to have a little talk on the very serious question before us.

I hope you are not making any more eyebars for the Quebec bridge. I cannot accept any until this matter is fully investigated. The responsibility is too vast to proceed on the result of a few tests or without a full discussion. I think it would save much time if others were enlisted in the examination.

Yours very truly,

THEODORE COOPER.

EXHIBIT No. 80c.

To JOHN STERLING DEANS, Esq.,
Phœnixville, Pa.

NEW YORK, July 22, 1905.

MY DEAR DEANS,— If you come over here next week please come and see me. I want to talk over McLure's case. Unless Hoare comes down, I will have to depend upon your aid to get through his head the difference between an inspector for the erection and one for rivets. I would like to get this settled before sending McLure up there. My present physical condition will disable me from going to Quebec when any difficulty comes up, and I must have a technical man there who can make me know how things are.

Yours truly,

THEODORE COOPER.

EXHIBIT No. 80d.

NEW YORK, February 19, 1906.

P. L. SZLAPKA, Esq.,
Phœnixville Bridge Company,
Phœnixville, Pa.

DEAR SIR,—In reply to yours of 17th instant, I regret very much these errors.

The only remedy for the chord 8R seems to be the second method you propose. The dowels should be of such a character to ensure the plates from being loosened or damaged.

For that centre cap where all the pin holes have been bored too large, I see no satisfactory remedy but enlarged pins. The pin plates, to my surprise, have 20 per cent more pressure than the eyebars (should not have been so) and with the large holes, will make this the weakest joint in the structure, much to my regret. T50 also have reversed strains and the joints should be tight ones instead of being so free as now made.

Your very truly,

THEODORE COOPER.

EXHIBIT No. 80e.

(Letterhead of Quebec & Lake St. John Railway.)

QUEBEC, January 29, 1898.

(Personal.)

DEAR MR. DEANS,—I intended writing sooner but I was waiting for something definite to communicate. Matters have been dragging lately on account of some cross firing, but now they look more settled. There is more or less public opposition to overcome regarding the site, which until cleared away affects negotiations at Otttawa. The subsidy question is going to be pressed very hard sometime next month. The formation of a contracting company just at present does not meet with much favour until it is known when a subsidy can be expected. There is an important directors' meeting on Monday to decide upon future action respecting certain attitudes towards the main object. If I see things going right it might be well for you to make an offer in the form of a construction company, taking bonds as you suggested, conditional upon the acquisition of a certain fixed subsidy. I could send you a traffic statement in this connection. I am sorry I was ignorant of your presence in Montreal the other day. I left the Windsor in the morning and remained down town all day and your telegram was not forwarded. Will you please return all my pencil sketches and blue prints when you have done with them. I don't want to have anything in use of that kind in case he return to the charge. I think he has found out that I am the stumbling block or thorn in his side. We have an ice jam here from the bridge site down to the island about 10 miles long. If you happen to be in Montreal it might be a reward to see it. It will hang on for a few months.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80f.

(Letterhead of Quebec Bridge Company.)

QUEBEC, December 12, 1898.

Mr. JOHN STERLING DEANS,
Chief Engineer, Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—I have the honour to acknowledge receipt of yours dated 9th instant in which you express some surprise at the two months' extension of time given to tenderers on our proposed bridge. I beg to state that this decision was arrived at in the absence of Mr. Hoare, our engineer, who had some conversation with you on the subject, and as mentioned in my letter of 3rd instant, on special request from different firms. However, your objection to such delaying will be submitted to the directors at their meeting.

Your respectfully,

ULRIC BARTHE,
Secretary.

EXHIBIT No. 80g.

(Letterhead of Quebec and Lake St. John Railway.)

QUEBEC, March 2, 1898.

DEAR MR. DEANS,—In reply to your note I am able to state positively that your tender was last received, all others were in the evening of your arrival. Johnson has left, he was waiting for a plan from Montreal. The board meets to-morrow afternoon. I expect to be in New York next Thursday. I am not quite positive about it.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80j.

(Letterhead Quebec Bridge Company.)

QUEBEC, March 31 (no year).

(Personal.)

DEAR MR. DEANS,—Can you arrange to meet Mr. Parent and myself on Tuesday, 10th April, at New York, and in meantime if we find we can't go will you be prepared to come on here for that day? Some steps must be taken to commence work this summer on Quebec bridge piers, and before doing so it is necessary to talk over matters with you *only*. No substructure people need appear for the present. The meeting could be more of a private nature with yourself.

Yours truly,

E. A. HOARE.

Reply by wire.

EXHIBIT No. 80k.

(Letterhead of Great Northern Railway Company and Quebec and Lake St. John Railway Company.)

(Private.)

QUEBEC, September 11, 1900.

DEAR MR. DEANS,—Will you please send the figures for maximum uplift for our anchor piers, so that I can check weight of masonry against it and say I have done so? If you could also send me the statement of formula showing a brief way to that end, and thus save book research, I shall be much obliged. Davis makes odd remarks (this is private) about the pier being smaller than that required for the shorter span, and says, I don't understand why it should *be so*. I should like to show him figures, as he says if the pier tips up it is not our fault, and so on. I don't want to bore Mr. Cooper with this, but your system can stand it after a trip to Europe.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80 l.

(Letterhead Quebec Bridge Company.)

December 7 (no year).

(Rec'd December 10, 1900.)

DEAR MR. DEANS,—Mr. Barthe has had a lot of domestic trouble lately, having lost his wife and mother the same week in his home, in consequence he finds it necessary to go away for a couple of weeks. Before he returns he may spend a day in Phœnixville to see your shops and steel works. He will let you know if he can manage it. Impress him all you can in connection with your working capacity, and if he refers to my trip to New York connect it with the contract and future orders. No election fights here, all going one side. Don't forget to send Davis the verses you showed me. Nothing new at present. Will you send me a sketch as you did for uplift weight, showing the load on bed plates of main piers and the way you arrived at the figures for my own satisfaction, and oblige,

Yours truly,

E. A. HOARE.

EXHIBIT No. 80m.

(Telegram.)

QUEBEC, January 15, 1902.

F. T. DAVIS, Treas.,
Phœnix Bridge Company.

Please draw on M. P. Davis, Quebec Bank, Ottawa, for sixty-seven thousand one hundred twenty-three ($67,123) dollars at site (sight) on Quebec Bridge Company's account. Draft will be honoured.

ULRIC BARTHE,
Sec'y, Quebec Bridge Company.

EXHIBIT No. 80o.

(Letterhead Quebec Bridge Company.)

QUEBEC, June 13, 1903.

(Private.)

DEAR DEANS,—I filed Cooper's amended specification in Ottawa last Wednesday. Mr. Schreiber immediately referred it to Douglas. He does not go into details personally. I have received a curious epistle from the latter this morning. To avoid annoying Mr. Cooper on account of Douglas, could you send me an approximate strain diagram showing relation of wind, live and dead loads on members, to allow Douglas to judge of changes proposed in unit stresses? He also wishes to know the sq. ft. pressures of wind used to arrive at Cooper's lin. ft. wind loads. He wants to know if it was taken from some standard or established practice on some large bridge already built or building. He wants its origin and examples. You no doubt have Cooper's amended specification (which, remember, does not replace the original beyond the clauses affected by it), and by reference to it you could no doubt supply Douglas with the above without Cooper's knowledge. If I can satisfy Douglas with information through you in this way it may save a rumpus, but if not I shall have to use unpleasant pressure.

Please also show me the comparison between Cooper's new column formula and Gordon's in my original using same unit stresses in each. Douglass suggests it. I am so engaged with other matters I cannot go into it in time. You can more readily do it. Douglass wrote a wild sort of a letter, just clear enough for me, but utterly unintelligible to an outsider. The company's bill making bridge and railway companies, *one* has passed. The grant will come up shortly. Your contracts have not arrived, unless sent to Mr. Parent who is absent till Monday. In haste.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80p.

(Telegram.)

August 3, 1903.

E. A. HOARE,
Chief Engineer on Quebec (Bridge) Co.,
Quebec, Canada.

I found Cooper had written and wired you and feels much more strongly than I do the serious result of any such action. It would be disastrous to have proposed appointment finally made. You and I should see Schreiber in Ottawa at once and come to some better understanding. As it now stands nothing can be done on plans. Answer to Phœnixville.

JNO. STERLING DEANS.

EXHIBIT No. 80p (2).

NEW YORK, August 4, 1903.

E. A. HOARE, Esq.,
Chief Engineer, Quebec Bridge,
Quebec, Canada.

DEAR SIR,—It seems to me that the entanglement in which we now find ourselves is largely due to a misunderstanding as to my desire to abbreviate the customary cir-

cumlocation in reference to the approval of plans for the Quebec bridge. It has not been my desire or intention, in any manner, to avoid or render perfunctory the supervision of the government authorities.

Many months of serious study must be given to the preparation of the plans before any work can be done towards ordering the material. As these plans develop the empirical rules (detail specifications) which apply to ordinary bridges must be modified to adapt them to a work of this magnitude. As the larger part of the rules in existing specifications are taken from my specifications, I know their inapplicability, unmodified, to a structure of this magnitude. A liberal excess of strength in the details of an ordinary bridge is judicious, but when this is applied proportionally to an 1,800 ft. span, it becomes onerous, and unnecessarily increases the cost and difficulties of construction. As the various members of this bridge will exceed anything heretofore made and will tax to the utmost the manufacturing appliances of the time, there should be given to the consulting engineer latitude to decide each case as it comes up with promptness. The work would be delayed beyond reason if each case must be discussed, and consent given beforehand.

I have no desire to reduce the efficiency of the bridge, but on the contrary I think the modifications I have suggested will be to the bettering of the structure.

My *chief* interest in this work is to obtain a work, which I can feel will crown my professional career of over forty years.

The changes I have suggested in the loadings will, in my opinion, increase the efficiency over that which would be obtained by a strict execution of the original contract.

The Dominion government will by no act of mine or with my consent get a structure in any manner inferior to the one they have a right to expect.

Neither do I see how the work can be carried out successfully or within a reasonable time unless trust and confidence be placed in some one consulting engineer, mutually acceptable to both the company and the government.

In the interest of the work, I am ready to withdraw, if the two parties can find some better engineer to meet this condition.

Yours very truly,

THEODORE COOPER.

EXHIBIT No. 80q.

(Letterhead of Quebec Bridge Company.)

QUEBEC, July 3, 190 .

(Rec'd July 6, 1903.)

DEAR DEANS,—I was in Ottawa last Tuesday and left with a promise that the specification will be attended to this week. I shall get my suggestion of having no government middlemen to interfere between Cooper and ourselves approved without a doubt. I have just arrived from the work and hasten to tell you that since the metal has been moved I find it horribly maltreated, no end of straightening to do, &c. One of the floor beams has been bent nearly the width of the flange in both directions and at the last rivet in the cover plate next to the flange angles, the upper leg of the latter has been cracked through as far as the rivet hole. I think the flange and webs can be straightened by loading and a narrow plate about 3 ft. long riveted under the flange to cover crack would answer the purpose, or extend cover plates and change lateral bracing connections. What do you think? As I am writing this off hand on my way home I have no detail plans handy for reference. But you can locate the place mentioned. Excuse haste.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80r.

(Letterhead of Quebec Bridge Company.)

QUEBEC, August 19, 190 .

(Rec'd Aug. 21, 1903.)

(Private.)

DEAR DEANS,—I have your letter of the 17th. Mr. S. is too old for the job and scared at his own shadow and that of the minister. Mr. Parent is absent. The chances are that no letter has come to hand so soon. You can do no more than follow the course outlined in your letter. I can't see why Mr. S. has not the courage to act independently, having authority to do so by council. I enclose a statement of spruce timber some of which may be suitable for wharfing. Timber is high here. The prices might be shaded a trifle. This timber is piled near St. Romuald wharf. While I think of it, my inspector incidentally tried some of the rivets in the north span and was able to turn them around with his fingers. I told him to inspect all important connections and report as soon as possible, as I have very little confidence in the whole outfit of last year.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80s.

OTTAWA, May 13, 1904.

SIR,—By direction, I return herewith, duly approved by the chief engineer of the department, two sets of the blue print plans marked 'U' 'V' and 'T,' respectively, sent in by you on the 7th inst., namely, of the anchor towers of the bridge of the Quebec Bridge and Railway Company, over the River St. Lawrence. The other set remains on file here.

I am, at the same time, to say that the plans in question are *detail drawings*, as are all others to which approval has been given (except the general design). The departmental general specifications for steel bridges require that a stress sheet of the entire structure should be submitted for approval, and that the stresses for dead and live load, wind, &c., for the various members of the trusses and towers should be indicated thereon.

I am to request that you will furnish this further information as early as possible.

I am sir,

Your obedient servant

L. K. JONES,
Secretary.

E. A. HOARE,
Chief Engineer, the Quebec Bridge and Ry. Co.,
Quebec, P.Q.

EXHIBIT No. 80t.

(Letterhead of Quebec Bridge and Railway Company.)

QUEBEC, September 14, 1904.

P. L. SZLAPKA, Esq.,
Phœnix Bridge Company,
Phœnixville, Pa.

DEAR SIR,—I received your letter of the 12th inst., also the two sets of stress sheets for anchor arm referred to. To complete the information required at Ottawa will you send duplicate stress sheets made in the same way for *suspension span for cantilever spans*. The government engineer at Ottawa requires a complete set of figures for his information. The second set is for myself for reference in communicating with him and for independent personal reference. Please let me have these immediately.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80u.

(Letterhead of Quebec Bridge and Railway Company.)

QUEBEC, September 19, 1904.

J. S. DEANS, Esq.,
Chief Engineer, Phœix Bridge Company,
Phœnixville, Pa.

DEAR SIR,—I have received this morning five prints of bottom chords for panel 2 of *anchor arms*. I have forwarded the same to Mr. Schreiber for approval, but I cannot get anything approved in connection with the trusses until I receive stress sheets asked for in my letter of the 14th inst. addressed to Mr. Szlapka.

Yours truly,

E. A HOARE.

EXHIBIT No. 80v.

(Letterhead of Quebec Bridge and Railway Company.)

QUEBEC, May 18th, 1905.

E. L. EDWARDS, Esq.,
Inspector c/o Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—Answering your letter of May 15th respecting rolling of material ahead of plans approved, &c., for cantilever arms suspended span, particulars of which I mentioned to you when in Phœnixville last week, will you please see Mr. Cooper with Mr. Deans or with Mr. Szlapka, so as to come to an understanding as to the class and quantity of metal that can be rolled, inspected and accepted for monthly progress estimates. The understanding with me is that Mr. Deans or Mr. Szlapka is to get the necessary plans approved by Mr. Cooper before he can sign any more estimates for work outside of anchor arms, towers, and a limited quantity of plate metal agreed to for cantilever arms, and not to deliver metal for the cantilever arms or suspended span before the time required to prepare it for delivery in time for erection at the specified periods. Besides that Mr. Deans is to furnish me with plans

ahead of any material ordered, to be approved by the Chief Engineer of the Department of Railways and Canals of Canada.

The above must be complied with before any more material is estimated, outside of the anchor arms, towers and floor system.

See Mr. Cooper, that you may get instructions before the end of this month.

Yours truly,

(No Signature.)

EXHIBIT No. 80w.

(Letter Head Quebec Bridge & Railway Company.)

Quebec, June 15, 1905.

Messrs. THE PHŒNIX BRIDGE CO.,
Phœnixville, Pa.

DEAR SIRS,—I have received the calculations for the cantilever arms a copy of which I immediately forwarded to Ottawa. I thought I had similar calculations for the suspended span, but cannot find them anywhere, and I do not think anything of the kind has been sent to Ottawa. Kindly send two sets as soon as convenient.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80x.

(Letter Head Quebec Bridge & Railway Company.)

(Personal.)

QUEBEC, July 9, 1906.

J. S. DEAN, Esq.,
Chief Engineer, Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—In answer to your letter of the 6th inst., nothing has been settled about the future of the bridge or the terminal railways. I cannot very well explain matters by writing but I do not consider we had a very good reception. In the meantime, however, they are going to back our notes for about six months longer to give time for a final deal. I am inclined to believe that our company will disappear.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80y.

(Letter Head Quebec Bridge & Railway Company.)

QUEBEC, August 9, 1906.

A. B. MILLIKEN, Esq.,
Supt. of Erection Quebec Bridge,
Care Phœnix Bridge Co.,
New Liverpool, Que.

DEAR SIR,—The Phœnix Bridge Company according to their contract are obliged to put a final coat on the approach spans, which I decided sometime ago to apply when

the whole bridge is being painted for the last time. In the meantime as the second coat was of such poor material, a large part of which has disappeared, it cannot be relied upon to protect the metal. Many places are bare, and rust has set in, which must be touched up this summer. When convenient, if you can send a man to do this work under the direction of Messrs. McLure and Kinloch, the company will pay for it.

Yours truly,

E. A. HOARE.

EXHIBIT No. 80z.

(Letter Head, The Commissioners of the Transcontinental Railway.)

QUEBEC, Oct. 20, 1906.

DEAR DEANS,—I wish to send you a few personal lines on the following matter. Mr. McLure showed me a letter dated October 5th, written by him to Mr. Milliken respecting the relieving of steel false work bents under anchor arm without giving him notice of such a procedure in order that Mr. Cooper first and then myself be previously notified. Mr. McLure has specific instructions to notify Mr. Cooper of any important procedure, and receive in return any instructions that may be necessary. I fancy changes were made from Phœnixville to relieve the false work. Mr. McLure —representing the Bridge Company's officers not daily on the work—should have been immediately informed notwithstanding the fact that you considered your instructions perfectly correct and safe. If Mr. McLure had been informed in time he could have wired Mr. Cooper your intentions without any delay to the work. I entirely endorse his letter to Mr. Milliken and to you on the subject of yours of the 8th inst. to Mr. Milliken.

Both you and Mr. Milliken appear to have misunderstood Mr. McLure's letter. He did not for a moment intend interference with erection orders from your office, but makes a plain request to be informed of important moves of the above nature, and not be ignored, in order that he may perform his duty and carry out his instructions. I regret your remarks on his lack of experience as it was uncalled for and is a reflection on the Bridge Company's supervision, and instead of helping matters the tendency will be to ignore general inspection orders which can be considered as given by me personally. Mr. McLure communicates daily with me and weekly with Mr. Cooper to receive instructions when necessary. I am writing you a personal and friendly letter which I hope will receive your usual generous consideration by seeing that Mr. McLure is better informed in future by your chief representative on the work of any proceedings of importance or of the nature referred to.

Yours truly,

E. A. HOARE.

EXHIBIT No. 81a.

(Letterhead Quebec Bridge & Railway Company.)

QUEBEC, March 20, 1907.

J. S. DEANS, Esq.,
Chief Engineer, Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—Your letter of the 18th instant received and I am very glad to hear that the last drawing is completed. (Will you please send me the usual five copies of

everything I have not received for final approval here, and if any back plans have been revised, please send substitutes also.)

I congratulate you on the successful completion of the office work and I fully realize the magnitude of the work required to detail the whole structure, having followed it from the beginning, and the satisfaction to you all to get this part of the work completed. (I regret that when I wanted to increase the quantities from the start you insisted that everything was provided for. Practically this cannot be avoided but it is a bad policy to underestimate, as I have been continually increasing my estimates from the start, which causes distrust in other quarters. I suppose, however, we will be able to worry it out.)

Yours truly,

E. A. HOARE.

EXHIBIT No. 81b.

(Letterhead of Quebec Bridge and Railway Company.)

QUEBEC, May 21, 1907.

J. S. DEANS, Esq.,
Chief Engineer, Phœnixville Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—Regarding the delay in sending plans here for approval for the department engineers at Ottawa, you must not be surprised if your estimates are held up until agreements are more carefully adhered to. The engineers at Ottawa have complained and are still complaining that the amended strain sheets and shop plans for a part of the cantilever and suspended spans have not been approved by the government in advance of work done and estimates paid. This should not continue any longer and I hope the plans will soon catch up to the work done and estimates paid. To state facts correctly you are already over paid a portion of your estimates, according to contracts. Personally I know that the situation is all right, but you must remember that no plans can be considered approved until certified copies have been received from Ottawa, and all the material paid for in Phœnixville and here, for a part of the cantilever arms and the suspended span should not have been estimated until the plans for the same were approved by the government. In other words you are getting a large sum in advance of what you should receive. This is a summary of the situation, which has been objected to because you do not send the plans to me in time to go to Ottawa before any work has commenced. It is only through my guarantee that I have been able to get any estimates passed at all for work represented by approved plans.

Yours truly,

E. A. HOARE.

EXHIBIT No. 81c.

(Letterhead of Quebec Bridge and Railway Company.)

QUEBEC, May 27, 1907.

J. S. DEANS, Esq.,
Chief Engineer, Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—In reply to your letter of the 24th instant, I am aware that you are doing everything that is possible to hasten the forwarding of the plans for approval

by the government except that much time might have been saved if Mr. Cooper had signed the *tracings* instead of having to sign so many blue prints.

The signature of the consulting engineer does not comply with the government regulations. The order in council passed some years ago only authorized certain modifications in the specification and details from time to time, if found necessary. The obligations under contracts, with the company and the government still remaining, viz.: that no work is to be proceeded with or estimates paid until the final plans have been passed through the various stages required by the government in the Department of Railways and Canals. This is the point they are objecting to. Understand that it is not myself that is raising any question, but I am only endeavouring to bring you in line with the contracts. The government has passed no order in council cancelling your obligation to have all your plans approved at Ottawa before any metal is fabricated. We are under very close investigation now.

Yours truly,

E. A. HOARE.

EXHIBIT No. 81d.

(Letterhead Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., August 6, 1907.

THE PHŒNIX BRIDGE COMPANY,
Phœnixville, Pa.

GENTLEMEN,—I enclose sketch of proposed diaphragm for splice between chords 7-L and 8-L of cantilever arm. One of the inside ribs is bent in at the bottom of the splice about ⅜ of an inch, the bend starting about 24" each side of splice.

We think that this was either in this condition when erected or was caused by this rib being slightly longer than the other ribs, which forced it to bend in when under stress. This is possible, as small bolts are used in bolting up the bottom splice plate. When this plate was removed for riveting the rib was found in its present condition.

The rib at the top of the splice is about ¼ inch out of line, but we do not think this requires any attention. If you approve of this diaphragm, please advise by wire and we will make it here.

Yours truly,

A. H. BIRKS.

EXHIBIT No. 81e

(Letterhead Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., August 16, 1907.

THE PHŒNIX BRIDGE COMPANY,
Phœnixville, Pa.

GENTLEMEN,—Referring to Mr. Deans' letter of the 12th inst. in regard to splice between chords 7-L and 8-L, cant. arm, Mr. McLure's first report on this splice was

similar to mine, but we to-day measured this point again, and the enclosed print of 'Sketch 28' will show you better its condition.

You will note that ribs CR of both chords is bent in at the splice, which was evidently not clear to you from my first report. The holes for rib CR in the bottom splice plate lie in a straight line, and a few of these holes near the splice point will not match well with the holes in the bottom angle of the rib. It can be determined better when this plate is fitted up whether or not it will require any exceptional drifting of the holes to insert bolts and rivets.

The top plate is at present connected to ribs GR and CL by means of $\frac{13}{16}$" drift pins, and the holes are not distorted to any extent. All ribs of 7-L have a full bearing on those of 8-L.

Yours truly,

A. H. BIRKS.

P.S.—Mr. McLure is sending print of 'Sketch 28' to Mr. Cooper.

EXHIBIT No. 81f.

(Letterhead Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., August 27, 1907.

THE PHŒNIX BRIDGE COMPANY,
Phœnixville, Pa.

DEAR SIRS,—In connection with Mr. Yenser's letter on the same subject, I enclose sketches showing the amount the ribs of chords 9-L, anchor arm, and 8-R and 9-R, cantilever arm, are out of line. We are satisfied that chord 9-L, anch. arm, was not in this condition until recently. Its present condition was noticed for the first time to-day. We are not certain about 8-R and 9-R, cant. arm, as to whether the ribs have always been out of line or have buckled some since erection.

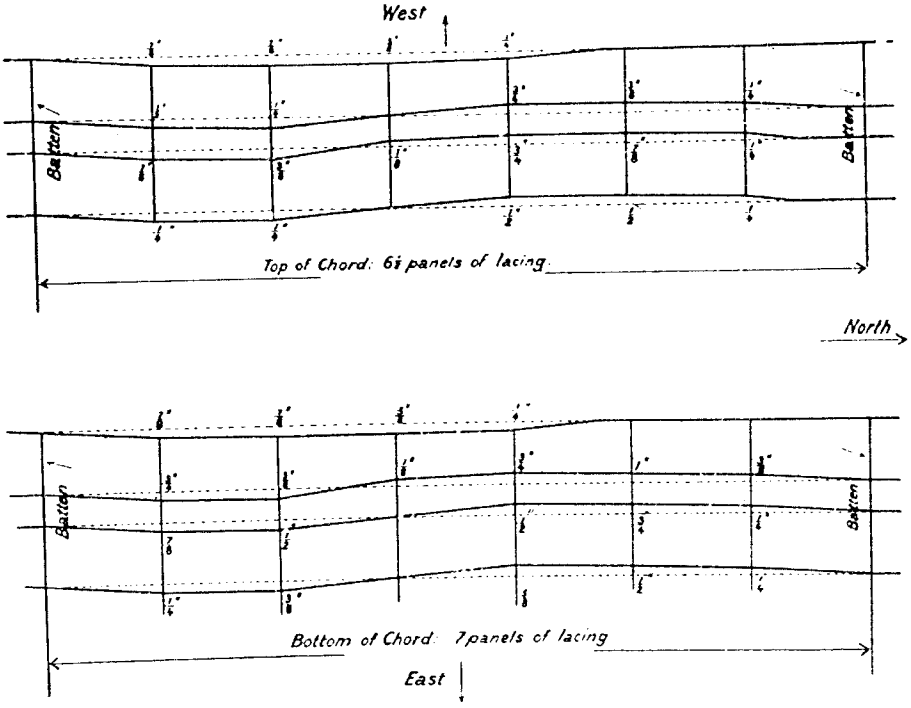
We have examined the lacing angles and they show no signs of buckling or distorting, and their connecting rivets show no signs of shearing. Chord 9-L, anch. arm, shows the greatest bending of the ribs. This is the chord that was repaired after receiving injuries in the storage yard.

Yours truly,

A. H. BIRKS.

P.S.—Sketch of 9-R. cant. arm, will follow.

SESSIONAL PAPER No. 154



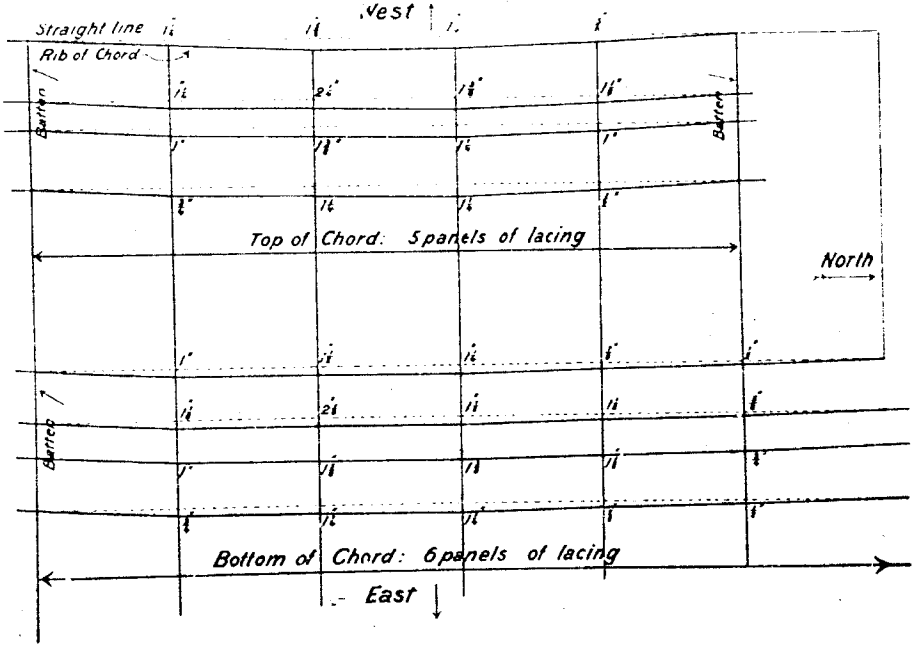


EXHIBIT No. 81g.

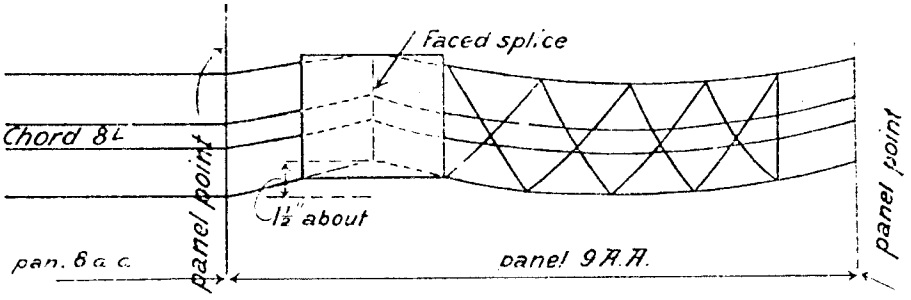
(Letterhead Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., August 28, 1907.
(Rec'd August 30, 1907.)

THE PHŒNIX BRIDGE COMPANY,
Phœnixville, Pa.

DEAR SIRS,—I have made a further investigation of chord 9-AA, and beg to report following additional data:—

The bend in the chord starts at the faced splice at the shore end and not at the edge of the splice batten. It appears from this that at least a large portion of the



bend was in the chord when the top and bottom splice battens were riveted early in June. This and the fact that the lacing angles are not distorted, leads me to believe that the ribs were bent before erection, in spite of the fact that Mr. Clark and Kinloch think all the ribs were straight when the chord was repaired.

From the evidence so far, I do not think we are justified in assuming it to be a fact that the ribs of any of the chords have buckled since erection, and Mr. Yenser has come to the same conclusion

Yours truly,

A. H. BIRKS.

EXHIBIT No. 81h.

(Leterhead Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., August 29, 1907.
(Rec'd Sept. 1, 1907.)

THE PHŒNIX BRIDGE COMPANY,
Mr. A. B. MILLIKEN, Supt. of Erection,
Phœnixville, Pa.

DEAR SIR,—Referring to talk over 'phone this morning, I told Mr. Hoare what you had to say regarding the bend in chord 9. He is entirely satisfied with the explanation, and is no longer concerned about the matter.

Referring to what you had to say about stopping erection, I fully appreciated from the first, the serious mistake we would make in taking this action, or in showing

that we were in the least concerned about the chord before it had been fully investigated and passed on by you.

Mr. McLure will explain to you the measurements we have made on the chords and we will check them as erection progresses.

Yours truly,

A. H. BIRKS.

EXHIBIT No. 81i.

(Letterhead of Quebec Bridge and Railway Company.)

QUEBEC, July 13, 1905.

J. S. DEANS, Esq.,
Chief Engineer, Phœnix Bridge Co.,
Phœnixville, Pa.

DEAR SIR,—Mr. Hudson has explained and shown to me the proposed reinforcements to broken chord A 9 L and in my opinion the reinforcements shown should make a very satisfactory job. I have instructed the resident inspector to thoroughly examine the chord to be sure that there is no other damage other than shown. As this is such an important member in the bridge *I think that Mr. Szlapka should see* Mr. Cooper and obtain his consent to the reinforcements proposed, for several reasons which it is not necessary now to mention.

Yours truly,

E. A. HOARE.

EXHIBIT No. 81j.

(Letterhead of Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., July 14, 1905.

THE PHŒNIX BRIDGE CO.,
Phœnixville, Pa.

GENTLEMEN,—In accordance with your letter of the 8th inst., I went to Quebec yesterday afternoon to see Mr. Hoare about the injured chord. After my explaining it to him, Mr. Hoare said he understood entirely what we intended to do and that he would allow us to repair the chord in the manner we proposed. Before our beginning the repairs, however, he wanted a report from his inspector, Mr. E. R. Kinlock, covering the extent of injury to the chord in order that he might be sure that we had found all breaks. I went over the chord this morning with Mr. Kinloch. After Mr. Kinlock examined the chord he reported by telephone to Mr. Hoare that the method of repairing the chord proposed by the Phœnix Bridge Co. would make it as strong or stronger than before, and Mr. Kinloch will confirm that verbal report to Mr. Hoare by a written one to-night. Mr. Hoare thought that as a matter of courtesy we should obtain Mr. Cooper's consent to our proposed repairs and he wrote you to that effect yesterday while I was in his office. As soon as you obtain Mr. Cooper's consent Mr. Shoemaker will begin the repairs.

Yours truly,

C. W. HUDSON.

EXHIBIT No. 81k.

(Letterhead of Phœnix Bridge Company.)

PHŒNIXVILLE, PA., July 21, 1905.

(Copy.

MR. E. A. HOARE,
Chief Engineer, Quebec Bridge & Ry. Co.,
Quebec, Canada.

DEAR SIR,—Mr. Szlapka saw Mr. Cooper yesterday and he is entirely satisfied with our method of splicing angles of chord 9 in Chaudiere yard and I have to-day so advised our foreman and have instructed him to exercise care to see that the work is done in a thorough and careful manner.

Yours truly,

JNO. STERLING DEANS.
Chief Engineer.

EXHIBIT No. 81l.

NEW LIVERPOOL, P.Q., August 30, 1905.

EXTRACT FROM LETTER.

THE PHŒNIX BRIDGE CO.,
Phœnixville, Pa.

GENTLEMEN,—Mr. Birks arrived on the work yesterday, Aug. 29, and I would also report that Mr. McLure is here in the interest of the Quebec Bridge & Ry. Co.

Yours truly,

W. H. SHOEMAKER.

EXHIBIT No. 81m.

QUEBEC, CANADA, September 26, 1907.

P. L. SZLAPKA.

In case Mr. Deans forgets please mail me immediately blue prints of calculations of strains, revised for the whole bridge. Those filed with government only for anchor and cantilever arms unrevised. Must have complete set immediately.

E. A. HOARE.

EXHIBIT No. 81n.

June 17, 1901.

E. A. HOARE, ESQ.,
Chief Eng'r. Quebec Bridge Co.,
Quebec, Que.

DEAR MR. HOARE,—I have your letter of June 14th, and have to-day sent copy to Mr. Cooper, with the request that he send us promptly his approval or suggestions in

connection with stress sheet of approach spans. As soon as we hear from Mr. Cooper we will start our detailed drawings. There is no time to lose now and we ask that you will stir up the government engineers and secure their approval to the plan that there may be no delay later on, on account of changes.

Referring to your personal letter of June 14th regarding width centre to centre of trusses main posts for channel span, we have never heard any criticism in connection with this width and in view of the fact that the matter has been carefully considered by Mr. Theo. Cooper and passed upon by him, it is unnecessary to take any serious notice of any criticism, which undoubtedly comes from a casual and incomplete knowledge of the conditions surrounding the design of a span of this magnitude.

I notice you will soon send us the detailed plans of the caissons together with copy of Mr. Cooper's letter approving same. We shall be much interested in learning of the successful launching of the caisson.

Yours truly,

JNO. S. DEANS,
Chief Engineer.

EXHIBIT No. 81o.

November 18, 1901.

E. A. Hoare, Esq.,
Chief Engineer Quebec Bridge Co.,
Quebec, Canada.

Dear Sir,—I have a telegram from Mr. Milliken, stating that there is a heavy snow at Quebec, that he has conferred with yourself and Mr. Davis and that it seems impracticable to undertake the erection of north span this winter.

We have always feared this might be the case in view of the limited time between the date when Mr. Davis expected to entirely complete the approach work and be out of our road, viz.: Oct. 15th and the time that winter would set in. Mr. Davis was somewhat delayed in this work on the approaches, but the more serious matter was the longer time required to complete the main river pier, thus throwing the delivery of his material to the same time our own material should have been handled. We were as you know forced to use Mr. Davis' plant, both at bridge site and at Louise Basin, as all available room at site was necesarily occupied by him. We had a thorough understanding with Mr. Davis, but of course could not expect him to neglect his own work to handle ours, nor would it have been to the interest of the Quebec Bridge Co. to have had him do this, and we therefore find ourselves in the present situation, through no fault or neglect of our own, as full and complete arrangements were made in advance, by our superintendent of erection, Mr. A. B. Milliken.

I am trying to arrange to go to Quebec to-morrow, Tuesday afternoon, and will hope to see you there on Wednesday, but I write you this letter in advance, should I be delayed.

Concerning duty charges, this structure being practically a government bridge, it was assumed in our general discussion of the business that no duty whatever would be collected in connection with this construction, therefore a separate and distinct clause was put in our agreement, as you will see by referring to same, as follows: 'It is further understood that the party of the first part (Quebec Bridge Co.) shall pay *all customs duties and charges.*' This does not refer particularly to the metal work in the structure, *but to all such charges of every description.* We wrote to Mr. Barthe some time ago in connection with this duty, when the time came to pay certain charges on some of our plant, that we would pay these charges at that time if more convenient and add same to our estimates as presented. We have no doubt that the

entire amount will be refunded to the Quebec Bridge Co. and that they will be at no expense in connection therewith.

Yours truly,

JNO STERLING DEANS,
Chief Engineer.

EXHIBIT No. 81p.

December 2, 1901.

Mr. E. A. HOARE,
Chief Eng'r Quebec Bridge Co.,
Quebec, Canada.

DEAR SIR,—As per your recent letter and at the request of Mr. Deans, I send you herewith the estimated weights of main bridge, St. Lawrence River, Crossing, Quebec.

Suspended span	4,700,000
2 Cantilever arms	18,280,000
2 Anchor arms	19,150,000
Metal on piers	4,850,000
2 Anchorages	2,290,000
Floor for entire bridge	7,700,000
Main bridge	56,970,000

Respectfully,

THE PHŒNIX BRIDGE CO.,
Per P. L. SZLAPKA.

EXHIBIT No. 81q.

(Letterhead of Quebec Bridge and Railway Company.)

QUEBEC, June 14, 1907.

(Received June 17, 1907.)

J. S. DEANS, Esq.,
Chief Engineer, Phœnix Bridge Company.,
Phœnixville, Pa.

DEAR SIR,—I have your telegram of even date asking for reply to your message of the 12th, and replied as follows :—

'Your message was answered the same day *to Philadelphia* 'repeating by letter.''

The following is the answer I sent to your message of the 12th :—

'Auditor finished here but will have to wait Mr. Parent's return from Winnipeg next week before will have definite information *re* payments due.'

Yours truly,

E. A. HOARE.

EXHIBIT No. 82.

Extracts from correspondence of erection department, Phœnix Bridge Company, furnished by Mr. Milliken.

EXHIBIT No. 82a.

(Letterhead of Phœnix Bridge Company.)

NEW LIVERPOOL, QUE., CANADA,
October 19, 1906.

SOUTH SIDE.

THE PHŒNIX BRIDGE COMPANY,
Phœnixville, Pa.

GENTLEMEN,—Work was resumed this morning after being suspended, except the removal of crane-runway at the storage yard, all of yesterday, 'Thanksgiving Day. Notice of this suspension was sent you in the following wire message under date of the 18th instant, viz. : 'All work suspended in observance of Thanksgiving Day.'

The work of removing the spacing blocks from the top chord and diagonal bars cantilever arm, has been completed except on the up-stream side of panels No. 7 and No. 6, which is now going ahead.

All attachments, suspension rods (temporary), erection struts, &c., have been removed as far as the cantilever arm has been erected.

Floor beam 'F-4,' panel No. 4, is swinging in the falls, preparatory to its erection in place, while the floor is being removed from the lower forward overhang of the traveller. One (1) span of the girders carrying the supply tracks has been taken out, the other is hooked onto.

The removal of the traveller track stringers from the falsework of the approach span continues. Panels No. 10, No. 9 and No. 1 are removed, and those from the down-stream side of panel No. 6.

A force is at work removing the shims from panel points Nos. 4, 5, 6 and 7, so that they just bear on the falsework. We found after removing all the shims from point No. 6, up-stream side, that the point still bore very heavily. This will necessitate the removal of the top course of the wooden camber blocking and replace it with enough material to give the point an easy bearing. Point No. 7, up and down-stream sides, has had the shims removed so that it now just bears, point No. 6, down-stream side, likewise. In order to release point No. 6, down-stream side, so that the wooden camber blocking can be removed, it will be necessary to jack up points No. 7 and No. 5. This work is now going ahead.

The usual work continues at the storage yard. Also the removal of a portion of the crane runway. 150 feet has been taken down, and the traveller run has been completed for the removal of 120 feet additional.

Weather	Clear.
Wind	East to southeast.
Anemometer readings	7 a.m. 12 miles.
	1 p.m. 10 "
Thermometer readings	7 a.m. 36 degrees.
	1 p.m. 78 "

Car report and force account enclosed.

Yours truly,

B. A. YENSER.

EXHIBIT No. 82b.

(Letterhead of the Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., July 26, 1907.

THE PHŒNIX BRIDGE CO.,
Phœnixville, Penna.

GENTLEMEN,—I beg to acknowledge receipt of your two favours of the 24th inst., and have carefully noted the contents thereof.

Regarding a copy of the bridge specifications, asked for at the request of Mr. Cudworth, we have, in accordance with your instructions, told Mr. Cudworth to write you for any information on any special point he may require.

I note, particularly, what you say regarding the cost of driving rivets, and I hope to still further reduce this cost by the addition of more riveting gangs.

I fully appreciate your anxiety to learn that the traveller has been moved forward for the erection of the second panel in the suspended span, and I can assure you that everything is being done to bring this about at the earliest date, and that I will feel just as much concerned until it has been accomplished.

I further note your remarks concerning the starting of the removal of the main traveller, and would advise that all preparations for commencing this work are practically completed, and that we will go ahead with it as soon as the small traveller has been moved clear of the upper forward overhang of the main traveller.

John Simmons reached here last evening.

Yours truly,

B. A. YENSER.

EXHIBIT No. 82c.

(Letterhead of the Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., August 24, 1907.

THE PHŒNIX BRIDGE CO.,
Phœnixville, Penna.

NORTH SIDE.

GENTLEMEN,—The general condition of the work follows:—

Timber falsework.—Bent No. 1 to bent No. 7-A, inclusive, erected complete except the horizontal diagonal bracing.

Bent No. 8—The four (4) bottom sections of legs are erected and braced transversely. They are connected to bent 7-A by the longitudinal level braces.

Metal falsework.—Bent No. 2 to bent No. 6, inclusive, erected and bolted complete except a few small braces.

Bent No. 7—All the plumb posts are erected in place except one (1) in the top section of each tower. One (1) box girder is also erected in place in each tower. The two towers are connected together by the lower level strut, and to bent No. 6 by the corresponding longitudinal struts.

Metal falsework foundations.—For bent No. 10, the excavating for the west side has been started. For the east side the excavating has been discontinued for the past few days, but is down to almost the required level necessary for the regular three (3) courses of grillage timber.

For bent No. 9—The bottom course of timber is in place for the east side. For the west side fourteen (14) of the eighteen (18) pieces of the first course are in place.

For bent No. 8—The bottom course of timber is in place for both the east and west sides.

Work on foundations will again be resumed at low tide this p.m.

Petty.—The filling in with stone continues. About 100 feet from the end of the present fill, toward the main pier, is yet to be made.

Yours truly,

B. A. YENSER.

EXHIBIT No. 82d.

(Letterhead of the Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., August 24, 1907.

THE PHŒNIX BRIDGE CO.,
Phœnixville, Pa.

SOUTH SIDE.

GENTLEMEN,—Work has gone ahead since our last report and continues at this writing, 1 p.m. The general condition is as follows:—

Erection of suspended span.—All metal has been erected in place in the third panel, and the work of bolting is being pushed to completion.

The track is being laid and the preparations going ahead for pulling the traveller forward into position for the erection of the fourth panel. This we hope to get done on Monday, the 26th inst.

Removal of main traveller.—All the lower forward overhang has been removed. These parts, together with the two (2) transverse girders—'TG—1' and 'TG—2,' have been lowered onto our large scow, and will be taken to the north side.

The work of removing all the timber from the top of the square of the traveller will be completed this p.m., after which the removal of the metal parts will be started.

Riveting.—Four (4) gangs are driving on the anchor arm and five (5) gangs on the cantilever arm.

River yard.—The usual work can be reported, viz., the removal of timber from the metal falsework foundations, the preparation of materials for delivery to the north side, and the handling and storing of main traveller parts as they are lowered from above.

Storage yard.—The separating and preparing of parts for delivery for erection, fourth panel suspended span, is going ahead.

Weather.—Cloudy; wind, east to southwest.

Anemometer readings	7 a.m.	7 Miles
	1 p.m.	20 "
Thermometer readings	7 a.m.	64 Degrees
	1 p.m.	72 "

Yours truly,

B. A. YENSER.

P.S.—Since writing the above all cars for which we hold invoices have been received and unloaded.

EXHIBIT No. 82e.

THE PHŒNIX BRIDGE COMPANY.

Quebec Bridge. *South Side.*

Report of weight on end of cantilever arm, No. 16. August 24, 1907:—

WEIGHT REMOVED.	Lbs.	Lbs.	WEIGHT ADDED.	Lbs.	Lbs.
Reports 1 to 15.. ..		462,000	Reports 1 to 15		3,068,500
Removed 8/24/07 ..			Added 8/24/07..		
Main traveller.. ..			Strut T 14..	7,000	
Timber..	42,000		Top chd. trav..		
Girders TG 1 & TG 2	30,000		Track Pan (1)	40,000	
Lower overhang.. ..	33,000				47,000
		105,000			
Removed to date ..		567,000	Added to date..		3,115,500

Remarks:

B. A. YENSER,
Foreman.

EXHIBIT No. 82f.

QUEBEC BRIDGE—DAILY FORCE ACCOUNT.

SATURDAY, August 24, 1907.

South Side:

1 general foreman.
1 foreman.
3 office.
2 civil engineer and helper,
1 electrician.
1 teamster.
2 night watch.
2 smiths' shops.
2 water boys.
1 machinist.
1 compressor.
1 asst. foreman.
2 engineers.
1 skiffman.
10 men (bolting).
13 men.
} Permanent structure.

1 asst. foreman.
1 engineer.
14 men.
} Removing main traveller.

1 riveting foreman.
2 rivet boys.
36 men (9 gangs).
} Riveting.

1 engineer.
7 men.
} Removing metal false work and main traveller.

1 man (plant).
2 men (drilling and bolting).
2 men (painting).
1 man (running down bolts).
8 men (assorting bolts).

Storage Yard:

1 foreman.
1 crane runner. } Unloading, distributing and preparing metal for erection.
3 men.
1 semaphore attendant.
1 engineer.
1 fireman. } Locomotive crew.
1 brakeman.

135

North Side:

1 foreman.
1 checker.
1 skiffman.
1 water boy.
2 night watch.
2 smith shops.
1 asst. foreman.
2 engineers.
4 men (bolting). } Erecting timber and metal false work.
9 men.
1 asst. foreman. } Preparations for erecting main traveller.
8 men.
1 asst. foreman.
1 engineer. } Dist'g, T. & M. false work & foundations.
11 men.
1 engineer. } Jetty.
7 men.

54

Belair Storage Yard:

1 asst. foreman.
1 engineer.
1 fireman.
1 night watch.
1 crane runner. } Unloading and str'g metal.
6 men.

11

200 grand total.

(Signed) B. A. YENSER,
General Foreman.

EXHIBIT No. 82g.

(Letterhead Phœnix Bridge Company.)

NEW LIVERPOOL, P.Q., CAN., Aug. 29, 1907.

THE PHŒNIX BRIDGE CO.,
Phœnixville, Penna.

North Side.

GENTLEMEN.—Operations were continued on all parts of the work yesterday p.m., but were discontinued on the erection of false work this a.m. on account of the high wind.

The general condition of the work follows:—

Timber falsework.—Bent No. 1 to No. 7-A, inclusive—Erected complete the horizontal diagonal bracing.

Bent No. 8, as reported yesterday, viz.: All legs are erected except those in the top section. They are braced transversely by the level and diagonal braces, and longitudinally by the level braces and four (4) sets of tower braces.

Metal Falsework.—Bent No. 2 to Bent No. 6, inclusive—Erected complete except seven (7) small braces. These we are unable to find at this time on account of the marks being obliterated from a number of these small members, but they are being put in place as fast as they are found.

Bent No. 7.—All the plumb and inclined posts are erected in place in both towers, also the box girders for the support of the blocking beams. The two towers are connected together, and to Bent No. 6 by the level struts.

Foundations for Metal Falsework.—No timber was placed on the last tide, the work being confined to excavating in No. 10. The general conditions are as follows: For Bent No. 8.—The east side is finished. The west side has one half of one course of timber yet to place.

For Bent No. 9.—The east side has two (2) of the four (4) courses of timber in place; the west side the bottom course.

For Bent No. 10.—We expect to finish the excavating for the east side on the next two (2) tides. The west side has about sixteen (16) inches yet to excavate.

General.—The hoisting of the ties to the deck of the Approach Span continues. All the timber blocking has been fastened in place on both the timber towers on the anchor pier.

Jetty.—Filling in with stone continues.

Yours truly,

B. A. YENSER,

EXHIBIT No. 82h.

((Letterhead of The Phœnix Bridge Co.)

NEW LIVERPOOL, P.Q., CAN., Aug. 29, 1907.

THE PHŒNIX BRIDGE CO.,
Phœnixville, Pa.

South Side.

GENTLEMEN,—Work has gone ahead since our report of yesterday without interruption, and continues at this writing, 1 p.m., with the general conditions as follows:

Erection of Suspended Span.—As reported yesterday the traveller has been moved forward and anchored in position for the erection of the fourth panel.

To-day all the ties and rails have been removed from the top chord in the rear of the traveller and the supply tracks have been extended over the temporary spans 's-1-s-2' and 's-1x-s-2-x.' These spans were put in place this a.m.

The two lower chord sections R & L are loaded on cars, and we expect to put them in place this p.m.

Removal of Main Traveller.—In addition to the parts already reported as being taken down, all the sheave stands and small parts have been removed from the top of the traveller and the rigging is now going ahead for the lowering of transverse girder 'TG-4'.

Riveting.—Three gangs are driving on the anchor arm, and four (4) gangs on the cantilever arm.

This is one (1) gang less than we had riveting yesterday, it having been taken off this morning to assist on the work at the front.

River yard.—The scow has been loaded with falsework materials and taken to the north side.

The timber is yet to be removed from three (3) metal falsework foundations. This work is going ahead. Also the storing of main traveller parts as fast as they are lowered into the yard.

Storage yard.—The preparing and loading of parts for erection in the fourth panel of the suspended span continues.

Weather.—Cloudy to clear; wind—northwest to west.

Anemometer readings—7 a.m. 29 miles.
1 p.m. 30 miles.

Thermometer readings—7 a.m. 58 degrees.
1 p.m. 65 degrees.

Your truly,

B. A. YENSER.

EXHIBIT No. 82i.

THE PHŒNIX BRIDGE COMPANY.

Quebec Bridge—South side.

Report on weight on end of cantilever arm No. 17, August 29, 1907.

WEIGHT REMOVED.

	Lbs.
Reports 1 to 16	567,000
Metal from main traveller, August 29, 1907	20,000
Removed to date	587,000

WEIGHT ADDED.

	Lbs.
Reports 1 to 16	3,115,000
Added to date	3,115,500

Remarks: Traveller now erecting panel 'D' suspended span.

B. A. YENSER, *Foreman.*

EXHIBIT No. 82j.

QUEBEC BRIDGE—DAILY FORCE ACCOUNT.

THURSDAY, August 29, 1907.

South side.

1 General foreman.
1 Foreman.
3 Office.
2 Civil engineer and helper.
1 Electrician.
1 Teamster.
2 Night watch.
2 Smith shops.
2 Water boys.
1 Machinist.
1 Compressor.

Permanent structure.

1 Assistant foreman.
2 Engineers.
1 Skiffman.
25 Men.

Removing main traveller.

1 Assistant foreman.
2 Engineers.
10 Men.

Riveting.

1 Riveting foreman.
2 Rivet boys.
28 Men (7 gangs).

Removing metal falsework.

1 Engineer.
8 Men.
4 Men (reaming and bolting)
1 Man (plant).
2 Men (painting).
1 Man (running down bolts).
10 Men (assorting bolts).

117

Storage yard—Separating, distributing and preparing metal for erection.

1 Foreman.
1 Crane runner.
7 Men.
1 Semaphore attendant.

Locomotive crew.

1 Engineer.
1 Fireman.
1 Brakeman.

130

North side.

1 Foreman.
1 Checker.
1 Skiffman.
1 Water boy.
2 Night-watch.
2 Smith shops.

Erecting metal falsework.

1 Assistant foreman.
1 Engineer.
2 Men (bolting).
15 Men.

Preparations for main traveller.

1 Assistant foreman.
1 Engineer.
6 Men.

Dist'g T. and M. falsework and foundations.

1 Assistant foreman.
1 Engineer.
11 Men.

Jetty.

1 Engineer.
8 Men.

57

Belair storage yard.

1 Assistant foreman.
1 Engineer.
1 Fireman.
1 Night-watch.

Unloading and str'g metal.

1 Crane runner.
6 Men.

11

198—Grand total.

B. A. YENSER,
General Foreman.

EXHIBIT No. 112.

(Copy.)

QUEBEC, 23rd March, 1907.

Mr. THEODORE COOPER,
Consulting Engineer,
35 Broadway, New York City.

DEAR SIR,—I am instructed by the board of directors to inform you that the verbal agreement made with you by the president in New York on the 13th instant has been unanimously ratified by the directors, that is that you undertake the examination and analysis of the several tenders and plans received on the 1st instant by this company for the construction of our proposed railway bridge, and that you will report on same to this board, your charges being a minimum fee of $2,500 for the first tender, not to exceed a maximum of $5,000 for the full work, the respective charges on the several tenders after the first one to be regulated on the actual work and, as you suggested yourself, to be arranged to the satisfaction of the president. I hope I have correctly stated the conditions.

Yours respectfully,

ULRIC BARTHE,
Secretary.

P.S.—Mr. Hoare has sent you by express a package of plans which he just told me to-day have not yet reached you. I have inquired at the express office, and the explanation is that owing to the snow blockade, the first train has left Levis last night only at nine o'clock.

U. B.

EXHIBIT No. 114.

Amounts paid to Mr. Theodore Cooper, consulting engineer, from September 18th, 1899, to February 1st, 1907:—

Sept. 18, 1899	Cash	$3,500
June 1, 1900	"	1,050
Dec. 7, 1900	"	1,675
Aug. 23, 1901	"	4,000
Nov. 26, 1902	"	4,000
Nov. 5, 1903	"	4,000
June 16, 1904	"	4,000
July 12, 1905	"	4,000
Jan. 8, 1906	"	2,000
July 18, 1906	"	2,000
Feb. 1, 1907	"	2,000
		$32,225

J. H. PAQUET,
Treasurer.

EXHIBIT No. 122.

DR. AMI'S REPORT.

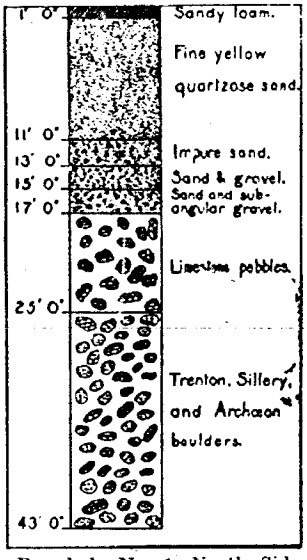
(I.) NOTES ON DRILLINGS OBTAINED IN SIX DIAMOND-DRILL BORE-HOLES IN THE BED OF THE ST. LAWRENCE RIVER AT VICTORIA COVE, SILLERY, EIGHT MILES ABOVE QUEBEC CITY, QUEBEC.

Through the kindness and courtesy of Mr. E. A. Hoare, engineer for the Quebec Bridge Company, Quebec, I had an opportunity afforded me of examining the drillings extracted from the six diamond-drill bore-holes which serve to indicate the character of the rock formations and materials occurring in the immediate vicinity of the abutments, anchor piers and main piers of the Quebec bridge now in the process of completion. The logs of the different borings were carefully preserved in boxes, and the following notes have been prepared by me, together with the sketch sections or illustrations accompanying them.

DESCRIPTIONS OF DRILLINGS.

North Side of the St. Lawrence River.

No. I. Bore-hole. 43 feet. Anchor pier, on centre line, 400 feet north of No. 3 bore-hole. Shore above water level.

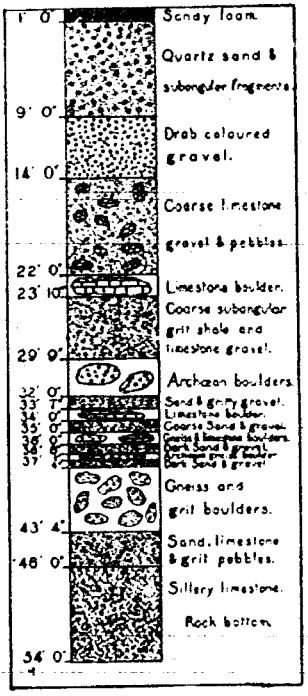


Bore-hole No. 1, North Side.

After penetrating the surface soil which consists of a sandy loam one foot in thickness in which grains of clear quartz abound, the drill traversed ten feet of fine yellow quartzose sand below which occurred two feet or more of rather impure sand, two feet more of sand and gravel underlaid by two additional feet of sand and fine subangular gravel. Eight feet were then traversed, in which limestone pebbles predominate, thus reaching a depth of twenty-five feet. Between twenty-five and forty-three feet depth, boulders of Trenton limestone associated with boulders of Archæan crystalline rocks and pebbles of sandstones belonging to the Sillery grit formation occur. This bore-hole was not continued deeper.

No. II. Bore-hole. Fifty feet east of the centre line.

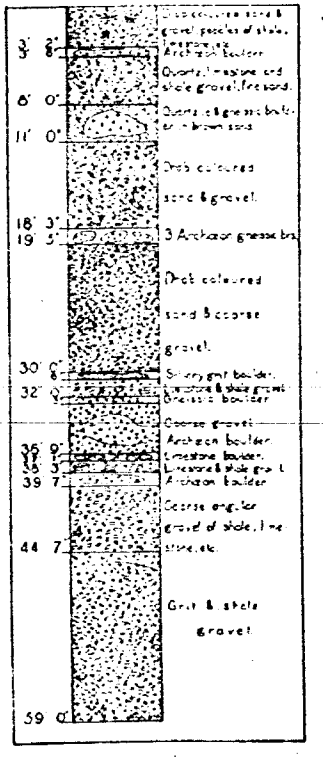
Drillings consist first of about one foot of sandy loam, followed downward by eight feet of quartzose sand rather coarser than the materials examined in bore-hole No. 1, together with a number of small subangular fragments of various kinds of rock and shale. Below this the drillings consist of five feet of a fine, well mixed, drab-coloured gravel underlaid by eight feet of coarse limestone gravel not unlike that met at the twenty-five feet depth in bore-hole No. 1. The next twenty-two inches were marked by the presence of a boulder of fossiliferous limestone underlaid by five feet and eleven inches of coarse and well mixed subangular pebbles of Sillery grit, Palæozoic limestone, shale, &c. In the next two feet three inches, a boulder of a dark crystalline Archæan basic rock occurs, probably dyke material, with garnet, &c., underlaid by one foot seven inches of coarse brownish grey quartzose sand associated with grains of felspar and grits. A limestone boulder was met in the next five inches at a depth of thirty-four feet, below which sand similar to that overlying the boulders of limestone just described above occurred to a depth of one foot, underlaid by two boulders, one, consisting of sedimentary or Palæozoic limestones, the other, an Archæan gneiss boulder. Eight inches of a dark-coloured, quartzose sand holding fragments of gneiss, the grains of both being subangular, are underlaid by a boulder of Archæan gneiss five inches in thickness, below which three inches of dark-coloured sand occurred similar to that above the last mentioned boulder. Six feet were then traversed marked by the presence of boulders, of grey greisses of Archæan age, and others of Sillery grit, underlaid by some eight inches of dark sand similar to that just described, in which were imbedded pebbles of Sillery grit, and limestone of Trenton or Black River age. The next ten feet, reaching a depth of fifty-four feet, were drilled in solid rock of typical Sillery grit, similar to that which occurs in the face of the escarpment on the north side of the river at Victoria Cove, Sillery.



Bore-hole No. 2, North Side.

No. III. Bore-hole, 480 feet from base-line, on the centre line; measurements taken from the river bed. Bed of River St. Lawrence.

Drillings at this point consist of three feet two inches of drab-coloured sand and gravel in which quartz veins predominate and fragments of felspar, limestone, arenaceous shale (resembling shales of the Lorraine formation) associated with pebbles of Archæan and Trenton (Ordovician) age, are underlaid by a boulder of Archæan rock eight inches in thickness, below which are four feet four inches of angular fragments of quartz, limestones, shales, rather free from sand and well washed and preserved. The next three feet consisted of a white quartzite and biotite (gneiss or coarsely crystalline pegmatite) boulder imbedded in a rusty, chocolate-coloured sand followed downwards by seven feet three inches of drab-coloured mixed fine and coarse gravel, below which were struck boulders of Archæan rocks consisting of light pinkish-grey micaceous and hornblendic as well as biotite gneiss reaching to a depth of nineteen feet five inches. Similar gravel to that just described above the boulders of Archæan rocks then characterize the drillings for the next ten feet seven inches down to a depth of thirty feet, where a six-inch boulder of Sillery grit was traversed by the drill. The next eighteen inches were characterized by a mixed gravel of limestone and shale fragments whose average size was about one centimetre across, below which, according to the engineer, 'a piece of a boulder was picked up with the two-and-a-half-inch pipe' measuring three inches across, which consists of a pinkish Archæan gneiss. Four feet six inches of coarse, mixed, angular gravel with boulders of Archæan rock then follow, under which occurred a boulder of fossiliferous limestone of typical Trenton age, as may be inferred from the following lists of fossil remains recognized in its mass:—



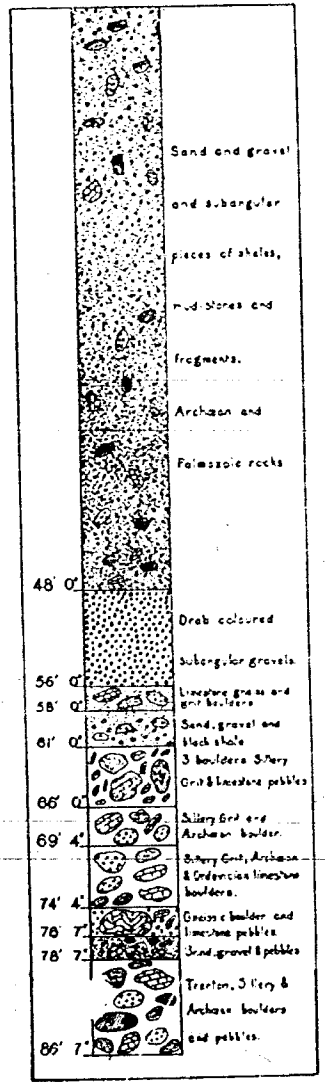
Bore-hole No. 3. North Side.

1. *Orthis (Dalmanella) testudinaria*, Dalman.
2. *Leptæna (Plectambonites) sericea*, Sowerby.
3. *Rhynchotrema inæquivalvis*, Castelnau.
4. *Pachydictya*, sp.
5. *Monticuliporoid*, indt.
6. *Trilobite* fragment, too imperfect for identification.

For one foot two inches below this Trenton boulder, similar gravel to that above the boulder occurred, followed downward by a boulder of Archæan crystalline rock to a depth of sixteen inches deeper, below which again, similar gravel was struck to a depth of forty-four feet seven inches. In the next fourteen feet five inches, the drillings gave a gravel of grit and shales. At the depth of fifty-four feet 'the tube broke' and the bore-hole was abandoned.

South Side of the St. Lawrence River.

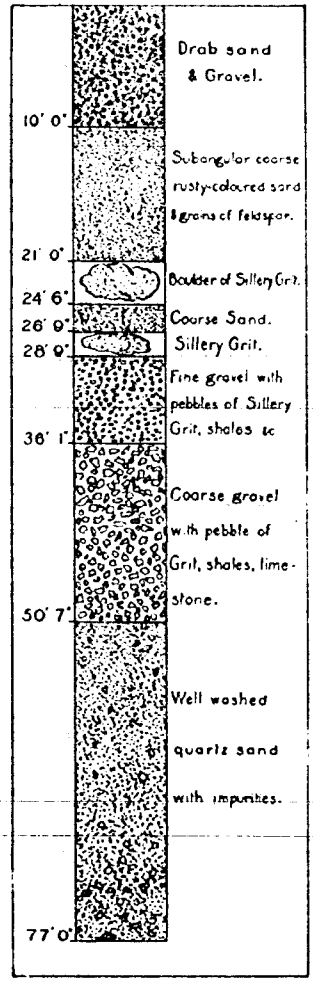
No. IV. Bore-hole. Bed of river.



Bore-hole No. 4, South Side.

The drillings which were examined as representing the first forty-eight feet of the material obtained in this bore-hole consisted of small angular pieces of Archæan and Palæozoic rocks together with water-worn and well rounded and subangular pebbles of the same rock and grey shale or siliceous mudstone. These are followed downward for eight feet by drab-coloured and subangular gravel. Then two feet of somewhat angular gravel with rounded blocks of limestone and boulders of pinkish gneiss wtih Sillery grit were traversed. The next three feet showed the presence of a sand or gravel with drab and rather dark-coloured black shale, with which were associated pebbles of Archæan gneissoid rocks and fragments of limestone, shales, &c., at times very angular. Three boulders of Sillery grit or sandstone follow with limestone pebbles in the next five feet of the drillings examined. These were underlaid by five feet four inches of similar rocks and pebbles, these in turn being underlaid by similar strata to a depth of seventy-six feet seven inches, where sand and gravel to a depth of two feet are then penetrated in which pebbles of Trenton limestone, of Archæan gneiss, of Sillery grit, black shale, &c., occur, followed downward by Trenton, Archæan and Sillery boulders to the bottom of the bore-hole at a depth of eighty-six feet seven inches, where the drilling was abandoned.

No. V. Bore-hole. Bed of river.

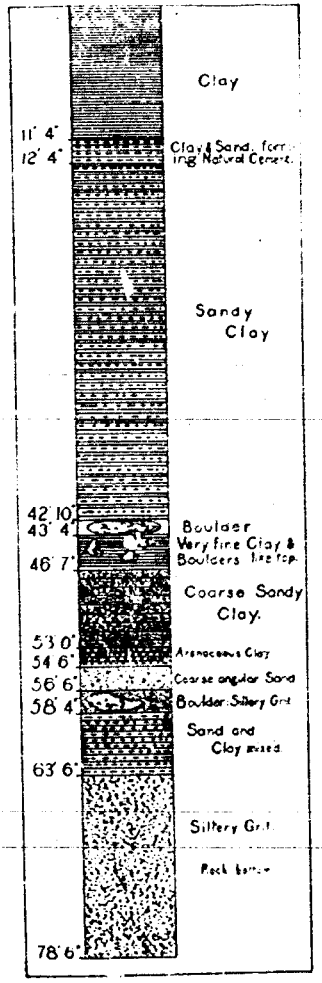


Bore-hole No. 5, South Side.

Drillings consist of drab-coloured sand and gravel associated with Sillery grit materials to a depth of ten feet, followed by eleven feet of subangular and rather coarse sand with felspar fragments, in turn underlaid by a Sillery grit boulder three feet six inches in thickness below which, two feet three inches of a coarse sand, like that above, in which boulders of gneiss, limestone and grit occur.

One of the limestone boulders contained *Leptæna* (*Plectambonites*) ***sericea***, Sowerby, indicating clearly the Trenton age of the mass. A typical Sillery grit boulder two feet thick was then struck, whilst the next seven feet are characterized by a mixed coarse and fine gravel, with pebbles of clay slate, &c. This material prevails throughout the drillings downward to a depth of fifty feet seven inches, whilst the next twenty-six feet five inches are marked by the presence of well washed quartzose sand with grains of felspar, chlorite, &c., reaching to a depth of seventy-seven feet, where the drill stopped.

No. VI. bore-hole. Close to south cliff, south anchor pier, 200 feet from foot of cliff.



Bore-hole No. 6, South Side.

Eleven feet four inches of a fine grained homogeneous bluish-grey clay characterized the first series of drillings obtained. Below this bed of clay a layer one foot in thickness of a more or less arenaceous and calcareous clay occurred, which when exposed to the air forms a rather strong natural cement, the grains adhering to one another very firmly, followed by some thirty feet three inches of a more or less pure though at times arenaceous clay. At a depth of forty-three feet four inches a boulder was met with about six inches in thickness, below which occurred three feet three inches of a whitish-grey very fine clay, in which a Sillery grit boulder was struck. This clay resembles the first or surface clay described in the drillings from this bore-hole. Six feet five inches of a coarse sandy clay, mostly sand follow, below which is a similar stratum eighteen inches thick, forming a comparatively strong natural cement. Coarse angular sand follows two feet in thickness; then a Sillery grit boulder twenty-two inches in diameter, below which are five feet two inches of a coarse rusty sand, continuing to a depth of sixty-three feet six inches. The drill then traversed the solid rock to a depth of fifteen feet. No sample of the rock traversed, however, was present in the drillings, but it is very likely, and most probable, that the Sillery grit rocks were struck at the depth of sixty-three feet six inches and penetrated to the seventy-eight feet six inch level, as given in the log accompanying the drillings.

NOTE.

In connection with the building of the piers, abutments, &c., of the Quebec bridge, a number of interesting specimens were obtained and forwarded by Mr. M. P. Davis, contractor, through his manager, Mr. A. A. Stuart, to the department for examination, and as donations to the Museum. These include fossil plants obtained from excava-

tions in the caissons both on the north and south slopes of the St. Lawrence river bed, Victoria Cove, Sillery, and samples of rock materials in which these were found imbedded at various depths from the surface. Besides these, a fine block of coarsely crystalline syenite or hornblendic granite employed in the construction of the piers and abutments from the quarries at Rivière à Pierre was also presented by Mr. Davis to the National Museum, which serves to illustrate admirably the various characters of this building material so excellent for heavy masonry. Of this rock, Mr. Davis informs me that a single block was quarried which contained not less than 1,000 cubic yards, even and homogeneous in structure throughout. This single block thus weighed no less than 9,069,840 lbs., equivalent to 4,535 tons. The rock is of a light pinkish-grey colour, quite pleasing to the eye, and takes a high polish, dresses and cuts well, constituting in a marked degree a highly desirable rock for heavy works and foundations.

Geology of the Site of the Quebec Bridge.

Early in October, with a view of determining the rock materials and geological formations upon which the abutments, anchor piers and main piers of the Quebec bridge rested, the Engineer in Chief and Deputy Minister of Railways and Canals presented a request that I should make a report upon the same. The result of the examination made by me from during field-work of 1901, of the drillings obtained from the diamond drill bore-holes, along the shore and in the bed of the St. Lawrence river at Victoria Cove, Sillery, eight miles above Quebec city, were verified and a report prepared, which has been transmitted to the Department of Railways and Canals, and a duplicate copy of the same was deposited with the acting director of this department, and reads as follows:—

Preliminary Report on the Geological Formations in the vicinity of the Quebec Bridge Piers and Abutments, Victoria Cove, Sillery, Que.

From the examination made of the materials obtained from within the caisson of the south main pier of the Quebec bridge, as well as of the geological formations along the north and south shores of the St. Lawrence river at Victoria Cove, Sillery, Que., I am led to conclude that there are at least three distinct geological formations upon which the abutments, anchor piers and the north and south main piers rest, in the following ascending order of succession and of age:—

I. The Sillery grit formation.
II. The boulder clay or glacial drift formation.
III. The later Pleistocene formation.

THE ABUTMENTS.

The abutments of the Quebec bridge, both on the north and south shores of the St. Lawrence river, rest directly upon the Sillery grit formation.

This Sillery grit formation consists for the most part of greenish drab-weathering and greenish-grey sandstones or coarse grits frequently assuming the character of fine conglomerates with white quartz pebbles at time the size of peas.

These sandstones are sometimes slightly micaceous, and occasionally hold scales of green and black shale, and a few spangles of graphite. They are often calcareous. They usually present massive beds, and at Sillery, the type locality, many of the layers are quarried for building purposes, the stone being used largely in Quebec city. When broken, the rock presents a sharp, cutting edge and fracture, the grains of material composing the rock being strongly cemented together.

THE ANCHOR PIERS.

The north anchor pier rests directly upon the Sillery grit formation.

The south anchor pier rests in the upper strata of the later Pleistocene or boulder sand formation, which at this point consists for the most part of fine clay and sand filling the interstices of rounded, water-worn and subangular boulders of Archæan and Palæozoic formations, such as are seen strewn on the beach at low water, held in a matrix of stratified and well washed sand. The Archæan boulders are as varied in composition, comprising as the rocks of that primitive series the Laurentian and Huronian systems as they are developed in the province of Quebec, including many eruptives.

THE MAIN PIERS.

The materials obtained from within the caisson of the south main pier indicate the presence of both 'the boulder clay or glacial clay' formation, and the 'sand and gravel formation' or later drift.

The boulder clay or glacial drift formation occupies by far the greater portion of the area upon which the south main pier rests.

This 'boulder clay' is the characteristic 'till' or glacial clay of geologists, the 'hard-pan' of Canadian and other American engineers. It was deposited here at a remote period during the Glacial Epoch of geologists.

This formation consists of an indurated, compact, tough and unstratified rock mass, composed of rounded, angular and subangular boulders and pebbles of Laurentian and Archæan gneisses and quartzites, associated with numerous boulders and pebbles of typical Sillery grit, sandstones and shales (of which materials the Sillery formation is composed), besides well-scored and striated or glaciated pebbles of limestone derived from the Trenton and Black River limestone formations of the north shore of the St. Lawrence, all cemented by an argillaceous paste, and held compactly together.

The materials, however, that were obtained from the two most westerly compartments within the caisson, consist of the 'boulder sand and gravel formation.' Rounded and subangular boulders and pebbles of Sillery grit and sandstones, of limestone, quartzite, gneisses and various other materials (not differing materially in character and composition from the boulders and pebbles constituting the boulder clay formation), are held in a matrix of sand, which, upon examination, appears to consist of well washed and fine grains of quartz, with occasional grains of hornblende and other impurities.

The sand and gravel formation is of later date than the 'boulder clay' or glacial drift formation, and was no doubt derived from the same, and is a stratified deposit.

THE NORTH MAIN PIER.

The north main pier rests upon the sand and gravel formation. From the materials obtained from within the caisson of this pier, it is evident that the boulders of gneiss, granite, quartzites and limestone, &c., which constitute this formation, have their interstices filled with sand and gravel, and that the whole is of sedimentary origin, of later date than the 'boulder clay or glacial clay' formation, and probably derived from it for the most part, being deposited as modified and stratified drift.

H. M. AMI.

Geological Survey of Canada,
Quebec, Que., October 10, 1902.

EXHIBIT No. 125.

LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES.

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Dept.
70	Strain Sheet	June 2, '01		June 25, '01.
Sheet 'B'	Floor Beams for Anchor Arms	Sept. 16, '03	Sept. 24, '03	Oct. 28, '03.
" 'B'	" " "	Sept. 16, '03	Sept. 24, '03	Oct. 28, '03.
" 'C'	Stringers of Anchor Arms	Sept. 16, '03	Oct. 5, '03	Oct. 28, '03.
" 'H'	Trussed Floorbeams of Cant. Arms	Dec. 2, '03	Dec. 16, '03	Jan. 19, '04.
" 'F'	Trussed " "	Nov. 20, '03	Dec 16, '05	Jan. 19, '04.
" 'G'	" " "	Nov. 28, '03	Dec. 16, '03	Jan. 19, '04.
" 'O'	" " Anchor Arms	Dec. 24, '03	Jan. 12, '04	Jan. 27, '04.
" 'O'	" " "	Dec. 24, '03	Jan. 12, '04	Jan. 27, '04.
" 'N'	" " "	Dec. 23, '03	Feb. 26, '04	Mar. 15, '04.
" 'P'	" " "	Dec. 24, '03	Feb. 26, '04	Mar. 15, '04.
" R	Gen. Pl. 675 ft. Suspended Span	Feb. 4, '04	Mar. 29, '04	April 18, '04.
" Q	Stress Dgm. " "	Feb. 18, '04	Mar. 29, '04	April 18, '04.
3	Lower Sections of Anchorage Shell	June 1, '04	June 10, '04	July 7, '04.
1	Pins, Pilots, Washers & Bolts for Towers	May 21, '04	June 15, '04	July 7, '04.
2	I Bars for Towers (Revsd)	June 4, '04	June 7, '04	July 7, '04.
5	Top Struts for Anchor Towers	June 3, '04	June 10, '04	Aug. 2, '04.
1	Transverse Bracing for Anch. Towers	May 27, '04	June 10, '04	July 7, '04.
2	" " "	May 30, '04	June 10, '04	July 7, '04.
4	Upper Sect. Anchor Shell & Splice Pl	June 10, '04	June 15, '04	July 7, '04.
5	Top Struts for Anch. Towers	June 3, '04	June 10, '04	July 7, '04.
'U'	N. Pier Transverse View of Anch. Bent	June 24, '04	April 25, '04	Aug. 2, '04.
'U'	" " "	April 19, '04	April 25, '04	May 12, '04.
'X'	Stress D'gm. for 1500 ft. Anch. Arm	June 1, '04	June 30, '04	Oct. 11, '04.
'T'	Anchorage Shell	April 20, '04	June 10, '04	Aug. 2, '04.
'V'	Details of N. Bent	April 21, '04	April 25, '04	Aug. 2, '04.
'V'	" "	April 21, '04	April 25, '04	May 12, '04.
8	R'y Stringers for Anch. Arm	July 12, '04	July 18, '04	Aug. 9, '04.
4	" " "	July 19, '04	July 18, '04	Aug. 9, '04.
'T'	Anchorage Shell	April 20, '04	April 25, '04	May 12, '04.
9	R'y Stringers for Anch. Arms	July 12, '04	July 18, '04	Aug. 9, '04.
7	Floorbeams Anch. Arms	July 5, '04	July 18, '04	Aug. 9, '04.
1	End Bottom Chords for Anch. Arms	July 1, '04	July 9, '04	Oct. 11, '04.
5	Anch. Arm. Elec. R'y. Stringers	July 15, '04	July 22, '04	Aug. 8, '04.
6	Roadway Stringers for Anch. Arms	July 20, '04	July 27, '04	Aug. 12, '04.
10	Elec. R'y & Roadway Stringers for Anch. Arm	July 21, '04	July 27, '04	Aug. 11, '04.
11	" " " "	July 22, '04	July 27, '04	Aug. 11, '04.
'Z'	Top. Chord Pin Packing for Anch. Arm	July 12, '04	July 27, '04	Oct. 11, '04.
13	Ry. Stringers for Anch. Arm	July 26, '04	Aug. 8, '04	Sept. 7, '04.
15	" "	Aug. 1, '04	Aug. 8, '04	Sept. 7, '04.
16	" "	Aug. 3, '04	Aug. 8, '04	Sept. 7, '04.
12	Floor Beams "	July 19, '04	Aug. 1, '04	Sept. 7, '04.
14	" "	July 28, '04	Aug. 3, '04	Sept. 7, '04.
17	" "	Aug. 4, '04	Aug. 9, '04	Sept. 7, '04.
18	Elec. Ry. & Roadway Stringers for Anch. Arms	Aug. 10, '04	Aug. 15, '04	Sept. 7, '04.
19	" " "	Aug. 11, '04	Aug. 15, '04	Sept. 7, '04.
1	End Floorbeams for Anchor Arms	July 14, '04	Aug. 1, '04	Oct. 10, '04.
2	Bottom Chords for Panel 2 of Anch. Arms	July 20, '04	Aug. 19, '04	Oct. 10, '04.
22	Anch. Arm. Diags. of Transv. Brac'g at Post Pl.	Aug. 26, '04	Sept. 9, '04	Oct. 17, '04.
25	" " " "	Sept. 5, '04	Sept. 9, '04	Oct. 18, '04.
11	Anchor Arm. Upper Sec's of Post Pl.	July 15, '04	Aug. 8, '04	Oct. 17, '04.
13	" Top Struts between Post Pl.	July 30, '04	Aug. 13, '04	Oct. 18, '04.
16	" Lower Trans. Struts betw Post Pl.	Aug. 10, '04	Aug. 15, '04	Oct. 18, '04.
3	Bottom Chords for Panel 3 of Anch. Arms	Sept. 10, '04	Sept. 13, '04	No date '04.
3	Lever Posts & Weights	June 15, '04	Aug. 3, '04	Oct. 17, '04.
14	Bottom Laterals for Pan. 1. Anch. Arms	Aug. 3, '04	Aug. 13, '04	Oct. 17, '04.
2	Tenon Girders, Rollers etc	June 16, '04	Sept. 7, '04	'04.
15	Hangers TO Por. Anch. Arm	Aug. 13, '04	Sept. 16, '04	Oct. 21, '04.
5	Bottom Chords for Pan'l 5 Anch. Arm	Sept. 15, '04	Sept. 23, '04	Oct. 21, '04.

LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES—*Continued.*

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Dept.
18	Struts ASS1 for Anch. Arm	Aug. 18, '04..	Aug. 23, '04..	Oct. 21, '04.
24	Bottom Laterals for Panel 5 Anch. Arm	Aug. 25, '04..	Sept. 13, '04..	'04.
26	" " 6 "	Aug. 30, '04..	Sept. 13, '04..	Oct. 21, '04.
12	Anch. Arm. Lower Secs. of Post P1	Aug. 6, '04..	Oct. 6, '04..	Oct. 21, '04.
25	End Top Chord AOO for Anch. Arm	Aug. 29, '04..	Sept. 8, '04..	Oct. 21, 04.
27	Sub-Verticals ASV1. "	Sept. 8, '04..	Sept. 16, '04..	Oct. 21, '04.
4	Bottom Chords for Panel 4 "	Sept. 17, '04..	Sept. 23, '04..	Oct. 17, '04.
17	Bottom Laterals for Panels 2, 3 & 4	Aug. 17, '04..	Aug. 23, '04..	Oct. 17, '04.
30	" " 8, Anchor Arms	Sept. 10, '04..		Oct. 22, '04.
6	Bottom Chords for Panel 6 "	Sept. 14, '04	Sept. 23, '04.	Oct. 22, '04.
39	Top Laterals for Panel O	Sept. 19, '04..	Sept. 23, '04..	Oct. 22, '04.
19	Anch. Arm. Upper Secs. of Post P2	Aug. 24, '04..	Sept. 21, '04..	Oct. 21, '04.
21	Sub-Diagonals ASP-1 for An. Arm.	Aug. 23, '04..	Sept. 8, '04..	Oct. 22. '04.
32	Bottom Laterals for Panel 9 An. Arm	Sept. 15, '04..	Sept. 21, '04..	Oct. 24, '04.
33	Anch. Arm. Top Strut betw. Sub Vert ASV1	Sept. 16, '04..	Sept. 21, '04..	Oct. 24, '04.
7	Bottom chords for Pan'l 7 of Anch Arms	Oct. 5, '04..	Oct. 12, '04..	Nov. 7, '04.
20	Anch. Arm. Lower Secs. of Post P.2	Sept. 14, '04..	Sept. 21, '04..	Nov. 7, '04.
34	Sub-Verticals A SV2 for Anch. Arms	Sept 21, '04..	Sept. 27, '04..	Nov. 7, '04.
29	Sub-Diags A SP2 for Anch. Arm	Sept. 10, '04..	Sept. 17, '04..	Nov. 7, '04.
28	Bottom Laterals for Panel 7, Anch. Arms	Sept. 2, '04..	Sept. 13, '04..	Oct. 22, '04.
35	Hanger ATOO for Anch. Arms	Sept. 23, '04..	Oct. 3, '04..	Nov. 7, '04.
31	Strut ASS2 for Anchor Arm.	Sept. 17, '04..	Sept. 23, '04..	Nov. 10, '04.
8	Bottom Chords for Pan'l 8 of Anch. Arms	Oct. 12, '01..	Oct. 17, '01..	Nov. 12, '01.
9	" " 9 "	Oct. 15, '01..	Oct. 22, '01..	Nov. 12, '01.
45	Sub-Verticals A SV-3 for Anch. Arms	Oct. 3, '01..	Oct. 13, '01..	Nov. 12, '01.
47	Anch. Arm. Lower Trans. Strut betw. Hangr's TO.	Oct. 4, '01..	Oct. 13, '01..	Dec. 14, '01.
42	Top Later'ls for Panel A	Sept. 26, '01..	Oct. 5, '01..	Dec. '01.
10	Bottom Chords for Pan'l 10. Anch. Arm	[Nov. 9, 01]..	Oct. 24, '01..	Dec. 14, '01.
40	Upper Secs. of Post P3 of "	Sept. 21, '01	Oct. 3 '01..	Dec. 14, '01.
61	Anch. Arm. Top Strut at SV-2	Oct. 13, '01..	Oct. 20, '01..	Dec. 14, '01.
63	Anch. Arm. Diag. of Transv. bracing at hangers TO.	Oct. 20, '01..	Oct. 26, '01..	Dec. 14, '01.
65	Anch. Arm. Bottom Strut at SV2	Oct. 17, '01..	Oct. 26, '01..	Dec. 14, '01.
36	" Upper Secs. of Post P4	Sept. 27, '01..	Oct. 5, '01..	Dec. 14, '01.
1	Trussed Floorbeams Anc. Arm	Sept. 26, '01..	Nov. 30, '01..	Dec. 15, '01.
2	" "	Oct. 4, '01..	Oct. 11, '01..	Dec. 15, '01.
72	Anch. Arm. Diagonal of Transv. bracing of Hangers TOO	Oct. 26, '01..	Nov. 30, '01..	Dec. 15, '01.
69	Anch. Arm. Top Strut betw. Posts P2	Oct. 24, '01..	Oct. 29, '01..	Dec. 15, '01.
44	Lower Secs. of Post P3 for Anch. Arms	Oct. 19, '01..	Oct. 29, '01..	Dec. 15, '01.
75	Lower Pedestal for Shoe over Main Pier	Oct. 28, '01..	Nov. 9, '01..	Dec. 15, '01.
73	An. Arm. Diag. of Trans. bracing at hangers TOO	Nov. 3, '01..	Dec. 1, '01..	Dec. 16, '01.
85	Diag. of " " Post P2	Nov. 12, '01..	Nov. 30, '01..	Dec. 16, '01.
86	Anch. Arm Diag. of Transv. Bracing at Post P2.	Nov. 18, '01..	Nov. 30, '01..	Dec. 16, '01.
77	" " Lower Strut betw. Posts P2	Oct. 31, '01..	Nov. 7, '01	Dec. 16, '01.
62	" " Diag. of Trans. Bracing Hang'rs TO.	Oct. 12, '01..	Oct. 26, '01..	Dec. 14, '01.
70	Sub Diag. (A) SP-3 for Anch. Arms	Oct. 26, '01..	Nov. 1, '01..	Dec. 16, '01.
3 & 4	Suspension Rods for Anch. Arms	Oct. 23, '01..	Nov. 7, '01..	Dec. 17, '01.
4	Trussed Floorbeams for Anch. Arms	Oct. 20, '01..	Nov. 12, '01..	Dec. 16, '01.
3	" " "	Nov. 1, '01..	Dec. 2, '01..	Dec. 16, '01.
37	A. Arm Middle Sections of Post P4	Oct. 6, '01..	Oct. 12, '01..	Dec. 16, '01.
68	Strut (A) SS-3 for Anch. Arm	Oct. 20, '01..	Oct. 29, '01..	Dec. 17, '01.
46	Top Later'ls for Panel 8.	Sept. 30, '01..	Oct. 13, '01..	Dec. 17, '01.
84	Anch. Arm, Bottom Strut at SB-3	Nov. 11, '04..	Nov. 17, '04..	Jan. 3, '04.
78	" " Top Strut at SB-3	Nov. 4, '04..	Nov. 9, '04..	Jan. 3, '04.
6	Bracing under Trussed Floorb'ms Anch. Arms	Nov. 21, '04..	Nov. 29, '04..	Jan. 3, '04.
90	Anch. Arm, Lower Strut betw. Posts P3	Nov. 17, '04..	Nov. 30, '04..	Dec. 30, '04.
83	" " Top Strut betw. Posts P3	Nov. 11, '04..	Nov. 17, '04..	Dec. 30, '04.
38	" " Lower Sections of Post P4	Nov. 15, '01..	Nov. 29, '04..	Dec. 30, '04.
94	" " Diag. of Transv. bracing at sub-vert SV-3	Nov. 30, '04..	Dec. 17, '04..	Dec. 30, '04.
89	" " Diag. of Transv. bracing at sub-vert (A) SV-3	Nov. 21, '04..	Dec. 5, '04..	Dec. 31, '04.
99	" " Diag. of Transv. brac'g at Post P3	Nov. 28, '04..	Dec. 15, '04..	Dec. 31, '04.
100	" " " " "	Dec. 3, '03..	Dec. 15, '04..	Dec. 30, '04.
59	Top Later'ls, Panel C	Oct. 6, '04..	Oct. 13, '04..	Dec. 30, '04.
64	" " D	Oct. 12, '04..	Oct. 20, '04..	Jan. 9, '05.
79	Sub-Verticals (A) SB-5 for Anch. Arms	Nov. 4, '04..	Nov. 12, '04..	Jan. 16, '05.
81	Lower Sec. of Hanger TOOOO	Nov. 18, '04..	Nov. 29, '01..	Jan. 17, '05.

LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES—*Continued.*

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Dept.
80	Upper Secs. of Hanger TOOOO for Anch Arms.	Nov. 10, '04.	Nov. 16, '04.	Jan. 17, '05.
5	Trussed Floorbeams Anch. Arms.	Nov. 9, '04.	Nov. 16, '04.	Jan. 17, '05.
96	Upper Secs. of Hanger T5Z for Anch. Arms.	Nov. 24, '04.	Dec. 2, '04.	Jan. 31, '05.
97	Middle Secs. " " "	Dec. 3, '04.	Dec. 19, '04.	Jan. 31, '05.
98	Lower Secs. " " "	Dec. 12, '04.	Dec. 17, '04.	Jan. 31, '05.
76	Strut (A) SS4 for Anch. Arm.	Nov. 7, '04.	Jan. 20, '05.	Jan. 31, '05.
107	Diag'nls (A) N1 & (A) N2 for Anch. Arms.	Dec. 8, '04.	Dec. 16, '04.	Jan. 31, '05.
67	Sub-Vert'cls (A) SB4 " "	Oct. 22, '04.	Oct. 29, '04.	Jan. 31, '05.
82	Sub-Diag'nls (A) SP4 " "	Nov. 16, '04.	Dec. 10, '04.	Jan. 31, '05.
87	Struts (A) SS5 & (A) SS6 " "	Nov. 14, '04.	Nov. 17, '04.	Feb. 3, '05.
95	" (A) SS7 & (A) SS8 " "	Nov. 21, '04.	Dec. 2, '04.	Feb. 3, '05.
118	" (A) SS9 & (A) SS10 " "	Dec. 21, '04.	Jan. 23, '05.	Feb. 4, '05.
123	Anch. Arm Strut (A) SS12L "	Dec. 23, '04.	Jan. 23, '05.	Feb. 4, '05.
75	Struts (A) H1 & (A) H2 " "	Dec. 3, '04.	Dec. 17, '04.	Feb. 4, '05.
113	Diag'nls (A) N3 & (A) N4 " "	Dec. 10, '04.	Jan. 23, '05.	Feb. 4, '05.
127	" (A) N5 & (A) N6 " "	Dec. 31, '04.	Jan. 23, '05.	Feb. 3, '05.
41	End of Top Chord (A) O.	Sept. 27, '04.	Jan. 26, '05.	Feb. 3, '05.
91	Anch. Arm, Upper Secs. Diag. T50.	Nov. 18, '04.	Dec. 10, '04.	Feb. 14, '05.
128	Lower Secs. of Diag. T50 for Anch. Arm	Jan. 5, '05.	Feb. 2, '05.	Feb. 14, '05.
114	Anch. Arm, Lower Secs. of Diag. T5.	Dec. 13, '04.	Dec. 21, '04.	Feb. 14, '05.
125	Strut (A) H3 for Anch. Arms.	Dec. 28, '04.	Jan. 6, '05.	Feb. 14, '05.
109	Sub-Diag. (A) SP-5 for Anch. Arm.	Dec. 19, '04.	Feb. 2, '05.	Feb. 14, '05.
74	Bottom Laterals for Panel 10 Anch. Arm.	Dec. 9, '04.	Dec. 17, '04.	Feb. 14, '05.
133	Sub-Diagonals (A) SP-5 for Anch. Arm.	Jan. 14, '05.	Feb. 8, '05.	Feb. 23, '05.
2	Anch. Arm I-bars for Diagonals.	Oct. 20, '04.	Dec. 14, '04.	Mar. 7, '05.
1	Top Chord I-bars for panels *c*, *d*, *e*, *f*, *g* Anc. Arms.	Aug. 5, '04.	Dec. 10, '04.	Mar. 7, '05.
43	Top Later'ls for Panel O.	Sept. 26, '04.	Oct. 5, '04.	Feb. 23, '05.
129	Anch. Arm, Transverse Strut (A) H4.	Jan. 4, '05.	Feb. 21, '05.	Mar. 7, '05.
117	" " Strut (A) SS-11-L.	Dec. 16, '04.	Dec. 21, '04.	Mar. 7, '05.
4	" " I-bars.	Dec. 12, '04.	Dec. 14, '04.	Mar. 15, '05.
93	" " Strut (A) SS-14 L.	Jan. 9, '05.	Jan. 14, '05.	Mar. 15, '05.
5	" " I-bars	Jan. 3, '05.	Jan. 6, '05.	Mar. 15, '05.
92	Struts (A) SS13.	Jan. 9, '05.	Jan. 14, '05.	Mar. 15, '05.
134	Anch. Arm, Later'ls (A) L-41-L.	Jan. 14 '05.	Jan. 25, '05.	Mar. 15, '05.
2	Upper Pedestal for Shoe over Main Pier.	Jan. 11, '05.	Jan. 23, '05.	Mar. 15, '05.
131	Anch. Arm. Upper Secs. of Diag. T5.	Jan. 5, '05.	Jan. 20, '05.	Mar. 15, '05.
60	Hanger TOOO for Anch. Arm.	Oct. 8, '04.	Oct. 19 '04.	June 22, '05.
126	Top Later'ls for Pan'l H.	Jan. 12, '05.	Jan. 23, '05.	June 22, '05.
1	Cen. Post Foot over Main Pier.	Jan. 16, '05.	Feb. 8, '05.	June 23, '05.
23	Brackets & Cap Pl's for Cen. Post Sec's CP1	April, 11, '05.	May 2, '05.	June 22, '05.
9	Over Main Pier, Brk'ts for transv. Bracing.	Feb. 14, '05.	Feb. 20, '05.	June 22, '05.
24	Upper Top Strut betw. Cen. Posts.	Mar. 28, '05	May 12, '05.	June 22, '05.
10	Secs. CP3-4 for Cen. Posts over Main Piers.	Feb. 22, '05.	Mar. 6, '05.	June 22, '05.
8	Lower Secs. of Cen. Post " "	Feb. 1, '05.	Feb. 9, '05.	June 22, '05.
5	Bottom Struts betw. Shoes " "	Jan. 26, '05.	Feb. 20, '05.	June 22, '05.
7	Bottom Diag'nls betw. Centre Posts.	Jan. 31, '05.	Feb. 16, '05.	June 22, '05.
2	Trussed Floorbeams betw. Cen. Posts.	Jan. 30, '05.	Feb. 16, '05.	June 22, '05.
3	" " "	Jan. 6, '05.	Feb. 16, '05.	June 22, '05.
4	" " "	Jan. 21, '05.	Feb. 16, '05.	June 22, '05.
71	Top Later'ls for Panel 'F'.	Oct. 24, '04.	Nov. 1, '04.	June 22, '05.
88	Anch. Arm Top Strut at SV4	Nov. 15, '04.	June 10, '05.	June 22, '05.
20	Stringer Seats, Anch. Arms.	Aug. 11, '04.	Aug. 15, '04.	June 22, '05.
104	Anch. Arm Diag. of Transv. Br'cing at SV4.	Nov. 29, '04.	Dec. 19, '05.	June 22, '05.
105	" " " "	Dec. 12, '04.	Dec. 19, '04.	June 22, '05.
112	" " " at Post P4.	Dec. 15, '04.	Dec. 30, '05.	June 22, '05.
1	" Pins, Pilots, Washers & Bolts.	Oct. 26, '04.	Nov. 1, '04.	June 22, '05.
2	" " "	Oct. 31, '04.	Nov. 7, '04.	June 22, '05.
101	" Bottom & Intermed Struts at SV4.	Nov. 24, '04.	Dec. 2, '04.	June 22, '05.
3	" Pins, Washers & Rods.	Nov. 4, '04.	Nov. 16, '04.	June 22, '05.
13	Sect. CP2 of Cen. Post over Main Pier.	Mar. 14, '05.	April 1, '05.	June 22, '05.
66	Top Later's for Pan'l E.	Oct. 18, '04.	Oct. 26, '04.	June 22, '05.
122	" " G.	Dec. 22, '04.	Dec. 29, '04.	June 22, '05.
16	Cen. Tower, Transv. Strut.	Mar. 23, '05.	May 12, '05.	June 22, '05.
22	Sec. CP1. for Cen. Post over Main Pier.	April 17, '05.	May 2, '05.	June 22, '05.
36	Upper Cen. Post Sec.	May 3, '05.	(Not signed).	June 29, '05.
103	Anchor Arm Top Strut betw. Posts P4	Nov. 30, '04.	June 10, '05.	June 29, '05.
111	" Diagnl. of Transv. Br. at Post P4	Dec. 10, '04.	Dec. 20, '04.	June 29, '05
108	" Intermed. and Lower Struts betw. Posts P4	Dec. 9, '04.	Dec. 16, '04.	June 29, '05

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LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES—*Continued.*

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Department.
15	Transv. Bracing betw. Cen. Posts	Mar. 2, '05.	May 12, '05.	June 29, '05.
14	" " "	Feb. 24, '05.	May 12, '05.	June 29, '05.
130	End Bottom Chords over Main Shoe Anch. and Cant. Arms	Jan. 12, '05.	Feb. 2, '05.	June 29, '05.
3	Main Pier Shoes	Feb. 9, '05.	Feb. 20, '05.	June 29, '05.
11	Portal Strut betw. Cen. Posts	Feb. 25, '05.	May 10, '05.	June 29, '05.
12	Cen. Tower Bracing for Portal	Feb. 18, '05.	May 10, '05.	June 29, '05.
19	" Posts Knee Brac'g for Portal	Mar. 15, '05.	May 12, '05.	June 29, '05.
6	Anch. Arm Pins, Pilots, Washers and Bolts	June 16, '05.	Jan. 25, '05.	June 29, '05.
1a	Stress Diagm. for Cant. Arms	May 23, '05.	May 25, '05.	June 30, '05.
37	Cen. Posts, Knee Braces for Portal	April 19, '05.	May 16, '05.	June 29, '05.
25	Lower Top Strut betw. Cen. Posts	April 5, '05.	May 16, '05.	June 29, '05.
26	Bracing for Top Strut betw. Cen. Posts	April 13, '05.	May 16, '05.	June 29, '05.
30	Top Diagnls. for Portal	April 7, '05.	May 16, '05.	June 29, '05.
32	Cen. Posts Top Diagnl. for Portal	April 14, '05.	May 16, '05.	June 29, '05.
124	Anch. Arm Diagnl. of Transv. Bracing at SV5	Dec. 29, '04.	Jan. 6, '05.	July 5, '05.
120	Diagnl. of Transv. Bracing at SV5	Dec. 20, '04.	Jan. 6, '05.	July 5, '05.
110	Anch. Arm Top Strut at SV5	Dec. 14, '04.	Dec. 19, '04.	July 5, '05.
121	" Interm. and Lower Struts at SV5	Dec. 22, '04.	June 22, '05.	July 5, '05.
53	Bottom Portal Strut	Nov. 17, '04.	Jan. 13, '05.	July 24, '05.
54	Top "	Nov. 25, '04.	Jan. 13, '05.	July 24, '05.
55	Gussets for End Posts	Nov. 14, '04.	Jan. 13, '05.	July 24, '05.
132	" End Top Chord A O for Anc. Arm	Jan. 4, '05.	Jan. 13, '05.	July 24, '05.
51	Diagnls. for End Portal Struts	Oct. 29, '04.	Jan. 13, '05.	July 24, '05.
52	" " "	Nov. 8, '04.	Jan. 13, '05.	July 24, '05.
9	Bottom Chords Panel 9 for Cant. Arms	July 8, '05.	July 14, '05.	Aug. 22, '05.
50	End Post	Nov. 3, '04.	Jan. 13, '05.	Aug. 22, '05.
115	"	Dec. 14 '04.	Jan. 13, '05.	Aug. 22, '05.
15	Upper Sections of T5Z for Cant. Arms	Aug. 3, '05.	Aug. 11, '05.	Dec. 9, '05.
16	Panel 9 Bottom Laterals for "	July 26, '05.	Aug. 7, '05.	Dec. 9, '05.
21	Brackets at End Floorbeam Anch. Arms	Jan. 19, '05.	May 10, '05.	Dec. 9, '05.
11	Panel 10 Bottom Laterals Cant. Arms	July 17, '05.	Aug. 7, '05.	Dec. 9, '05.
10	Bottom Chords Panel 10 Cant. Arms	July 29, '05.	Aug. 4, '05.	Dec. 9, '05.
3	Members of Trussed Floorbeam 10 Cant. Arms	Aug. 9, '05.	Aug. 24, '05.	Dec. 9, '05.
45	Middle Sec. of Post P4 for Cant. Arms	Sept. 16, '05.	Nov. 4, '05.	Dec. 9, '05.
46	Lower Secs. of Post P4 "	Sept. 6, '05.	Nov. 4, '05.	Dec. 9, '05.
2	Members of Trussed Floorbeam FB10 Cant. Arm.	July 21, '05.	Aug. 23, '05.	Dec. 9, '05.
1	Top Chords " FB9 and FB10 Cant. Arms	July 17, '05.	Aug. 23, '05.	Dec. 9, '05.
18	Lower Secs. of Diagnl. T5 for Cant. Arm.	July 28, '05.	Aug. 23, '05.	Dec. 28, '05.
22	Upper Secs. " "	Aug. 7, '05.	Aug. 23, '05.	Dec. 23, '05.
1	Ry. Stringers for Cant. Arms	Aug. 31, '05.	Sept. 22, '05.	Dec. 9, '05.
1	" Suspended Span	Aug. 26, '05.	Sept. 22, '05.	Dec. 9, '05.
4	Diagnl. Bracing Upper Truss'd Floorbeam FB10 Cant. Arms	Aug. 16, '05.	Aug. 30, '05.	Dec. 9, '05.
24	Side Struts SS4 and SS5 Cant. Arms	Aug. 11, '05.	Aug. 28, '05.	Dec. 27, '05.
33	Upper Secs. of Diagnl. T50 Cant. Arms	Aug. 16, '05.	Aug. 30, '05.	Dec. 27, '05.
28	Sub-Diagnls. SP5 for Cant. Arms	Aug. 18, '05.	Aug. 29, '05.	Dec. 26, '05.
29	" " "	Aug. 11, '05.	Aug. 28, '05.	Dec. 26, '05.
12	Strut SS1 for Cant. Arms	July 24, '05.	Aug. 7, '05.	Jan. 5, '06.
19	" SS2 and SS3 for Cant. Arms	Aug. 2, '05.	Aug. 11, '05.	Jan. 4, '06.
26	" SS6 for Cant. Arms	Aug. 9, '05.	Aug. 23, '05.	Jan. 4, '06.
25	" SS7L "	Aug. 9, '05.	Aug. 29, '05.	Jan. 4, '06.
31	" H2 "	Aug. 14, '05.	Sept. 7, '05.	Jan. 6, '06.
32	" H3 "	Aug. 14, '05.	Aug. 30, '05.	Jan. 4, '06.
27	Sub-Diagnl. SP5 "	Aug. 10, '05.	Aug. 24, '05.	Jan. 4, '06.
17	Bottom & Intermed. Struts at SV5 for Cant. Arms	July 27, '05.	Aug. 28, '05.	Jan. 10, '06.
30	Top Strut at SV5 for Cant. Arms	Aug. 10, '05.	Aug. 29, '05.	Jan. 10, '06.
20	Strut H1 for Cant. Arms	July 31, '05.	Aug. 24, '05.	Jan. 10, '06.
23	Diagnls. N1 and N2 for Cant. Arms	Aug. 9, '05.	Aug. 23, '05.	Jan. 10, '06.
21	Diagnl. Bracing at SV5 for Cant. Arms	Aug. 3, '05.	Aug. 29, '05.	Jan. 10, '06.
35	Lateral L11L for Cant. Arms	Aug. 17, '05.	Aug. 30, '05.	Jan. 10, '06.
34	Sub-Vert. SV5 "	Aug. 16, '05.	Sept. 7, '05.	Jan. 30, '06.
5	Strut T6 Under Floorbeam FB10 for Cant. Arms	Aug. 19, '05.	Aug. 30, '05.	Jan. 30, '06.
36	Diagnls. N3 and N4 for Cant. Arms	Aug. 17, '05.	Sept. 7, '05.	Jan. 31, '06.
37	Top Laterals for Panel H "	Aug. 22, '05.	Sept. 7, '05.	Jan. 31, '06.
38	Lower Secs. of Diagnl. T50 "	Aug. 24, '05.	Sept. 9, '05.	Jan. 31, '06.
1	Pins for Cant. Arms	July 25, '05.	Sept. 9, '05.	Jan. 31, '06.
49	Strut SS8 "	Aug. 5, '05.	Sept. 9, '05.	Jan. 31, '06.

LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES—*Continued.*

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Department.
7	Strut T2A Under Trussed Floorbeam FB9 Cant. Arms	Aug. 31, '05.	Sept. 9, '05.	Jan. 31, '06.
4	Roadway Stringers for Cant. Arms	Sept. 25, '05.	Nov. 8, '05.	Feb. 1, '06.
6	Members of Trus'd Fl'b'm FB9 for Cant. Arms	Aug. 30, '05.	Sept. 9, '05.	Feb. 1, '06.
3	Pilots, Rods, Caps, &c., for Cant. Arms	Aug. 3, '05.	Nov. 8, '05.	Feb. 6, '06.
7	Stringer Seats for Cant. Arms	Oct. 5, '05.	Nov. 8, '05.	Feb. 1, '06.
8	Members of Trus'd Flr'bm FB9 for Cant. Arms	Sept. 5, '05.	Sept. 9, '05.	Feb. 1, '06.
8	Bottom Chords Panel 8 Cant. Arms	Oct. 11, '05.	Nov. 15, '05.	Feb. 2, '06.
3	Elec. Ry. Stringers for "	Sept. 23, '05.	Nov. 8, '05.	Feb. 2, '06.
51	Sub-Vertical SV4 for "	Sept. , '05.	Nov. 18, '05.	Feb. 2, '06.
2	Railway Stringers for "	Sept. 16, '05.	Nov. 17, '05.	Feb. 3, '06.
52	Top Strut at SV4 for "	Sept. 25, '05.	Nov. 20, '05.	Feb. 3, '06.
53	Bottom and Intermed. Struts SV4 Cant. Arms	Sept. 28, '05.	Nov. 21, '05.	Feb. 3, '06.
5	Elec. Ry. Stringers for Cant. Arms	Sept. 29, '05.	Nov. 22, '05.	Feb. 13, '06.
6	Roadway " "	Oct. 2, '05.	Nov. 22, '05.	Feb. 13, '06.
57	Diagnl. Bracing at SV4 "	Oct. 5, '05.	Nov. 21, '05.	Feb. 13, '06.
10	Strut T2V Under Trussed Floorbeam FB8 for Cant. Arms	Oct. 6, '05.	Nov. 23, '05.	Feb. 15, '06.
9	Top Chord Trussed Flr'b'm FB8 for Cant. Arms	Oct. 3, '05.	Nov. 22, '05.	Feb. 15, '06.
59	Sub-Diagonal USP4 for Cant. Arms	Oct. 13, '05.	Nov. 23, '05.	Feb. 15, '06.
11	Members of Trussed Flr'b'm FB8 for Cant. Arms	Oct. 11, '05.	Nov. 23, '05.	Feb. 17, '06.
48	Strut H4 for Cant. Arms	Oct. 20, '05.	Nov. 25, '05.	Feb. 17, '06.
54	Sub-Diagnl. SP4 for Cant. Arms	Sept. 28, '05.	Nov 24, '05.	Feb. 16, '06.
8	Railway Stringers "	Oct. 9, '05.	Nov. 24, '05.	Feb. 16, '06.
9	Elec. Ry. " "	Oct. 21, '05.	Nov. 24, '05.	Feb. 21, '06.
61	Struts SS9 and SS10 "	Oct. 18, '05.	Nov. 25, '05.	Feb. 21, '06.
62	Diagnls. N5 and N6 "	Oct. 21, '05.	Nov. 25, '05.	Feb. 20, '06.
14	Floorbeam FB6 "	Nov. 3, '05.	Nov. 28, '05.	Feb. 23, '06.
55	Lower Secs. of Hanger T4Z for Cant. Arms	Oct. 3, '05.	Nov. 29, '05.	Feb. 24, '06.
7	Pin Packing for Diagnl. Bars T4 "	Dec. 7, '05.	Dec. 13, '05.	Feb. 23, '06.
66	Bottom Laterals Panel 6 for Cant. Arms	Nov. 9, '05.	Nov. 29, '05.	Feb. 24, '06.
3	I Bars for Cant. Arms	Nov. 9, '05.	Dec. 13, '05.	Feb. 26, '06.
6	Bottom Chords Pan'l 6 for Cant. Arms	Oct. 23, '05.	Nov. 28, '05.	Feb. 26, '06.
1	I Bars for Cant. Arms	July 28, '05.	Aug. 4, '05.	Mar. 5, '06.
15	Elec. R'y Stringers for Cant Arms	Nov. 13, '05.	Dec. 16, '05.	Mar. 9, '06.
4	I Bars for Cant. Arms	Nov. 10, '05.	Dec. 13, '05.	Mar. 9, '06.
69	Top Later'ls for Panel G. Cant. Arms	Nov. 14, '05.	Dec. 7, '05.	Mar. 10, '06.
56	Upper Sec'ts of Hanger T4Z "	Oct. 26, '05.	Dec. 4, '05.	Mar. 5, '06.
73	Top Later'ls for Panel F "	Nov. 21, '05.	Dec. 15, '05.	Mar. 8, '06.
47	Upper Sec's of Post P4 "	Nov. 27, '05.	Dec. 21, '05.	Mar. 20, '06.
16	R'dwy Stringers "	Nov. 21, '05.	Dec. 15, '05.	Mar. 20, '06.
10	" " "	Oct. 27, '05.	Dec. 15, '05.	Mar. 27, '06.
64	Struts SS11 "	Oct. 27, '05.	Dec. 5, '05.	Mar. 26, '06.
63	Panel 7 Bottom Later'ls "	Oct. 26, '05.	Dec. 5, '05.	Mar. 24, '06.
18	Floorbeam FB5 & FB3 "	Nov. 24, '05.	Dec. 29, '05.	Mar. 26, '06.
11	Floorbeam FB7 "	Oct. 20, '05.	Nov. 28, '05.	Mar. 26, '06.
71	4 Diagn'ls of Transv. brac. at Post P4 Cant. Arms	Nov. 15, '05.	Dec. 5, '05.	Mar. 26, '06.
67	2 " " "	Nov. 8, '05.	Dec. 5, '05.	Mar. 29, '06.
13	R'y Stringers for Cant. Arms	Nov. 8, '05.	Dec. 16, '05.	Mar. 27, '06.
2&4	Suspension R'ds for "	Nov. 2, '05.	Dec. 14, '05.	Mar. 28, '06.
65	Intermed. & lower Struts betw. Posts P4, C. Arms	Oct. 30, '05.	Nov. 28, '05.	April 5, '06.
70	Bottom Later'ls Pan'l 5 for Cant. Arms	Nov. 16, '05.	Dec. 7, '05.	April 5, '06.
12	R'dway Stringers "	Oct. 30, '05.	Dec. 15, '05.	April 5, '06.
75	Sub-Vert SV3 "	Nov. 27, '05.	Dec. 28, '05.	April 18, '06.
79	Lower Strut betw. Posts P3 "	Dec. 6, '05.	Jan. 3, '06.	April 18, '06.
3	Bottom Chords Pan'l No. 3 "	Jan. 29, '05.	Feb. 28, '06.	April 19, '06.
17	Floorbeams FB4 & FB2 "	Dec. 9, '05.	Jan. 31, '06.	April 18, '06.
68	Top Strut at P4 "	Nov. 21, '05.	Dec. 15, '05.	April 18, '06.
135	Cornice for bottom Portal Strut		Mar. 28, '06.	April 18, '06.
83	Top Later'ls for Panel E for Can. Arms	Dec. 12, '05.	Jan. 5, '06.	April 19, '06.
74	Strut S912 "	Nov. 27, '05.	Dec. 22, '05.	April 19, '06.
141	Portal	Jan. 23, '05.	Mar. 28, '06.	April 19, '06.
7	Bottom Chords Pan'l 7 for Cant. Arms	Oct. 3, '05.	Nov. 17, '05.	April 11, '06.
89	Top Later'ls for Pan'l D "	Dec. 20, '05.	Jan. 23, '06.	April 11, '06.
88	Sub Diag'nl SP2 "	Dec. 18, '05.	Jan. 22, '06.	April 12, '06.
2	Pins for Cant. Arms	July 28, '05.	Dec. 29, '05.	April 10, '06.
5&6	Suspension R'ds for Cant. Arms	Nov. 20, '05.	Dec. 14, '05.	April 10, '06.
90	Hanger TOOL "	Dec. 26, '05.	Jan. 26, '06.	April 10, '06.
93	Top Latr'ls Pan'l C "	Jan. 2, '06.	Jan. 31, '06.	April 10, '06.
60	Pan'l 8 Bottom Latr'ls "	Oct. 17, '05.	Dec. 5, '05.	April 10, '06.
78	Hanger TOOL "	Dec. 1, '05.	Jan. 3, '06.	April 11, '06.

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LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES—*Continued.*

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Department.
116	Cornice for End Post	Dec. 24, '04...	Mar. 28, '06...	April 10, '06.
119	Ornaments for Portal Strut Anchor Arms	Dec. 19, '04. .	Mar. 28, '06...	April 10, '06.
137	Detail Cornice Mo'ld'g for Bottom Portal Strut	Feb. 4, '05,..	Mar. 28, '06...	April 12, '06.
49	Cornice for End Post EP...	Oct. 11, '04...	Mar. 28, '06...	April 12, '06.
56	" " "	.....	Mar. 28, '06,..	April 10, '06.
48	Caps for End Posts EP, R & L	.....	Mar. 28, '06...	April 11, '06.
57	Cornice for Posts " "	Nov. 22, '04...	Mar. 28, '06...	April 11, '06.
102	" " "	Dec. 3, '04...	Mar. 28, '06...	April 17, '06.
106	Caps for End Posts EP	Dec. 12, '04...	Mar. 28, '06...	April 17, '06.
58	" " "	Nov. 24, '04...	Mar. 28, '06...	April 18, '06.
84	Diag'l of Transv. bracing betw. Posts P3, Cant. Arms	De . 18, '05...	Jan. 31, '06...	April 18, '06.
43	Lower Sec's of Post P3 for Cant. Arms	De . 4, '05...	Jan. 7, '06...	April 17, '06.
80	Bottom Strut SV3 "	Dec. 5, '05...	Jan. 3, '06...	April 17, '06.
85	Diagn'l of Transv. Brac. betw. Posts P3 Cant. Arms	Jan. 3, '06...	Jan. 31, '06...	April 20, '06.
86	Strut S813 for Cant. Arms	Dec. 16, '05...	Jan. 22, '06...	April 20, '06.
4	Bottom Chords Pan'l 4 for Cant. Arms	Jan. 2, '06...	Feb. 6, '06...	April 20, '06.
5	" " 5 "	Dec. 4, '05...	Jan. 5, '06...	April 20, '06.
81	Diag'nl Brace at Sub-Vert SV3 "	Dec. 14, '05...	Jan. 22, '06...	April 19, '06.
6	Pins, Caps, Washers etc. "	Nov. 30, '05...	Dec. 29, '05...	April 19, '06.
7	" Rods, Caps, Pilots etc. "	Dec. 18, '05...	Jan. 26, '06...	April 19, '06.
8	Pin Pack'g for diagn'l Bars T3 "	Dec. 13, '05...	Jan. 17, '06...	April 20, '06.
82	Diag'nl Bracing at Sub-Vert SV3	Dec. 21, '05...	Jan. 22, '06...	April 20, '06.
87	Sub-Vert'l SV2 "	Dec. 16, '05...	Jan. 19, '06...	April 19, '06.
136	Full Size detail Mold'g for Cornice, Bot. Portal Strut	Jan. 28, '05...	Mar. 28, '06...	April 19, '06.
28	Top Later'l Pls. at Cen. Post	Mar. 29, '05...	May 16, '05...	May 7, '06.
38	Cen. Tower Roof Sections	April 24, '05...	April 11, '06...	May 7, '06,
34	" "	April 19, '05...	April 11, '06...	May 7, '06.
33	" "	April 14, '05...	April 11, '06...	May 8, '06.
18	" "	Mar. 9, '05...	April 11, '06...	May 7, '06.
17	" "	Mar. 7, '05...	April 11, '06...	May 7, '06.
27	Peak of Cen. Post	Mar. 28, '05...	April 11, '06...	May 7, '06.
29	" "	April 10, '05...	April 11, '06...	May 4, '06.
31	" "	April 11, '05...	April 11, '06...	May 7, '06.
44	Upper Secs of Post P3 for Cant. Arm	Jan. 10, '06...	Feb. 14, '06...	May 14, '06.
41	Lower " " P2 "	Jan. 4, '06...	Feb. 9, '06...	May 12, '06.
35	Cen. Tower	April 1, '05...	April 11, '06...	May 12, '06.
3	Erect'n Plan for Tower	May 13, '05...	April 11, '06...	May 11, '06.
6	Shims for Anch. "	May 3, '05...	April 11, '06...	May 14, '06.
20	Cen. Tower Roof Sects.	.....	April 11, '06...	May 14, '06.
21	" "	April 3, '05...	April 11, '06...	May 11, '06.
7	Anch. Arm, Pins, Washers & Nuts	April 17, '05...	May 10, '05. .	May 18, '06.
92	Bottom Later'ls Pan'l 4 for Cant. Arms	Jan. 6, '06...	Feb. 16, '06...	June 29, '06.
98	" " " 3 "	Jan. 16, '06...	Feb. 16, '06...	June 28, '06.
102	Top " " 13 "	Jan. 10, '06...	Feb. 9, '06..	June 27, '06.
91	" Strut at SV2 "	Dec. 26, '05...	Jan. 26, '06..	June 29, '06.
94	" " P2 "	Mar. 12, '06...	Mar. 27, '06...	June 29, '06.
76	" " P3 "	Dec. 8, '05...	Mar. 27, '06...	June 29, '06.
95	Bottom " SV2 "	Jan. 2, '06...	Feb. 16, '06..	June 29, '06.
99	" Strut betw. P2 "	Jan. 9, '06...	Feb. 16, '06...	June 28, '06.
2	" Chords Pan'l 2 "	Feb. 20, '06..	Mar. 14, '06..	June 29, '06.
39	Lower Sec's of Post P1 "	Feb. 6, '06...	Mar. 14, '06...	July 26, '06.
100	Diag'nl Bracing at SV2 "	Jan. 9, '06...	Feb. 16, '06...	June 28, '06.
101	" " "	Jan. 15, '06...	Feb. 16, '06...	July 26, '06.
95	" Transv. Bracing betw. Posts P2 Cant. Arms	Jan. 26, '06...	Feb. 16, '06...	June 27, '06.
77	Top Strut at SV3 for Cant. Arms	Dec. 6, '05...	Jan. 3, '06...	July 3, '06.
104	Bottom Strut P1 "	Jan. 24, '06...	Mar. 27, '06...	July 3, '06.
105	" Latrls Pn'l 2 "	Feb. 7, '06...	Mar. 13, '06...	July 3, '06.
19	R'y Stringers "	..... '05...	Jan. 31, '06...	June 29, '06.
21	Roadw'y Stringers "	Dec. 23, '05...	Feb. 1, '06...	July 3, '06.
20	Elec. R'y " "	Dec. 26, '05..	Feb. 1, '06...	June 29, '06.
5	I-bars for Cant. Arms	Nov. 13, '05...	Jan. 18, '06..	July 3, '06.
8	Pins, Rods, Caps, Pilots, &c. for Cant. Arms	Feb. 6, '06...	Mar. 13, '06...	July 3, '06.
42	Upper Sec. of Post P2 "	Feb. 6, '06...	Mar. 10, '06...	July 26, '06.
9	Pins, Rods, Caps, etc., for Cant. Arms	July 14, '06..	Sept. 12, '06..	May 16, '07.
10	I-bars " " "	July 11, '06..	Sept. 6, '06..	May 14, '07.
11	Pin Pc'kg for diagonal Bars T2 Cant. Arms	July 28, '06..	Sept. 6, '06..	May 14, '07.

LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES—*Continued.*

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Department.
13	I-bars for Panl. OO for Cant. Arms.	Aug. 13, '06.	Sept. 12, '06.	May 15, '07.
40	Upper Sec. of Post P1 " "	July 23, '06.	Sept. 6, '06.	May 14, '07.
109	Hanger TOL " "	July 25, '06.	Aug. 24, '06.	May 14, '07.
111	Sub diagonal SP1 " "	June 5, '06.	Aug. 24, '06.	May 14, '07.
113	Bottom Strut at SP1 " "	July 13, '06.	Aug. 24, '06.	May 14, '07.
114	Top Strut at SV1 " "	Aug. 17, '06.	Sept. 12, '06.	May 16, '07.
115	Transv. Bracing betw. SV1 " "	Aug. 8, '06.	Sept. 13, '06.	May 17, '07.
116	Top Laterals for Pan'l OO " "	Aug. 9, '06.	Sept. 6, '06.	May 17, '07.
117	Strut OO Top Chord OO " "	Aug. 10, '06.	Sept. 12, '06.	May 15, '07.
118	Sub-Ver't'l SV1 " "	Aug. 20, '06.	Sept. 13, '06.	May 15, '07.
119	Transv. Bracing betw. SV1 " "	Aug. 22, '06.	Sept. 13, '06.	May 15, '07.
107	Diag'nl of transv. br'cing betw. Post P1 Cant. Ar.	May 21, '06.	Aug. 24, '06.	May 22, '07.
108	" " " " "	May 21, '06.	Aug. 24, '06.	May 21, '07.
10	Pins, Caps, Pilots, etc., for Cant. Arm	Oct. 19, '06.	Nov. 23, '06.	May 21, '07.
15	I-bars for Pan'l O " " "	Sept. 28, '06.	Oct. 24, '06.	May 21, '07.
14	Eye-bars for Cant. Arms	Aug. 29, '06.	Oct. 18, '06.	May 20, '07.
130	Top Chord Strut Pan'l O for Cant. Arm.	Nov. 13, '06.	Dec. 17, '06.	May 20, '07.
125	Top Lat'rl Pl's Pan'l O " " "	Oct. 26, '06.	Nov. 23, '06.	May 21, '07.
126	" " Pan'l O " " "	Oct. 29, '06.	Nov. 23, '06.	May 21, '07.
112	" " " A " " "	July 25, '06.	Aug. 9, '06.	May 20, '07.
121	Bottom Lat'rl Panel 1 " " "	Sept. 26, '06.	Oct. 11, '06.	May 17, '07.
1	Bottom Chords " " "		Oct. 13, '06.	May 17, '07.
123	Bottom Lateral Struts " " "	Oct. 15, '06.	Oct. 18, '06.	May 18, '07.
110	Top Strut at Post PI " " "	May 25, '06.	Aug. 9, '06.	May 20, '07.
106	Strut SS 14 " " "	Mar. 30, '06.	Aug. 9, '06.	May 20, '07.
27	Stringer Br'kts " " "	Nov. 2, '06.	Nov. 28, '06.	May 20, '07.
25	Roadway Stringers " " "	Sept.	Sept. 29, '06.	May 20, '07.
24	R'y Stringers " " "	Sept. 13, '06.	Sept. 29, '06.	May 22, '07.
23	Elec. R'y Stringers " " "	Sept. 7, '06.	Sept. 29, '06.	May 20, '07.
12	Pin Pc'kg for diagonal Bars T1 for Cant. Arms.	July 30, '06.	Oct. 18, '06.	May 18, '07.
1	" " Suspended Span.	Feb. 8, '07.	Mar. 7, '07.	May 22, '07.
2	Eye Bars " " "	Feb. 13, '07.	Mar. 7, '07.	May 22, '07.
14	Stringer Bk'ts " " "	Jan. 25, '07.	Feb. 19, '07.	May 20, '07.
10	End Floor bm. & Horiz. Girder for Susp. Span.	Jan. 17, '07.	Feb. 14, '07.	May 22, '07.
26	" " " " Cant. Arms.	Oct. 19, '06.	Oct. 25, '06.	May 21, '07.
1	Rectang. Pins betw. Susp. Span & Cant.	Feb. 14, '07.	Mar. 21, '07.	May 22, '07.
3	Top Strut at E. P. for Susp. Span	Oct. 12, '06.	Oct. 20, '06.	May 17, '07.
2	Bottom Strut at E. P. for Susp. Span	Oct. 1, '06.	Oct. 18, '06.	May 18, '07.
1	End Post E. P. " " "	Oct. 13, '06.	Oct. 17, '06.	May 18, '07.
4	Dia'gn'l of Transv. Bracing at Post E. P. at Susp. Span	Oct. 9, '06.	Oct. 18, '06.	May 17, '07.
5	Dia'gn'l of Transv. Bracing at Post E.P. at Susp. Span	Oct. 12, '06.	Oct. 18, '06.	May 18, '07.
6	Connecting Links for Susp Span	Nov. 3, '06.	Nov. 16, '06.	May 18, '07.
Q.	(Revr'sd.) Stress Dg'm for 1 675 ft. Susp. Span.	Nov. 27, '06.	May 17, '07.	June 3, '07.
10	End Bottom Chord Sec'ts for " "	Jan. 11, '07.	Feb. 6, '07.	May 31, '07.
72	Sub-Diag'nl SP3 for Cant. Arms.	Nov. 27, '05.	Mar. 7, '06.	May 31, '07.
14	Middle Sec'ts of Hanger T5Z Arms		Aug. 9, '05.	May 31, '07.
13	Lower Sec'ts " " "	July 18, '05.	Aug. 9, '05.	May 31, '07.
47	Transv. Bracing betw. SV2 for Susp. Span.	Feb. 14, '07.	Feb. 21, '07.	June 12, '07.
45	" " " " "	Feb. 8, '07.	Mar. 1, '07.	June 20, '07.
31	" " " " "	Jan. 29, '07.	Feb. 21, '07.	June 24, '08.
57	" " Posts P2 " "	Feb. 19, '07.	Mar. 21, '07.	June 24, '07.
58	" " " " "	Feb. 25, '07.	Mar. 21, '07.	June 18, '07.
62	" " SV3 & P3 " "	Mar. 8, '07.	Mar. 28, '07.	June 17, '07
61	" " " " "	Mar. 4, '07.	Mar. 28, '07.	June 18, '07.
38	" " SV1 " "	Feb. 4, '07.	Feb. 21, '07.	June 12, '07.
39	" " Posts P1 " "	Feb. 2, '07.	Feb. 26, '07.	June 12, '07.
40	" " " " "	Feb. 8, '07.	Feb. 26, '07.	June 12, '07.
48	Top Later'ls Panels E & F " "	Feb. 13, '07.	Mar. 28, '07.	June 12, '07.
7	" " A " "	Dec. 10, '06.	Jan. 15, '07.	June 13, '07.
26	" " B " "	Jan. 24, '07.	Feb. 1, '07.	June 1, '07.
34	" " B " "	Jan. 29, '07.	Feb. 15, '07.	June 17, '07.
23	" " C " "	Jan. 24, '07.	Feb. 6, '07.	June 17, '07.
56	Bottom Lat'rls " 1 " "	Feb. 19, '07.	Mar. 6, '07.	June 17, '07.
65	" " 2 " "	Feb. 28, '07.	Mar. 13, '07.	June 12, '07.
66	" " 3 & 4 " "	Feb. 28, '07.	Apr. 12 '07.	June 14, '07.
33	" " O " "	Jan. 31, '07.	Feb. 19, '07.	June 14, '07.
55	" " OO " "	Feb. 19, '07.	Mar. 6, '07.	June 15, '07.
43	" Struts " "	Feb. 6, '07.	Mar. 1, '07.	June 11, '07.

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LIST OF PLANS OF BRIDGE, WITH IMPORTANT DATES—*Concluded.*

Plan No.	Description.	Date of Plan.	Date Cooper Signed.	Date Signed by Department.
11	Bottom Lat'rl Struts at HV1 for Suspen. Span	Jan. 10, '07	Jan. 26, '07	June 12, '07.
60	" " at SV3 " "	Feb. 25, '07	Mar. 28, '07	June 15, '07.
41	" " at SV2 " "	Feb. 4, '07	Feb. 21, '07	June 12, '07.
50	Top Struts T16 & T17 " "	Feb. 19, '07	Mar. 28, '07	... ...
14	" " T12 " "	Jan. 14, '07	Jan. 26, '07	June 24, '07.
16	" " T13 " "	Jan. 23, '07	Feb. 14, '07	June 19, '07.
32	" " T14 " "	Jan. 28, '07	Feb. 14, '07	June 14, '07.
37	" " T15 " "	Feb. 1, '07	Feb. 19, '07	June 11, '07.
35	Strut SS2 " "	Jan. 30, '07	Feb. 15, '07	June 19, '07.
21	" SS1 " "	Jan. 24, '07	Feb. 14, '07	June 17, '07.
24	" LT13 " "	Jan. 24, '07	Mar. 7, '07	June 14, '07.
8	Hanger TOL " "	Dec. 28, '06	Feb. 1, '07	June 13, '07.
49	" TOOOL " "	Feb. 15, '07	Mar. 27, '07	June 19, '07.
22	" TOO " "	Jan. 25, '07	Feb. 15, '07	... ...
9	Top Chord Sec'ts A, R & L " "	Dec. 21, '06	Jan. 26, '07	June 13, '07.
17	" " " C, R & L " "	Jan. 22, '07	Feb. 6, '07	June 20, '07.
12	" " " B, R & L " "	Jan. 28, '07	Feb. 1, '07	June 20, '07.
18	" " " D, R & L " "	Feb. 5, '07	Feb. 21, '07	June 17, '07.
19	" " " E, R & L " "	Feb. 14, '07	Mar. 28, '07	June 17, '07.
26	Bottom Chord Sec'ts O " "	Jan. 27, '07	May 10, '07	June 14, '07.
29	" " " 2 " "	Mar. 5, '07	May 10, '07	June 14, '07.
27	" " " OO R & L " "	Feb. 22, '07	May 10, '07	June 13, '07.
28	" " " 1 " "	Feb. 9, '07	May 10, '07	June 13, '07.
30	" " " 3 S, R & L " "	Mar. 13, '07	Apr. 12, '07	June 17, '07.
46	Upper Sec'ts of 3 N, R & L Post P1 "	Feb. 12, '07	Mar. 1, '07	June 29, '07.
54	" " Post P2, Susp. Span	Feb. 19, '07	Mar. 21, '07	June 17, '07.
42	Lower " " P1, "	Feb. 7, '07	Feb. 26, '07	June 18, '07.
53	" " " P2, "	Feb. 20, '07	Mar. 21, '07	June 13, '07.
9	Elec. R'y Stringers for "	Jan. 12, '07	Feb. 26, '07	June 12, '07.
11	" " " "	June 16, '07	Feb. 26, '07	June 13, '07.
12	" " " "	Jan. 18, '07	Feb. 26, '07	June 14, '07.
13	Roadw'y " " "	... ...	April 12, '07	June 13, '07.
15	" " " "	Feb. 6, '07	April 12, '07	June 13, '07.
17	" " " "	Feb. 9, '07	April 12, '07	June 13, '07.
2	Railw'y " " "	June 21, '06	June 26, '07	June 13, '07.
3	" " " "	July 3, '04	Feb. 26, '07	June 13, '07.
6	" " " "	Dec. 15, '06	April 12, '07	June 13, '07.
7	" " " "	Dec. 21, '06	April 12, '07	June 13, '07.
5	" " " "	Dec. 7, '06	April 12, '07	June 14, '07.
13	Sub-vert SV1 " "	Jan. 9, '07	Jan. 26, '07	June 24, '07.
36	" SV2 " "	Feb. 1, '07	Feb. 15, '07	June 19, '07.
52	" SV3 " "	Feb. 20, '07	Mar. 27, '07	June 13, '07.
44	Sub-Diagonal, SP2 " "	Feb. 9, '07	Feb. 15, '07	June 24, '07.
15	" SP1 " "	June 12, '07	Feb. 1, '07	June 13, '07.
51	" SP3 " "	Feb. 18, '07	Mar. 27, '07	June 17, '07.
67	Diag'nl T3 " "	Mar. 4, '07	Mar. 30, '07	June 12, '07.
71	" T3OS & T3ON " "	Mar. 12, '07	Mar. 30, '07	June 17, '07.
19	Floor B'ms FB3 & FB5 "	Mar. 1, '07	May 10, '07	June 11, '07.
16	" FBO & FB1 "	Feb. 11, '07	April 13, '07	June 13, '07.
19	" FB2 & FB4 "	Feb. 15, '07	April 13, '07	June 14, '07.
8	Bracing Shims in Cen. for R'y Stringers Susp. Spn	Dec. 31, '06	May 10, '07	June 12, '07.
21	Shims for Susp. Span	Mar. 20, '07	May 10, '07	June 14, '07.
4	Variation betw. Chords & Stringers for var. loading Sus. 1 Span	Nov. 22, '05	Jan. 15, '07	June 13, '07.
70	Bottom Chord Secs. S4 & L. South ½ Susp. Sp.	Mar. 15, '07	June 11, '07	June 26, '07.
69	" Strut SM4L for Suspen. Span	Mar. 11, '07	June 11, '07	June 26, '07.
3	Eye-bars in bottom Chord "	Mar. 13, '07	June 11, '07	June 26, '07.
2	Pins, Caps, Washers, &c "	Mar. 6, '07	June 11, '07	June 26, '07.
63	Lower Sec's of Post P3 "	Mar. 2, '07	June 13, '07	July 2, '07.
64	Upper " "	Feb. 27, '07	June 13, '07	June 27, '07.
68	Strut LT17 " for "	Mar. 5, '07	June 13, '07	June 27, '07.
59	Struts SS3 & SS3x " "	Feb. 26, '07	June 13, '07	June 28, '08.
20	Top Chord Secs. FSRL & FN "	Feb. 22, '07	June 13, '07	July 3, '07.
3	Pins, Caps, Pilots in Cen. for "	Mar. 9, '07	June 13, '07	June 27, '07.