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THIS AGREEMENT, made this 2nd day of April, A. D. 1907, by and between THE UTAH CONSTRUCTION COMPANY, a corporation organized and existing under the laws of the State of Utah, party of the first part, and WESTERN PACIFIC RAILWAY COMPANY, a corporation organized and existing under the laws of the State of California, party of the second part;

WITNESSETH: That for and in consideration of the payments, promises and agreements hereinafter mentioned, to be made and performed by the said party of the second part, the said party of the first part hereby covenants and agrees that it will perform and complete in a workmanlike and substantial manner, to the satisfaction and approval of the Chief Engineer of the WESTERN PACIFIC RAILWAY COMPANY and in conformity in all respects with the annexed specifications, which are hereby made a part of this contract, all the clearing, grubbing, grading, tunneling, masonry, bridge foundations, pile and trestle bridging, culverts, ditches, creek channels, and such other work connected therewith or rendered necessary thereby, as may be required by the Engineer in charge of the work, in order to complete and make ready for the laying of track, upon that portion of the line of railroad of the party of the second part as the same may be staked out and located between a point at Survey Station 4236, near Hot Springs, on Black Rock Desert, and a point at Survey Station 9, near Winnemucca, in the State of Nevada, a distance of 75 miles more or less.

And it is hereby mutually agreed as follows between the parties to this contract:—

1. The word "Contractor" whenever used in this agreement shall refer to and indicate the party of the first part; the words "Chief Engineer" shall refer to the Chief Engineer of the party of the second part; the word "Engineer" without the prefix "Chief" shall refer to the Engineer of the party of the second part for the time being in charge of the work and may include the Chief Engineer.

2. The said work shall be commenced the first day of May, 1907, and be entirely completed on or before the fifteenth day of August, 1908. It is understood that the Chief Engineer will have the right to direct application of forces to such parts of the work as in his judgment should be first completed.

3. No part of the work to be performed under this contract shall be sublet or transferred without the written consent of the Chief Engineer, and no such written consent shall release the Contractor from any obligation, either to the Railway Company or to any person employed by the Contractor, and in all cases the sub-contractors are to be considered merely as foremen employed by the Contractor and the Engineer shall have the right to require the discharge of the same and the discharge of any and all other foremen or employees of the Contractor for incompetence, misconduct, neglect of duty or whenever in the opinion of the Engineer the interest of the Railway Company demands such discharge.

4. The work shall be performed under the direction and supervision of the Engineer by whose measurements and calculations the amount of work to be performed under this contract shall be determined and who shall have power to condemn and reject any or all work or material which, in his opinion, is unsatisfactory or does not conform to the spirit of this agreement; and all such imperfect or insufficient work or material shall be immediately remedied by the Contractor at his sole cost and expense and to the satisfaction of the Engineer; provided, however, that no omission by said Engineer to disapprove of or reject any insufficient or defective or imperfect work or material at the time of any monthly or other estimate shall be deemed an acceptance of such work or material, and said Engineer shall have the power to have any defective work or material taken out and rebuilt or replaced at the expense of the Contractor at any time prior to the final acceptance of the work.

5. The said Chief Engineer shall decide all questions which may arise between the parties hereto, relative to said work, or the construction or meaning of any of the provisions and stipulations contained in this agreement or the sufficiency of performance or classification of work and materials performed and furnished by the Contractor, or the price to be paid; and his decision in the nature of an award shall be final and binding upon both parties to this Contract.

6. The party of the second part shall have the right to make any alterations that may be hereafter determined upon as necessary or desirable in the location, line, grade, plan, form or dimensions of the work, either before or after the commencement, defining them in writing and by or without drawings, and in case such alterations increase the quantities, the Contractor shall be paid for such excess at the contract rates herein specified; but should such alterations diminish the quantity or extent of work to be done, it shall not under any circumstances be construed as constituting, and shall not constitute a claim for damages, nor shall any claim be made on account of any profits that may or might or could have been made on the work altered or dispensed with.

Should any work be required to be done which is not now contemplated or provided for in this contract and specifications, the Chief Engineer shall fix the prices for the same and the parties hereto shall abide by such prices, provided the Contractor enters upon and commences such work with a full knowledge and understanding of the prices so fixed. But if the Contractor declines to undertake and execute such work at the prices so fixed by the said Chief Engineer, then the party of the second part

may enter into a contract with any other party or parties for its execution, the same as if this contract had never existed.

7. Claims for extra work will not be allowed unless the same shall be done in pursuance of a written order of the Engineer, to be presented with the claim, and the claim made at the end of the month in which the work is done, unless the Chief Engineer, at his discretion, shall direct the claim, or such part as he may deem just, to be allowed. Payment for extra work, when not otherwise provided for, shall be at actual cost, plus ten (10) per cent for use of tools, supervision and profit. Wages for teams employed in the several classes of work will be figured at the current rates for teams in the locality where the work is situated.

Any materials furnished by the Contractor used in connection with extra work shall be paid for at actual net purchase price, plus ten (10) per cent for supervision and profit, and plus cost of transportation to site of use.

With the exception of excavations for bridge foundations and the construction and placing of necessary coffer dams required therefor, nothing shall constitute extra work which can be measured under the specifications.

8. It is further agreed that if there is any delay in commencing work at the time agreed, the party of the second part shall have the right to place other parties upon the work at the expense of the Contractor, or cancel the contract and re-let the work as the Chief Engineer may deem best. The failure, however, of the party of the second part to exercise such right shall not be taken to extend the time of the Contractor for the completion of the work or affect his responsibility for the non-completion of the same within the time agreed. No charge shall be made by the Contractor for hindrance or delays from any cause in the progress of the work of any part thereof under this contract, but if the construction is materially delayed by the failure of the Engineer to make out work promptly or from any cause for which the party of the second part is responsible, then the time herein specified for the completion of the work shall be extended for a period which shall reasonably compensate therefor, not exceeding in any case a period equal to the time of such delay, and the Contractor shall have no further claim for anything arising directly or indirectly from such delays. It is also distinctly understood that an extension of time on such account shall apply only to the work immediately affected and shall not act as an extension of time for the completion of any other part of the work covered by this contract. No allowance of time by reason of delays shall be made unless the claim arising therefor shall have been presented in writing to the Chief Engineer by the Contractor within twenty (20) days after such delay shall have occurred.

9. If the Contractor shall fail to prosecute the work or any division or portion thereof with a force sufficient, in the opinion of the Chief Engineer, to ensure its completion within the time specified in this agreement, or if the character of the work being done is not, in the opinion of the Chief Engineer, in accordance with the specifications hereinafter set forth, the Chief Engineer may serve written notice on the Contractor either by delivering the same to the Contractor or an officer thereof, or by posting said notice in a conspicuous place on the work, or by notifying the foreman in charge of said work, said notice stating the force, appliances or tools required, or the desired improvement in the character of the work; and if at the end of ten (10) days thereafter the Contractor shall have failed to comply with the said notice, such failure shall be considered a breach and forfeiture of this contract, and the Railway Company at its option may declare this contract as a whole or any division or portion thereof specified in such notice, abandoned and forfeited, and enter upon and take possession of either the whole of said work or the division or portion thereof declared to be abandoned and forfeited, and proceed to perform or re-let the same as it may think best; and in case it so does, the Contractor shall be liable for the actual damages thereby sustained up to the time the work is completed; or the Railway Company may employ such additional force, appliances or tools as may be necessary in the opinion of the Chief Engineer to insure the completion of said work within the time specified, and pay the expenses thereof and charge the same to the Contractor.

10. It is further mutually agreed that the party of the second part, at any time before the completion of the work contracted for, may order a reduction of the force engaged thereon, or may suspend the work or any part thereof, for any length of time, without liability for damages; or may discontinue the entire work and cancel this contract, and, in case of such cancellation a full and final estimate of the work done shall be made and the Contractor paid in full therefor at the contract price, less all proper deductions hereunder or hereinafter specified; and said payment shall be in full satisfaction of all claims and demands arising out of this contract, and no additional claim shall be made on account of such cancellation.

11. The Contractor shall at his own expense make good all loss or damage from casualties of

every kind, including those which may be occasioned by winds, floods, lightning or other acts of the elements, or loss of materials in building embankments in water or streams, and shall claim no compensation therefor or for work done in substitution for work so lost or damaged, and no extension of time by reason thereof.

12. The Contractor shall at his own expense provide commodious passing places for public and private roads and keep them in a safe condition and will also, at his own expense, construct and maintain in good repair fences sufficient for keeping up enclosures for the protection of stock and crops.

13. The Contractor must carefully preserve all stakes and benchmarks, and in case of neglect he will be charged with and shall pay for all expenses in replacing them.

14. The Contractor shall pay for all labor done or materials furnished to him, in the performance of this agreement; in default whereof said Railway Company may retain from installments as they become due, such amounts of money as the Chief Engineer shall deem sufficient to pay such amounts in default; and before payments are made hereunder said Contractor shall furnish to said Chief Engineer satisfactory evidence that no claim then exists against said Contractor for labor done or materials furnished under said contract.

15. In the prosecution of work under this contract at or near the operated tracks of any Railway Company, everything must be subservient to the safe and uninterrupted operation of said tracks, and nothing shall be done or suffered to be done by the Contractor, his agents or employees, which will, in the opinion of the Chief Engineer, or his assistants, endanger or delay the operation of the trains on the operated tracks contiguous to or crossing the work. In the event of any claims on the part of any such Railway Company, due to any failure on the part of the Contractor to comply with the foregoing conditions, said Contractor shall be held solely liable.

In making excavations and embankments close to any operated track, the Contractor shall be governed by the instructions of the Chief Engineer or his assistants as to how near to said track said excavations or embankments shall be made, and as to the slopes thereof close to said track. Tramways or tracks used by the Contractor shall be placed and always kept at a safe distance from said operated track.

No grading material shall be handled across the operated track of any Railway Company, except by order of the Engineer, and in each and every case where such crossing is ordered to be made a flagman or watchman shall protect such crossing place and the crossing shall be made in every case according to the signals or warnings of said flagman or watchman. In no case whatsoever shall such crossing of material be made while trains are approaching the place of crossing. The Contractor shall use the highest degree of care in taking precautions to avoid accidents to trains, persons and teams while running on or crossing an operated track.

16. It is understood and agreed that the Contractor shall indemnify and hold the party of the second part harmless and free from all liability for all injuries to any person or persons, whether employees of the Contractor or any sub-contractor, or any third person or persons, and also any and all damage to property owned either by the Contractor or any person or persons, caused in any way by the Contractor, his agents, employees or sub-contractors, or any agent or employee of such sub-contractor, or caused by the prosecution of the work hereby contracted for, and all damages and liability and judgments, costs, charges, expenses and attorney's fees arising or to arise from any of these causes.

17. In consideration of the faithful performance of the covenants and conditions in this agreement made by the Contractor, the party of the second part covenants and agrees to pay, or cause to be paid, to the Contractor or assigns, the rates and prices hereinafter named, to-wit:

GRADING.

For solid rock excavation	One dollar five cents (\$1.05) per cubic yard.
“ loose rock excavation	No dollars fifty-two cents (\$0.52) per cubic yard.
“ common excavation	No dollars twenty-two cents (\$0.22) per cubic yard.
“ overhaul, per 100 feet	No dollars one cent (\$0.01) per cubic yard.
“ overhaul beyond two thousand feet, by Contractor's train; for each one thousand feet.....	No dollars one and one-half cents (\$0.01½) per cubic yard.

MASONRY.

For rip rap	One dollar ten cents (\$1.10) per cubic yard.
“ concrete above water	Twelve dollars no cents (\$12.00) per cubic yard.
“ concrete in arch culverts	Thirteen dollars no cents (\$13.00) per cubic yard.
“ wagon overhaul on concrete material after five miles free haul; for each mile of such overhaul	No dollars thirty-five cents (\$0.35) per ton.

TUNNELS.

- For tunnel excavation, neat rock section, single track. . . . Four dollars no cents (\$4.00) per cubic yard.
- “ enlargement for lining Three dollars fifty cents (\$3.50) per cubic yard.
- “ timber lining in place Fifty dollars no cents (\$50.00) per 1,000 ft. B. M.
- “ iron in place, wrought and cast No dollars seven cents (\$0.07) per pound.
- “ dry packing Two dollars fifty cents (\$2.50) per cubic yard.
- “ overhaul of tunnel excavation per 100 feet See Specifications, Paragraph 83.
- “ wagon overhaul on tunnel material used in timber lining, after five (5) miles free haul; for each mile of such overhaul;
 - For timber No dollars fifty-five cents (\$0.55) per 1,000 ft. B. M.
 - “ iron No dollars thirty five cents (\$0.35) per ton.

PILE AND TRESTLE BRIDGING.

- For piles delivered No dollars forty-two cents (\$0.42) per lineal foot.
- “ pile driving, below cut-off No dollars thirty-five cents (\$0.35) per lineal foot.
- “ timber, including placing iron Fifty dollars no cents (\$50.00) per 1,000 ft. B. M.
- “ iron, wrought or cast, in place No dollars seven cents (\$0.07) per pound.
- “ wagon overhaul on pile and trestle bridging material after five (5) miles free haul; for each mile of such overhaul;
 - For piles No dollars eighty-five cents (\$0.85) per 100 lineal ft.
 - “ timber No dollars fifty-five cents (\$0.55) per 1,000 ft. B. M.
 - “ iron No dollars thirty-five cents (\$0.35) per ton.

CONCRETE PIPE CULVERTS.

- For 24-inch concrete pipe in place, 4-inch shell Two dollars sixty cents (\$2.60) per lineal foot.
- “ 36-inch concrete pipe in place, 6-inch shell Four dollars no cents (\$4.00) per lineal foot.
- “ 48-inch concrete pipe in place, 8-inch shell Seven dollars fifty cents (\$7.50) per lineal foot.
- “ wagon overhaul on material for concrete pipe culverts after five (5) miles free haul; for each mile of such overhaul No dollars thirty-five cents (\$0.35) per ton.

18. Approximate estimates of the amount of work done under this contract shall be made on or about the last day of each month by the Engineer, subject to the approval of the Chief Engineer; and upon the certificate of the Chief Engineer as to the value of the work done during the month estimated on the basis of the prices specified herein, the amount of said estimate less ten (10) per cent thereof shall be paid to the Contractor on or about the 20th day of the next ensuing month; the said ten (10) per cent so retained to constitute a reserved percentage and to be withheld by the party of the second part until the final completion and acceptance of the work, when the same shall be paid as a part of the final payment hereinafter provided for. But when the amount of said reserved percentages so retained from said monthly payments shall equal the sum of five thousand dollars (\$5000), the Chief Engineer, if he is satisfied that the Contractor is in good faith using his utmost endeavors to perform the said work herein contracted for and to comply with the provisions of this contract, may, at intervals, upon the completion of successive sections of road of twenty (20) miles each, in his discretion and at his option, direct the payment to the Contractor of a portion of such reserved percentages including not only the percentages retained on account of such completed sections, but also the percentages retained on account of any detached entire piece or connected pieces of work that shall have been performed to the amount in a single locality at the prices named herein of as much as one hundred thousand dollars (\$100,000); provided that in no case shall the amount of such reserved percentages be reduced below the said sum of five thousand dollars (\$5000) or below a sum equal to five (5) per cent of the entire price estimated as hereinbefore provided of the work theretofore performed hereunder.

19. When all of the work herein contracted for shall be completed, and accepted by the Chief Engineer, he shall make a final estimate of the amount of work done under this contract and shall return to the party of the second part a final certificate that the whole work provided for in this contract has been acceptably completed within the time specified; and thereupon the party of the second part upon the tender to it by the Contractor of a valid release and discharge of and from any and all claims and demands whatsoever for all matters growing out of or connected with this contract, shall pay to the Contractor the balance due upon this contract in accordance with said final estimate.

It is further expressly agreed that the Chief Engineer in preparing the final estimate and giving his final certificate, need not be bound by the preceding monthly estimates and certificates and such,

preceding monthly estimates shall be held to be final estimate and shall in no case be taken as a final determination of the amounts to be paid for said work or as an acceptance of the work or as a release to the Contractor for responsibility therefor.

20. It is further agreed that in case of a total suspension of work under this contract, arising from no fault, failure or collusion of the Contractor, for a longer period than ninety (90) days, unless such suspension shall have been caused by the winter season or protracted rigor of weather, it shall be the duty of the Engineer to make a final estimate of all work done according to the terms of this contract, and the amount then found to be due, together with all reserved percentage, except as herein otherwise provided, shall be paid to the Contractor.

21. The Contractor shall be subject to the laws of the State of Nevada regarding liens for labor or material furnished for said work and shall protect or indemnify said party of the second part against all claims or liens against the work for labor or material furnished said Contractor; and the said second party may, whenever it deems proper or expedient so to do, pay to the laborers or other persons employed by said Contractor, or to persons who may have furnished material for said work, out of any moneys due on monthly or other estimates, any sums due for labor or material under this contract and charge the same to the party of the first part as so much paid on this contract; and before a final settlement is made between said parties for work done and material furnished under this contract the Contractor shall furnish satisfactory evidence to said second party that the said road and structures are free and clear from all liens for labor, workmanship, or material and that no claim then exists in respect to which such liens could attach.

22. None of the provisions of this contract shall be held to be waived by the party of the second part by reason of any act whatsoever or in any manner other than by an express waiver thereof in writing by the Chief Engineer.

23. Insofar as the same may be lawfully done, transportation at free rates shall be given the Contractor by the party of the second part over any part of the main line of its road that may be operated for any time, long or short, during the term of this contract, for laborers or others employed by the Contractor on the work of this contract, and for construction tools, plant, livestock, powder, feed for stock, wood, coal, fuel oil and water used in the performance of this contract, but the supplies sold through stores or used in feeding the men shall pay regular tariff rates. PROVIDED, however, that it shall be optional with the party of the second part to charge and collect full tariff rates for the transportation of men or property, but in the event of its so doing the Contractor shall at the end of each month render approved bills for all amounts so paid by it for the transportation aforesaid other than for supplies sold through stores or used in feeding the men, and the amount of such bills shall be added to the sum payable on approximate estimate under the provisions of Section 18 hereof, and shall be paid by the party of the second part with such estimates without deduction.

It is hereby mutually agreed that it shall be the right and duty of the party of the first part to obtain the lowest possible rates for men, plant, tools, live stock, supplies, and material, which must be shipped over foreign lines to the party of the first part; and the party of the second part hereby agrees, as further consideration for the performance of the covenants of the party of the first part to pay to the party of the first part, on properly approved bills with vouchers attached, the amount of the excess over one-half cent per passenger mile or per freight ton mile paid by the party of the first part for transportation of laborers, materials, tools, other appliances, and live stock to be employed or used in the performance of this contract, from Denver, Colorado Springs, Pueblo or Trinidad, Colorado, or from points in Colorado and Utah west thereof to Salt Lake City or Ogden; provided, however, that this clause shall not apply to powder nor to supplies sold through stores or used in the feeding of men; and provided further, that men, material and live stock transported from points east of Salt Lake City shall be routed, so far as reasonably possible, as directed by the Chief Engineer.

24. It is distinctly understood and declared by the Contractor that this contract is made by him for the consideration herein named, solely on his own knowledge and information derived from others than the said second party, its agents or officers, of the nature and formation of the country in which said work is to be done, and the proximity of other public works, roads, etc., and the means of access thereto, also of the character, quantities and location of the material to be used or required in forming the roadbed for said railroad and in performing and completing all the work described herein; and that the plans, maps and profiles of said work prepared by the Chief Engineer and his assistants and the quantities estimated therefrom are approximate only, and are subject to change and alteration as herein provided.

25. Before the commencement of work under this contract, the Contractor agrees to make, execute and deliver to the party of the second part a bond in the penal sum of seventy-seven thousand dollars (\$77,000), said bond to be approved both as to amount and as to the surety or sureties by the President or Chief Engineer of the party of the second part, the said bond to be on the condition that the Contractor shall well and truly keep and perform all the terms and conditions of this contract on its part to be kept and performed and shall indemnify and save harmless the party of the second part from and against any and all claims, demands or liens whatsoever for materials furnished for or used in, and for labor performed and furnished upon and in the doing of the work provided for in this contract, and shall indemnify and hold the party of the second part harmless and free from all liability for all injury to any person or persons incurred in the doing of said work and also any and all damage to property or business incurred in the doing of said

work; and the said bond shall provide that any change in the nature, extent or method of performance of the said work or in the time for the commencement or completion of said work that may be made under any authority contained in this contract, and any change of any nature whatsoever that may be made in the terms of this contract by agreement between the said Contractor and the said Railway Company, and any change that may be made in the performance of said work by the practice of the Contractor assented to by the Railway Company, whether made under an express agreement or not, may be made without affecting the obligation of the surety or sureties on said bond and without requiring the further consent of the same. Said bond shall also provide that the same shall cover any work that may be extra to this contract as well as work specifically provided for herein.

26. It is agreed that for the purpose of facilitating the filing for record of this contract it may be executed in counterparts, each of which shall be deemed an original.

IN WITNESS WHEREOF, the parties hereto have caused these presents to be executed by their respective officers thereunto duly authorized, and have caused their respective corporate names and seals to be affixed hereto, the day and year first above written.

THE UTAH CONSTRUCTION COMPANY,

by

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President.

Attest:

.....

Secretary.

WESTERN PACIFIC RAILWAY COMPANY,

by

.....

President.

Attest:

.....

Assistant Secretary.



Specifications

FORMATION.

- Line.** 1. The center of the roadbed shall strictly conform to the center stakes set for it by the Engineer.
- Grade.** 2. The grade line drawn on the profile represents sub-grade.
- Road Bed.** 3. The roadbed shall be formed as directed by the Engineer; and when finished and properly settled, must truly conform to the grade levels and elevation for curves set for it, and usually be of the following dimensions for single track, viz.:

- Dimensions.** On embankments—sixteen (16) feet wide, or more as directed by the Engineer.
- In earth excavations—width of cutting at base, twenty-one (21) feet; width of roadbed, fifteen (15) feet; and width of side ditches on top, three (3) feet.
- In rock excavations—width of cutting at base, eighteen (18) feet; width of roadbed, fourteen (14) feet; and width of side ditches on top, two (2) feet. Where cuts are liable to fill with snow, or for other reasons, these widths may be increased at the discretion of the Engineer, or to afford material for adjacent embankments.

When providing for double track, twelve and one-half (12½) feet shall usually be added to the width given above.

- Slopes.** 4. The slopes of all earth embankments will be one and one-half to one. Embankments of rock to be one and one-quarter to one. Earth excavations, side ditches, and channels to be one to one, to one and one-half to one. Solid rock excavations from one-eighth to one, to one-half to one. Loose rock excavations from one-quarter to one, to one to one. Bank berms ten (10) feet or more, as directed by the Engineer. Cut berms, twenty (20) feet or more, as directed by the Engineer.

CLEARING.

5. As much ground included in the right of way as the Engineer in charge may direct shall be cleared of trees, logs, brush and rubbish, all of which shall be burned, except such materials as are available for cross ties, timber or wood, and which, being the property of the Railway Company, will be deposited at points designated by the Engineer.

6. All logs, stumps, roots and brush must be thoroughly cleared from ground adjacent to excavations, so they cannot fall or be washed into cuts or ditches, and to furnish ample space for any required drains or surface ditches at the sides of cuts, or elsewhere.

7. All trees, logs, brush, weeds, rubbish and other perishable matter, shall be entirely removed from ground to be occupied by embankments.

8. Where embankments are to be two (2) feet or more in height, all trees, stumps and brush shall be cut off even with the surface of the ground and removed.

9. Where embankments are to be under two (2) feet high, all stumps and brush shall be grubbed out and removed.

10. Clearing shall not be held to cover the removal of grass, weeds, sagebrush, planted crops and insignificant amounts of small brush or other similar growths; such removal, where required, to be included in the price paid for grading.

11. Fences, buildings and other materials, not properly classified as clearing, shall be removed by the Contractor when required by the Engineer at cost plus ten (10) per cent., or as may otherwise be agreed upon in advance.

12. Clearing will be paid for by the acre, but the smallest unit used in the computation thereof shall be the station of 100 feet.

13. All grubbing, wherever found, shall be included in or covered by the price of grading.

GRADING.

14. "Grading" will include all excavation required for the formation of the roadbed, embankments, sidings, station grounds, cutting of channels, ditches and drains about or contiguous to the road, all borrow pits, changing of streams, roads or highways, foundation pits for bridges, culverts, trestle work and all other excavations in any way connected with, required for or incident to the construction of the railroad.

- Excavation.** 15. Excavation will be classified under the following heads, viz.: solid rock, loose rock, or common excavation.

16. Solid rock will include all rock found in ledges or masses of more than one cubic yard, which in the judgment of the Engineer, can only be removed by blasting.

17. Loose rock will include all boulders and detached masses of rock, measuring more than one cubic foot in bulk and less than one cubic yard; also all slate, hard shale, soft sandstone, disintegrated rock and soapstone that can be quarried or removed without blasting, although blasting may occasionally be resorted to, and such hard pan, gravel and boulder deposits and beds of such consistency as to prevent being plowed with a good ten-inch grading plow behind a well-handled team of six good horses or mules. The use of powder shall not be regarded as conclusive as to its necessity.

18. Common excavation will include all materials not classified above as loose or solid rock. The position in which it may occur, or its temporary condition as affected by the elements, shall not effect its classification.

19. When materials of different kinds are removed from an excavation or borrow pit, the estimate and payment shall be made for each kind of material as determined by the above classifications, excepting that loose rock will be the highest classification for borrow, but if in the judgment of the Engineer, it is impracticable on account of the admixture of materials to measure with reasonable certainty the actual quantity of each separate kind of material, he shall, from time to time, take such measurements, and make such observations, as will, in his judgment, best aid in arriving at a just and equitable conclusion as to the proper percentages of materials of the different classifications in the entire excavation or borrow pit to be estimated, and base his estimate thereon.

20. All excavations shall be taken out to the plane of the true measured prisms, and no projections will be allowed beyond the true plane of the slope toward the center line.

21. In rock excavations the bottom must, in all cases, be taken out to twelve (12) inches below sub-grade, and filled in again to sub-grade with material suitable for the roadbed, side ditches being formed at the foot of the slope.

22. No material shall be wasted within twenty (20) feet of the slope stakes of cuts, and the Engineer shall usually require all surplus material of cuts to be hauled out and wasted on either or both sides of embankments, or to provide for future double track, or in such places as he may determine below grade line.

23. Contractors will deposit at convenient points designated by the Engineer, any rock or stone from excavations, and such material shall not be used by Contractors except by permission of the Engineer.

24. Side drains shall be left neat and clear of obstructions and shall be extended at ends of cuts, if necessary to secure good drainage.

Ditches.

25. Surface ditches, to prevent drainage from running over or against slopes, shall be made wherever directed by the Engineer, and paid for at regular excavation rates.

26. Materials excavated for creek beds or ditches, or for changing water courses or highways, will be placed in embankments unless otherwise ordered by the Engineer.

Embankments.

27. Embankments shall be made of suitable materials approved by the Engineer, and in accordance with his instructions, either by dumping from grade or in layers of such thickness as he may direct, care being taken to work the coarser materials to the sides and slopes.

28. Where there is a choice of material, the best shall be used on top of embankments for at least one (1) foot in depth.

29. Embankments built without borrow pits alongside shall, when required, have a ditch cut with berms as already indicated.

30. At bridge openings, around the ends of Culverts, and other places where wash is likely to occur, sod and earth must be carefully packed to prevent earth from being carried away. Bridge openings and slopes liable to wash must be protected with rock or brush, when it can be had. No large stone will be allowed within one (1) foot of sub-grade.

Steps and Toe Walls.

31. In building embankments on slopes, steps shall be cut in the slope, as may be required by the Engineer, the material thus excavated being classified and paid for the same as other excavation. Also, the Contractor may be required by the Engineer to place the larger pieces of rock, as they come from the excavation or borrow pit, in a rough wall on fair lines along the foot or toe of embankment slope, to afford a footing for and support the balance of the material and prevent its waste, and for the extra work thus required the compensation shall be twenty (20) cents per cubic yard of such wall, measured in place.

32. In all cases, allowance for shrinkage will be added to the embankment, as directed by the Engineer, without extra charge therefor.

33. Embankments over or against masonry or other structures shall be built at such time, in such manner and of such material as the Engineer may direct.

34. Borrow pits shall be confined to such limits as the Engineer may direct, both as to their location and extent.

When, in the opinion of the Engineer, quantities of borrowed material can be more accurately measured in embankment, he may measure in that manner, using the cross-section notes of the embankment prisms, and making the allowance which in his judgment is necessary, so that the quantities so measured shall, as nearly as possible, equal the excavation quantities had it been practicable to measure them in excavation.

35. Where borrow pits are made, they shall be left in as neat shape as practicable, and, unless otherwise ordered, they shall be connected from pit to pit or taken out to a grade which will afford drainage and leave no stagnant pools.

36. When it can be avoided, the bottom of borrow pits near bridge or culvert openings shall not be excavated below the surface over which the water runs to pass through such bridge or culvert.

37. No material shall be borrowed from between the line of railway and an adjacent stream where the natural surface is below high-water mark; and where above high-water mark, no borrow pits shall be excavated to a depth below high-water mark without permission of the Engineer.

38. The Engineer may require borrow pits to be located at one side of the roadbed only; and in all cases, the slopes of borrow pits on the sides toward embankments shall not be less than that of embankment. No material shall be left on the slopes or sides of borrow pits which in falling is liable to endanger life or property.

39. At depot grounds, no borrowing will be allowed below grade and no wasting will be allowed above grade. The Engineer may require the spaces between sidings to be filled in or excavated to grade, as may be necessary.

Unless otherwise specially directed in writing by the Engineer, any excess required in embankments shall be provided for by widening adjacent excavations.

40. In finishing top of banks or bottom of cuts, care will be taken that the surface be left neat and true, and that no wagon or car tracks or other depressions are left which might lead water in the direction of the road.

**Snow and
Ice and
Blasted
Materials.**

41. Snow and ice shall be removed from between the slope stakes by the Contractor, at his own expense, both before and during construction.

42. The Contractor shall, at his own expense, remove from public or private roads, or from property of value adjoining the right of way, and from the channels of streams or ditches, when required by the Engineer, all rock or other material which he may have blasted or otherwise deposited thereon or therein.

**Channels,
etc.**

43. Where old channels or streams are crossed by where channels are filled in making embankments, the portion of the abandoned channel between the roadbed and the new channel, shall be filled to a level with the surface of the ground adjoining such abandoned channel, so as to make a false berme, and such work shall be considered as ordinary embankment.

Whenever directed by the Engineer, wet boggy, or unsuitable material shall be excavated from embankment sites and deposited where the Engineer directs, and such work shall be classified and paid for the same as regular excavation; the embankment shall be started from a firm foundation. No perishable material shall be placed in any embankment.

**Dry Slope
Walls.**

44. Dry slope walls shall be composed of durable stone not less than five (5) inches in thickness, twelve (12) inches in width and eighteen (18) inches in length. The stones are to be laid on their natural beds at right angles to the slope, and are to break joints at least four (4) inches and be laid so as to secure a good bond, without spawls or pinners. Headers shall be used between every three (3) stretchers and shall extend entirely through the wall.

Slope walls shall be built in such manner and of such form and dimensions and on foundations prepared as the Engineer directs; they will be estimated and paid for as provided for "rough toe walls" in paragraph 31 of these specifications.

Rip Rap.

45. Rip rap shall be laid by hand by competent workmen in such manner as to secure uniformity of surface and to afford protection to the structure against which it is placed. It shall be of such thickness and slope and of such ordinary stone as the Engineer may direct.

Rip rap shall be estimated and paid for by the cubic yard in place.

Log Cribs.

46. Log cribs, built log-house fashion, of round logs with all bark removed, will be used for sustaining the foot of embankments at points designated by the Engineer, according to plans furnished by him. In construction, the face log joints must not be above each other in alternate courses and the ties will be saddled on to the face of logs and bolted with drift bolts of proper lengths. The face and rear longitudinal logs must average at least fourteen (14) inches in thickness at the butt end and be properly laid, alternating butts and tops so that each course will build up nearly horizontal. The price for logs in these cribs will be _____ cents per lineal foot, only length being considered, no account being taken of the varying thickness, except that each course must build up an average of not less than one (1) foot. The price per lineal foot of logs will include all necessary bolts, spikes, or other iron used. The filling of these cribs will be considered as embankment and not paid for except as embankment. They will preferably be filled with rock from the excavations and care taken to work the largest rock to the face.

Overhaul.

47. The price paid for "excavation" in all its several classes will be understood to cover and pay the entire excavation and removal expense by any method whatever, including loading, unloading, transportation to and deposit in the manner prescribed in these specifications, in the places designated by the Engineer, provided the haul of the material so transported does not exceed five hundred (500) feet, and beyond that distance one cent per cubic yard per hundred (100) feet will be allowed and paid for such extra haul in addition to the price paid for excavation.

The price paid for overhaul shall be the same as provided above, up to the limit of 2,000 feet overhaul, but in special cases it may extend beyond this limit as determined by the Engineer at the same rates, for team haul, but where haul is by Contractor's locomotive and train, the price shall be one and one-half cents per cubic yard per 1,000 feet or fraction thereof beyond the limit of 2,000 feet.

Use of Powder.

48. The Engineer in immediate charge of the work shall have the right to direct the use of powder and to restrict the size of charges in all cases where excessive loads may, in his judgment, unnecessarily shatter slopes of cuts or the roofs and sides of tunnels, damage property of value or be dangerous to human life. He may prohibit shaft or drift shots altogether, wherever he may deem necessary.

MASONRY.

Drawings.

49. The masonry structures in form and dimensions shall conform strictly to the detailed drawings furnished by the Engineer. All drawings will be made to the scale indicated and marked, but in all cases where figures are shown, they shall be followed in preference to measurements by scale.

Kinds of Stone.

50. All stone used for different classes of masonry shall be sound, durable material, suitable for the several parts of work and subject to the approval of the Engineer, and the several classes of masonry shall be of the following description:

FIRST CLASS BRIDGE MASONRY.

51. This shall comprise the masonry in abutments and piers of all important bridges, arches and side walls and portals of tunnels, and all dimension stone as in bridge seats, coping, steps and bearing blocks for second class masonry.

Dimension Stones.

52. First class bridge masonry shall include all bridge seats, coping, steps and bearing blocks. Each stone shall be cut to the required form and dimensions, and shall have beds and joints finely bush hammered so as to be laid to $\frac{3}{8}$ inch joint throughout when placed in the work. The face shall have a neat chisel draft one and one half ($1\frac{1}{2}$) inches wide, and the face shall nowhere project more than two (2) inches beyond the draft line.

Headers and Stretchers.

53. The face stones shall be rock-faced with edges pitched to straight lines, and no projection of the "rock-face" shall exceed four (4) inches beyond the pitched line of the masonry (in tunnel side walls this projection must not exceed two (2) inches); they shall have parallel beds and rectangular joints. The beds, for sixteen (16) inches back from the face, shall be dressed to a $\frac{1}{4}$ inch joint, and a chisel draft one and one half (1½) inches wide shall be cut on each side of any angle in the masonry. The face stones shall be arranged on their natural beds as headers and stretchers in regular courses not less than ten (10) nor more than thirty (30) inches in thickness, and the stones of one course must break joints, at least twelve (12) inches, with those of the course below. One third of each course shall consist of headers, so placed as to alternate with those in contiguous courses.

Headers shall not be less than four (4) feet long, when the thickness of the wall will admit of that length, and in width not less than two (2) feet, nor less than their thickness.

Stretchers shall not be less than two and one half (2½) feet in length and in width not less than one and one-half (1½) times their thickness, but in no case less than eighteen (18) inches. The thickest courses shall be placed at the bottom of the wall, and the thickness of any course shall not exceed that of the course below it.

Backing.

54. The stones of the backing shall have dressed beds, and the backing shall be leveled up true with the face stones on the completion of every course. The backing shall generally be of the same thickness as the face stones. But two thicknesses of backing may be used for one course of face stones, provided no backing is less than ten (10) inches thick. It shall be laid so as to break joints and thoroughly bond the work in all directions, and leave no spaces between them over six (6) inches wide, which spaces shall be filled with small stones, and spalls well grouted.

Setting.

55. The stones shall be laid wet in full mortar beds; they shall be lowered on the bed of mortar and brought to a bearing with a sledge and each successive course well wet and thoroughly grouted before the next course is laid. No hammering or dressing of stone on the wall will be allowed.

Arch.

56. First class bridge masonry shall comprise the ring of all important arches, as designed by the Engineer. The beds shall be dressed for the entire depth of the arch, to an even surface throughout, out of wind, full at the back to conform to the radius of the arch. The intrados shall be neatly pointed off to fit closely to the centering, and no stone shall be less than two and one half (2½) feet long. It shall be laid wet with one-quarter inch joints, in thin mortar, sufficient merely to equalize the bearing and fill the interstices between the dressed beds.

Pointing.

57. The joints on the face of all first-class masonry shall be raked out to the depth of one (1) inch, and pointed in mild weather with finely tempered mortar driven in with a caulking iron.

Mortar.

58. The mortar shall be composed of the best Portland cement of approved quality, and clean, coarse, sharp sand satisfactory to the Engineer, in preparation varying from two to three parts of sand to one of cement, as may be directed by the Engineer for different parts of the work. Sand and cement will be thoroughly mixed dry, before the addition of water.

SECOND CLASS BRIDGE MASONRY.

General.

59. For dimensions, kind of stone, etc., see paragraphs 49 and 50, of these specifications.

60. Second class masonry shall be used in abutments and piers in all unimportant bridges and arches; generally for spans of bridges 150 feet long and under, and for arches with spans fifteen (15) feet and under.

Headers and Stretchers.

61. Headers and stretchers shall be rock-faced, with edges pitched to straight line, and no projection exceeding four inches, and shall have parallel beds and rectangular joints. The bed for sixteen (16) inches back from the face, and the end joints for eight (8) inches back, shall be dressed to a one-half inch joint, and a chisel draft, one and one-half inches wide shall be cut on each side of any angle in the

masonry. The face stones shall be arranged on their natural beds as headers and stretchers, in regular courses not less than ten (10) nor more than thirty (30) inches in thickness, and the stones of one course must break joints at least twelve (12) inches with those of the course below. One-fourth of each course shall consist of headers so placed as to alternate with those in contiguous courses.

Headers shall not be less than four (4) feet long, when the thickness of the wall will admit of that length, and in width not less than two (2) feet, nor less than their thickness.

Stretchers shall not be less than two and one-half (2½) feet in length, and in width not less than their thickness, but in no case less than eighteen (18) inches. The thickest course shall be placed at the bottom of the work, and the thickness of any course shall not exceed that of the course below it. Each stone shall be set level, in full mortar bed, and laid to a one-half inch joint.

Backing

62. Backing shall be of large, roughly squared stone, laid in courses corresponding with the face stone; but two courses may fill up one of the face, provided no stone less than six (6) inches is used. The broadest bed shall be laid undermost, and must have a good bearing on the stone below. Two-thirds of the upper bed shall be the full thickness of the course. The stones shall be laid in full mortar beds, well bonded with each other and the face stones, and with all spaces filled with small stones and spawls, well grouted.

Sheeting

The coping, bridge seats, etc., shall be the same as for first-class masonry.

63. Stones shall not be of less thickness than eight inches on the intrados of the arch, and shall be dressed with three-eighths inch joints, and be of the full depth specified by drawings or otherwise for the thickness of the arch; the joints must be made on truly radial lines; the ring stones and the sheeting shall break joints at least twelve (12) inches. It shall be laid with close joints in thin mortar.

Pointing

64. The joints on the face of the wall shall be raked out and pointed in mild weather, with finely tempered mortar.

Mortar

65. The mortar shall be composed of the best Portland cement of approved quality, and clean, coarse, sharp sand satisfactory to the Engineer, in proportion varying from two and one-half to three parts of sand to one of cement, as may be directed by the Engineer for different parts of the work. Sand and cement will be thoroughly mixed dry, before the addition of water. In proportioning mortar, the governing unit will be held to be the volume of one barrel of cement as measuring three and one-half cubic feet.

Headers and Stretchers

66. Third class masonry shall be used in retaining walls and elsewhere as the Engineer may direct. The face stone shall be rock-faced, with edges pitched to straight lines, and no projection exceeding four (4) inches and shall have parallel beds and rectangular joints. The beds and end joints for six (6) inches back from the face shall be point or hammer dressed to one-half inch joint, and a chisel draft one and one-half inches wide shall be cut on each side of any angle in the masonry. No face stone shall be less than eight (8) inches thick nor in length and breadth less than twelve (12) inches nor less than its thickness. They need not be arranged in regular courses, but shall be laid level on their natural beds as headers and stretchers and with joints broken at least six (6) inches. At least one-fourth of the face stones shall be headers not less than three (3) feet long or extending through the wall where it is four (4) feet thick or less, and so distributed as to secure the best possible bond. Each stone shall be laid in a full mortar bed, and laid to one-half inch joint on the face.

Backing

67. The backing to be well shaped stone, not less than six (6) inches thick, and of which at least one-half shall measure two (2) cubic feet; laid close in full mortar beds, and well bonded with the face stones. The spaces to be filled with stone chips, and grouted.

Coping

68. The coping-course shall consist of square stones not less than eight (8) inches thick, rock dressed on face, with edges pitched to straight lines, point dressed to one-half inch joint on beds and ends, covering the entire thickness of the walls when the same does not exceed two feet and eight inches.

Pointing

69. Pointing and mortar to be of the same kind and quality as described in paragraphs 64 and 65 of these specifications.

FOURTH CLASS MASONRY.

Slope Wall

70. Slope walls shall consist of stones not less than four (4) inches thick and one (1) cubic foot solid contents, laid in cement mortar and bonded to give the greatest degree of strength, with close joints and as free from spawls as possible, with beds perpendicular to the face if required. It will be laid dry or in full mortar as the Engineer may direct. No stone shall be dressed on the wall, and no stone once bedded shall be removed unless directed by the Engineer for the purpose of inspection. Mortar shall be composed of best hydraulic cement in the proportion of two or three parts of sand to one of cement, as may be directed by the Engineer.

Stone Paving

71. Stone paving shall consist of stones set on edge from eight (8) to fifteen (15) inches in depth, laid either dry or grouted with strong cement mortar, as may be directed by the Engineer.

DRY RETAINING WALLS.

72. Dry retaining walls shall be of heavy, rough rubble masonry, made of sound, clean stones, of suitable size and quality approved by the Engineer. The stones must be laid on their natural beds

and be roughly squared on their joints, beds and faces, all irregular projections and feather edges being hammered off, and they shall break joints at least six (6) inches, and with at least one (1) header for every three (3) stretchers.

In general, the sizes of stones may vary with the character of excavations, borrow pits or quarries, whence they are obtained, but no stone shall be used on the face of the wall less than eight (8) inches in thickness or less than eighteen (18) inches in the least horizontal dimension.

The work must be well bonded through the whole thickness of the wall, and but few spawls will be allowed, as may be directed by the Engineer or Inspector.

Headers shall be at least three (3) feet long or otherwise extend entirely through the wall.

The wall must be brought to a good face and be built and finished in all its parts in accordance with the plans and directions of the Engineer or Inspector.

If required by the Engineer, the top of the wall shall be finished by a coping-course as described under head of third class masonry.

BRICK MASONRY.

73. Brick masonry shall be laid with the best quality of all hard burned brick, well tempered, and moulded, or cut to standard size, they are to be culled when delivered upon the ground, and all bats and imperfect bricks must be immediately removed from the work. No bats, cracked, crooked or salmon bricks will, under any circumstances, be allowed in the work.

The bricks are to be thoroughly wet by immersion immediately before being laid. Every third course must be laid fair and smooth by line, the courses are to be kept straight in the direction of the arch, and parallel with the rise of the same.

Every brick must be laid in a full and close joint of mortar on its beds, ends and sides at one operation. Grout will be substituted for mortar when required by, and to the extent ordered by the Engineer. The work in all cases must be thoroughly bonded in the manner specified on the plans. All brick work, as it progresses must be raked back in courses unless permission is given for toothing. All inverts or bottom curves or culverts are to be worked from templates accurately made according to the dimensions of the culvert and correctly set according to grades furnished. The upper curves of culverts and arches are to be formed on strong proper centers, and according to the size and shape required. The crown is to be keyed with stretchers in full joints of mortar. The extrados of the upper arch must be neatly coated with mortar at least one-half inch in thickness.

In tunnel arching, whenever a seam of water is met the arch must be covered with roofing felt, or a course of asphaltum applied hot, of such thickness as shall be directed by the Engineer, and this covered again with a coating of mortar, so as to make the arch impervious to water; a drainage channel properly formed being left in the backing of the arch and side walls, with suitable openings left for its escape at such points and of such size as may be directed by the Engineer. No centering shall be removed until the work upon it is well set; and the packing between the arch and tunnel roof over any section of the arch shall never be done until the section has had at least forty-eight hours for setting after being keyed. Mortar same as specified in paragraph 65 of these specifications.

74. Concrete shall be composed of fragments of hard, sound, acceptable stone, gravel, furnace slag or hard brick, broken to a size that will pass through a two and one-half inch ring in any direction, thoroughly clean and free from mud, dirt or any earthy admixture whatever, mixed in proportion to two parts in bulk of broken stone to one part of mortar prepared as specified in paragraph 65 of these specifications.

When directed by the Engineer, concrete may be substituted for any or all classes of masonry hereinbefore specified, either wholly or in part. The mixing shall be approved by the Engineer and may be done either by hand or by machines. The consistency of the fresh concrete shall be what is known as "medium wet," it will be moderately rammed in 12-inch layers or less, and spaded to insure the filling of all voids; a smooth face will be obtained by working a spade or fork between the form boards and concrete on all exposed surfaces; no separate facing will be necessary, and no plastering will be allowed, and when the forms are removed a smooth surface free from voids will be required. Beveled or rounded corners will be made on all exposed angles by introducing the proper triangular strips or round corner moulding pieces within the forms. The form boards used on all exposed surfaces shall be of sized lumber and closely fitted in order to secure the best results in the appearance and surface of the finished work, and all forms shall be furnished by the Contractor at his own expense.

Anchor bolts will be furnished by the Railway Company and set by the Contractor as part of the price per yard of concrete.

Where iron plates are required on the cut-water ends of concrete piers, they will be furnished bent to the proper form by the Railway Company, but shall be placed by the Contractor as a part of the price per yard of concrete.

Clean crusher screenings or stone dust will be admitted as forming any part of the volume of sand required up to one-half thereof.

In large masses of concrete, as the bottom of bridge abutments and piers, large stone may be incorporated in the concrete, but great care must be taken to have such stone cleaned and wet before

being placed. They shall not be laid closer than eighteen (18) inches from any surface of the structure, nor less than two feet from the bottom thereof. They shall be placed at least twelve (12) inches apart, so as to give sufficient room for tamping around.

Bridge seats will be finished in exact heights by floating a mixture of one part cement to one part sand to place with guides and straight edges.

Concrete shall not be placed after set has begun, but must be removed from the vicinity of the work at once.

In making connection with any portion partially set, the old concrete shall be wetted down and sprinkled with neat cement.

Concrete shall not be mixed in weather considered unsuitable.

The Contractor shall remove forms and clean up generally after work is completed.

The surface of finished work shall be kept moist if required by the Engineer, for a time not exceeding three weeks.

When required by the Engineer, broken stone or gravel will be wetted before mixing.

CONCRETE PIPE CULVERTS.

75. At such places as the Engineer may direct, concrete pipe culverts will be used for carrying the drainage under the roadbed. These pipes are to conform to the plans furnished and to be of the following sizes and thickness;

Pipe 12 inches inside diameter to have shell 3 inches thick.				
" 18	"	"	"	3½
" 24	"	"	"	4
" 36	"	"	"	6
" 48	"	"	"	8

They are to be made of one part of Portland hydraulic cement, two parts clean sharp sand and two parts of washed gravel or broken stone, no size of which shall exceed one and one-half (1½) inches mixed with sufficient water to form what is known as a wet mix, and to be thoroughly tamped in the forms. These pipes may be made on the ground as a continuous pipe or in sections of suitable length for handling. All pipe to be subject to the inspection of the Engineer. Joints are to be made of neat cement unless otherwise directed by the Engineer. All pipes to be laid on an even bed and upon the best foundation to be prepared. Excavation to secure an even bed to be paid for as per paragraph 15 of these specifications.

Concrete pipe will be paid for by the lineal foot in place.

At the ends of pipe culverts concrete end walls are to be constructed according to plans furnished by the Engineer. These are to be estimated and paid for as other concrete masonry under this contract.

TUNNELS.

76. Tunnels will be taken out for either single or double tracks as may be determined upon. The normal cross-section for single-track tunnels will be not less than sixteen (16) feet, nor more than seventeen (17) feet wide between vertical side walls, twenty-two and one-half (22½) feet high above sub-grade, and one (1) foot below sub-grade. The curve of the arch will be a semi-circle, whose springing line shall be fourteen (14) feet above sub-grade. The normal cross-section for double-track tunnels will be twenty-nine (29) feet between vertical side walls, twenty-two and two-thirds (22 2/3) feet high above sub-grade, and one (1) foot below sub-grade. The curve of the arch will be a semi-ellipse, whose springing line shall be fourteen (14) feet above sub-grade and shall have a nine and two-thirds (9 2/3) feet rise on the span of twenty-nine (29) feet.

The normal cross-section for single-track tunnels will contain an area of 368.4 square feet equaling 13.65 cubic yards per lineal foot of tunnel, and for double-track tunnels will contain an area of 655.1 square feet equaling 24.26 cubic yards per lineal foot of tunnel.

77. The tunnels must, at all places, be excavated so that no rock or other material will project inside of the line of cross-section determined by the Engineer for that place. The bottom shall be taken out to the full width of the section and broken stone ballast filled in to height required by the Engineer.

78. Excavation of tunnel shall be classified as follows:

1. Neat rock section—which shall include the normal cross section only.
2. Enlargement—which shall apply to the change in form of the cross-section; or enlargement thereof necessary to accommodate timber or masonry lining as may be determined by the Engineer.

79. If timber lining is used the sections will be enlarged and measured to a line three (3) inches outside of such timber or lagging on side walls or arch; or if masonry lining is used the section will be enlarged and measured to a line six (6) inches outside of the exterior lines of side walls and arch.

Overbreakage beyond the neat rock section or enlargement will be paid for at a rate fixed by the Chief Engineer, if in his judgment such overbreakage has been necessary or unavoidable and not caused by carelessness or excessive use of powder.

80. Recesses for refuge shall be excavated at such points and of such dimensions as may be indicated by the Engineer, in tunnels exceeding eight hundred (800) feet in length. These recesses shall be from two hundred and fifty to four hundred feet apart as may be determined by conditions, the

work required thereby being part of the tunnel work of this contract and subject to the same conditions and same contract rates or prices.

81. The price paid for excavation will include the cost of all temporary supports, shores, scaffolds, etc., that may be necessary for the safe prosecution of the work in advance of the introduction of permanent supports of timbering or masonry and all such temporary timbering shall be removed by the Contractor upon the completion of the permanent supports.

82. Drilling and blasting must be conducted with care, so as not to shatter the roof and sides outside the prescribed section, and if any "falls" occur that in the opinion of the Engineer are attributable to carelessness or want of proper attention on the part of the Contractor, they shall be removed and disposed of at his expense; but if by unavoidable accident or natural causes, outside rock shall become loose or shattered, it shall be removed by the Contractor on a just and equitable allowance made him by the Chief Engineer as compensation therefor.

83. The price paid for tunnel excavation will be understood to cover and pay for the entire expense of its removal and transportation to the designated place of deposit, provided that the haul of such material does not exceed five hundred (500) feet outside of the tunnel portals, and beyond that distance the regular price for overhaul shall be paid.

84. The location, extent, kind and plan of all tunnel lining shall be as directed by the Engineer. Timber lining will ordinarily consist of twelve by twelve posts for side walls, spaced four (4) feet centers, or as may be necessary, with either longitudinal or cross sills, or both, as may be required, and either with or without wall plates, as may be determined. The arch will usually consist of five (5) segments of twelve by twelve timbers placed over each pair of posts. The lagging will usually be four (4) inches in thickness.

85. Plans showing the dimensions of all timbers to be used and the form of framing and placing of such timbers will be furnished by the Chief Engineer for each particular tunnel requiring timbering and lining, and the work of placing and erecting the timbers shall be done in strict conformity with these plans and in a first-class, substantial and workmanlike manner, to the entire satisfaction of the Engineer. The Contractor will be required to protect the timbering when in place from the effects of blasting or other forms of damage, and to replace at his own cost any timber which is shattered, crushed or materially damaged during any stage of the work.

86. Before the tunnels are accepted, their whole length must be entirely cleared of debris, rubbish and surplus material of every kind, and the bottom filling dressed off to the required grade, leaving side ditches of such width as may be directed by the Engineer.

87. All material excavated on the approach cuts to the tunnels and above the portals, will be paid for as grading excavation.

88. All timbers shall be redwood, fir, pine, red spruce, or other timber of durable quality approved by the Engineer; it will be paid for by the thousand feet board measure for the amount left standing permanently in the work. All wrought iron or cast iron required will be paid for by the pound in place in the work.

89. The quality of masonry of whatever kind used in lining tunnels, shall be governed by the masonry specifications of the several classes, but a separate price shall be bid for masonry in tunnels together with their portals.

90. The vacancies behind the timber lagging or masonry walls, and above the arching must be filled with concrete or dry packing, or rubble or brick masonry as the Engineer may from time to time direct. Dry packing must be of hard, durable stone or waste timber or cord wood as the Engineer may direct. It shall be well rammed in. Dry packing shall be paid for by the cubic yard. Other forms of packing shall be classified under the several heads of masonry in tunnels. Packing that may be required to fill falls or voids attributable to want of care on the part of the Contractor shall be placed by him, of the kind and in the manner directed by the Engineer and free of cost to the Railway Company.

FOUNDATIONS BELOW WATER.

91. Foundations above water shall not be subject to a special classification, but all work of the several classes shall be included in the regular specifications and be paid for accordingly at the regular prices of grading, masonry or pile and trestle bridging as the case may be.

92. Foundations below water shall include excavations, piles and pile driving and the cutting off the same under water, timber, iron, concrete and all work connected therewith. All excavations for bridge foundations, and coffer dams required therefor, will be paid for as extra work.

93. The character of foundations, and plans for the same shall be determined by the Engineer in all cases, they shall be excavated to such depths as may be necessary to secure a good bearing for the masonry, and in case of foundations on rock, the rock must be leveled or stepped in such manner as the Engineer may direct, and when a solid foundation cannot be found at a reasonable depth approved by the Engineer there shall be prepared by the Contractor such artificial foundations as the Engineer may direct.

94. Timber foundations when required shall be such as the Engineer, by drawings or otherwise, may prescribe, and will be paid for by the thousand feet board measure.

95. All timber, piles and iron in foundations shall conform to the general specifications governing such classes of material, see paragraphs 111, 112 and 113 of these specifications

96. Concrete in foundations shall conform to the general specifications therefor, and shall, wherever possible, be deposited upon the previously prepared foundation in the open air, the water being removed by pumping or otherwise for that purpose.

If this method is impracticable, as judged by the Engineer, the concrete may under certain conditions be laid in water, using such appliances and working in such manner as the Engineer may direct.

97. Where pile foundations are used, the piles shall be driven to a firm, hard bearing, in a manner to provide sustaining power for the imposed loads, of which the Engineer shall be the judge.

Piles will be estimated and paid for by the lineal foot; 1. As delivered at the site of the structure, according to bills furnished by the Engineer. 2. For driving, straightening and cutting off ready for the caps, only the length actually left standing in the structure to be paid for.

PILE AND TRESTLE BRIDGING.

98. Pile and trestle bridging shall conform strictly to the detailed drawings furnished by the Engineer, and in all cases where figures are shown they will be taken in preference to scale.

99. Piles shall be driven on hard bottom or to such penetration as the Engineer shall determine, and the outside piles in bents shall be driven on a batter of one and one-half inches per foot when required.

100. The number and position of posts or piles will be indicated on the plans. No mortise or tenon work will be required. Connections will be made by sizing or dapping the timber where shown on the plans, and using screw bolts, drift bolts, dowels, separators and spikes as required.

101. The span between centers of pile or timber bents will usually be fifteen (15) feet, with stringers the length of two spans.

102. Caps and sills will usually be twelve (12) by fourteen (14) inch timbers, and posts will usually be twelve (12) by twelve (12) inch timbers, stringers of eight (8) by seventeen (17) inch timbers, ties of eight (8) by eight (8) inch timbers, surfaced one side, guard rails or six (6) by eight (8) inch timbers, sway braces of three (3) or four (4) inch plank, but the sizes of these and all other timbers may be varied by the Engineer as required.

All timber will be estimated and paid for by the thousand feet board measure, according to bills furnished by the Engineer.

Piles will be estimated and paid for by the lineal foot, 1. As delivered at the site of the structure, according to bills furnished by the Engineer. 2. For driving, straightening and cutting off ready for the caps, only the length actually left standing in the structure to be paid for.

CAST IRON OR VITRIFIED PIPE CULVERTS.

103. For drainage openings of a size not requiring arch culverts, or where suitable material is not available for stone box culverts, the Engineer may order cast iron pipe culvert openings varying from eighteen to forty eight inches in diameter.

104. Cast iron pipes shall be thoroughly coated and be of what is known as first quality of regular manufacture. The thickness of shell shall, within these conditions, be specified by the Engineer, and it shall be paid for by the ton in place.

105. The pipe shall be laid on lines and be firmly bedded as directed by the Engineer. The joints shall be carefully filled with cement mortar of good quality.

106. Parapet walls shall be built on the ends of all cast iron pipe culverts where required by the Engineer, the regular masonry specifications governing as to class and price.

107. Cast iron pipes shall usually be furnished in lengths of twelve feet, but to accommodate the length of culverts more nearly to the actual requirements, a certain number of six-foot lengths may be required by the Engineer, without additional cost per ton.

108. For certain small openings or drains, the Engineer may order vitrified tile pipe, usually twelve or eighteen inches in diameter; it shall be of the best quality, and shall be paid for by the lineal foot in place.

TIMBER CULVERTS.

109. Timber culverts will be used at points designated by the Engineer, and will be built of either sawed or hewed timber on plans furnished by him. They will be estimated by the thousand feet board measure, according to bills furnished by the Engineer, and the price will cover and include the cost of all iron drift bolts and spikes entering into their construction. They will preferably be built of cedar, but other approved timbers will be used when directed by the Engineer.

110. The bottom of timber culverts will be paved with angular rock of suitable size laid close with a carefully laid curbing of larger sized rock at the discharge end. The price paid for paving will be the same as that paid for rip rap. Plank boxes will also be used for drainage as may be directed by the Engineer, and will be estimated and paid for by the thousand feet board measure, according to bills furnished by the Engineer, the price for which will include all necessary spikes and bolts.

TIMBER, PILES AND IRON.

111. All timber used in the various classes of work shall be of sugar pine, yellow pine, Douglas fir, Colorado yellow pine or red spruce, (except bridge stringers, which, unless otherwise ordered by

the Engineer, shall be of Douglas fir), or such other timber as may be approved by the Engineer. It must be sound, straight grained and free from sap, loose or rotten knots and wind shakes, or other defects that would impair its strength and durability. It must be sawed or hewed perfectly straight, and close to dimensions with full corners and square edges; all framing must be done in a thorough and workmanlike manner, and both material and workmanship must pass the approval of the Engineer.

112. All piling used in the various classes of work shall be of sugar pine, yellow pine, Douglas fir, Colorado yellow pine or red spruce, or such other timber as may be approved by the Engineer. Piles must not be less than ten inches in diameter at the small end and fourteen inches at a point three feet from the butt. They must be so straight that no point in the center of the pile shall vary more than one-fourth of its diameter from a line passing from the center at one end to the center at the other. Ends must be square, all bark taken off, branches and knots trimmed close and finished in a workmanlike manner.

113. Wrought iron must be of the best quality of refined iron, capable of standing a tensile strain of 50,000 pounds per square inch; all cast iron must be well manufactured of good gray iron. Iron of both kinds to be made exact to the dimensions shown on plans. The labor of placing iron of whatever kind, is to be included in the price of timber in place.

GENERAL PROVISIONS.

114. Contractors shall not, by themselves nor by their agents, give or sell any ardent spirits to their workmen, or any person at or near the line of railway, nor allow any to be brought to the work by the laborers or by any other person.

115. The line will be divided into sections averaging about one mile in length, so arranged as to accommodate, as near as practicable, the economical distribution of material from excavations or required embankments. This will not prevent the removal of materials required for the roadbed or structures from one section to another whenever the Engineer may require.

116. Unless otherwise ordered by the Engineer, haul of materials from cuts will not stop at crossings of creeks and streams. If the Engineer sees fit he may require a bridge or roadway made for very difficult crossings at the expense of the second party.

117. Excavations from prism of road, and loose or solid rock, wherever excavated, will be measured in place, excepting where the Engineer may judge best to do otherwise. The Engineer will take such measurements on all parts of work as he may deem best to secure correct estimates.

118. All masonry will be paid for by the cubic yard of twenty-seven cubic feet. No constructive or conventional measurements will be allowed, any rule or custom in the section of the country through which the road passes to the contrary notwithstanding.

119. No masonry of any kind shall be covered up until it has been inspected and accepted by the Engineer.

120. All materials will be subject to a rigid inspection, and any that have been condemned must be removed from the site of work immediately. The masonry will be built under the supervision of an Inspector, whose duty will be to see that the requirements of these specifications are carried out, but his presence is in no way to be presumed to release the Contractor in any degree from his obligations and responsibility.

121. No allowance will be made for timber, or work on same, used in scaffolding, forms for concrete, shoring or centering grades, excepting only timber, sheet piling or foundation plank necessarily, and by order of the Engineer, left in the ground.

122. It is hereby distinctly understood and agreed that, should the party of the second part require the party of the first part to lay and surface any portion of its track comprised within the limits of this contract, the price therefor shall be: Four hundred fifty dollars (\$450.00) per mile for track laying and four hundred fifty dollars (\$450.00) per mile for surfacing, and that the specifications of this contract shall apply thereto.

123. Team or wagon haul from point of rail or water delivery, (such point of delivery to be designated by the Engineer,) on masonry and bridge or culvert materials, and of materials required in lining tunnels, to site of use or structure, up to a limit of five (5) miles, will be performed by the Contractor at his own cost, but beyond such five (5) mile limit the prices named therefor in this contract will apply. Other than the foregoing no allowance whatever will be made for haul or transportation of such material by any method whatever.

SPECIFICATIONS FOR CROSS-TIES.

124. All ties must be made of living timber, perfectly sound and free from loose knots or other imperfections.

The following kinds of timber will be accepted: White cedar, Douglas fir, sugar pine, yellow pine, red spruce and redwood.

Ties may be either pole, square hewed or square sawed.

125. No. 1 POLE TIES to be eight (8) feet long, seven (7) inches thick between parallel faces, and not less than seven (7) or more than twelve (12) inches wide on any part of the face. They must be well hewn or sawed on two sides only, out of wind, ends cut square and bark removed; not over one-quarter ($\frac{1}{4}$) inch variation in thickness will be allowed, nor over one (1) inch variation in length from standard dimensions.

Overhaul
on
Construction
Material.

126. No. 2 POLE TIES to have a width of face not less than six (6) inches, and in other respects conform to specifications for No. 1 pole ties.

127. No. 1 SQUARE HEWED TIES to be eight (8) feet long, seven (7) inches thick between parallel faces, and not less than eight (8) or more than twelve (12) inches in width. They must be well hewn on four sides, out of wind and ends cut square, and free from sap except on corners, where not more than one (1) inch of sap will be allowed; not over one-quarter ($\frac{1}{4}$) inch variation in thickness will be allowed, nor over one (1) inch variation in length from standard dimensions.

128. No. 2 SQUARE HEWED TIES to have a width of face not less than seven (7) inches, and in other respects conform to specifications for No. 1 square hewed ties.

129. No. 1 SQUARE SAWED TIES to be eight (8) feet long, and seven (7) inches thick between parallel faces, and eight (8) inches wide. They must have ends cut square and be full cornered, and free from sap, except on corners, where not more than one (1) inch of sap will be allowed; not over one-quarter ($\frac{1}{4}$) inch variation in thickness will be allowed, nor over one (1) inch variation in length from standard dimensions; while in width they may vary from one-quarter ($\frac{1}{4}$) inch under, to (1) inch over standard dimensions.

130. No. 2 SQUARE SAWED TIES to have a width of face of not less than seven (7) inches, and in other respects conform to the specifications for No. 1 square sawed ties.

131. Ties must be delivered on the premises of the Railway Company, at or above grade, and at such points as may be acceptable to the Railway Company, but not closer than eight (8) feet from the line of the rail. Ties of different woods and classes to be piled separately. All ties to be cross piled in stacks of one hundred (100) each, or as may otherwise be directed, and owner's name should be marked on each pile. Ties on cars must be delivered to the tracks of this Company, or to such other points as may be agreed upon free of freight charges.

Not over ten (10) per cent. of No. 2 ties will be accepted on an order for No. 1 ties.

SPECIFICATIONS FOR TRACK LAYING AND SURFACING.

I. TRACK LAYING.

132. Track laying will include all the work of laying the main track, sidings and other permanent tracks, frogs, switches, crossings, etc., together with laying and spiking the plank of road crossings wherever required, and trimming down or filling up the surface of the roadbed to bring it to the true grade, when such trimming or filling does not exceed one-half foot in depth or height—but when it is more than one-half foot, the actual cost of the excess will be allowed.

133. The materials for track will be furnished by the Railway Company; also the necessary engines, cars (except iron cars) and men to operate them.

134. The Railway Company will furnish the necessary number of box cars to accommodate the laborers, such cars to be fitted up at the expense of the Contractor.

135. The Contractor will furnish all tools, including iron cars, and all supplies incidental to the work of track laying and providing for their laborers and animals.

136. The Railway Company will deliver on cars, as near as convenient, to the place where used, all materials for track brought from a distance by rail, or not delivered along the line of road. When from any cause materials are unloaded from cars at or near the end of track, the Contractor will unload and reload them at his own expense. When cross-ties are delivered along the line of road the Contractor will do all the handling required to put them in place in the track, including loading them on cars when necessary, to the extent of not less than 2,640 ties to the mile of track. If plated ties are used, they will be plated by the Railway Company, but any plates detached by handling will be replaced by the Contractor, or if necessary to remove plates from joint ties, the removing will be done by the Contractor.

137. The road bed will first be brought to the correct grade as prescribed by the Engineer and made true and smooth by trimming or filling.

138. The cross-ties on tangents will be laid at right angles with the center line of the railway and with one end accurately lined. Ties on curves must be laid on true radial lines with their inner ends accurately lined up to curves parallel with track. The best ties will be selected and laid under the joints of rails and at the shoulders next to the joint ties. Ties will be used and laid at the rate of not less than 2,640 per mile; or one to every two feet of track.

139. Rails will be laid with broken joints, the joints in one rail to be approximately opposite the center of the opposite rail.

140. The rolling mill brands on rails will be laid inwards.

141. Rails will not be cut to equalize lengths, or for other purposes, except by consent of the Engineer. A number of rails of unequal lengths are provided, and will be used, when necessary, to adjust the joints to their proper position, or to equalize lengths as far as practicable.

142. Rail joints will be laid on the middle of the joint ties, and special care will be taken to select the widest and best ties to lay at the joints.

143. The rails will be laid at an equal distance from the center line on each side. They will be accurately laid to the prescribed gauge of four feet eight and one-half inches, except on certain curves, where a widening of gauge will be made from three degrees upward, as the Engineer may direct.

144. In laying rails on curves greater than two (2) degrees, each rail must be curved as directed by the Engineer. On one degree curves or less, and straight lines, rails must be carefully straightened

before being laid. In no case will forcing, springing or sledging the rails be allowed. A curving machine will be furnished by the Railway Company, which must be used by the Contractor for curving rails. The rails will be laid with proper provision for expansion, as prescribed by the Engineer. Iron shims of proper thickness will be used for this purpose.

145. On curves, the outer rail will be elevated one inch for curves one degree or less, and at the rate of one-half inch for each additional degree of curvature until it is elevated four inches, beyond which it will not be raised except by order of the Engineer.

146. In putting on angle bars, care must be taken to get them in exact position with the holes properly matched; all joints must be full bolted and properly screwed up as the work progresses, the concave side of the nut to go against the plate.

147. Great care must be taken to avoid bending rails in loading, unloading and handling them.

148. The rails will be full spiked throughout. Spikes must be driven perpendicular to the face of the tie, and shall alternate on opposite sides of the rail. Each spike shall be at least one inch from the center of the tie and not more than four inches from center to center of spike on a line parallel with the rail, and the two inside spikes near the same edge of tie. Each spike shall be well driven, so as to hold the face of the tie firmly against the bottom of the rail, and so that the vertical face of the spike is against the flange of the rail.

149. On curves of more than four degrees, an additional spike in each tie shall be driven on the outside of outer rail. Brace chairs will be used when directed by the Engineer.

2. SURFACING TRACK.

150. The ties will be well bedded and tamped underneath along their whole length. The spaces between the ties will be filled with the best material that can be cast in from the adjacent sides, or otherwise as directed by the Engineer. No sod shall be used for filling track. When material at hand is unsuitable for filling track it will be hauled by train. The Railway Company will furnish train and trainmen, and the Contractor will load and unload the material at price to be agreed upon.

151. The filling will be made highest in the center, where, for two feet wide, or one foot each side of center line, it will be three (3) inches deep over top of cross-ties, and thence slope off each way to bottom ends of ties. The ends of all ties must be left just clear of the surface of the ground; and the roadbed outside and beyond the ends of ties must have a uniform descending slope away from them, in order to allow water to flow away freely and prevent it from settling under or around the ties, or upon the roadbed.

152. All road or surface ditches will be left clear and free, so opened and extended as to allow the water at all times to flow freely away from the roadbed; and special care must be taken that side-ditches in all cuts are left unobstructed.

153. The side slopes and ditches must be left neat, smooth and free from all rubbish, materials or obstructions. Material for filling track must not be taken from side slopes of embankments within five feet of center line unless embankments are above the proper grade. The top or surface of roadbed must be left of equal width on each side of the track as far as practicable, and not less than five feet wide on each side of center line in all cases. In no case will the Contractor be permitted to disfigure embankment in order to obtain material for surfacing.

154. The filling and surfacing must be kept well up with track laying, and not allowed to be more than three miles behind at any time, except by consent of the Engineer. Any damage to track or otherwise, caused by or in consequence of the surfacing not being so kept up, must be made good by the Contractor.

155. When the surfacing is completed, the track must be left well lined, with a smooth, even surface, and so maintained by the Contractor until accepted by the Railway Company.

156. Track laying and surfacing will be accepted from the Contractor when completed in sections of twenty (20) miles each.

157. Track laying and surfacing track will be estimated by the lineal mile of fifty-two hundred and eighty (5,280) feet. Sidings will be estimated from head-block to head-block of switch.

158. Only the main track, and such permanent sidings and other tracks as are ordered by the Engineer will be estimated and paid for. The work of laying temporary spurs and "Y's" put in merely for use and convenience while laying and surfacing track, will be done at the cost of the Contractor.

END.

INDEMNITY BOND.

KNOW ALL MEN BY THESE PRESENTS, that we, THE UTAH CONSTRUCTION COMPANY, a corporation organized and existing under the laws of the State of Utah, as principal, and _____

as sureties, are held and firmly bound unto WESTERN PACIFIC RAILWAY COMPANY, a corporation, in the sum of seventy-seven thousand dollars (\$77,000.00), to be paid to the said Western Pacific Railway Company, its successors and assigns, for which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this second day of April, A. D. 1907.

The condition of this obligation is such that whereas the said The Utah Construction Company has entered into a contract with said Western Pacific Railway Company, bearing date the second day of April, 1907, a copy of which contract is hereto attached and by reference is made a part hereof.

NOW THEREFORE, if the said The Utah Construction Company shall well and truly keep and perform each and all the terms and conditions of the said Contract on its part to be kept and performed, and shall indemnify and save harmless the said Western Pacific Railway Company from and against any and all claims, demands or liens whatsoever for materials furnished for or used in or for labor performed or furnished upon or in the construction of the work specified in said contract and shall indemnify and hold said Western Pacific Railway Company harmless and free from all liability for all injuries to any person or persons, as provided in said contract, and also from any and all damage to property or business as provided in said contract, then this obligation shall be of no effect, but otherwise it shall remain in full force and effect.

It is mutually agreed and made a condition hereof that any change in the nature, extent or method of performance of said work or in the time for the commencement or completion of said work that may be made under any authority contained in this contract, and any change of any nature whatsoever that may be made in the terms of said contract by agreement between the said principal herein and the said Western Pacific Railway Company, and any change that may be made in the performance of said work by the practice of the said principal, assented to by the said Western Pacific Railway Company, whether made under an express agreement or not, may be made without affecting the obligation of the sureties on this bond and without requiring the further consent of said sureties.

It is further mutually agreed that this bond shall cover any work which may be extra to the said contract, as well as the work specifically provided for therein.

IN WITNESS WHEREOF, The Utah Construction Company has by its President and Secretary, thereunto duly authorized, signed its corporate name and affixed its corporate seal, and said sureties have signed their names the day and year first above written.

THE UTAH CONSTRUCTION COMPANY

by _____
President.

by _____
Secretary.

Western Pacific Railway Company

CONTRACT-H

The Utah Construction Co.



Construction of line from Hot Springs
to Winnemucca.

Dated April 2, 1907
