CITY OF NEWBERG
CITY RECORDER INDEX NO. 1084

CITY OF NEWBERG, OREGON

WATER SUPPLY SYSTEM IMPROVEMENTS

NOTICE TO CONTRACTORS

INSTRUCTIONS TO BIDDERS

ESTIMATE OF QUANTITIES

PROPOSAL

CONTRACT

GENERAL CONDITIONS

CONSTRUCTION SPECIFICATIONS

John W. Cunningham & Associates

Consulting Engineers

Portland, Oregon

499 - C.E.G.

March 1949

P.S. Lord
Ord. # 1058
4/25/1949

NOTICE TO CONTRACTORS

Sealed proposals addressed to the City of Newberg, Oregon, will be received at the office of the City Recorder until 2:00 P.M., April 25, _____, 1949, and thereafter will be publicly opened and read.

The proposed work consists of installing water pipe and appurtenances for the City. Materials for this work have been purchased by the City and are available for the work. The principal items upon which bids are invited are as follows:

1.	Installing 12" B&S Cast Iron Pipe	5,200 lin. ft.
2.	Installing C.I. Pipe Fittings	16,000 lbs.
3.	Installing 12" Steel Pipe	4,300 lin. ft.
4.	Installing 12" Gate Valves	10
5.	Installing 6" Gate Valves	13
6.	Installing 4" Gate Valves	6
7.	Installing Fire Hydrants	9
8.	Installing 1" Corporation Cocks	10
9.	Installing 3/4" Corporation Cocks	100
10.	Excavation and Backfill, Common	2,800 cu. yds.
11.	Restoring pavement	150 sq. yds.

Plans, Specifications, Instructions to Bidders, Proposal and Contract may be seen at the office of the Consulting Engineers, John W. Cunningham and Associates, 1112 Spalding Building, Portland 4, Oregon, or at the

City Hall, Newberg, Oregon. Copies may be obtained upon receipt of a deposit check in the amount of Twenty Dollars ($20.00) made payable to the City of Newberg. The deposit will be refunded in case a bonafide bid is submitted and the Plans and Specifications returned in good condition. If no bid is submitted and the plans and specifications returned in good condition, a refund of Five Dollars ($5.00) will be made.

All proposals must be on the regular blank forms furnished with the Specifications and must be accompanied by certified check payable to the City of Newberg in an amount equal to or exceeding five per cent (5%) of the total bid. A one hundred percent (100%) corporate surety performance bond will be required to guarantee the faithful performance of the contract. The right is reserved to postpone making the award for a reasonable length of time or to reject any or all bids, for good and sufficient reasons, and to accept the proposal deemed in the best interest of the City regardless of bid prices.

By Order of the Mayor & City Council

Newberg, Oregon

INSTRUCTIONS TO BIDDERS

1. Local Conditions & General Description of Improvements

Bidders are notified that they must carefully examine the plans, specifications, form of contract, proposal, etc. and thoroughly familiarize themselves with all phases of the proposed work and all laws affecting the improvement. They must also examine and judge for themselves as to the location and character of the proposed work, the materials to be encountered in excavation and performing the work required and the conditions under which the proposed improvements may be constructed.

The work is to be done partly within and partly outside of the city limits of Newberg.

The work encompassed in this improvement involves constructing a new steel supply line and the installation of new cast iron mains together with fittings, valves, fire hydrants, corporation cocks and other appurtenances within the City. Both steel and cast iron pipe to be used on the project has been purchased by the City and is to be installed by the Contractor. Gate valves, fire hydrants, valve boxes etc. are also to be furnished by the City and installed by the Contractor.

Insofar as information is available about existing water mains and other underground structures it is shown on the plans but neither the City nor the Engineers guarantee the accuracy or completeness of such information. The Contractor should plan to use a pipe locator in advance of excavation for the purpose of locating underground piping which he may encounter during the course of the work.

If there is any doubt or obscurity as to the meaning of any part of the Plans and Specifications, it shall be brought to the attention of the Engineers in order that necessary explanations or corrections may be made prior to submitting a bid.

2. Existing Pipe Lines

Some of the work contemplated in this improvement will parallel existing water works lines. Except where noted on the plans, such lines are to be abandoned after the new lines are placed in service. The Contractor shall take special care not to damage such lines in order that water service may be maintained during the construction period.

Connections to services along the route of the work shall be done by City employees, and the Contractor shall cooperate with such employees.

3. Estimate of Quantities

The estimate of quantities of work to be done under the Specifications is approximate only and is given only as a basis of calculation upon which the award of the contract shall be made. The City reserves the right to increase or dimish without restriction the amount of any class of work that may be deemed necessary, and bidders shall submit balanced bids in order that they may not be affected adversely by increase or decrease of quantities.

4. Bidders Pre-Qualifications

Bidders shall pre-qualify as required under Section 98-103, Oregon Code Laws Annotated.

5. Insurance

Bidders shall carry not less than $50,000 - $100,000 Liability and $25,000 Property Damage insurance in an agency or company satisfactory to the City.

6. Form of Proposal

All Proposals shall be made upon the form furnished by the City herewith, and anyone desiring to bid upon the work shall submit his bid by filling in each and every blank provided for that purpose.

Proposals shall be sealed and marked on the outside of the wrapper "Proposal For Water Works Improvements" and addressed to the City of Newberg, Oregon.

Each bid shall be accompanied by a certified check in the amount of not less than five per cent (5%) of the total amount bid, made payable to the City of Newberg. Such check shall be forfeited and become the property of the City if the Bidder fails or refuses to enter into a contract and furnish satisfactory bond within ten (10) days (Saturdays and Sundays excepted) after notification that his bid has been accepted. The checks accompanying the accepted bid or bids will be retained until the contract is signed and the bond of the successful bidder or bidders has been approved by the City. All other checks will be returned to bidders after the contract has been awarded.

7. Payments

Payments for the work contemplated in this improvement will be made from cash funds obtained from the sale of general obligation bonds of the City. Progress estimates for payment will be prepared at the end of each month and will be acted upon by the City Council at the first regular meeting thereafter. Checks will be promptly issued by the City for the amount of the monthly estimates, less fifteen per cent (15%) which will

be withheld and retained by the City until the work is tested and accepted by the Engineers and satisfactory evidence has been presented that all bills and claims which might become liens against the work have been paid and satisfied and all damage actions, if any, have been settled.

8. Basis of Award

The award will be made to the bidder who is found by the City to have submitted the most favorable proposal in light of unit prices, time of completion and responsibility and experience of the bidder.

The City reserves the right to waive irregularities not affecting substantial rights, to reject any or all proposals, or to accept the proposal deemed in the best interest of the City.

The work comprised by the Contract shall be completed and ready for use as soon as possible. Bidders shall state in the Proposal the time at which they will complete the work in all respects and should take into consideration possible unfavorable weather and any other probable or possible adverse conditions. Extensions of time will be allowed only under conditions for which the City is clearly responsible.

9. Clearing; Shrubs, Sod, etc.

The bidder will be expected to do whatever clearing may be required in certain sections of the work as circumstances may require. Should it be necessary to remove shrubs, trees or sod during the work, the Contractor shall restore the same to original condition satisfactory to the Engineer. No payment other than excavation and backfill will be made for work covered in this item.

ESTIMATE OF QUANTITIES FOR COMPARISON OF BIDS

The estimate of quantities given below for materials to be furnished and work to be done are approximate only and are given for use as a basis of calculation upon which the award of contract may be made. The City reserves the right to increase or decrease without limitation any of the materials or work herein listed, and the Bidders are advised to submit balanced bids in order that they may not be adversely affected by any such change in quantities. The Bidders are further advised that alternate bids are required for different types of jointing materials for cast iron pipe. The City will decide after the bid opening what type of joints will be used in the work.

ESTIMATE OF QUANTITIES

No.	Item	Quantity
1.	Install 12" Cast Iron Pipe	5200 lin. ft.
2.	Install 6" Cast Iron Pipe	110 lin. ft.
3.	Install B&S Cast Iron Fittings	16,000 pounds
4.	Install 12" Hub Gate Valves	10
5.	Install 6" Hub Gate Valves	13
6.	Install 4" Hub Gate Valves	6
7.	Install 3" Gate Valves	1
8.	Install Fire Hydrants	9
9.	Install 12" Steel Pipe	4300 lin. ft.
10.	Install 1" Corp. Cocks	10
11.	Install 3/4" Corp. Cocks	100
12.	Excavation, common	2800 cu. yds.
13.	Replace Pavement	130 sq. yds.
14.	Replace Oiled Surface	20 sq. yds.

No.	Item	Quantity
15.	Sand or Gravel for Pipe Bedding	100 cu. yds.
16.	Concrete Anchors	5 cu. yds.
17.	Deep Well Discharge Chamber	Lump Sum

PROPOSAL

Mayor and City Council
Newberg
Oregon

Gentlemen:

The undersigned bidder declares that he has examined all of the Plans and Specifications, has visited the site and made such investigations as are necessary to determine the character of the material and the conditions to be encountered, and that if this proposal be accepted, he will contract with the City of Newberg in a form of contract herein outlined, will provide the necessary equipment, materials, tools, apparatus and labor as specified, and under the requirements of the Engineers at the unit bid prices herein written.

The undersigned further agrees that the work shall be completed in all respects within 90 days from date of award of the contract, and that he will pay as liquidated damages to the City for any delay, the sum of Twenty Dollars ($20.00) per day required beyond that period.

BID ITEMS

1a. Installing 12" Class 150 B&S Cast Iron Pipe with Lead Joints, the sum of Eighty Eight Cents Dollars ($ 0.88) per lin. ft.

1b. Installing 12" Class 150 B&S Cast Iron Pipe with Cement Joints, the sum of Eighty Three Cents Dollars ($ 0.83) per lin. ft.

1c. Installing 12" Class 150 B&S Cast Iron Pipe with Silica Sulphur Joints, the sum of Eighty Three Cents Dollars ($ 0.83) per lin. ft.

2a. Installing 6" Class 150 B&S Cast Iron Pipe with Lead Joints, the sum of Seventy Five Cents Dollars ($ 0.75) per lin. ft.

2b. Installing 6" Class 150 B&S Cast Iron Pipe with Cement Joints, the sum of Seventy Five Cents Dollars ($ 0.75) per lin. ft.

2c. Installing 6" Class 150 B&S Cast Iron Pipe with Silica Sulphur Joints, the sum of Seventy Five Cents Dollars ($ 0.75) per lin. ft.

3a. Installing B&S Cast Iron Fittings with Lead Joints, the sum of Nine Cents Cents ($ 0.09) per lb.

3b. Installing B&S Cast Iron Fittings with Cement Joints, the sum of Nine Cents Cents ($ 0.09) per lb.

3c. Installing B&S Cast Iron Fittings with Silica Sulphur Joints, the sum of Nine Cents Cents ($ 0.09) per lbs

4a. Installing 12" Hub End Gate Valves with Lead Joints, and Valve Boxes, the sum of Twenty Eight Dollars ($ 28.00) each

4b. Installing 12" Hub End Gate Valves with Cement Joints and Valve Boxes, the sum of Twenty Eight Dollars ($ 28.00) each

4c. Installing 12" Hub End Gate Valves with Silica Sulphur Joints and Valve Boxes, the sum of _____

Twenty Eight Dollars ($ 28.00) each

5a. Installing 6" Hub End Gate Valves with Lead Joints and Valve Boxes, the sum of _____

Eighteen Dollars ($ 18.00) each

5b. Installing 6" Hub End Gate Valves with Cement Joints and Valve Boxes, the sum of _____

Eighteen Dollars ($ 18.00) each

5c. Installing 6" Hub End Gate Valves with Silica Sulphur Joints and Valve Boxes, the sum of _____

Eighteen Dollars ($ 18.00) each

6a. Installing 4" Hub End Gate Valves with Lead Joints and Valve Boxes, the sum of Fourteen _____

_____ Dollars ($ 14.00) each

6b. Installing 4" Hub End Gate Valves with Cement Joints and Valve Boxes, the sum of _____

Fourteen Dollars ($ 14.00) each

6c. Installing 4" Hub End Gate Valves with Silica Sulphur Joints and Valve Boxes, the sum of _____

Fourteen Dollars ($ 14.00) each

7. Installing 3" Gate Valves and Valve Boxes, the sum of _____
Twelve Dollars ($ 12.00) each

8. Installing Fire Hydrants, the sum of _____
Fifty Dollars ($ 50.00) each

9. Installing 12" Steel Pipe, the sum of _____
Thirty Eight Cents Dollars ($ 0.38) per lin. ft.

10. Installing 1" Corporation Cocks, the sum of _____
One & 50/100 Dollars ($ 1.50) each

11. Installing $\frac{3}{4}$" Corporation Cocks, the sum of _____
One & 25/100 Dollars ($ 1.25) each

12. Excavation and Backfill, Common, the sum of _____
One & 50/100 Dollars ($ 1.50) per cu. yd.

13. Restoring Hard Surface Pavement, the sum of _____
Five Dollars ($ 650.00) per sq. yd.

14. Restoring Light Oil Surface Pavement, the sum of _____
Two & 50/100 Dollars ($ 2.50) per sq. yd.

15. Furnishing and Placing Sand or Gravel for Pipe Bedding, the sum of _____

One Dollars ($ 1.00) per cu. yd.

16. Furnishing and Placing 4-Sack Concrete in "Kick Blocks" and "Anchors," the sum of _____

Twenty Five Dollars ($ 25.00) per cu. yd.

17. Furnishing All Concrete, Reinforcing Steel, Structural Steel, Drain, etc. and Constructing Complete Enclosure for Deep Well, Discharge Chamber and Installing Valves, Fittings and Couplings Furnished by the City, the lump sum of Nine Hundred Twenty Five Dollars ($ 925-00

Accompanying this proposal is a certified check on the U.S. National Bank Citizen Br of Portland in the sum of Nine Hundred Dollars ($ 900.00), according to the conditions of the advertisement and instruction to bidders.

If this Proposal shall be accepted by the City, and the undersigned shall fail to execute a satisfactory contract and bond, as stated in the Instructions to Bidders hereto attached, within ten (10) days (Sundays excepted) from the date of notification, then the City may, at its option, determine that the undersigned has abandoned the contract and thereupon this Proposal shall be null and void, and the certified check accompanying this Proposal shall be forfeited to and become the property of the City, otherwise the certified check accompanying this Proposal shall be returned to the undersigned.

The full name and residence of all parties and persons interested in the foregoing bid as principals are as follows:

NAME	RESIDENCE
P.S. Lord	4507 S.E. Milwaukie ave Portland Ore
G.A. Lord	
Richard A. Lord	
W.T. Lord	

The name and business address of the Surety Company which will furnish the required bond insuring the construction is General Casualty Company of America

The principal items of construction equipment which are available for and are intended to be used on the work are:

Trenching Machine
Link Belt Hoe
Bull dozer

The undersigned bidder has heretofore completed the following work of a similar nature to that contemplated:

JOB	LOCATION	DATE
Hillsboro water line	Hillsboro Ore	1946
West slope water dist.	Portland	1947
Medford water line	Medford Ore	1948
Merrill water line	Merrill Ore	1946

Submitted by:

Name of Bidder P. S. Lord Mechanical Contractors

Signature of Authorized Agent W. J. Lord

Title Partner

Business Address of Bidder 4507 S. E. Milwaukie ave Portland Ore.

Date April 25 1948

CONTRACT

FOR FURNISHING MATERIALS AND CONSTRUCTING

WATER WORKS IMPROVEMENTS

CITY OF NEWBERG, OREGON

THIS AGREEMENT, made and entered into this 27th day of April, 1949, by and between the City of Newberg, Oregon, a public corporation existing under the laws of the State of Oregon, by its Mayor and City Council, Party of the First Part, hereinafter called the "City" or "Owner" and P.S. Lord Mechanical Contractor of 4507 SE Milwaukie Ave Portland, Oregon, Party of the Second Part, hereinafter called the "Contractor,"

WITNESSETH:

That the Contractor, in consideration of the payments to be made and the premises to be performed by the City herein specified, hereby covenants and agrees to furnish all labor and materials for, and to execute, construct and finish in full compliance with the Plans and Specifications in a most substantial and workmanlike manner and to the satisfaction of the Engineers for the City, the work described in the specifications and shown on the Plans for the improvement which are listed as follows:

Plans

Sheet No.	Title	Plan No.
1.	Map, Water System Improvement Distribution Feeder Main	499-A-6
2.	" " " "	499-A-7
3.	Map & Details, Water System S. Willamette Well Supply Line	499-A-8

The work to be done and the class of materials to be furnished shall be in accordance with the proposal filed by the Contractor, dated April 25, 1949, and the Resolution accepting the same, passed by the Mayor and City Council on April 25, 1949.

The drawings listed above, together with copies of the Proposal under which the work is undertaken, are hereby made a part of this contract and are mutually cooperative therewith. Anything shown or called for in one plan and omitted in another is as binding as if called for or shown by both. Any work not herein specified which may be fairly implied as included in this improvement and for which subsequent construction drawings will be furnished if necessary, shall be done by the Contractor without extra pay.

Under the same date as this Contract, the Contractor is furnishing the City with a performance bond in an amount of one hundred (100) percent of the amount of the contract, with General Casualty Company of America, in the amount of Fourteen thousand nine hundred eighty two and 50/100 Dollars ($14,982.50).

Said bond shall be issued by a surety company satisfactory to the City and shall insure full compliance, execution and performance of this Contract by the Contractor in accordance with all its items and provisions, including provision for payment of materials, labor, contributions to the State Industrial Accident Commission, insurance, social security and workmen's compensation, hospital association dues, etc.

It is mutually understood that all portions of the Specifications are an integral part of this Contract and binding upon both parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused these presents to be duly executed.

CITY OF NEWBERG, OREGON

Party of the First Part

By Homer Hester
Dr. Hester, Mayor

Approved as to Form

Herbert Swift
Herbert Swift, City Attorney

Contractor, Party of the Second Part

Attest:

P. S. Lord Mechanical Contractors
By W. J. Lord (partner)

Thomas Beaty
Thomas Beaty, City Recorder

GENERAL CONDITIONS

1. City or Owner

Wherever the word "City" or "Owner" occurs in these specifications, the term shall signify the City of Newberg, Oregon or its duly authorized officers.

2. Engineer

Wherever the word "Engineer" occurs in these Specifications, the term shall signify the Engineer or firm of Engineers employed by the City for the purpose of having in charge and directing the design and construction work, said Engineer acting either directly or through an authorized assistant whose instructions and decisions shall be limited by the particular duties entrusted to him.

3. Contractor

Wherever the word "Contractor" occurs in these specifications, the term shall signify the party or parties contracting to perform the work contemplated under these Plans and Specifications, as party of the second part.

4. Arbitration

The Engineer shall decide all questions which may arise between the parties relative to the true intent and meaning of any of the provisions or stipulations contained in this agreement, or the amount of quantities, quality, character, and classification of the work performed by the Contractor under this contract and his decision in the nature of an award shall be final and binding upon both parties to this agreement.

5. Laying Out of Work

The Contractor shall give forty-eight (48) hours notice when he shall require the services of the Engineer for laying out any portion of the work under this improvement. He shall furnish a man to assist in giving lines and levels under the direction of the Engineer. He shall carefully preserve all stakes when set, together with all benchmarks or monuments existing along the lines of this Improvement. And in case any of them have to be replaced unnecessarily by the Engineer, the Contractor shall be charged the expense thereof, and the same may be deducted from his estimate.

6. Inspection

The Contractor shall not work on any part of this improvement without notifying the Engineer of his intention to do so. If an

Inspector is placed in charge of the work, it is understood that he is the representative of the Engineer and it shall be his duty to direct the construction of the work and the manner of carrying on the same, within the limits of these Specifications; also to inspect all materials used on the work and to accept or reject the same. No materials of any kind shall be used on any part of this improvement until they have been inspected and approved by the Engineer or Inspector. All rejected material of whatever kind shall be removed from the work by the Contractor immediately after its rejection, and shall not be used on this Improvement. Instructions given by the Inspector shall be respected and executed by the Contractor, but no Inspector shall have the power to waive the obligations resting upon the Contractor to furnish good materials or do good work, as herein prescribed. Any omission to condemn work at the time of its construction shall not be construed as an acceptance of any defective work, but the Contractor shall at any time prior to final acceptance, upon notice from the Engineer to do so, tear out, remove and properly reconstruct, at his own cost, any portion of the Improvement which may be found defective; and the Contractor will be held wholly responsible for the safety, proper construction and efficiency of the entire Improvement until the same has been finally accepted by the Owner.

7. Orders Given Contractor

The Contractor shall have an authorized representative on the ground and in charge of the work, and whenever the Contractor himself is not present, orders will be given to such representative, Superintendent or Foreman in immediate charge, and shall by them be received and obeyed. If any person employed on the work shall refuse or neglect to obey the instructions of the Engineer in any way relating to the work, or shall appear to the Engineer to be incompetent, unreliable, negligent, disorderly, or unfaithful, he shall, upon written request of the Engineer, be at once discharged and not again employed upon any part of the work.

8. Subcontractors

No part of the work to be performed shall be sublet or transferred without the written consent of the Engineer, and no such written consent shall release the Contractor from any obligation either to the Owner or to persons employed by the subcontractors, and in all cases, subcontractors will be considered merely as foreman employed by the Contractor and liable to be ordered discharged for incompetency, neglect of duty or misconduct.

9. Change in Plans

It is understood and agreed that the Owner shall have the right to make such changes in the amount, dimensions, or character of the work

to be done as may be deemed necessary, as, in the opinion of the Engineer, the interest of the work may require. If any such changes or alterations should diminish the quantity of the work to be done, they shall not constitute a claim for damages for anticipated profits on the work that may be so dispensed with. If the amount of work to be done is increased, payment shall be made according to the quantity actually done and at the price established for similar work under this contract.

10. Prosecution of Work

The work embraced in this Improvement shall be begun within _____ days after the date of this contract, and shall be prosecuted regularly and uninterruptedly thereafter (unless the Owner in writing especially directs otherwise) with such force as to secure its completion by _____, which date has been computed from the time limit fixed by the Contractor in his proposal and is specifically agreed upon as one of the considerations under which the award has been made.

If the Contractor shall fail to complete the work within the time specified, the Contractor shall reimburse the Owner for additional expense and damage incurred by reason of an extended time of engineering service due to such delay and the interest on the invested capital. Owing to the difficulty of definitely ascertaining this expense and damage, and the extreme need for the new facilities to provide reasonable water service and fire protection, it is hereby agreed that it shall be estimated at Twenty Dollars ($20.00) per day for each and every day such work remains uncompleted after the expiration of said time of completion.

It is understood and agreed that these amounts are not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the Contractor, and the Owner is authorized to deduct the amount of such damages from any money due the Contractor for work performed or material furnished under this Contract. It is provided, however, that should the Owner or its authorized agents cause a delay in the completion of the Contract, the Contractor will be allowed additional time for completion. The amount of such additional time shall be equal to the actual delay caused by the Owner or its authorized agents, as determined by the Engineer, whose decision shall be binding upon all parties.

11. Taking Over Work

If, in the opinion of the Engineer, the Contractor is using defective material or improperly performing the work, and shall neglect or refuse to take up or reconstruct such work at his own cost as shall have been rejected by the Engineer as defective, or in conflict with the plans and specifications, or unsuitable, then the Engineer may give written notice

that all work be stopped and any work performed after such notice is given shall not be accepted. After work has been ordered stopped, the Owner may, upon giving twenty-four (24) hours notice, or without giving notice if any emergency or danger to the work or public exists, take over the work or that portion which has been improperly executed and reconstruct it properly at the expense of the Contractor, and to deduct the cost thereof from the unpaid part of the contract price to be paid to the Contractor.

If it shall appear to the Engineer that the work done under this agreement has been abandoned or that the said work is unnecessarily delayed and will not be finished within the prescribed time, he shall so certify in writing to the Owner, and the Owner shall have the power to notify the Contractor to discontinue all work or any part thereof under this contract, and thereupon the Contractor shall discontinue said work and the Owner shall thereupon have the power, by contract or otherwise, as may be determined, to employ such persons, and to use such implements, tools, and materials as they may deem necessary to complete the work, and charge the expense of all labor and materials for such completion to the Contractor. And the expense so charged shall be deducted and paid by the Owner out of such money as may then be due or may afterwards become due to the said Contractor under and by virtue of the contract for this Improvement and in case such expense is less than the sum which would have been payable under said contract if the same had been fulfilled by the Contractor, then the Contractor shall be entitled to receive the difference and in case such expense is greater, the Contractor shall pay the Owner the amount of such excess so due, and his bond shall answer and be liable therefor.

12. Suspension of Work

The Owner reserves the right to suspend operations on the work or any parts thereof, temporarily. In the event of such temporary suspension the Owner shall give the Contractor five (5) days written notice thereof and the date of completion of the contract shall be extended for a period of time equal to said temporary suspension period, but the Contractor shall have no claim for damage or anticipated profits on said work from or by reason of said temporary suspension.

13. Rights of Way

The Owner shall provide the necessary rights of way for the work. The Contractor shall confine his operations to this right of way, and shall be liable for damages from trespassing outside of right of way limits.

14. Contractor's Risk

It is understood that the whole of the work to be performed under the contract for this Improvement is to be done at the Contractor's risk,

that he has familiarized himself with the conditions of material, existing water works facilities, weather and other conditions and contingencies likely to be encountered, and has bid accordingly and that he is to assume the responsibility and risk of all loss or damage to materials or work which may arise from any cause whatsoever prior to final completion.

15. Damage Claims

The Contractor agrees to indemnify and hold harmless the Owner from any and all claims for damages of every nature and description arising from or through the operation of the Contractor or those in his employ, including all subcontractors, including all claims for death or injury to persons, and for injury or damages to the property or right of any person, persons or corporations, either public or private, and including any fine or penalties that may result or to be imposed by any public authority as a result of the prosecution of the work under said contract, and the Contractor further agrees to accept the terms of the Workmens' Compensation Act of the State of Oregon, and to indemnify and save the Owner harmless from any claim of the State of other authority for fees, compensation or industrial insurance for workmen injured or killed in connection with the prosecution of the work called for by this contract.

In the event of the failure of the Contractor to secure a valid release of any and all such claims before the final acceptance of the work, then the Owner be and it is hereby empowered to settle or compromise such claims as best it can and charge the cost thereof to the Contractor as so paid on this Contract, provided, however, that if upon completion of the work called for by the Contract, any such claims are pending and unsettled, irrespective of whether they are in litigation or not, the Contractor shall be privileged to furnish the Owner surety bond covering the full amount of said claims, executed by a responsible surety company authorized to transact a general surety business in the State of Oregon, for the purpose of indemnifying the Owner from such claims, and thereupon the Owner shall release and pay to the Contractor all moneys withheld as a protection against such claims, but such bond shall not operate to release the Contractor from the primary obligation outlined in this section of the contract.

16. Fees & Royalties

All fees and royalties for any patented machine, device, article, or arrangement that may be used upon or be connected with the work or any part of the work comprehended by these Specifications shall be paid by the Contractor. The Contractor shall and must protect and hold harmless the Owner from any and all claims, demands, damages, cost disbursement, actions and proceedings arising or resulting from the use of any patented machine, device, article, or arrangement.

17. Contractor's Bills

The Contractor shall promptly pay all payrolls and all bills for materials, supplies, outfit, equipment, machinery, appliances and expenses incurred upon or on account of the work. Prior to final settlement, the Contractor shall furnish the Owner satisfactory evidence that all payrolls and bills are paid, and if required shall give access to books and records in substantiation of such payments. Before making said final or any other payment, the Owner may pay for and charge to the Contractor any unpaid bills or accounts and sums so paid shall be deducted from amounts earned by the Contractor on the work, the Owner shall recover such excess from the Contractor or his bondsmen.

18. Release

As a condition of final payment to the Contractor and payment of retained percentage, the Contractor shall execute and deliver to the Owner in substance and form as required by the Owner, a release and waiver of all claims against the Owner out of or connected with the contract.

19. Payments

In consideration of the faithful performance of all the covenants, stipulations and agreements in this contract to be kept and performed by said Contractor, the Owner herevy covenants and agrees to pay the Contractor in accordance with the Schedule of Prices in the "Proposal" submitted by the Contractor to the Owner and dated _____, which said Proposal is attached hereto and made a part hereof.

Payments for the work shall be made on monthly estimate of the Engineer, taken about the end of each calendar month and payable after authorization by the City Council at regular meetings. Fifteen per cent (15%) shall be retained by the Owner to insure the faithful completion of the work and payment of all claims. Within thirty (30) days after the work is fully completed and a certificate to this effect is given by the Engineer to the Owner and upon the execution of the release heretofore mentioned, the retained percentage shall be paid to the Contractor, unless the Contractor has failed to complete the contract within the time specified, or has been deficient or defaulted in the completion of full performance of this contract.

20. Revision of Estimates

No estimate made under this contract (except the final estimate mentioned in the previous section) shall be construed or considered as final or conclusive against the Owner in respect to the amount of work

done or material furnished, or compensation to be allowed therefor or payments made, but all such estimates made before the final payment shall be construed and considered only as being altogether approximate and provisional, and same shall be subject to revision and adjustment, readjustment and correction by the Engineer for the Owner, for errors or omissions as to the determination of the amount of work done or material furnished under this contract, or the amounts paid, or the amounts of work unfinished, or the amounts of material unfurnished, or as to any other matter or thing connected therewith, and the values thereof, respectively, as well as the amount of compensation therefor, having reference to the uncompleted part of said material as well as the work done and the material furnished.

Any omission to disapprove of work at the time of making any monthly estimate or other estimate shall not be construed as an acceptance of any defective work, material or equipment, and the contractor at his own cost, must remove and rebuild or make good any work, material or equipment which the Engineer may find defective in any way.

21. Extra Work

Any work necessary or incident to the carrying out of the work herein contracted, but which is clearly not indicated in the plans and specifications, nor covered by the intent and meaning of this agreement and which cannot be classified and paid for under the unit prices agreed to, but which may be advantageously furnished or performed by the Contractor, shall be designated as "extra work" and shall be paid for at actual cost of said work as determined by the Contractor's account of material and labor, if and as approved by the Engineer, plus fifteen per cent (15%) for the Contractor's supervision, use of tools and equipment, bond premiums, insurance and profit.

Extra work shall be performed or supplied by the Contractor only upon written order of the Engineer and all claims and demands for extra work must be made out in itemized and detailed bill form and furnished to the Engineer by the Contractor for settlement at least three days before the day upon which the monthly estimates are to be prepared by the Engineer.

22. Statutory Labor Clause

The Contractor agrees that he will comply with all Federal and State laws pertaining to the employment and compensation of labor.

23. Permits

The Contractor shall secure all Municipal, County and State permits incidental to or necessary in the actual performance of the work under this contract, and shall during its progress, comply with all laws, statutes and governmental regulations pertaining to or necessary to the carrying out of the work. The Owner shall, however, obtain rights of way for pipe lines. All highway crossings, restoration of pavements, blockading of roads and highways, erection and maintenance of barricades,

etc. shall be done by the Contractor in accordance with the requirements of the City of Newberg or the State Highway Commission whichever has jurisdiction. The Contractor shall also post any security or bonds required by the State Highway Commission for the construction of pipe lines across or along the right of ways of the foregoing.

24. Safety Requirements

The Contractor shall at all times conduct his work in such a manner as comply with all the requirements of the State Industrial Accident Commission and minimize the possibility of accident or injury to any of his workmen or the general public, and he shall so conduct his work, maintain his operations, and provide all reasonable safeguards so as to protect public and private property as well as to protect persons from injury.

CONSTRUCTION SPECIFICATIONS

1. General

The Maps, Plans and Specifications are presumably correct, but extreme accuracy is not guaranteed. Notes, figures, and writing on the Plans must be strictly followed, as they constitute a part of the Plans and Specifications. Should any error or ambiguity be discovered in the Plans or in the Specifications, the Contractor shall report the same to the Engineer before starting the work. In the event of a disagreement arising as to the true intent and meaning of the Plans and Specifications, the Engineer shall interpret the same and his interpretation shall be accepted by the Contractor as final.

The General Specifications which are included and referred to above are supplemental to the Material and Construction Specifications. They are to be followed as a general guide, representing good practice where not in conflict with the Material and Construction Specifications.

Bids will be considered for installing Class 150 bell and spigot cast iron pipe with cement, lead, or silica-sulphur compound joints. The type of joints to be used will be determined after bids are received and analyzed.

Dresser Couplings shall be used for jointing steel pipe together except at cast iron fittings and valves.

2. Pipe Jointing Materials, Cast Iron Pipe

Bids are requested for laying bell and spigot cast iron pipe with joints of lead, cement or silica-sulphur compounds. The material used and the methods employed shall conform to the requirements specificed under pipe laying.

3. Concrete

If concrete blocks are required by the Engineer, they shall be of concrete containing four (4) sacks of cement per cubic yard and the concrete shall have a slump of not over six inches. Materials used in concrete anchor blocks shall be clean and free from organic matter or any other deleterious substances.

Form boards shall be used to retain the concrete in place during pouring and until after the concrete has set for 24 hours, provided however, that with the permission of the Engineer one wall of the trench excavation may be used to retain the poured concrete in "kick blocks" or "anchor blocks."

4. Trench Excavation

Stakes will generally be set for position of alignment only and the Contractor will be expected to dig to proper depth and vertical curvature. The trench depth shall be such as to approximately permit a covering of 30" over the top of the pipe unless otherwise required by the Engineer. The width of trench shall be such as will permit the careful laying and jointing of the pipe. The Contractor will not be held to any width of trench so long as the trench is adequate for careful pipe laying.

If during trench excavation materials subject to sliding or caving are encountered, the Contractor may at his own expense excavate beyond the neat lines or provide shoring or other supports necessary to prevent caving of the trench wall. In all excavation work adequate provision shall be taken to prevent injury of workmen.

Payment for excavation and backfill in common material shall be made on a cubic yard basis, pay width of trench shall be twenty-four inches (24"). Pay quantities for excavation items outlined above shall be determined by measuring the depth to the bottom outside grade of pipe, disregarding bell holes. The cost of excavating under bells shall be absorbed in the price bid for excavation and backfill.

In areas in which shale, rock or other unsuitable foundation material is encountered in the trench sub-grade, the pipe shall be supported with a cushion of soil or sand as directed by the Engineer. If a soil or sand cushion is required, the excavation shall be carried not less than 2" and not more than 6" below normal sub-grade elevation and a soil or sand cushion shall be placed in the trench before pipe is lowered in place. If required by the Engineer, sand for pipe cushioning will be paid for in accordance with unit price bid. Payment for additional excavation required will also be made at the price bid. If soil or sand is available at the trench and used for pipe bedding, no additional payment will be made for it.

Excavated material shall be piled alongside the trench in such a manner that necessary traffic shall not be obstructed, shrubs and sod not damaged. The Contractor will be allowed to open only a reasonable amount of trench in advance of pipe laying, testing and backfilling. Crossings of main roads and highways shall be kept open to traffic and closures of secondary roads shall be only sufficient for excavation, pipe laying and backfilling, with ample equipment and force. All dangerous piles of excavated material shall be protected by barricades and lights must be kept burning at night. All provisions for safety, convenience of traffic and protection of property shall be at the Contractor's expense.

All underground piping, utilities, etc. encountered in trench excavation and pipe laying shall be left in or restored to original condition by the Contractor at his expense.

5. Classification of Materials

Excavated materials shall be classified as follows:

a. Solid rock

All rocks in ledges or masses that cannot be removed without blasting, or boulders containing more than 6 cu. ft. in volume shall be classified as solid rock.

b. Common

This classification shall include all other material not described as solid rock, including hardpan, slate, shale, clay, sand, gravel, loose rock, and soil.

6. Crossing and Paralleling Paved Highways

Pipe crossing under paved highways or pipe laid along paved roads shall be constructed in conformance with the plans and to all specifications and requirements of the State Highway Department and the City of Newberg, whichever has jurisdiction. Such work shall be done with the least interference and interruption to the movement of traffic possible. All pavement broken or damaged during the installation of pipe lines shall be restored to its original condition, satisfactory to the Highway Department having jurisdiction.

If after restoring paved surfaces settlement occurs within a period of eight months after completion of the work, the Contractor shall be responsible for its repair.

Payment for restoring pavement shall be made in accordance with the unit prices bid per square yard of surface for the particular type of surface to be replaced. The width for calculating payment for this item shall be thirty inches (30"). All other costs shall be included in the payment for excavation and backfill.

7. Gravel, Crushed Rock or Water Bound Macadam Roads

Gravel, crushed rock or water bound macadam roads may be cut for pipe crossings but the interruption of traffic shall be the minimum possible under the most efficient procedure. While the trench is open, plank bridges with guard fences and lights shall be provided. Surfacing material shall be piled separately from other excavated material and backfill shall be carefully tamped and placed around and over the pipe before the surfacing material is restored as the last course, with sufficient new material added to restore the crossing to its original condition. If surface material is not piled separately, the Contractor shall replace it with new material so as to restore the surface to its original condition. The cost of making such crossings shall be absorbed in the price bid for excavation and backfill.

In locations where it is necessary to excavate in or along gravel surfaced shoulders, the contractor shall restore the shoulders to their

Public Works Contract Bond
State of Oregon

GENERAL CASUALTY COMPANY OF AMERICA

SEATTLE, WASHINGTON

KNOW ALL MEN BY THESE PRESENTS, THAT WE, P. S. LORD MECHANICAL CONTRACTORS of Portland, Oregon (hereinafter called the Principal), as Principal, and the GENERAL CASUALTY COMPANY of AMERICA, a corporation organized and existing under and by virtue of the laws of the State of Washington, and duly authorized to transact a surety business in the State of Oregon (hereinafter called the Surety) as Surety, are held and firmly bound unto CITY OF NEWBERG, OREGON (hereinafter called the Obligee) in the sum of FOURTEEN THOUSAND NINE HUNDRED EIGHTY TWO AND 50/100- DOLLARS ($ 14,982.50) lawful money of the United States of America to be paid to said Obligee, we do bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas on the 27th day of April, 19 49, the Principal entered into a contract with the Obligee described as follows:

installation of water main

NOW, THEREFORE, if the principal herein shall faithfully and truly observe and comply with the terms of the contract and shall well and truly perform all matters and things undertaken to be performed under said contract upon the terms proposed therein and shall promptly make payments to all persons supplying labor or material for any prosecution of the work provided for in such contract and shall not permit any lien or claim to be filed or prosecution against the State on account of any labor or material furnished, and shall promptly pay all contributions or amounts due the State Industrial Accident Fund and all contributions or amounts due the State Unemployment Compensation Trust Fund incurred in the performance of said contract, and shall promptly, as due, make payment to the person, copartnership, association or corporation entitled thereto of the moneys and sums mentioned in Section 98.203 of the Oregon Compiled Laws Annotated, then this obligation is to be void, otherwise to remain in full force and effect.

The total amount of the surety's liability under this bond both to the Obligee and to the persons furnishing labor or materials, provisions and goods and to any other person or persons, shall in no event exceed the penalty hereof.

Provided, however, that the conditions of this obligation shall not apply to any money loaned or advanced to the principal or to any subcontractor or other person in the performance of any such work, whether specifically provided for in the contract or not.

This bond is executed for the purpose of complying with Chapters 1 and 2 of Title 98, Oregon Compiled Laws Annotated, the provisions of which are hereby incorporated herein and made a part hereof.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument this 27th day of April, 19 49.

WITNESS:

P. S. LORD MECHANICAL CONTRACTORS

By W. J. Lord (partner)
Principal

Countersigned:
DOOLY & CO.

By R. M. Dooly
R. M. Dooly - Partner
Resident Agent

GENERAL CASUALTY COMPANY OF AMERICA

By B. Spalding
B. Spalding
Attorney-in-Fact

S-544 7-46

CERTIFICATE OF INSURANCE

TO: **CITY OF NEWBERG, OREGON**

ADDRESS: **Newberg, Oregon**

This is to certify that we have placed with Lloyd's Underwriters through our London correspondents the following described policy of insurance:

Name of Assured: **P. S. LORD, MECHANICAL CONTRACTORS**

Certificate No.: **L 29830**
Policy No.: Effective: **7/1/48** Expiring: **7/1/49**

Coverage: **THIRD PARTY PROPERTY DAMAGE**

Limits: **$50,000.00 any one loss and in the aggregate.**

Subject to **TEN (10) DAYS'** Cancellation Clause.

RATHBONE, KING & SEELEY

By M B Waterbury Jr

DATED: **April 27, 1949**

In respects to installation of water main at Newberg, Oregon.

5M-6/1/47

CERTIFICATE OF INSURANCE

TO: **CITY OF NEWBERG, OREGON**

ADDRESS: **Newberg, Oregon**

This is to certify that we have placed with Lloyd's Underwriters through our London correspondents the following described policy of insurance:

Name of Assured: **P. S. LORD, MECHANICAL CONTRACTORS**

Certificate No.: **L 29830**
Policy No.: Effective: **7/1/48** Expiring: **7/1/49**

Coverage: **THIRD PARTY PROPERTY DAMAGE**

Limits: **$50,000.00 any one loss and in the aggregate.**

Subject to **TEN (10) DAYS'** Cancellation Clause.

RATHBONE, KING & SEELEY

By M B Waterbury Jr

DATED: **April 27, 1949**

In respects to installation of water main at Newberg, Oregon.

5M-6/1/47

CERTIFICATE OF INSURANCE

GENERAL CASUALTY COMPANY OF AMERICA
SEATTLE 5, WASHINGTON

HEREBY CERTIFIES that such insurance policies as are indicated hereunder have been issued and are in full force and effect on the effective date of this certificate.

Name of Insured P.S. LORD MECHANICAL CONTRACTORS

Mailing Address of Insured 4507 S.E. Milwaukie Ave., Portland, Oregon
(Street / City / State)

Policy Period: from October 28, 1948 to October 28, 1951

12:01 A. M., Standard Time, at the address of the insured shown above.

This certificate indicates insurance afforded only with respect to such and so many of the policies of insurance as are indicated by number herein, and to such and so many of the coverages under such policies as are indicated by the inclusion of limits of liability, amount of coverage or the word "Included."

This certificate is only a statement of the existence of the policy or policies of insurance herein referred to and does not change or affect the terms thereof.

TYPE OF INSURANCE	POLICY NUMBER	COVERAGE	LIMITS OF LIABILITY OR AMOUNT OF COVERAGE
Public Liability Other Than Auto or Elevator	BLP 46602	Bodily Injury	One Person 150,000.00 One Accident 300,000.00
		Property Damage	One Accident
Public Liability Auto		Bodily Injury	One Person 150,000.00 One Accident 300,000.00
		Property Damage	One Accident 5,000.00
Workmen's Compensation		Subject to the Terms of the Workmen's Compensation Laws of the State in Which Policy Affords Coverage	
			One Person One Accident Aggregate
			One Accident

Location of risk covered, or description of automobile or elevator covered, or description and location of operations or work covered:

Installation of a Water Main for the City of Newberg, Oregon

All operations of the Insured in accordance with the Policy terms and conditions.

Certificate issued to City of Newberg,
Address Newberg, Oregon

In the event of cancellation of said policy, the GENERAL CASUALTY COMPANY OF AMERICA will endeavor to notify the party to whom this certificate is issued, but the GENERAL CASUALTY COMPANY OF AMERICA shall not be liable in any way for failure to give such notice.

Dated at Portland, Oregon on April 27, 1949

GENERAL CASUALTY COMPANY OF AMERICA
LADD INSURANCE AGENCY
By C. A. Marshall

C70—R2—2-48 (Replaces C-384 and C-164)

CERTIFICATE OF INSURANCE

GENERAL CASUALTY COMPANY OF AMERICA

SEATTLE 5, WASHINGTON

HEREBY CERTIFIES that such insurance policies as are indicated hereunder have been issued and are in full force and effect on the effective date of this certificate.

Name of Insured P.S. LORD MECHANICAL CONTRACTORS

Mailing Address of Insured 4507 S.E. Milwaukie Ave., Portland, Oregon
(Street / City / State)

Policy Period: from October 28, 1948 to October 28, 1951

12:01 A. M., Standard Time, at the address of the insured shown above.

This certificate indicates insurance afforded only with respect to such and so many of the policies of insurance as are indicated by number herein, and to such and so many of the coverages under such policies as are indicated by the inclusion of limits of liability, amount of coverage or the word "Included."

This certificate is only a statement of the existence of the policy or policies of insurance herein referred to and does not change or affect the terms thereof.

TYPE OF INSURANCE	POLICY NUMBER	COVERAGE	LIMITS OF LIABILITY OR AMOUNT OF COVERAGE
Public Liability Other Than Auto or Elevator	BLP 46602	Bodily Injury	One Person 150,000.00 One Accident 300,000.00
		Property Damage	One Accident
Public Liability Auto		Bodily Injury	One Person 150,000.00 One Accident 300,000.00
		Property Damage	One Accident 5,000.00
Workmen's Compensation		Subject to the Terms of the Workmen's Compensation Laws of the State in Which Policy Affords Coverage	
			One Person One Accident Aggregate
			One Accident

Location of risk covered, or description of automobile or elevator covered, or description and location of operations or work covered:

Installation of a Water Main for the City of Newberg, Oregon

All operations of the Insured in accordance with the Policy terms and conditions.

Certificate issued to City of Newberg,
Address Newberg, Oregon

In the event of cancellation of said policy, the GENERAL CASUALTY COMPANY OF AMERICA will endeavor to notify the party to whom this certificate is issued, but the GENERAL CASUALTY COMPANY OF AMERICA shall not be liable in any way for failure to give such notice.

Dated at Portland, Oregon on April 27, 1949

GENERAL CASUALTY COMPANY OF AMERICA

LADD INSURANCE AGENCY

By D. Marshall

C70—R2—2-48 (Replaces C-384 and C-164)

original condition after completion of his pipe laying work. The contractor may either first remove top gravel or crushed rock before excavation and later restore it to place as described in the foregoing paragraph, or he may elect to excavate the entire material without segregation and replace the gravel or rushed rock with the same type of material hauled to the trench side and placed after backfilling.

No additional payment shall be made for restoring gravel, crushed rock or water bound macadam surfaces, but the cost thereof shall be included in the price bid for excavation and backfill. The contractor shall be responsible for the condition and repair of such surfaces for a period of eight months after completion of the work.

8. Laying Cast Iron Pipe

Pipe trenches shall be fine graded to give each length of pipe full support and allow equal deflection for successive lengths in either horizontal or vertical curves. If the bottom material in the trench is unsuitable for pipe support, a cushion of either earth or sand shall be provided as specified in Item 4. Pipe joints shall be adjusted so as to give a uniform space around the entire pipe prior to making of the joint. Bell holes shall be excavated of sufficient size to permit the making of proper joints.

Bell and spigot cast iron pipe joints shall be made by placing a gasket of clean rubber, hemp, yarn or oakum, placed evenly around the entire pipe. The remainder of the joint shall then be completed either with neat cement, lead, or silica-sulphur compound approved by the Engineer, and in accordance with the type of joints specified at the time of award of contract.

Joints shall be made only by skilled workmen having previous experience in this type of work. Cement joints shall be made with neat cement mixed very dry and thoroughly rammed in place. Lead joints shall be made of first quality material and carefully caulked. If silica-sulphur proprietary joint material such as Hydrotite, Leadite, Mineral-lead, etc. is used, the Contractor shall make such joints in accordance with the Engineer's requirements and in strict conformance with the recommendations of the manufacturer of the product used. Temperature control of the hot mix will be required.

Payment for laying cast iron pipe shall be based upon net, over-all length measured in the trench without deducting for fittings. The price of preparing beds and making joints to valves, fire hydrants, specials and fittings shall be covered by the price paid for valves, fire hydrants, specials and fittings in place.

9. Laying Steel Pipe

Steel pipe shall be laid in accordance with the same specifications and requirements as listed for cast iron pipe in so far as preparation of trench, bedding and deflection for horizontal and vertical curves is concerned. In addition, special precautions shall be taken not to damage

either the dip or wrap on the pipe at any time during handling, placing in trenches or in backfilling.

No steel pipe may be laid in the trench until checked and approved by the Inspector or Engineer. All scuffed or damaged areas on the pipe shall be repaired to a condition equivalent to the original before being lowered into the trench.

If steel pipe must be cut in order to connect up or in order to meet curvature requirements without excessive deflection in any joints, the Contractor will be required to cut the pipe with a cutting tool and not a torch. The wrapping shall then be stripped back only far enough for the placement of couplings and care shall be taken to insure that the ends of wrapping so cut are securely held in position by the application of proper coating material or other methods as approved by the Engineer.

After steel pipe is assembled in the trench and before any backfilling begins, the plain ends of the pipe not covered with wrap and the Dresser Couplings shall be given a thorough and complete coat of hot asphaltic material of the same type as used in coating the pipe during its fabrication. The Contractor shall be responsible for having the couplings and unwrapped areas thoroughly cleaned before the coating is applied.

The cost of coating pipe in the trench shall be included in the price bid for pipe laying. Pipe cutting shall also be included in this item.

10. Installing Cast Iron and Steel Fittings and Specials

Cast iron fittings shall be installed as shown on the plans or as may be required by the Engineer. All tees, elbows or other fittings or specials involving unbalanced pressures and all sharp curves in pipe lines shall be properly braced, anchored or blocked for stability, as required by the Engineer.In instances wherein blocking can be satisfactorily accomplished by timber traces, it shall be done at the expense of the Contractor. If concrete is required for blocking or bracing, it shall be paid for at the price bid by the Contractor. Concrete anchorages shall be placed only at the direction of the Engineer.

Steel specials shall be connected to steel pipe by Dresser or equal couplings. The pound price bid for installing cast iron fittings and steel fittings and specials shall include all costs of placing, connecting up and bracing as aforesaid. The prices bid shall include hauling from City shop.

11. Alignment

Pipe lines or runs intended to be straight shall be so laid. Deflections from a straight line or grade made necessary by vertical or horizontal curves or offsets shall not exceed in inches six divided by the diameter of pipe in inches for each lineal foot of pipe. If the specified or required

alignment required deflections in excess of those stipulated above, the Contractor shall install special bends as approved by the Engineer.

12. Cutting Cast Iron Pipe

Cutting of cast iron pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner, by a method which will give a smooth end and not damage the pipe.

13. Connections to Existing Mains

Connections to existing mains shall be made where shown on the plans. It is the intent that all such connections shall be made by standard fittings wherever possible, and specials in other instances. Except when certain conditions in the existing system require otherwise, the connections will be made with cast iron fittings together with necessary adapters, plugs, and connecting piping. No special payment will be made for connecting up other than the prices bid for installing pipe and fittings, excavation, etc.

The Contractor shall so conduct his operations that a minimum of interference or interruption of service within the City will take place, and the Contractor shall not shut off any of the distribution mains within the district or make any connections thereto without the approval of the Superintendent of the Water Department. All work done by the Contractor shall be conducted in such a way as to keep to an absolute minimum any interference with water service within the City.

14. Setting Gate Valves

The Contractor shall prepare the beds, install and joint up the valves, set valve boxes and otherwise place all gate valves in operating condition in accordance with the plans. Valves shall be set opposite property lines or as staked by the Engineer.

15. Fire Hydrants

Fire hydrants shall be installed where indicated on the plans. All hydrants shall be equipped with auxiliary gate valves and valve boxes and each hydrant shall be set in crushed rock or gravel and either adequately blocked or strapped to the supply main fitting.

In some locations tee fittings may be installed in the supply and distribution mains for the future addition of fire hydrants. All such tees shall be of cast iron, provided for a 6" connection and be plugged for the present.

16. Corporation Cocks

Corporation cocks will be required for all services along the route of cast iron mains in the distribution system. The Owner may elect to

furnish and install corporation cocks with its own employees, or the Contractor may be required to do so. Should the Contractor be instructed to install corporation cocks, he shall be paid according to the unit prices bid which will include drilling and tapping cast iron pipe and installing corporation cocks. The Contractor will not be expected to furnish, install or connect any service pipes or fittings.

17. Backfilling

Earth filled around and three inches (3") over the pipe shall be free from heavy gravel or stone and carefully packed and well rammed in layers with proper tools for the purpose. Special care shall be taken in ramming not to injure or displace the pipe or its dip or wrap and to give it a solid bearing throughout its entire length. The balance of earth fill above the pipe shall be sufficiently packed to prevent serious settlement and surplus material shall be neatly crowned up over the trench. Trenches within surfaced areas of roads or streets or gravel or crushed rock surfaced shoulders shall be sufficiently compacted to eliminate or keep to an absolute minimum settlement of backfilled trenches. Care shall be taken to obtain adequate and thorough compaction before pavement is restored. All roads and streets shall be cleaned up and left in as good a condition as before trenching was done.

Pipe shall be partially backfilled between joints as soon as laid, but joints and service connections shall be left uncovered until lines are tested and approved by the Engineer.

The Contractor may elect to completely backfill over steel pipe, but if so, it shall be his responsibility to locate and correct any leaks which may be found when the line is tested. Any excess excavated material from trenches over that which can be crowned up over the trench or which can be wasted or distributed along the route of the pipe line shall be disposed of as directed by the Engineer without any additional compensation to the Contractor.

Attention is called to the fact that the City has under contract street paving and construction, and storm sewer work, some of which is to be undertaken on streets along which some of the cast iron pipe is to be laid. It is the intent of the City that the Contractor on the water supply work install the cast iron mains in advance of the street paving work, and he should schedule his work accordingly. In those areas wherein new paving is to be placed, the Contractor shall be held strictly responsible for obtaining a thorough job of compacting backfill in order that no settlement of finished paving will occur later.

18. Well Connection

Included in the work is the installation of a concrete box enclosure at the point of connection to well discharge piping. The concrete therein

shall be Class "A" containing six sacks of cement per cubic yard. Reinforcing steel shall be accurately cut, bent and placed. Metal cover plates and supports shall be given one shop coat and two finish coats of metal protective paint of quality and color approved by the Engineer.

19. Private Property, Shrubs, Driveways, etc.

The Contractor shall take all reasonable care in protecting and leaving in original condition all shrubbery, mail boxes, driveways, etc. along the route of the improvement. If the work requires the installation of pipe under concrete driveways, the Contractor shall tunnel under such driveways. Private driveways paved with asphalt, "black top" or oil shall be restored to their original condition. The latter shall be paid for in accordance with the unit price bid for restoring oil pavement, but no extra compensation shall be paid for tunnelling under concrete driveways. Driveways having crushed rock or gravel surfacing shall be restored in kind as under the requirements for crossing and paralleling roads and highways.

20. Basis of Payment

Excavation and Backfill shall be paid in accordance with the price bid per cubic yard and calculated as set forth in item 4, page CS-2, using a width of 24".

Restoring Hard Surface Pavement shall be paid for at the price per square yard using a width of 30".

Restoring Light Oil Surface Pavement shall be paid for at the price bid per square yard using a width of 30".

Sand for Bedding Pipe shall be paid for in accordance with the bid price per cubic yard in place.

Concrete Anchors shall be paid for in accordance with the unit bid price per cubic yard for concrete in place.

Installing Steel Pipe shall be paid for in accordance with the price per lineal foot in place, including couplings.

Installing Steel Fittings and Specials shall be paid for in accordance with the unit price bid per pound in place.

Installing Cast Iron Pipe shall be paid for in accordance with the unit prices bid per lineal foot in place for the particular type of joints used.

Installing Cast Iron Bell and Spigot Fittings shall be paid for in accordance with the unit price bid for the particular type of joints used. Plugs will be included in this classification, as well as bushing adapters.

Installing Gate Valves shall be paid for as bid per valve in place including materials required in connecting up and installing valve boxes.

Installing Fire Hydrants shall be paid for at the unit price bid which shall include gravel under barrel, straps or blocking, and connection to 6" pipe. The price bid will be in addition to payments to be received for excavation and backfill, laying pipe, installing fittings and installing valves and valve boxes.

Installing Corporation Cocks shall be paid for in accordance with the unit prices bid.

Connections to Existing Mains. No extra payment shall be made for connections to existing mains.

Flushing, Disinfection and Testing of Pipe Lines. No extra payment shall be made for flushing, disinfection or testing of pipe lines, but the water required as well as the chlorine compounds necessary for treatment will be furnished by the Owner.

21. Pipe Testing

The work shall be planned and carried on in such a manner that the existing water supply system may be maintained in service with a minimum of interruption and so as to permit placing mains in service, section by section after testing. After a section of pipe has been laid and is ready to be tested, and before backfilling has been placed over the joints and service connections, the Contractor shall notify the Engineer that he is ready to test pipe. Water shall be admitted only as ordered and under the personal supervision of the Engineer or Water Superintendent. In case of any leakage in pipe or joints, necessary replacements and repairs must be undertaken and backfill shall not be placed until approved by the Engineer. Upon completion of the work, a final test will be made under a pressure of not less than 150 lbs. per sq. inch, and the Contractor shall be required to correct any defects which may develop. The manipulation of all gate valves of the existing water system and that portion of the new system in service as the work progresses shall be done only by or under the direction of the Water Superintendent.

22. Disinfection of Pipe Lines

After installation of new pipe lines, they shall be flushed and disinfected with chlorine or chlorine compounds in accordance with the requirements of the State Board of Health. The water and chlorine compounds required for this purpose will be furnished by the Owner. This procedure may be incorporated with tests for leakage but shall be done in accordance with the instructions of the Engineer.

23. Cleaning Up

Before the work is finally accepted the Contractor shall at his own expense clean up and remove from streets and private or public property all lumber, rubbish, debris, surplus material and equipment. Settled backfill in trenches shall be regraded and patches of macadam or other pavement shall be restored to first class condition. All streets and roads shall be restored to a condition comparable to that which existed prior to the beginning of the work. The Contractor will be responsible for the condition of the surface for a period of eight months following completion of the work.

GENERAL SPECIFICATIONS FOR CONCRETE CONSTRUCTION

1. General

These general specifications for concrete construction shall apply to all materials used in plain and reinforced concrete. Additional specifications elsewhere in the specifications and as indicated on the drawings shall apply.

The proportioning, mixing, placing and finishing of concrete shall be done under the direction of the Engineer and in conformance with the best practice required to secure the objectives of strength, density, watertightness and good surface appearance.

2. Cement

All cement shall be of a brand approved by the Engineer and must conform to the Standard Specifications for Type I Portland Cement of the American Society for Testing Materials, Serial Designation C-150-44 and subsequent revision thereof. The cement shall be delivered in sacks marked with the brand. A sack of cement shall contain not less than ninety-four (94) pounds of cement, net, and shall be deemed equivalent to one (1) cubic foot in volume.

3. High Early Strength Portland Strength

High early strength cement shall be used only where expressly called for in the specifications or approved by the Engineer, and shall conform to the Standard Specifications for Portland Cement (Type III) of the American Society for Testing Materials (C-150-14) and revisions thereof.

4. Admixtures

Admixtures shall be used only by special written permission of the Engineer and for particular locations. They shall be considered only as a means of improving the workability of the concrete and facilitating its placement, and in no case shall be a reason for reducing the cement content below the amount specified.

5. Water

Water for concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

6. Fine Aggregate

The fine aggregate shall consist of sand, or other approved inert materials with similar characteristics, or a combination thereof, having clean, hard, strong, durable, uncoated grains and free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam, or other deleterious substances.

The fine aggregate shall conform to the pertinent sections in the Standard Specifications for Concrete Aggregates of the American Society for Testing Materials (C 55-44) and revisions thereof.

7. Coarse Aggregate

The coarse aggregate shall consist of crushed stone, gravel, or other approved inert materials with similar characteristics or combinations thereof, having clean, hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter.

If bank gravel is used, it shall be washed. The maximum size shall be as designated in the detailed specifications, and for general concrete work in the absence of any indication on the plans and specifications shall be a size which will pass a 1½ inch square opening. Coarse aggregates shall conform to the pertinent sections in the Standard Specifications for Concrete Aggregates of the American Society for Testing Materials (C 33-44) and revisions thereof.

8. Reinforcing Steel

Steel for concrete reinforcement shall be intermediate grade deformed (not twisted) bars, conforming to the Standard Specifications for Billet Steel Bars for Concrete Reinforcement of the American Society for Testing Materials (A-15-39) and revisions thereof. Bars shall be new stock, free from dirt, excessive scale, rust, paint, oil, or other foreign substances.

9. Wire Fabric

Steel wire fabric or mesh used for reinforcement shall conform to the Standard Specifications for Welded Steel Wire Fabric of the American Society for Testing Materials (A-185-37) and to the Standard Specifications for Cold Drawn Steel Wire (A 82-34). Any make or style of mesh conforming to the specifications and giving equal or greater sectional areas may be substituted for the one indicated on the plans.

10. Form Lumber

Form lumber shall be straight, well manufactured shiplap or boards, surfaced on one side and two edges and free from loose knots, cracks or roughness which will show on the surface of the finished concrete. Lumber which is cupped or twisted shall not be used. Form lumber may be re-used providing that it has been thoroughly cleaned and is the equivalent in usefulness of new lumber. Framing defects that will reduce the strength for the purpose intended. Studs shall be surfaced one edge. Where the forms may stand for some time before use, the lumber shall be sufficiently dry to avoid shrinkage or warping after erection.

11. Forms for Special Finish

For exposed surfaces requiring a special finish the Engineer may specify the use of matched lumber or form lining. Matched lumber shall be straight,

well manufactured flooring, grade "C" under the rules of the West Coast Lumbermen's Association, free from warping or cupping. As a substitute the Contractor may use full thickness Concrete Form Plywood conforming to the specifications for the Douglas Fir Plywood Association, or may use ¼ inch plywood as lining inside of board forms. Plywood shall be true and free from defects on the side next to the concrete and shall be used in as large sheets as are practical. Lining material may be re-used, providing that it is in good condition and thoroughly cleaned. Joints in plywood forms shall be filled with cold water putty, plastic wood or other approved material.

12. Form Construction

Forms shall conform to the shape, lines, grades and dimensions of the concrete as called for on the drawings. Joints shall be horizontal or vertical, and adjacent surfaces shall be in substantially true planes to permit the concrete to be finished with a minimum of grinding. Forms shall be substantially tight to prevent leakage of mortar and formation of fins.

Forms shall be adequately supported by studding and waling to carry the maximum concrete pressures and shall be braced against distortion from any cause during or after the placing of concrete. Form ties shall generally be bolts or rods with spacers, so arranged that when the forms are removed no metal will be within one inch of any surface. Wire ties shall be used only for buried or unimportant walls. Floor slabs and horizontal members shall be adequately supported, allowing not only sufficient strength but also rigidity to prevent deflection when the forms are loaded, and where necessary the forms shall be cambered so that the finished members shall conform accurately to the desired line and grade. If adequate foundation for shores cannot be secured, trussed supports shall be provided. Shores supporting successive stories or pours shall be placed directly over those below, or so designed and placed that the load will be transmitted directly to them. Unless otherwise specified, outside or inside corners which are for convenience shown square on the drawings shall be chamfered by the use of suitable moldings or bevels placed in the angles of forms. The tops of exposed walls shall generally be finished to a molding inside the forms which shall be accurately leveled and lined.

Temporary openings shall be provided at the base of columns and wall forms, and otherwise where necessary to facilitate cleaning and inspection immediately before depositing concrete, and other temporary openings shall be placed where necessary for spading or vibrating. The inside of forms shall be coated with an approved non-staining mineral oil or other material, or wooden forms not to be re-used shall be thoroughly wetted. Where oil is used, it shall be applied before the reinforcement is placed.

Removal of forms shall be subject to the approval of the Engineer, and shall not be started until the concrete has attained the necessary strength to support its own weight and any construction live loads.

13. Bending and Placing Reinforcement

Metal reinforcement, before being positioned, shall be thoroughly cleaned of mill and rust scale and of coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing concrete, reinforcement shall be reinspected, and,

when necessary, cleaned. Reinforcement shall be carefully formed to the dimensions indicated on the plans. Bends in bars shall be made around pins having diameters not less than the following:

For stirrups and tie bars	2 bar diameters
Bars 1" or less	6 " "
Bars exceeding 1"	8 " "

Metal reinforcement shall not be straightened or rebent in a manner which will injure the metal, and bars with kinks or bends not called for on the drawings shall not be used. All bars shall be bent cold except in special cases where the entire operation of heating and bending is specifically approved by the Engineer.

Metal reinforcement shall be accurately positioned, and secured against displacement by using annealed iron wire of not less than No. 18 gauge, or suitable clips at intersections, and shall be supported by concrete or metal chairs or spacers, or metal hangers. The minimum clear center to center distance between parallel bars shall be 2½ times the diameter of round or 3 times the side dimensions of square bars, but in no case shall the clear spacing between the bars be less than 1½ times the maximum size of the coarse aggregate, nor less than 1 inch in beams and girders, nor less than 1½ inches in columns. Bars parallel to the exterior face of any member not exposed to water or weather shall be embedded at least one bar diameter for round bars or diagonal dimension for square bars, but in no case less than 3/4 inch from the exterior surface. In walls exposed to water pressure, the imbedment shall be not less than 1½ inches and in footings in contact with the ground not less than 3 inches.

When it is necessary to splice reinforcement at points not shown on the drawings, the bars shall be lapped not less than 40 diameters for round bars or 40 times the side dimension for square bars, and the use of splices shall at all times be subject to the approval of the Engineer. Splices shall not be made at points of maximum stress, except in the case of hoops, and splices in adjacent bars shall be well staggered.

14. Storage of Materials

Cement shall be delivered on the work a sufficient length of time in advance of use to permit sampling and testing. It shall be stored in a dry shed or on a platform elevated above the ground and covered with a tent or canvas in such a manner that the canvas does not come in contact with the sacks. Cement must come up to the specification requirements at the time of use, and shall not be released from storage without the express permission of the Engineer. Sacks shall be tiered up in such a manner as to facilitate counting and shall be hauled away only with the knowledge and approval of the Engineer.

Fine and coarse aggregate shall be kept in separate piles and in such a manner as to avoid the inclusion of dirt or foreign materials. Frozen aggregate shall be thawed by the use of steam and aggregate containing lumps shall be broken up before using.

15. Proportioning Concrete

The classification of concrete used in different parts of the work shall be indicated on the plans or covered by the detailed specifications for construction. It shall be based upon two factors, namely;

1. The minimum number of 94 pound sacks of cement per cubic yard of finished concrete, which number shall be the Class designation.

2. The maximum size of coarse aggregate, referring to round opening test screens.

Subject to these fixed factors, the proportions of fine and coarse aggregates and the water content shall be subject to the control and approval of the Engineer, with the objectives of securing the maximum strength, density, and watertightness reasonably practicable for the location and conditions of placement. The fact that concrete has more than adequate strength for the design requirements shall not be a reason for increasing the water cement ratio, and if the Contractor desires added workability to suit the particular equipment and methods of placement that he uses, this shall be attained by increasing the cement content at the Contractor's expense.

For small jobs, requiring less than 100 cubic yards at a given plant set up, the fixed proportions of aggregates may be controlled by volumetric measurements, and a measuring box of exactly one cubic foot volume shall be provided for checking the contents of wheelbarrows or buggies. For larger jobs, materials shall be measured by weighing, using approved apparatus specially designed and constructed for the purpose. The mixing water shall in all cases be measured by volume or by weight. The tolerance of uniformity in aggregate weights shall be plus or minus 1% from the desired amount and the tolerance of accuracy for water measurement shall be plus or minus ½%.

The Contractor shall allow the Engineer all necessary facilities and cooperation in sampling materials and concrete. The testing of these samples for quality, strength, and consistency shall be done at the expense of the City.

16. Consistence of Concrete

The consistency of concrete to be used in different sections of the work shall be determined by the Engineer and shall in all cases have the lowest water-cement ratio which can reasonably be placed, using the best available equipment together with mechanical vibration as hereinafter specified. As a guide in the field, standard slump cones shall be provided and used by the Contractor, and generally the following slumps will be required.

	Slump in inches	
	Maximum	Minimum
Reinforced foundation walls and footings	3½	2
Plain footings and substructure walls	3	1
Slabs, beams and reinforced walls	4	2
Building columns	4	2
Pavements	2	1½
Heavy mass construction	2	1

17. Mixing Concrete

Unless otherwise specifically authorized by the Engineer, the mixing of concrete shall be done in a batch mixer of approved type which will insure a uniform distribution of the material through the mass. Hand mixing shall be permitted only for very small and isolated structures and under approved methods. The equipment at the mixing plant shall be so constructed that all materials entering the drum, including the water, can be accurately proportioned within the tolerances heretofore provided. The entire batch shall be discharged before recharging and the mixer shall be cleaned at frequent intervals during use. The volume of the mixed material per batch shall not exceed the manufacturer's rated capacity. The mixing period shall be not less than one and one-half (1½) minutes for mixers having a rated capacity of 1 cubic yard or less and two (2) minutes for larger mixers, the mixing periods being measured from the time when all solid materials are in the mixer drum, providing that all of the water shall be added before one-fourth of the mixing time has elapsed. The retempering of concrete or mortar which has partially set, that is remixing with or without additional cement, aggregate or water, will not be permitted.

18. Truck Mixing

Truck mixers may be used in connection with batching plants which will insure proportioning of materials within the tolerances stated above. Truck mixers shall be provided with a tank for carrying mixing water, and only the prescribed amount of water shall be placed in the tank. Mixers shall be of the revolving drum type, watertight, and so constructed that the concrete can be mixed to insure a uniform distribution of materials throughout the mass. The maximum batch shall not exceed manufacturer's rating. The Engineer may require that truck mixers be provided with a timing device. Mixing shall continue for not less than fifty revolutions at a speed of not less than 4 r.p.m. after all ingredients, including the water, are added. Mixing shall begin within 30 minutes after the cement has been added to the batch, and the batch shall be discharged within 1½ hours after the cement has been added to the batch. With special cements or under high temperatures these periods may be reduced in the discretion of the Engineer.

19. Hauling Ready Mixed Concrete

Concrete may be hauled from a central mixing plant only for distances and under conditions which will insure that there be no segregation of materials, and strictly subject to the approval of the Engineer. The use of a truck mixer or a truck equipped with agitating blades may be required. The volume of mixed concrete transported in an agitator shall be in accordance with the manufacturer's rating. Concrete shall be discharged from an agitator or other transportation device within 1½ hours after the cement has been added to aggregates at the batching point.

20. Placing Concrete

Under these specifications concrete shall be placed only in the dry. Under-water work requiring special methods shall be covered by detailed specifications therefor. Any water flowing into the excavation shall be diverted to a sump or removed by other approved methods which will prevent it from

coming in contact with the freshly deposited concrete.

Before beginning the placement of any run of concrete, surfaces of contact at construction joints shall be cleaned and prepared, as hereinafter specified. Forms shall be cleaned and wetted or oiled. All debris shall be removed from the space to be occupied by the concrete. Placement and tying of reinforcement shall be finally checked. Mixing and conveying equipment shall be cleaned. Concreting shall begin only after all conditions have been inspected and final approval given by the Engineer.

Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which prevent the separation or loss of the ingredients. It shall be deposited in the forms as nearly as practicable in its final position to avoid rehandling. It shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. Forms for walls or other thin sections of considerable height shall be provided with openings, or other devices, that will permit the concrete to be placed in a manner that will avoid segregation of accumulations of hardened concrete on the forms or metal reinforcement. Under no circumstances shall concrete that has partly hardened be deposited in the work.

For ordinary structures, the preferred method of placing concrete shall be by the use of buggies or other approved containers or bottom dump buckets. Chuting shall be done only after the plant set-up has received specific approval of the Engineer, and with equipment of such size and design as will insure a continuous flow in the chute. Chutes shall be metal or metal lined, with a uniform slope of not less than one vertical to two horizontal. The discharge end of the chute shall be provided with a baffle plate, and if the height of the discharge end above the surface of the concrete is more than 5 times the thickness of the layer being deposited, a spout or trunk shall be used and the lower end shall be kept close to the surface. When the operation is intermittent, the chute shall discharge into a hopper. It is the intent of these specifications that no segregation of concrete shall take place between the mixing plant and the point of final placement in the forms, and the methods of handling shall be strictly under control of the Engineer

21. Special Methods of Placing

Concrete may be placed by pumping with equipment which is suitable in construction and adequate in capacity for the work. An agitating hopper shall be provided immediately ahead of the pump. The operation shall be such that a continuous flow of concrete without air pockets is produced. The length of discharge line shall be limited to 1000 feet with a minimum number of bends. Special pipe with detachable couplings shall be used. All precautions shall be taken to avoid segregation at the point of discharge, and an air booster at the end of the line shall be used only with great care and subject to the approval of the Engineer. When pumping is completed, the concrete remaining in the line shall be ejected by methods which will avoid addition of water to the concrete or separation of its ingredients. After this operation and before re-use, the entire equipment shall be thoroughly cleaned.

Pneumatic methods of placing shall be used only for tunnel lining, and with equipment backed by adequate experience and suitable in kind and capacity for the work. The gun shall be located as close as practicable to the place

of deposit, and the methods of placement shall be such as will avoid segregation of the concrete.

22. Concreting in Cold Weather

Concrete when deposited shall have a temperature of not less than 50 degrees nor more than 120 degrees F. When the air temperature is below 40 degrees at any time during the day or night, concreting shall be carried on only under special precautions which shall meet the approval of the engineer, and the concrete in place shall receive special protection. For moderate cold weather conditions, the mixing water shall be heated, but not to a higher temperature than 140 degrees F. When necessary the aggregates shall also be heated by the use of steam. Forms shall be free from frost or ice, and after the concrete is placed it shall be protected on all exposed sides by the use of straw, sawdust, tarpaulins or other means, and heat shall be provided if necessary during the entire curing period, as hereinafter specified. Salts, chemical, or other foreign materials shall not be mixed with the concrete for the purpose of preventing freezing.

23. Compacting Concrete

As concrete is placed, it shall be thoroughly compacted to secure a dense structure without voids, close bond with reinforcement, and smooth exposed surfaces. Generally this shall be accomplished by the use of mechanical vibrators, of the internal or external type, or both. The use of hand tools for spading or rodding the concrete shall be permitted only in locations where the use of mechanical equipment may prove impractical. Methods, and the extent of compaction shall be subject to the control of the Engineer. Any tendency to accumulate water or fines at the surface shall be offset by adjustment in the mix.

24. Construction Joints

Concrete shall be generally deposited continuously, or in layers of such thickness that no concrete which has hardened sufficiently to prevent bond or create planes of weakness shall come in contact with fresh concrete. Where a section cannot be placed continuously, or where construction joints may be necessary or desirable to provide for shrinkage, such joints shall be located as provided in the drawings or approved by the Engineer to create the minimum weakening of the finished structure.

Joints in columns shall be made at the underside of floor members and at floor levels. Haunches and column capitals shall be considered as part of and continuous with the floor or roof. At least two (2) hours must elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs. Construction joints in floors shall be located near the middle of span of slabs, beams or girders, unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. Adequate provisions shall be made for shear by use of inclined reinforcement.

Where construction joints do not serve as expansion joints, means shall be adopted to insure bonding of the new concrete to the old. The surface of the hardened concrete shall be roughened to expose the solidly imbedded particles of aggregate. Loose or damaged concrete, foreign matter, and laitance shall be removed, and the surface thoroughly washed. Forms shall be tightened, and to insure an excess of mortar at the juncture of the old and new concrete, the cleaned surfaces, including vertical and inclined surfaces, shall be coated with a layer of mortar or neat cement grout against which the new concrete shall be placed before it has attained its initial set. Where additional strength or resistance to shear is required at construction joints, it shall be provided through the use of concrete keys or additional dowel bars.

25. Watertight Structures

Where walls or floors are required to be watertight, special care shall be used in the location and workmanship of construction joints. Generally a keyway will be required to increase the length of the leakage path, and a continuous metal plate or water stop will be placed in the middle of the keyway. Joints not shown on the plans and placed to suit the operations of the Contractor shall be in every way equal to those definitely shown, and it shall be the responsibility of the Contractor to secure complete watertightness in the finished structure. Otherwise methods used shall correspond to those specified for other construction joints.

26. Removal of Forms

Forms shall not be removed until the concrete has attained a strength fully adequate to support itself and carry any superimposed loads, and also to permit the removal of forms without breaking corners or defacing the surface. Subject to these limitations the forms for exposed surfaces shall be removed as early as possible, to permit repair of defects and surface grinding while the concrete is still green. The time for form removal shall be subject to the approval of the Engineer, and shall take into account the location and character of the concrete, weather and curing conditions. As a general guide, representing favorable conditions, the forms for heavy walls and other sections carrying no appreciable stress may be removed in 24 hours, ordinary wall forms in 48 hours, column forms and sections carrying light loadings in 3 days, and supports for slabs, beams, etc. in from 4 days upward.

27. Curing Concrete

All concrete shall be so protected that there will be no loss of moisture from the surface for at least 7 days after placing. (Three days for high early strength cement.) On vertical and bottom faces the forms shall be kept wet, and if removed the exposed concrete faces shall be kept moist by frequent spraying with water. The upper surfaces of slabs or floors shall be protected from evaporation by the use of burlap or other absorbent material which shall be kept wet by spraying, or by the use of waterproof paper. The surfaces of walls shall be cured in the same manner as floors. Sealing compounds may be used if

they do not discolor the concrete, and if the compound and its application are approved by the Engineer. The use of calcium chloride or other salts will not be permitted.

28 Surface Finish

Concrete that is to have a showing face, even though no particular finish is called for, shall be mixed, placed and compacted in a manner that will insure a uniform distribution of aggregates, freedom from void spaces, and a uniform texture. Existence of rock pockets, air or water bubbles shall be evidence of improper mix or handling and shall be corrected. After the forms are removed, all defects shall be repaired at once. The same cement shall be used as in the original work, and color shall be added if necessary to match the wall. Holes left by tie rods shall be hammer packed with stiff, dry mortar, and the surfaces shall be leveled and floated. Rock pockets shall be similarly filled and finished. Honeycombed areas shall be cut out to a depth at which sound concrete is exposed and filled with concrete matching that of the structure. Offsets, fins and irregularities due to defective forms shall be filled and ground off to a reasonably true surface in keeping with the location in the structure and subject to the approval of the Engineer.

Exterior and interior walls and surfaces of structures, where matched flooring or plywood forms are called for, shall have a true alignment, free from streaks or discoloration and uniform finish with no form marks of any sort. This result shall be secured by special care in the construction of forms and placing the concrete. Only a minimum of pointing up will be permitted, and there shall be no plastering. Irregularities shall be removed by mechanical grinding or by hand rubbing with a carborundum brick.

Top surfaces of walls, etc. not subject to wear shall be struck off evenly to screeds which have been set with a level. Generally a bevelled moulding shall be used to finish top corners in preference to a curbing edger. Excess water shall be drained off and the surface finished with a wood float.

Floors and other wearing surface shall be finished as one course work to accurately set screeds or templates. The concrete proportions and consistency and the methods of compaction shall be such that only sufficient mortar is available for finishing and there is no excess water. During the preliminary finishing operation the surface shall be worked only as necessary to insure a layer of mortar at the surface. While the concrete is still soft, the surface shall be checked with a straight edge or template, and inaccuracies corrected. The final trowelling shall be delayed generally until the surface can no longer be dented with the finger. Floors of substantial area shall be finished by the use of a rotary finishing machine. Smaller areas shall be given a steel trowel finish by experienced cement finishers, to give a dense, hard surface meeting the approval of the Engineer. Joints and edges shall be finished with proper tools and surplus mortar cleared away. The finished surface shall be immediately covered and protected from sun and rain, and shall be cured under moist conditions as hereinafore provided.