STANDARD SPECIFICATIONS

FOR

MUNICIPAL PUBLIC WORKS CONSTRUCTION

Prepared By

WASHINGTON STATE CHAPTER
AMERICAN PUBLIC WORKS ASSOCIATION

1963

№ 1839

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FOREWORD

This, the first edition of STANDARD SPECIFICATIONS FOR MUNICIPAL PUBLIC WORKS CONSTRUCTION, was conceived and prepared by the Washington State Chapter of the American Public Works Association.

The exacting task was accomplished through the organization of the Construction Standardization Committee of the Chapter, consisting of a cooperative body of experienced engineers, consultants, contractors and materals suppliers having as a common goal the standardization of designs and specifications for uniformity of municipal construction in the State of Washington.

Ten separate subcommittees, including in their memberships more than fifty members, were actively engaged for many months in developing the preliminary specification drafts of the various sections and standard design plans. These drafts and standard plans were circulated throughout the State to more than one hundred and fifty city engineers and members of the Chapter prior to the final approval and adoption for inclusion in this publication.

This initial edition of specifications is dedicated to the ideal of obtaining better workmanship and a more effective use of the tax dollar through state-wide uniformity of municipal construction practices. The text and standard plans reflect the consensus of the best municipal construction practices throughout the State as developed by the many participants who actively developed this initial publication.

As an original production, it is certain that some readjustments, revisions and additions to these specifications will be inevitable. Assistance in this phase of development is solicited from the users of this publication.

Additional copies of this publication may be secured through the office of the Association of Washington Cities

Suggestions pertaining to corrections or amendments to future editions of these specifications should be submitted in writing to:

Executive Secretary, Association of Washington Cities
250 Smith Hall, University of Washington, Seattle 5, Wash.

ACKNOWLEDGMENTS

This project has had the enthusiastic and helpful support of many groups and organizations from its very inception. The Washington State Chapter of the American Public Works Association extends its grateful acknowledgment for beneficial cooperation to the following:

The Washington State Highway Commission, for making the project financially possible by allocating funds necessary for the preparation and publication of the specifications, and for providing space and facilities for the coordination and editing of the specification material.

The Association of Washington Cities, and the Bureau of Governmental Research and Services of the University of Washington, for their generous assistance in determination of ways and means for financing the project, for circulating the preliminary draft material among the participating engineers, and for accepting the responsibility of becoming the permanent agency for this publication and its distribution.

Finally, to the scores of participants whose time and tireless endeavors have made possible this first edition of "Standard Specifications for Municipal Public Works Construction."

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DIVISION I—GENERAL REQUIREMENTS AND COVENANTS

Section 1—Definitions and Terms

In the interpretation and construction of these specifications and the contract, or in any documents or instruments dealing with the construction operations governed by these specifications, the following words, terms and abbreviations, or pronouns in place of them shall each be construed as defined below.

1.01 OWNER

The city, or other municipality, acting through its legally constituted officials, officers, or employees.

1.02 ENGINEER

The city engineer, or an engineer of a municipality, including such assistants as are authorized to represent him.

1.03 CONSULTING ENGINEER

A licensed engineer or an authorized member of a licensed consulting firm or organization retained by the Owner for design and supervision of its public works.

1.04 INSPECTOR

The inspector or inspectors of the Owner who are placed in supervision of any part of the inspecting or engineering work with authority limited to the particular duties entrusted by the Engineer.

1.05 SPECIFICATIONS

The directions and requirements of the standard specifications as contained herein, as supplemented by such special provisions as may be provided, pertaining to the manner of performing the work or the quantities and quality of materials to be furnished under the contract.

1.06 SPECIAL PROVISIONS

The special provisions are contract requirements peculiar to the project and which are not otherwise thoroughly or satisfactorily detailed and set forth in the standard specifications.

1.07 SUPPLEMENTAL SPECIFICATIONS

Supplemental specifications are those adopted subsequent to the standard specifications and generally involve alterations and new construction items, or substantial changes in the standard specifications.

1.08 PLANS

The official drawings, plans, profiles, typical cross sections and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions and details of work to be performed. All such documents are to be considered as a part of the plans whether attached to the specifications or separate therefrom.

The terms "standard drawing," generally used in the specification text, and "standard plan," generally appearing in the titles of drawings, are synonymous for reference purposes.

1.09 BIDDER

An individual, firm, co-partnership or corporation, or combination thereof, submitting a proposal for the work contemplated and acting directly or through a duly authorized representative.

1.10 PROPOSAL

The written offer, or copy thereof, of the bidder to perform the work proposed, properly signed and guaranteed.

1.11 PROPOSAL GUARANTY, BID BOND

Cash, bid bond, cashiers check or certified check accompanying the proposal submitted by the bidder as a guaranty that he will enter into contract with the Owner for performance of the work if the contract is awarded to him.

1.12 CONTRACT

The written agreement covering the performance of the work and the furnishing of labor, materials, tools, and equipment in the construction of the work. The contract shall include the notice to contractors, proposal, plans, specifications, special provisions and contract bonds; also any and all supplemental agreements amending or extending the work contemplated and which may be required to complete the work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the contract and include contract change orders.

The contract documents are complementary and what is called for by one shall be as binding as if called for by all. In case of conflict between plans and specifications, the specifications shall govern.

1.13 AMOUNT OF CONTRACT

For the purpose of awarding the contract and determining the amount of the bond, the total amount of the bid and the full amount of the contract price will be the summation of the products of the quantities shown in the proposal by the unit bid prices.

1.14 CONTRACTOR

The individual, firm, co-partnership or corporation, and his, their, or its heirs, executors, administrators, successors and assigns, or the lawful agent of any such individual, firm, partnership, covenantor or corporation, or his, their or its surety under the contract bond, constituting one of the principals to the contract and undertaking to perform the work herein specified. Where any pronoun is used as referring to the word "Contractor" it shall mean the Contractor as defined above.

1.15 SUBCONTRACTOR

The individual, firm, partnership or corporation to whom the Contractor, with written consent of the Owner, sublets any part of the work covered by the contract.

1.16 CONTRACT BOND, PERFORMANCE BOND

The approved form of security furnished by the Contractor and his surety, as required in the contract. It shall be conditioned that such person or persons who enter into contract with the Owner shall faithfully perform all the provisions of the contract and complete the work in strict accordance with the plans and specifications including full payment for labor and materials used in the work.

1.17 SURETY

The sureiies or surety company (RCW 39.08.010) responsible for the bidder's acts in the execution of the contract, or which is bound with and for the Contractor to insure performance of the contract, the payment of all obligations pertaining to the work, and the fulfillment of such other conditions as may be specified or required by law.

1.18 WORK

All the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments or extensions thereto made by contract change order or other written orders of the Engineer.

1.19 DAYS

Unless otherwise designated, days as used in the specifications will be understood to mean calendar days.

1.20 LIQUIDATED DAMAGES

The amount prescribed in the specifications to be paid the Owner, or to be deducted from any payments due or to become due the Contractor, for each day's delay in completing the whole or any specified portion of the work beyond the time allowed in the specifications.

1.21 "OR EQUAL"

In order to establish a basis of quality for some things in the work, certain processes, types of machinery and equipment, or kind of material may be mentioned on the plans by designating a manufacturer by name and referring to his brand or model numbers. Such mention is not intended to exclude other processes, equipment or materials that will measure up to the designated standards

of that mentioned. If the Contractor desires to use other products as equal thereto, he shall secure the approval of the Engineer before entering an order therefor. Wherever in the specifications a manufacturer's name, brand or model is mentioned, it is to be understood that the phrase "or equal" is assumed to follow thereafter whether or not it does in fact.

1.22 ABBREVIATIONS

A.S.T.M. (ASTM) American Society for Testing Materials.

A.W.W.A. (AWWA) American Water Works Association.

A.S.A. (ASA) American Standards Association.

A.A.S.H.O. (AASHO) American Association of State Highway Officials.

A.G.C. (AGC) Associated General Contractors of America.

A.P.W.A. (APWA) American Public Works Association.

1.23 HIGHWAY, STREET, ROAD, OR ALLEY

The whole area within the right of way which is reserved for and secured for use in constructing the roadway and its appurtenances.

1.24 ARTERIAL STREET

A general term denoting a highway primarily for through traffic, usually on a continuous route.

1.25 RIGHT OF WAY, EASEMENT

The land provided by the Owner upon which to construct the roadway or other work and appurtenances specified in the contract.

1.26 ROADWAY

That portion of the highway included between curbs, gutters, or ditches, intended primarily for vehicular traffic, and including all appertaining structures and other features necessary to proper drainage and protection.

1.27 SUBGRADE

That portion of the roadbed surface which has been prepared, as specified, and upon which a layer of specified roadbed material or base, or surfacing, or pavement is to be placed.

1.28 SURFACING

The uppermost layer of material placed on the traveled way or shoulders. This term is used interchangeably with pavement.

1.29 TRAVELED WAY

That portion of the roadway intended for movement of vehicles, exclusive of shoulders and auxiliary lanes.

1.30 PAVEMENT

The uppermost layer of material placed on the traveled way or shoulders for riding surface, generally rigid or flexible in composition. This term is used interchangeably with surfacing.

1.31 BRIDGE

A structure, other than a culvert, which carries traffic over a water course, highway or railroad, or railroad traffic over a highway or street.

1.32 CULVERT

A drainage structure which may or may not directly support traffic, extending across and beneath a highway, street, driveway or alley.

Section 2—Proposal Requirements and Conditions

2.01 CONTENTS OF PROPOSAL FORMS

Prospective bidders will be furnished with proposal forms which will state the location and description of the contemplated construction and will show the approximate estimate of the various quantities and kind of work to be performed and/or materials to be furnished, with a schedule of items for which unit bid prices are asked.

2.02 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF WORK

Before submitting his bid, the bidder shall examine the site of the work and ascertain for himself all the physical conditions in relation thereto. Failure to do this shall not relieve the bidder from entering into a contract nor excuse him from performing the work in strict accordance with the terms of the contract and specifications. He will not be entitled to additional compensation if he subsequently finds the conditions to require other methods or equipment that he did not anticipate in making his unit contract bid prices.

Any statement or representation made by an officer, agent or employee of the Owner with respect to the physical conditions appertaining to the site of the work shall not be binding upon the Owner.

2.03 INTERPRETATION OF CONTRACT DOCUMENTS

The documents forming the contract are complementary and what is called for by one shall be as binding as if it were called for by all. They are intended to include all detail of labor and material reasonably necessary for the proper execution of the work. Should there be any discrepancy between the specifications and the plans, the specifications shall have precedence.

If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or other documents, he may submit to the Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery not less than five (5) days prior to the date set for opening bids. Any interpretation of the proposed documents will be made by an addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of the plans and specifications and each bidder shall enclose each addendum thus issued with his bid in order to have the bid considered. The Owner will not be responsible for any other explanations or interpretations of the proposed documents.

2.04 QUANTITIES AND UNIT PRICES

The quantities, for which unit prices are indicated in the proposal form, are approximate only, and do not constitute a warranty or guarantee by the Owner as to the actual quantities involved in the work. Such quantities are to be used for the purpose of comparison of bids and determining the amount of the performance bond. The Owner expressly reserves the right to increase or decrease the quantities during construction as outlined in Section 4.03 of the specifications; also to make reasonable changes in design, provided such changes do not materially change the intent of the basic contract. The amount of work to be paid for shall be upon the actual quantities performed.

2.05 QUALIFICATION OF BIDDERS

The bidder must be qualified by experience, financing and equipment to do the work called for in the plans and specifications. Whenever required in the special provisions, the bidder shall furnish upon a form for that purpose, a statement of his construction experience and his general ability to perform the work contemplated, and shall submit same along with his bid proposal.

The Owner shall have the right to take such action as he may deem necessary in determining the ability of the bidder to perform the work satisfactorily. The right is reserved to the Owner to reject any bid.

Upon request of the Owner, a bidder whose bid is under consideration for award of a contract, shall submit promptly to the Owner satisfactory evidence of financial resources, his construction experience and his organization available for performance of the proposed contract.

2.06 PREPARATION OF PROPOSAL

Each bid shall be made on the forms furnished by the Owner and shall be signed by the bidder with the signature in full. If the proposal is made by a partnership, it shall contain the names of each partner and shall be signed in the firm name, followed by the signature of the person authorized to sign. If the proposal is made by a corporation it shall be signed in the name of the corporation by the officer or officers having authority to sign contracts. The address of the bidder shall be typed or printed on the proposal.

A unit price shall be submitted on each and every item of work included in the group or division of which bids are requested. Any omission of prices on such items shown in the proposal forms or any addition in writing to the form of the bid, or any condition, limitation, or provision will be liable to render the proposal informal and cause its rejection.

Each proposal shall specify a unit or lump sum price, typed or written with ink in both words and figures, for each of the separate items as called for. In case of discrepancy between the written words and figures, the written words shall govern.

2.07 DELIVERY OF PROPOSAL

Each proposal or bid shall be completely sealed in a separate envelope, properly addressed to the Owner at the address indicated on the proposal form, with the name and address of the bidder and the name of the project for which the bid is submitted, plainly written on the outside of the envelope.

Proposals will be received at the time and place stated in the Call for Bids. It is the sole responsibility of the bidder to see that his bid is delivered in time. Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

Bids shall be submitted intact, including all proposal documents, specifications and addenda furnished by the Owner. No portion of these items shall be removed or deleted.

2.08 WITHDRAWAL OR REVISION OF PROPOSAL

A bidder may, without prejudice to himself, withdraw, modify, or correct a proposal after it has been deposited with the Owner, provided the request for such withdrawal, modification, or correction is filed with the Owner, in writing or by telegrams, before the time set for opening proposals. The original proposal, as modified by such written or telegraphic communication, will be considered as the proposal submitted by the bidder.

No bidder will be permitted to withdraw his proposal between the closing time for receipt of proposals and the actual award of contract, unless the award is delayed for a period exceeding thirty (30) calendar days.

2.09 SUPPLEMENTAL PROPOSALS

If supplemental proposals are required due to the character of the improvement and uncertainties which may be encountered during construction, bidders shall submit supplemental bids on all items as shown on the supplemental proposal. The unit contract price bid shall be full compensation for furnishing all labor, tools and equipment which may be required under the several items listed and shall be a basis for final settlement.

Only the proposal for the basic contract shall be considered in the determination of the lowest and best bid. The supplemental proposal shall not be considered in this determination unless it is so provided in the special provisions.

2.10 PROHIBITION OF ALTERATIONS

Except as otherwise provided herein, proposals which are incomplete, or which are conditioned in any way, or which contain erasures, alterations or items not called for in the proposal, or which are not in conformity to the law, may be rejected.

The proposal form invites bids on definite plans and specifications. Only the amounts and information asked for on the proposal form furnished will be considered as the bid. Each bidder shall bid upon the work exactly as specified and as provided in the proposal form. The bidder may bid upon all alternates indicated on the proposal form as provided therein. When bidding on an alternate for which there is no charge, the bidder shall write the words "No Charge" in the space provided on the proposal form.

No oral or telephone proposals or modifications will be considered.

2.11 OPENING OF PROPOSALS

At the time and place set for the opening and reading of the proposals as indicated in the call for bids, each and every proposal (except any which may have been withdrawn in accordance with Section 2.08) received prior to the scheduled closing time for receipt of proposals, will be publicly opened and read aloud, irrespective of any irregularities or informalities in such proposals.

2.12 REJECTION OF PROPOSAL

The Owner reserves the right to reject any and all proposals. Any informalities or irregularities in connection with any proposal or bid shall be sufficient reason for its rejection. The Owner also reserves the right to reject any or all bids if the total of each proposal exceeds the Engineer's estimate. Whenever the Call for Bids incorporates a supplemental proposal, the Contractor shall submit unit price bids for all of such items in addition to those of the basic bid proposal, and failure to do so shall be cause for rejection of the proposal.

2.13 PROPOSAL GUARANTY

A certified check, cashier's check, cash or proposal bond in an amount equal to at least five percent (5%) of the total amount bid must accompany each bid as evidence of good faith and as a guarantee that if awarded the contract, the bidder will execute the contract and give a performance bond as required. Checks shall be made payable to the fiscal officer of the Owner, such as the treasurer of a city, or other official designated in the specifications.

2.14 FAMILIARITY WITH LAWS AND ORDINANCES

The bidder is assumed to be familiar with all federal, state, and local laws, ordinances, and regulations, which in any manner affect those engaged or employed in the work or the materials or equipment used in the proposed construction, or which in any way affect the conduct of the work, and no plea of misunderstanding will be considered on account of ignorance thereof. If the bidder, or contractor, shall discover any provision in the plans, specifications, or contract which is contrary to or inconsistent with any law, ordinance, or regulation, he shall forthwith report it to the Owner in writing.

Section 3—Award and Execution of Contract

3.01 AWARD OF CONTRACT

The award of contract, if made, will be to the lowest responsible bidder. No award will be made until necessary investigations are made by the Owner as to the responsibility of the bidder. The Owner shall be the sole judge as to the responsibility of the bidder to satisfactorily perform the work as specified and within the time limit set.

3.02 RETURN OF PROPOSAL GUARANTY

After the bids have been tabulated and compared, the Owner will return the guaranty deposits to all bidders except the deposits accompanying the three lowest bids, all of which will be held pending execution of the contract and bond therefor.

3.03 EXECUTION OF CONTRACT

Within ten (10) days after notification of award of contract, as evidenced by receipt from the Owner of properly prepared contract documents, the bidder to whom award is made shall execute and return the contract in the required number of copies, and shall furnish a performance bond and other required bonds and insurances satisfactory to the Owner.

3.04 PERFORMANCE BOND, CONTRACT BOND

The Contractor shall, at the time of delivery of the executed contract, furnish to the Owner a corporate surety bond in the full amount of the contract price conditioned for the faithful performance of the contract. The surety must be authorized to do business in the State

of that mentioned. If the Contractor desires to use other products as equal thereto, he shall secure the approval of the Engineer before entering an order therefor. Wherever in the specifications a manufacturer's name, brand or model is mentioned, it is to be understood that the phrase "or equal" is assumed to follow thereafter whether or not it does in fact.

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That portion of the roadbed surface which has been prepared, as specified, and upon which a layer of specified roadbed material or base, or surfacing, or pavement is to be placed.

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2.02 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF WORK

Before submitting his bid, the bidder shall examine the site of the work and ascertain for himself all the physical conditions in relation thereto. Failure to do this shall not relieve the bidder from entering into a contract nor excuse him from performing the work in strict accordance with the terms of the contract and specifications. He will not be entitled to additional compensation if he subsequently finds the conditions to require other methods or equipment that he did not anticipate in making his unit contract bid prices.

Any statement or representation made by an officer, agent or employee of the Owner with respect to the physical conditions appertaining to the site of the work shall not be binding upon the Owner.

2.03 INTERPRETATION OF CONTRACT DOCUMENTS

The documents forming the contract are complementary and what is called for by one shall be as binding as if it were called for by all. They are intended to include all detail of labor and material reasonably necessary for the proper execution of the work. Should there be any discrepancy between the specifications and the plans, the specifications shall have precedence.

If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or other documents, he may submit to the Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery not less than five (5) days prior to the date set for opening bids. Any interpretation of the proposed documents will be made by an addendum duly issued, and a copy of such addendum will be mailed or delivered to each person receiving a set of the plans and specifications and each bidder shall enclose each addendum thus issued with his bid in order to have the bid considered. The Owner will not be responsible for any other explanations or interpretations of the proposed documents.

2.04 QUANTITIES AND UNIT PRICES

The quantities, for which unit prices are indicated in the proposal form, are approximate only, and do not constitute a warranty or guarantee by the Owner as to the actual quantities involved in the work. Such quantities are to be used for the purpose of comparison of bids and determining the amount of the performance bond. The Owner expressly reserves the right to increase or decrease the quantities during construction as outlined in Section 4.03 of the specifications; also to make reasonable changes in design, provided such changes do not materially change the intent of the basic contract. The amount of work to be paid for shall be upon the actual quantities performed.

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The bidder must be qualified by experience, financing and equipment to do the work called for in the plans and specifications. Whenever required in the special provisions, the bidder shall furnish upon a form for that purpose, a statement of his construction experience and his general ability to perform the work contemplated, and shall submit same along with his bid proposal.

The Owner shall have the right to take such action as he may deem necessary in determining the ability of the bidder to perform the work satisfactorily. The right is reserved to the Owner to reject any bid.

Upon request of the Owner, a bidder whose bid is under consideration for award of a contract, shall submit promptly to the Owner satisfactory evidence of financial resources, his construction experience and his organization available for performance of the proposed contract.

2.06 PREPARATION OF PROPOSAL

Each bid shall be made on the forms furnished by the Owner and shall be signed by the bidder with the signature in full. If the proposal is made by a partnership, it shall contain the names of each partner and shall be signed in the firm name, followed by the signature of the person authorized to sign. If the proposal is made by a corporation it shall be signed in the name of the corporation by the officer or officers having authority to sign contracts. The address of the bidder shall be typed or printed on the proposal.

A unit price shall be submitted on each and every item of work included in the group or division of which bids are requested. Any omission of prices on such items shown in the proposal forms or any addition in writing to the form of the bid, or any condition, limitation, or provision will be liable to render the proposal informal and cause its rejection.

Each proposal shall specify a unit or lump sum price, typed or written with ink in both words and figures, for each of the separate items as called for. In case of discrepancy between the written words and figures, the written words shall govern.

2.07 DELIVERY OF PROPOSAL

Each proposal or bid shall be completely sealed in a separate envelope, properly addressed to the Owner at the address indicated on the proposal form, with the name and address of the bidder and the name of the project for which the bid is submitted, plainly written on the outside of the envelope.

Proposals will be received at the time and place stated in the Call for Bids. It is the sole responsibility of the bidder to see that his bid is delivered in time. Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

Bids shall be submitted intact, including all proposal documents, specifications and addenda furnished by the Owner. No portion of these items shall be removed or deleted.

2.08 WITHDRAWAL OR REVISION OF PROPOSAL

A bidder may, without prejudice to himself, withdraw, modify, or correct a proposal after it has been deposited with the Owner, provided the request for such withdrawal, modification, or correction is filed with the Owner, in writing or by telegrams, before the time set for opening proposals. The original proposal, as modified by such written or telegraphic communication, will be considered as the proposal submitted by the bidder.

No bidder will be permitted to withdraw his proposal between the closing time for receipt of proposals and the actual award of contract, unless the award is delayed for a period exceeding thirty (30) calendar days.

2.09 SUPPLEMENTAL PROPOSALS

If supplemental proposals are required due to the character of the improvement and uncertainties which may be encountered during construction, bidders shall submit supplemental bids on all items as shown on the supplemental proposal. The unit contract price bid shall be full compensation for furnishing all labor, tools and equipment which may be required under the several items listed and shall be a basis for final settlement.

Only the proposal for the basic contract shall be considered in the determination of the lowest and best bid. The supplemental proposal shall not be considered in this determination unless it is so provided in the special provisions.

2.10 PROHIBITION OF ALTERATIONS

Except as otherwise provided herein, proposals which are incomplete, or which are conditioned in any way, or which contain erasures, alterations or items not called for in the proposal, or which are not in conformity to the law, may be rejected.

The proposal form invites bids on definite plans and specifications. Only the amounts and information asked for on the proposal form furnished will be considered as the bid. Each bidder shall bid upon the work exactly as specified and as provided in the proposal form. The bidder may bid upon all alternates indicated on the proposal form as provided therein. When bidding on an alternate for which there is no charge, the bidder shall write the words "No Charge" in the space provided on the proposal form.

No oral or telephone proposals or modifications will be considered.

2.11 OPENING OF PROPOSALS

At the time and place set for the opening and reading of the proposals as indicated in the call for bids, each and every proposal (except any which may have been withdrawn in accordance with Section 2.08) received prior to the scheduled closing time for receipt of proposals, will be publicly opened and read aloud, irrespective of any irregularities or informalities in such proposals.

2.12 REJECTION OF PROPOSAL

The Owner reserves the right to reject any and all proposals. Any informalities or irregularities in connection with any proposal or bid shall be sufficient reason for its rejection. The Owner also reserves the right to reject any or all bids if the total of each proposal exceeds the Engineer's estimate. Whenever the Call for Bids incorporates a supplemental proposal, the Contractor shall submit unit price bids for all of such items in addition to those of the basic bid proposal, and failure to do so shall be cause for rejection of the proposal.

2.13 PROPOSAL GUARANTY

A certified check, cashier's check, cash or proposal bond in an amount equal to at least five percent (5%) of the total amount bid must accompany each bid as evidence of good faith and as a guarantee that if awarded the contract, the bidder will execute the contract and give a performance bond as required. Checks shall be made payable to the fiscal officer of the Owner, such as the treasurer of a city, or other official designated in the specifications.

2.14 FAMILIARITY WITH LAWS AND ORDINANCES

The bidder is assumed to be familiar with all federal, state, and local laws, ordinances, and regulations, which in any manner affect those engaged or employed in the work or the materials or equipment used in the proposed construction, or which in any way affect the conduct of the work, and no plea of misunderstanding will be considered on account of ignorance thereof. If the bidder, or contractor, shall discover any provision in the plans, specifications, or contract which is contrary to or inconsistent with any law, ordinance, or regulation, he shall forthwith report it to the Owner in writing.

Section 3—Award and Execution of Contract

3.01 AWARD OF CONTRACT

The award of contract, if made, will be to the lowest responsible bidder. No award will be made until necessary investigations are made by the Owner as to the responsibility of the bidder. The Owner shall be the sole judge as to the responsibility of the bidder to satisfactorily perform the work as specified and within the time limit set.

3.02 RETURN OF PROPOSAL GUARANTY

After the bids have been tabulated and compared, the Owner will return the guaranty deposits to all bidders except the deposits accompanying the three lowest bids, all of which will be held pending execution of the contract and bond therefor.

3.03 EXECUTION OF CONTRACT

Within ten (10) days after notification of award of contract, as evidenced by receipt from the Owner of properly prepared contract documents, the bidder to whom award is made shall execute and return the contract in the required number of copies, and shall furnish a performance bond and other required bonds and insurances satisfactory to the Owner.

3.04 PERFORMANCE BOND, CONTRACT BOND

The Contractor shall, at the time of delivery of the executed contract, furnish to the Owner a corporate surety bond in the full amount of the contract price conditioned for the faithful performance of the contract. The surety must be authorized to do business in the State

of Washington and be satisfactory to the Owner. Each bond must be approved in writing by the legal representative of the Owner.

3.05 FAILURE TO EXECUTE CONTRACT

Upon failure to enter into the contract and furnish the necessary bond within the time specified in Section 3.03, the proposal guaranty which accompanied the bid, whether in form of a bond, check or cash deposit, shall be forfeited to the Owner. The award may then, at the discretion of the Owner, be made to the next lowest responsible bidder or the work may be readvertised, or may be constructed by the Owner in any legal manner.

3.06 NON-COLLUSION AFFIDAVIT

Each bid shall be accompanied by a properly executed non-collusion affidavit on the form furnished therefor by the Owner.

3.07 CONTRACTOR'S INSURANCE

The Contractor shall not commence work under the contract or under any special condition until he has obtained all insurance as required under the following sub-paragraphs, and until such insurances have been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurances required of the subcontractor have been obtained and approved.

3.07A Compensation Insurance

The Contractor shall take out and maintain during the life of this contract Workmen's Compensation Insurance for all of his employees employed at the site of the project and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all the latter's employees unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work under this contract at the site of the project is not protected under Workmen's Compensation statutes, the Contractor shall provide, and shall cause each subcontractor to provide compensation insurance with a private company in an amount equivalent to that provided by the Workmen's Compensation statute for the protection of his employees not otherwise protected.

3.07B Public Liability and Property Damage Insurance

The Contractor shall obtain and keep in force during the term of the contract, public liability and property damage insurance in companies and in form to be approved by the Owner. Said insurance shall provide coverage to the Contractor, any subcontractor performing work provided by this contract, and the Owner. The Owner shall be named as an additional insured on said policy insofar as the work and obligations performed under the contract are concerned. The coverage so provided shall protect against claims for personal injuries, including accidental death, as well as claims for property damages which may arise from any act or omission of the Contractor or the subcontractor, or by anyone directly or indirectly employed by either of them.

The minimum policy limits of such insurance shall be as follows:

Bodily injury liability coverage with limits of not less than $100,000 for bodily injury, including accidental death, to any one person, and subject to that limit for each person, in an amount not less than $300,000 for each accident; and property damage coverage in an amount of not less than $50,000 for each accident.

A copy of the insurance policy, together with a copy of the endorsement naming the Owner as an additional insured, shall be provided to the Owner within a reasonable time after receiving notice of award of contract.

3.07C Indemnify Owner From Loss

The Contractor hereby agrees to save the Owner harmless from all loss or damage occasioned to it or to any third person or property by reason of any carelessness or negligence on the part of the Contractor, subcontractors, agents, and employees in the performance of the contract and will, after reasonable notice thereof, defend and pay the expense of defending any suit which may be commenced against the Owner by any third person alleging injury by reason of such carelessness or negligence, and will pay any judgment which may be obtained against the Owner in such suit.

3.07D Street Obstruction Bond

Where required by law or by municipal procedures, the Contractor shall furnish the Owner a Street Obstruction bond in the amount of not less than $5,000 prior to commencement of any work covered by the contract. The award of the contract shall be considered to be the permit to work upon the streets, alleys, easements or public places as specified in the contract.

3.08 PROOF OF CARRIAGE OF INSURANCE

The Contractor shall furnish the Owner with satisfactory proof of carriage of the insurances required.

Section 4—Scope of Work

4.01 INTENT OF CONTRACT

The intent of the contract is to prescribe a complete work or improvement which the Contractor undertakes to do, in full compliance with the provisions and requirements of the contract. The Contractor for all or any part shall furnish all labor, materials, tools, equipment, transportation, necessary supplies and incidentals required to make each and every item complete as contemplated by the contract. Any deviation from these requirements must be stipulated in the special provisions.

4.02 ADDITIONAL INSTRUCTIONS

In the event it is found that the instructions and drawings contained in the contract documents are not sufficiently clear to permit the Contractor to proceed with the work, the Engineer shall, either upon his own initiative or upon the request from the Contractor, furnish such additional written instructions, together with such additional drawings as may be necessary. When such request is made by the Contractor, it must be in ample time to permit the preparation of the instructions and drawings by the Engineer before the construction of the work covered by them is undertaken. Such additional instructions and drawings shall be consistent with the contract documents and shall have the same force and effect as if contained in the contract documents.

For the purpose of avoiding delays in the preparation of such additional instructions and drawings, the Engineer and the Contractor shall jointly prepare a schedule showing the time for the commencement of the work to be included in them and the time the Contractor shall furnish the necessary shop drawings, which may be necessary for their preparation. The Contractor shall do no work without proper drawings or instructions and shall at his own expense, replace any work wrongly executed.

4.03 INCREASE OR DECREASE OF WORK

The Owner reserves the right to make such alterations in the plans or in the quantities of work as may be considered necessary. Such alterations shall be in writing by the Engineer and shall not be considered as a waiver of any conditions of the contract nor to invalidate any of the provisions thereof; provided, however, that the execution of a supplemental agreement acceptable to both parties of the contract will be necessary before any alteration is made which involves (1) an extension or shortening of the length of the project by more than 25%, (2) an increase or decrease of more than 25% of the total cost of the work calculated from the original proposal quantities and the unit contract prices, or (3) an increase or decrease of more than 25% in the quantity of any one major contract item.

For condition (3) above, a major item is defined as any item, unless otherwise indicated on the plans or designated in the special provisions, the contract price for which amounts to 10% or more of the total contract price as determined by the original quantities and the unit contract prices.

When an alteration requires the execution of a supplemental agreement, the agreement shall be fully executed before any work on the alteration is started. Alterations involving an increase of more than 25% in the net of any one minor contract item will not require a supplemental agreement.

4.04 EXTRA WORK

Any extra work made necessary by alteration of or additions to the plans or by other reasons for which no price is provided in the contract, shall be performed by the Contractor as directed by the Engineer and he shall be compensated therefor as elsewhere provided herein.

Extra work which by reason of its character or extent is covered by a supplemental agreement between the Owner and the Contractor, must have the written consent of the surety on the bond, but extra work and change orders not covered by a supplemental agreement will not require the consent of the surety.

4.05 CHANGED CONDITIONS

Should the Contractor encounter subsurface or latent physical conditions at the site differing materially from those indicated in the contract, or unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract, which changed or unusual conditions will be considered by the Contractor as the basis for a claim for extra compensation, the Contractor shall promptly and before any such conditions are disturbed, notify the Engineer of the alleged conditions in writing, with copies to the principal officer of the Owner.

If the Owner is not given written notice prior to the conditions being disturbed, the Contractor will be deemed to have waived any claim or claims for extra compensation in any manner arising out of the changed or unusual conditions.

If the Owner shall determine the conditions to be such as to justify a claim for additional compensation, he may provide for additional payment for the particular phase of work in question by a negotiated agreement with the Contractor upon new unit contract prices, by cost plus an agreed percentage, or by any other equitable arrangement mutually agreed upon by the Owner and the Contractor and consented to in writing by the surety to the bond. In any event, the Contractor shall not be relieved, unless permitted to do so by the Owner, from his obligation of resuming construction operations pending decision as to the validity of a claim, or pending the execution of a negotiated agreement to cover additional costs if a claim shall be recognized under the provisions of this section of the specifications.

4.06 WASTE SITES

The various sections of these specifications require three different types of waste sites which are: (1) private property abutting the improvement, (2) waste sites designated on construction plans, and (3) waste sites to be provided by the Contractor.

In all cases, waste sites shall be operated in such a manner as to meet safety and health requirements of state, county, and city. Sites, operations, or the result of such operations, which create a definite nuisance problem, or which result in damage to public or private properties will not be permitted. In all cases, waste sites shall be approved by the Engineer before use.

4.06A Private Property Abutting the Project

It shall be required that waste excavation not needed on the project shall be equitably distributed among those private properties abutting the project and desiring waste material. The Contractor will be required to haul and dump the excavated material at no expense to the property owner or to the Owner. The material shall be dumped as the Owner may direct, except that no leveling or dressing will be performed under this contract other than as may be necessary to provide access for the material to be dumped. Where conditions are such as to require additional work such as clearing and grubbing, the providing of drainage, leveling and shaping (other than previously mentioned), the property owner shall make necessary arrangements with the Contractor for payment of such additional work. The Engineer shall make final determination of responsibility in event of controversy.

4.06B Waste Sites Designated on the Construction Plans

Where waste sites are designated on the plans, the operations shall be performed as the Engineer may direct, and upon completion, the area shall be uniformly cleaned and shaped as directed by the Engineer. Other requirements shall be as provided in the special provisions.

4.06C Waste Sites to Be Provided by the Contractor

Where there is additional waste excavation in excess of that needed for the project and that needed for compliance with requests of abutting properties, the Contractor shall, unless otherwise provided for in the special provisions, secure and operate his own waste site at his own expense. In such case, the Contractor shall meet the general requirements hereinbefore described.

4.07 SALVAGE

If indicated on the plans or in the special provisions, all castings, pipe and any other material of any value taken from any of the discarded facilities shall be carefully salvaged and delivered to the Owner in good condition and in such order of storage as the Engineer may direct.

4.08 FINISHING AND CLEANUP

From time to time or as may be ordered by the Engineer and immediately after completion of the work, the Contractor shall at his own expense clean up and remove all refuse and unused materials of any kind resulting from the work. Upon failure to do so within twenty-four (24) hours after request by the Engineer, the work may be done by the Owner and the cost thereof be charged to the Contractor and deducted from his final estimate. Upon completion of the work, the Contractor shall remove all his equipment and put the area of the work in a neat and clean condition and do all other cleaning required to complete the work in a workmanlike manner, ready for use and satisfactory to the Engineer.

All cleanup shall be performed as specified in the various sections of these specifications, in the special provisions, or in Section 57.

If no bid item is included in the proposal for "Finishing and Cleanup," per lump sum, or for "Finishing and Cleanup," per station (100-foot), then all work of cleaning up as required shall be considered as incidental to the construction and the costs thereof shall be included in other items of the work.

Section 5—Control of Work

5.01 AUTHORITY OF ENGINEER

It is understood and agreed by and between the parties hereto that the work included in the contract is to be done under the direct supervision and to the complete satisfaction of the Engineer, or his duly authorized representative, and that the decision of the Engineer as to the true construction and meaning of the contract, plans, specifications and estimates, and as to all questions arising as to proper performance of the work shall be final. The Engineer shall determine the unit quantities and the classification of all work done and materials furnished under the provisions of this agreement and his determination thereof shall be final and conclusive and binding upon the Contractor.

The Engineer shall decide any and all questions which may arise as to the quality or acceptability of materials furnished and work performed and as to the rate of progress of the work, and all questions as to acceptable fulfillment and performance of the contract on the part of the Contractor and as to compensation. The decision of the Engineer in such matters shall be final.

Nothing contained in this section or in the contract shall be construed as requiring the Engineer to direct the method or manner of performing any work under this contract.

5.02 AUTHORITY AND DUTIES OF INSPECTORS

The Engineer may appoint assistants to inspect all materials used and all work done. Such inspection may extend to any or all parts of the work and to the preparation or manufacture of the materials to be used. The assistants will not be authorized to revoke, alter, enlarge or relax the provisions of these specifications. An assistant is placed on the work to set the necessary lines and grades and to keep the Engineer informed as to the progress of the work and the manner in which it is being done; also to call the attention of the Contractor to any infringements upon plans, or specifications, but failure of the assistant or the Engineer to call the attention of the Contractor to faulty work or infringements upon the plans or specifications shall not constitute acceptance of said work.

An assistant will not be authorized to approve or accept any portion of the work or to issue instructions contrary to the plans and specifications. The assistant will have authority to reject defective material and to suspend any work that is being improperly done, subject to the final decision of the Engineer. The assistant will exercise such additional authority as may, from time to time, be especially delegated to him by the Engineer.

5.03 COOPERATION BY CONTRACTOR

A set of approved plans, specifications and any special provisions and authorized alterations will be supplied to the Contractor and these must be kept available on the job at all times. The Contractor shall be present either in person or by duly authorized representatives on the site of the work continually during its progress. The Contractor or his representative shall receive from the Engineer all explanations and directions necessary for the satisfactory prosecution and completion of the work. The Contractor shall not cause any unnecessary delay or hindrance to other Contractors on the work, but he shall be required to cooperate with other Contractors to the fullest extent.

5.04 INTERFERENCE WITH OTHER CONTRACTORS

Bidders are required to inform themselves fully of the conditions relating to construction and labor under which the work will be or is now being performed, and the Contractor shall employ, as far as possible, such methods and means in the carrying out of his work as will not cause any interruption or interference with any other Contractor or agency.

If the performance of any contract for the project is likely to be interfered with by the simultaneous execution of some other contract or contracts, the Engineer shall decide which Contractor shall cease work temporarily and which Contractor shall continue, or whether the work under the contracts can be co-ordinated so that the Contractors may proceed simultaneously. The Owner shall not be responsible for any damages suffered or extra costs incurred by the Contractor, resulting directly or indirectly from the award or performance or attempted performance of any other contract or contracts on the project, or caused by any decision or omission of the Engineer respecting the order of precedence in the performance of the contracts other than for an extension of time.

5.05 NOTIFICATIONS RELATIVE TO CONTRACTOR'S ACTIVITIES

The Contractor performing work in street and alley rights of way and easements shall notify all of the affected agencies in regard to his operations so as to properly co-ordinate and expedite his work in such a manner as to cause the least amount of conflict and interference between his operations and those of other agencies.

Notification may be verbal and must be in such detail as to give the time of commencement and completion of work, names of streets or location of alleys to be closed, schedule of operations, routes of detours where possible, etc. Those agencies usually concerned with construction activities will be as indicated elsewhere in the specifications under special provisions.

Notification of commencement shall be made sufficiently ahead of time to provide for proper rerouting of traffic and the erection of signs. On larger projects requiring extended periods of time to complete, the Contractor shall make such additional notifications as the conditions may require.

The Engineer will initially notify the agencies concerned as to the time bids will be called, and the approximate time of starting work. The Engineer will also define what the project consists of and will point out particular problems. The Contractor shall be responsible for making detailed notifications as above mentioned.

Any or all damages or claims resulting from improper or insufficient notification of the affected agencies shall be the responsibility of the Contractor.

5.06 PROTECTION OF LINE AND GRADE STAKES

The work shall be done in strict conformity with the plans and specifications and to the lines and grades as fixed by the Engineer, and be according to such instructions as may be given by the Engineer. The Contractor shall protect and preserve in their original position all stakes, points, or marks set for the work by the Engineer. Where the Engineer shall consider such stakes, points, or marks to have been unnecessarily destroyed, he may cause the expense of replacing them to be chargd to the Contractor and the amount of such costs deducted from any monies due or which may become due to the Contractor under the contract.

5.07 REMOVAL OF DEFECTIVE OR UNAUTHORIZED WORK

Defective work or material may be condemned by the Engineer any time before the final acceptance of the work. Notice of such condemnation shall be given in writing by the Engineer. Such condemned work shall be immediately removed or disposed of to the satisfaction of the Engineer. Failure or neglect on the part of the Engineer to condemn unsatisfactory material or reject inferior workmanship will in no way release the Contractor, nor shall it be construed to mean the acceptance of such work, nor shall the final acceptance bar the Owner from recovering damages in case fraud was practiced, or for defective work resulting from the Contractor's dishonesty. No compensation will be made for defective work or materials.

Work done contrary to or regardless of the instructions of the Engineer, work done without lines, grade and/or cross section stakes and grades shown on the plans or as given by the Engineer, or any deviation made from the plans and specifications without written authority will be considered unauthorized and at the expense of the Contractor, and will not be measured or paid for by the Owner. Any and all work so done may be ordered removed and replaced immediately at the Contractor's expense.

5.08 MOVING OF PUBLIC AND PRIVATE UTILITIES

Prior to awarding the contract, the Owner will notify all affected utilities to move such of their installations as would be within the confines of the finished improvement. This kind of work by the utilities will normally have been accomplished in most instances before the Contractor is working at points affected. Under some circumstances, however, the work of the utilities may have to be performed during the construction. It shall be the responsibility of the Contractor to co-ordinate his work with that of the utilities in such manner as to cause the least possible interference, and as may be further provided in the special provisions.

It is provided that no utility, private or public, shall be moved to accommodate the Contractor's equipment or his method of operation when such utility does not interfere with the improvement under construction unless the costs of such removal shall be at the expense of the Contractor.

5.09 PROTECTION OF PUBLIC AND PRIVATE UTILITIES

The Contractor shall support and protect by timbers or otherwise, all pipes, conduits, poles, wires or other apparatus which may be in any way affected by the work, and do everything to support, sustain and protect the same, under, over, along or across said work. In case any of said pipes, conduits, poles, wires, or apparatus should be damaged they shall be repaired by the authorities having control of same, and the expense of such repairs shall be charged to the Contractor.

The Contractor shall further be responsible for any damage done to any street or other public property, or to any private property by reason of the breaking of any water pipe, sewer or gas pipe, electric conduit, or other utility by or through his negligence.

Specific requirements in other sections of these specifications or special provisions shall prevail over the foregoing requirements in case of conflict.

5.10 DAMAGE TO EXISTING IMPROVEMENTS AND UTILITIES

The Contractor's work shall be confined to the Owner's premises, including easements and construction permit limits, whenever possible. He shall not enter upon or place materials on other private premises except by written consent of the individual owners, and he shall save the Owner harmless from all suits and actions of every kind and description that might result from his use of private property.

Underground utilities of record will be shown on the construction plans insofar as it is possible to do so. These, however, are shown for convenience only and the Owner assumes no responsibility for improper locations or failure to show utility locations on the construction plans.

The Contractor shall take adequate precautions to protect existing lawns, trees and shrubs outside rights of way, sidewalk, curbs, pavements, utilities, adjoining property, and structures, and to avoid damage thereto. He shall at his own expense completely repair any damage thereto caused by his operations to the satisfaction of the Engineer, except as otherwise provided in other sections of these specifications.

5.11 INSPECTION BY ENGINEER

All materials furnished by the Contractor shall be subject to the inspection and approval of the Engineer at any time during the progress of the work and until final completion thereof. The materials shall be delivered by the Contractor sufficiently in advance of the work to enable the Engineer to make the proper tests and inspections. As soon as materials have been tested and inspected, the Contractor shall immediately remove all rejected materials from the work to such place distant therefrom as the Engineer may require, and shall arrange for replacement of rejected materials and things at his own expense. The neglect or failure on the part of the Engineer to condemn or reject inferior materials or work shall not be construed as an acceptance of the materials or work.

The Contractor shall furnish, at his own expense, such labor and facilities as may be required to enable the Engineer to make a thorough inspection and culling of the materials.

In lieu of inspection, the Owner may require certified statements from the producer as to quality.

5.12 MAINTENANCE OF WORK AFTER ACCEPTANCE

The work occasionally involves such items as buildings, machinery or other mechanical equipment and/or the setting of same, or may otherwise be of such a nature that it is desirable to have the Contractor maintain or guarantee the work for a period of time after final acceptance by the Engineer. (Sec. 5.16)

When such maintenance or guarantees are desired by the Owner and are not specifically provided for in these specifications, the requirements and terms shall be defined in the special provisions. Such maintenance or guarantees shall not affect the manufacturer's warranties.

5.13 WATER AND POWER

In instances, other than those specifically mentioned in the specifications or special provisions, the Contractor shall make all necessary arrangements for power and water. All costs thereof shall be borne by the Contractor.

5.14 METHOD OF SERVING NOTICE

Any written notice to the Contractor which may be requisite under these specifications may be served on him, either personally, by mailing, or by leaving at his last postoffice address known to the Owner.

5.15 VERBAL AGREEMENTS

No verbal agreement or conversation with any officer, agent, or employee of the Owner, either before or after execution of the contract, shall affect or modify any of the terms or obligations contained in any of the documents comprising the contract. Any such verbal contact shall be considered as unofficial information and in no way binding upon the Owner.

5.16 FINAL INSPECTION

As soon as practicable after the completion of the entire work, it will be examined thoroughly by the Engineer. The Contractor will be notified when the examination is to be made so that he or his representative may be present. When the work is found to be satisfactory, it will be accepted, subject to provisions of Section 5.12, and such final acceptance will not be reopened after having once been made, except on evidence of collusion, fraud, or obvious error.

If the inspection reveals any defects in the work as contemplated by the specifications, such defects shall be repaired or unsatisfactory work be replaced as the Engineer may direct before final acceptance. The cost of all such repairs and replacements shall be borne by the Contractor, and no extension of the contract time will be granted because of the time required to remedy such defects.

Section 6—Control of Materials

6.01 SOURCE OF SUPPLY AND QUALITY OF MATERIALS

Promptly after the approval of the contract, the Contractor shall notify the Engineer of the proposed sources of supply of all materials to be furnished by him. At the option of the Engineer the source of supply of each of the materials shall be approved by the Engineer before the delivery is started. Representative preliminary samples of the character and quality prescribed shall be submitted by the Contractor or producer for examination and tests by the Engineer. Only materials conforming to the requirements of these specifications and approved by the Engineer shall be used in the work. Any of the materials proposed to be used may be inspected or tested at any time during their preparation and use. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved material from other approved sources. No material which, after approval, has in any way become unfit for use shall be used in the work.

6.02 SAMPLES AND TESTS

All tests of materials furnished by the Contractor shall be made by the Engineer in accordance with commonly recognized standards of national organizations, and such special methods and tests as are in use at the laboratory of the Department of Highways or as set forth in the special provisions.

Field tests of materials will also be made by the Engineer when deemed necessary and these tests shall be made in accordance with standard practices of the Department of Highways.

The Contractor shall furnish without charge such samples of all materials as may be requested by the Engineer. Materials shall not be used until they have been approved by the Engineer. Samples will be secured and tested whenever necessary to determine the quality of the material.

Materials shall be delivered on the work in advance, in such quantities as to afford the Engineer an opportunity to make tests before the materials are to be used.

The following shall apply in the use of specifications and methods of tests of the organizations named below:

ASTM—American Society for Testing Materials. The ASTM designation number refers to the latest adopted standard or tentative standard of this society. The standard or tentative standard in effect at the time of call for bids shall apply in each case. Revisions shall be considered as becoming effective on the first day of December in the year in which they are adopted.

AASHO—American Association of State Highway Officials. The specifications or test method shown by number refers to the "Standard Specifications for Highway Materials and Methods of Sampling and Testing," currently published by the association, or to such revisions as may have been subsequently adopted by the association. Revisions in effect at the time of call for bids shall apply. Revisions shall be considered as becoming effective sixty days after announcement of adoption is published in the "Annual Reports of the Permanent Committees" of the Association.

AWWA—American Water Works Asosciation. The effective date of the AWWA specifications is on the first day of the second month after publication in the American Water Works Journal. The AWWA specifications and revisions thus in effect at the time of the call for bids shall apply whenever referenced in these specifications.

Federal Specifications — U. S. Government Federal Stock Catalogue. The specification number refers to the latest revised specifications adopted by the Federal Specifications Board. Revisions in effect at the time of call for bids shall apply. Revisions shall be considered as becoming effective sixty days after adoption by the Board.

PUBLICATIONS:

Copies of any separate ASTM specifications or method of test may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Copies of "Standard Specifications for Highway Materials and Methods of Sampling and Testing" may be obtained from the American Association of State Highway Officials, 917 National Press Building, Washington, D. C.

Copies of standard grading and dressing rules may be obtained from the West Coast Lumber Inspection Bureau, Seattle, Washington, or Portland, Oregon, and from the Western Pine Association, Portland, Oregon.

6.03 SPECIAL METHODS OF TEST

The methods of tests which follow shall apply when so designated elsewhere in these specifications or in the special provisions. Details of test methods are available from the Materials Laboratory of the Department of Highways, Olympia, Washington.

1. *Stabilometer Resistance Value and Swell Pressure Test:* The resistance value (R-value) is measured by the stabilometer test which is a form of triaxial test. The test is performed on untreated or treated soils or aggregates for use as subgrades, subbases, or bases. The test result is reported as an R-value on a scale from 0 to 100 which is a numerical index of the ability of the material to resist plastic deformation under vehicle loads.
2. *Test for Moisture Retaining Effectiveness of Concrete Curing Compounds:* This test measures the ability of concrete curing compounds to prevent loss of water from a fresh concrete mixture made under definite specified conditions.
3. *Modified Immersion-Compression Test:* The modified immersion-compression test measures the degree to which a compacted bituminous specimen resists the action of water. The test is performed by soaking a compacted briquette 4 inches in diameter and 2½ inches high in water at 140° F., for 24 hours. The ratio of the stabilometer value of the soaked specimen to the stabilometer value of a companion specimen that has not been soaked is the measure of the resistance of the material to water action.
4. *Mortar Strength Test:* The mortar strength test is a procedure to determine the strength developed by mortar using a given concrete sand in relation to that developed by mortar using Ottawa sand. The test indirectly measures the concrete making properties of the sand under test.
5. *Sand Equivalent Test:* The sand equivalent test indicates the proportion of detrimental fine dust or clay-like materials in soils or fine aggregates.
6. *Test for Effectiveness of Concrete Waterproofing Materials:* The test for effectiveness of concrete waterproofing materials measures the ability of those materials to prevent moisture absorption by concrete specimens under standardized test conditions.
7. *Stabilometer Test (Asphalt Concrete Mixtures):* The stabilometer test is a form of triaxial test employing compacted test specimens of asphalt concrete mixtures having a height-diameter ratio of approximately 0.6. The results are reported as stabilometer values in units on a scale ranging from 0 to 100, indicating the relative ability of the pavement to resist distortion under the action of traffic.
8. *Cohesiometer Test (Asphalt Concrete Mixtures):* The cohesiometer test is a measure of the cohesive resistance or tensile strength of a compacted asphalt concrete mixture.
9. *Thin Film Oven Test:* The thin film oven test is a method of determining the amount which an asphalt changes when subjected to prolonged, elevated temperature.
10. *Penetration Ratio:* The penetration ratio is the ratio of the penetration at 39.2° F. to that at 77° F., and is a means of determining the effect of low temperatures on the characteristics of the asphalt.

6.04 STORAGE OF MATERIALS

All materials intended for use in the work shall be stored by the Contractor by means that will prevent damage from exposure to the elements, from admixture of foreign material, or from any other cause. The engineer will refuse to accept, or to sample for testing, any materials that are improperly stored.

6.05 DEFECTIVE MATERIALS

All materials not conforming to the requirements of these specifications will be rejected by the Engineer, and all such materials whether in place or not, shall be immediately removed from the site of the work by the Contractor.

6.06 SIEVES FOR TESTING PURPOSES

Sieves for testing purposes shall be woven wire cloth sieves or square hole perforated plates conforming to the requirements of AASHO Designation M92 or ASTM Designation E11.

Section 7—Legal Relations and Responsibility to the Public

7.01 MUNICIPAL REGULATIONS AND STATE LAWS

All municipal ordinances of the Owner and regulations and laws of Washington shall become a part of the contract and be complied with in the performance of all portions of the work.

7.02 CONTRACT BOND, PERFORMANCE BOND

The Contractor agrees to execute and furnish to the Owner a good and sufficient bond with an approved surety company as surety, said bond to be payable to the Owner in the penal sum of the full amount of the contract, conditioned that all the provisions of the contract shall be faithfully performed by the Contractor, or the surety if so required, and shall indemnify the Owner against any direct or indirect damages that shall be suffered or claimed, for injuries to persons or property, during the carrying out of the work of the contract, and further conditioned as required by law for the payment of all laborers, mechanics, subcontractors and material men, and all persons who shall supply such person or persons or subcontractors with provisions or supplies for the carrying on of such work. If the Engineer shall have reason to believe that the security on said bond has become impaired since the execution thereof, or is insufficient, he may require the Contractor to furnish other or additional security.

7.03 ACCIDENT PREVENTION

Precaution shall be exercised at all times by the Contractor for the protection of persons, employees and property. The safety provisions of applicable laws and local building and construction codes shall be observed.

The operations of the Contractor for the protection of persons, and for guarding against hazards of machinery and equipment, shall meet the requirements of state law and all safety regulations as set out in "Safety Standards for Construction" and "General Safety Standards," published and in effect at the time of call for bids. These publications will be furnished without charge by the Department of Labor and Industries, Olympia, Washington.

7.04 PROTECTION OF WORKMEN AND PROPERTY

The Contractor shall erect and maintain good and sufficient guards, barricades and signals at all unsafe places at or near the work, and shall in all cases maintain safe passageways at all road crossings, crosswalks, street intersections, and shall do all other things necessary to prevent accident or loss of any kind.

7.05 LABOR

The Contractor shall at all times employ workmen who are skilled in their respective lines. The Contractor is restricted in his selection of labor and payment therefor by certain legal requirements which must be observed for compliance with the public policy enunciated in RCW 49.28. This refers to the eight hour day, payment for overtime, cancellation of contract for violations, and penalties for violations of provisions therein. The Contractor should be thoroughly familiar with all provisions of this and other statutes that are subsequently noted herein before commencing work on his contract.

7.06 SELECTION OF LABOR (Chapter 246, Laws of 1943, RCW Chapter 39.16)

In all contracts awarded by the Owner for the erection, construction, alteration, demolition or repair of any public building, structure, bridge, highway, or any other kind of public work or improvement, the Contractor, subcontractor, or person in charge thereof, shall employ ninety-five (95) percent or more bona fide Washington residents as employees where more than fifty (50) persons are employed, and ninety (90) percent or more where fifty (50) or less are employed. The term "resident" as used in this act shall mean any person who has been a bona fide resident of the State of Washington for a period of ninety (90) days prior to such employment, *provided*, that in contracts involving the expenditure of Federal-aid funds this act shall not be enforced in such a manner as to conflict with or be contrary to the Federal statutes, rules and regulations prescribing a labor preference to honorably discharged soldiers, sailors and marines, or prohibiting as unlawful any other preference or discrimination among the citizens of the United States.

In the event that a sufficient number of Washington residents shall not be available, the Contractor or subcontractor shall immediately notify the Owner and shall state the number of non-residents needed. The public body shall immediately investigate the facts and if the conditions are as stated, the public body may, by written order, designate the number of non-residents and the period for which they may be employed, *provided*, that should residents become available within the period, such residents will be immediately employed and the period shortened consistent with the supply of residential labor.

The provisions of this act shall be written into every such public contract including the following penalty: Any Contractor or subcontractor who shall employ a non-resident in excess of the percentage preferences, excepting as herein permitted, shall have deducted from the amount due him for every violation, the prevailing wages which should have been paid to a displaced resident. The money so deducted shall be retained by the public body for whom the contract is being performed.

Any person, firm or corporation violating any of the provisions of this act shall be guilty of a misdemeanor.

7.07 LEGAL WAGES ON PUBLIC WORKS

Under the provisions of RCW 39.12, the hourly wages to be paid to laborers, workmen, or mechanics upon all public works of this State and upon work contemplated in this contract, shall be not less than the prevailing rate of wage for an hour's work in the same trade or occupation in the locality within the State where such labor and work herein contemplated is to be performed.

All laborers, workmen or mechanics shall be paid not less than the minimum hourly rate of wage hereinafter specified, *provided, however,* that nothing herein contained shall be construed to prohibit the Contractor, subcontractor or other person doing or contracting to do the whole or any part of the work under this contract, from paying any such laborers, workmen or mechanics wages in excess of the hourly minimum rate above specified.

The "prevailing rate of wage," for the purposes of the contract, shall be the rate of hourly wage and overtime paid in this locality, as hereinafter defined, to the majority of workmen, laborers or mechanics, in the same trade or occupation. In the event that there is not a majority in the same trade or occupation paid at the same rate, then the average rate of hourly wage and overtime paid to such laborers, workmen, or mechanics in the same trade or occupation shall be the prevailing rate.

If the wage paid by any Contractor or subcontractor to laborers, workmen or mechanics in the performance of this contract is based upon some period of time other than an hour, the hourly wage, for the purpose of this contract shall be mathematically determined by the number of hours worked in such period of time.

The "locality" for the purposes hereof shall be the largest city in the county wherein the physical work is being performed.

Before payment is made by or on behalf of the Owner of any sum or sums due under this contract, the Contractor shall submit a certificate in the following form:

State of Washington, }
County of..... } ss.

I, the undersigned, having been duly sworn, depose, say and certify that in connection with the performance of the work, payment for which this voucher is submitted, I have paid the following rate per hour for each classification of laborers, workmen, or mechanics, as indicated upon the attached list, now referred to and by such reference incorporated in and made an integral part hereof, for all such employed in the performance of such work; and no laborer, workman or mechanic so employed upon such work has been paid less than the prevailing rate of wage or less than the minimum rate of wages as specified in the principal contract; that I have read the above and foregoing statement and certificate, know the contents thereof and the substance as set forth therein is true to my knowledge and belief.

Attention is called to RCW 39.12.050, which reads as follows:

> "Any Contractor or subcontractor who shall, upon his oath, verify any statement required to be filed under this act which is known by him to be false, or is made without knowledge in reckless disregard of the truth, shall be guilty of perjury in second degree and shall be punished as provided in Section 101, Chapter 249, Laws of 1901 (Section 2353, Remington's Revised Statutes)."

In case any dispute arises as to what are the prevailing rates of wages for work of a similar nature to that contemplated under the contract and such dispute cannot be adjusted by the parties involved, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries of the State of Washington, and his decision therein shall be final, conclusive, and binding on all parties involved in the dispute.

The hourly minimum rate of wage, not less than the prevailing rate of wage, which may be paid to laborers, workmen or mechanics in each trade or occupation required in the performance of this contract, either by the Contractor, subcontractor or person doing or contracting to do the whole or any part of the work contemplated by this contract, is shown in the special provisions.

The Owner does not guarantee that labor can be procured for the minimum wages set forth. The rates of wages listed are minimum only, below which the Contractor cannot pay and they do not constitute a representation that labor can be procured for the minimum listed. It will be the responsibility of the Contractor to ascertain for himself the wages above the minimum set forth he may have to pay.

7.08 FAILURE TO PAY FOR LABOR AND MATERIALS

If, at any time the Contractor fails to pay the subcontractor or the laborers employed upon the work, or fails to pay for the materials used therein, the Owner may withhold from the money which may be due the Contractor under this agreement such amount or amounts as may be necessary for the payment of such subcontractors, laborers, or materials, and may, acting as agent for the Contractor, apply the same to such payments and deduct the same from the final estimate of the Contractor. This provision is intended to protect the subcontractors and laborers employed upon the work and the parties who may be furnishing the materials to be used herein.

7.09 STATE SALES TAX

Pursuant to the existing laws of the State of Washington and rulings of the Tax Commission, certain activities relating to the building, repairing, or improving of public streets are not subject to a retail sales tax. Most other construction activities are deemed to be retail sales and hence subject to the sales tax.

The Owner will claim any exemption from the retail sales tax authorized by law, and the Contractor should determine which activities are subject to tax in order to properly evaluate the work. The Owner will furnish such information as it has available regarding the application of sales tax, but in no event shall the furnishing of such information constitute a representation or warranty and the Contractor shall be responsible for the correct interpretation of any laws or regulations relating to the application of the State sales tax.

7.10 PERMITS AND LICENSES

The Contractor shall procure all necessary permits, pay for the same, and obtain all official licenses for the construction of the work and for temporary obstructions, inclosures, opening of streets for pipes, walls, etc., arising from the construction and completion of the work described in the specifications. He shall be responsible for all violations of the law for any cause in connection with the construction of the work, or caused by obstruction of the work, or caused by obstructing streets, sidewalks, etc., and he shall give all requisite notices to public authorities.

7.11 ROYALTIES AND PATENTS

The Contractor shall be liable for all suits brought against the Owner by reason of infringement of patent rights on any material, machine or appliance that he may use on the work or incorporate in the finished job, except where specifically exempted by the special provisions. Unit prices named in the proposal shall include payment of royalties, if any.

7.12 USE OF PREMISES

The Contractor shall confine his equipment, storage of materials and operation of work to the limits indicated by law, ordinances, permits or direction of the Engineer, and shall not unreasonably encumber the premises with his materials. The Contractor shall comply with the Engineer's instructions regarding signs, advertisements, fires, and smoking.

7.13 CONFINE OPERATIONS WITHIN RIGHTS OF WAY AND EASEMENTS

Property lines, limits of easements, and limits of construction permits are indicated on the plans and it shall be the Contractor's responsibility to confine his construction activities within these limits. Any damage resulting to persons or property from encroaching beyond these limits shall be the sole responsibility of the Contractor.

7.14 SAFEGUARDS

The Contractor shall provide and maintain on a 24-hour basis all necessary safeguards such as watchmen, warning signs, barricades, and night lights at his own expense. Special care shall be exercised to prevent vehicles, pedestrians, and livestock from falling into open trenches or being otherwise harmed as a result of the work. The Contractor shall, in all cases, hold the Owner harmless for any and all damages resulting from any of his operations.

7.15 MAINTENANCE OF TRAFFIC

7.15A Division of Responsibility

The Contractor shall be responsible for maintenance, control, and the safeguarding of traffic within and immediately abutting the project as further outlined herein, and as may otherwise be provided in the special provisions. The Owner will be responsible for maintenance, control, and safeguarding of traffic on all detours which do not lie within the project limits, unless otherwise required in the special provisions.

7.15B Street Closures or Partial Closures

Streets may be closed to through traffic unless otherwise provided for in the special provisions. Streets shall not be closed to traffic until such closure has been approved by the Engineer or an authorized traffic officer. Street closures shall be made in such a manner as to provide for maximum public safety and public convenience. They shall be opened to through traffic at such time as the work has been completed, or as the Engineer may direct.

7.15C Notifications

Notifications for street closures shall be made in accordance with Section 5.05.

7.15D Existing Traffic Signs and Facilities

The Owner will make all necessary adjustments to traffic signals and traffic signal activators at no cost to the Contractor. Existing traffic and street name signs which will interfere with construction shall be removed by the Contractor and stored in a safe place. These signs shall not be removed until the Engineer has so directed and until the necessary measures have been taken to safeguard traffic after the signs have been removed. Preservation and maintenance of the signs shall be the sole responsibility of the Contractor. Upon completion of the project, the Owner will reset all such signs at no cost to the Contractor.

7.15E Detours

Detours outside the limits of the project shall be the sole responsibility of the Owner unless otherwise provided in the special provisions. Detours within the limits of the project such as side street crossings, temporary bridges over freshly placed concrete, utilization of one or more lanes of the construction area for maintenance of traffic, and such related facilities for the maintenance of traffic shall be the responsibility of the Contractor, the costs for which shall be included in the unit contract prices unless otherwise provided in the special provisions.

7.15F Local and Emergency Traffic

Local traffic shall be provided access to private properties at all times, except during some urgent stages of construction when it is impracticable to carry on the construction and maintain traffic simultaneously, such as for the placing of asphalt concrete pavement, placing and curing of portland cement concrete pavement, and deep sewer excavations which prohibit safe travel of vehicular traffic.

No private driveway may be closed without the approval of the Engineer unless written permission has been given the Contractor by the owner of the property affected.

Emergency traffic such as police, fire, and disaster units shall be provided reasonable access at all times. The Contractor shall be liable for any damages which may result from his failure to provide such reasonable access.

7.15G Protection of Pedestrian and Vehicular Traffic

The Contractor shall take every precaution to protect pedestrian and vehicular traffic. Wherever, in the opinion of the Engineer, the Contractor has not provided sufficient or proper safety precautions and safeguards, he shall do so immediately and to whatever extent the Engineer deems advisable.

7.15H Restriction of Parking

Where parking is a hazard to through traffic or to the construction work, it shall be restricted either entirely or during the time when it creates a hazard. Signs for this purpose will be initially furnished and placed by the Owner. The Contractor shall be responsible for and shall maintain the signs if they are used on any street which is directly involved in the construction work. If the parking signs are to be used beyond the confines of the work area such as another street being used as a detour, the signs will be the responsibility of the Owner.

7.15I Flagmen

The Contractor shall furnish at his own expense all flagmen who may be needed unless otherwise provided in the special provisions.

7.16 TRAFFIC CONTROL WITHIN AND ABUTTING THE PROJECT

The Contractor shall place and maintain all signs, barricades and warning lights within the limits of the project on all streets, alleys and driveways entering the project so that approaching traffic will turn right or left on existing undisturbed streets before reaching the warning signs and barriers immediately abutting the project. Signs which are required will, unless otherwise provided in the special provisions, be furnished by the Owner as provided in Section 7.17.

Barricades shall be furnished by the Contractor. The barricades shall be of a conventional design normally used in street construction work and painted a current traffic yellow with black stripes.

Unless otherwise provided in the special provisions, the Owner will assume responsibility for signs and traffic control devices beyond the limits hereinbefore described.

7.17 TRAFFIC CONTROL SIGNS

Standard traffic control signs required for construction will be furnished to the Contractor at no charge. He shall maintain them in a neat condition until the need for them has ceased, after when he shall carefully remove the signs and return them to the Engineer in good condition. All signs lost or destroyed shall be replaced in kind by the Contractor or else a deduction will be made on estimates due him to cover the value of signs not returned in acceptable condition.

All costs incurred by the Contractor in placing and maintaining the signs shall be considered as incidental to the cost of the construction and be included in the unit contract prices of the work.

7.18 PROCEDURE FOR PROCURING SIGNS

The Contractor shall call the Engineer for those signs the Owner is to furnish. Except in an emergency, the call shall not be less than eighteen (18) hours before signs are required. Where special signs are involved, the notification shall be not less than one (1) week before delivery.

The Contractor shall pick up the signs at the point designated by the Engineer and return them at such time as they are no longer needed on the particular project. At the time the Contractor picks up the signs, he or his representative shall sign an itemized receipt showing the number and types of signs delivered to him. Any signs not returned, or which have been damaged, will be charged against the Contractor at a rate to be determined by the Engineer, and the cost thereof shall be deducted from the pre-final estimate.

7.19 MAINTAINING POSTAL SERVICE

Postal service shall be maintained in accordance with the instructions of the U. S. Post Office Department. The Contractor shall be responsible for moving mail boxes to temporary locations designated by the Post Office Department, and at completion of the work he shall replace them in location and in condition satisfactory to the Post Office Department.

It will be the Contractor's responsibility to contact the U. S. Post Office Department for their requirements in maintenance of postal service and to follow the requirements.

In cases where the posts upon which the box or boxes are fastened are in such condition that they cannot be reset, the Contractor shall furnish posts for this purpose at his own expense unless payment therefor is otherwise provided in the proposal or special provisions.

All cost incurred in work outlined above shall be considered as incidental to the construction of the contract unless otherwise provided in the proposal or special provisions.

7.20 USE OF EXPLOSIVES

Blasting will not be permitted in any case without specific authority of the Owner, and then only under such restrictions as may be required by the proper authorities. Explosives shall be handled and used in strict compliance with "Safety Standards for Construction," by the Department of Labor and Industries, Olympia.

When the use of explosives is necessary for the prosecution of the work, the Contractor shall use the utmost care so as not to endanger life or property, cause slides or disturb the materials outside the neat lines of the cross section.

Blasting shall be completed in the vicinity of new structures before construction on such structures is undertaken. All explosives shall be stored in a secure manner and place in compliance with local laws and ordinances and all such storage places shall be clearly marked "Dangerous—Explosives". No explosive shall be left in an unprotected manner along or adjacent to any existing highway or public place.

7.21 RAILROAD CROSSINGS

Wherever a project is being constructed beneath, at grade or above railroad tracks, the permits for the construction will have previously been secured by the Owner. It shall be the Contractor's responsibility, however, to contact the railroad company prior to constructing such crossings and to proceed with the construction as directed by the railroad company. The Contractor shall hold the Owner harmless from any and all damages resulting from his operations in the construction at such crossings.

7.22 SANITARY PROVISIONS

The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements and regulations of the State Department of Health and of other bodies or officers having jurisdiction thereover. He shall permit no public nuisance.

7.23 USE AND OCCUPANCY PRIOR TO COMPLETION OF CONTRACT

The Owner reserves the right to use and occupy any portion of this improvement which has been sufficiently completed, but such use and occupancy shall not be construed as an acceptance of any portion of the work, and any claims which the Owner may have against the Contractor shall not be deemed to have been waived by such occupancy.

7.24 PERSONAL LIABILITY OF PUBLIC OFFICIALS

Neither the Engineer nor any of his assistants, nor any other officer of the Owner shall be personally responsible for any liability arising under or growing out of the contract.

7.25 NO WAIVER OF LEGAL RIGHTS

Should an error be discovered in or payment of unauthorized work be made by the final estimate or should dishonesty on the part of the Contractor be discovered in the work, the Owner reserves the right, after the final payment has been made, to claim and recover by process of law such sums as may be sufficient to correct the error, to recover the overpayment, or to make good the defects in the work resulting from the Contractor's dishonesty.

Section 8—Prosecution and Progress

8.01 CONSTRUCTION SCHEDULE

After being awarded the contract and if requested by the Engineer, the Contractor shall immediately prepare and submit to the Engineer for approval a progress schedule which will insure the completion of the project within the time specified. Adequate equipment and forces shall be made available by the Contractor to start work immediately upon order of the Engineer and to carry out the schedule to completion of the contract within the time specified.

8.02 NOTICE TO PROCEED AND PROSECUTION OF THE WORK

The Contractor shall begin work as specified in the special provisions and shall prosecute the work vigorously and continuously to completion except when it is physically impossible to do so on account of weather conditions or other unavoidable handicaps.

The necessity of discontinuing and resuming work on any portion of the contract shall be determined by the Engineer.

8.03 SUSPENSION OF WORK

When, in the judgment of the Engineer, unfavorable weather makes it impractical to secure first class results, or other conditions warrant the granting of a suspense order, he shall issue to the Contractor a written order to suspend work wholly or on any part of the contract. When conditions are again favorable for prosecution of the work the Engineer shall issue to the Contractor a written order to resume the suspended work. Orders to suspend work will not be written for intermittent shutdowns due to weather conditions unless the suspension of work is to be for an extended period of time. The Contractor shall take every precaution to prevent any damage or unreasonable deterioration of the work during the time it is closed down.

Suspension of the work by the Engineer shall not furnish any grounds for claims by the Contractor for damages or extra compensation, but the period of such suspensions shall be taken into consideration in determining the revised date for completion as hereinafter provided. The Contractor shall not suspend work under the contract without the written order of the Engineer as stated in the preceding paragraph. The Contractor will be required to work a sufficient number of hours per day in order to complete the project within the work days specified. The question as to the necessity of discontinuing any portion of the work by reason of unfavorable weather conditions shall be determined by the Engineer. Suspension orders will not be issued for the unavoidable delays mentioned in Section 8.07.

Upon failure of the Contractor to carry out the orders of the Engineer or to perform work under the contract in accordance with its provisions, the Engineer may suspend the work for such period as he may deem necessary. Time lost by reason of such failure or in replacing improper work or material shall not furnish any grounds to the Contractor for claiming an extension of time or extra compensation, and shall not release the Contractor from damages or liability from failure to complete the work within the time prescribed.

8.04 SUSPENSION OF WORK FOR AN EXTENDED PERIOD

In the event that a suspension of work is ordered in writing by the Engineer for an extended period of time due to unsuitable weather, which work in the opinion of the Engineer could have been performed prior to the occurrence of unsuitable weather conditions had the Contractor diligently prosecuted the work when conditions were suitable, the Contractor, at his own expense, shall do all work necessary to provide a safe, smooth and unobstructed roadway through the construction area for use by public traffic, and particularly for access to abutting property, during the period of suspension as required in Section 7.15F, or as provided in the special provisions. If the Contractor fails to do the work as above specified, the Owner will perform such work and deduct the cost thereof from any moneys due or to become due the Contractor.

In the event that a suspension of work for an extended period of time is ordered in writing by the Engineer due to unsuitable weather or unforeseen conditions and, in the opinion of the Engineer the Contractor has prosecuted the work with energy and diligence prior to the time of suspension of operations and has so constructed the temporary roadway or detour that it may be maintained by routine maintenance forces of the Owner during the period of suspension, the cost of maintaining a smooth and unobstructed roadway will be borne by the Owner at no cost to the Contractor.

In the event that a suspension of work for an extended period of time is ordered in writing by the Engineer on oiling or resurfacing projects, which do not require disturbing the existing traveled surface and on which the existing surface or shoulders have not been disturbed by the Contractor, the owner will maintain the roadway at no cost to the Contractor during the period of suspension.

If a suspension of work for an extended period, under which the Owner assumes the responsibility of maintenance, is granted in writing by the Engineer, the Owner will assume no responsibility except for routine maintenance which shall include and be restricted to the following:

(a) Maintenance of the traveled roadway and/or detour surface.
(b) Maintenance of roadway surface drainage along the roadway and/or detour.

Any areas which are closed to traffic shall be maintained and safeguarded by the Contractor at his own expense.

In the event that the Owner has assumed maintenance of a project during a period of suspension, the Contractor agrees to accept the roadway or detour as it has been maintained by the Owner and no claim for extra payment shall be made on account of its condition or the manner in which the maintenance has been performed by the Owner. Such suspensions of work shall not relieve the Contractor of his responsibility of restoring the roadway and its slopes to the designated roadway section at his unit contract prices and for performing all other remaining work in accordance with the contract.

An extended period of time as expressed in these specifications is intended to mean shutdowns ordered in writing by the Engineer to cover extended shutdowns due to winter or seasonal weather, or extended shutdowns due to delays occasioned by the failure of another contractor to complete a portion of the work on which progress of the contract is dependent, or for other causes approved by the Engineer.

8.05 TIME FOR COMPLETION

The improvement contemplated by the contract shall be completed in its entirety within the number of working days, or by definite completion date specified in the special provisions. The contract time shall commence at the time specified in the special provisions.

A working day is defined as any day not otherwise defined herein as a non-working day. A non-working day is defined as Saturday, Sunday, a recognized holiday, a day on which the Contractor is specifically required by the special provisions to suspend construction operations, a day on which a suspension order is in effect, or a day on which work is not performed for reasons set forth in Section 8.07. Recognized holidays shall be: January 1st, February 22nd, May 30th, July 4th, Labor Day, Presidential Election day, Thanksgiving Day, and December 25th. When any of the above days fall on Sunday, the following Monday shall be counted as a holiday.

A suspension order covering a certain portion of the work only, will affect a working day by the percentage set forth on the suspension order, which percentage is intended to compensate for anticipated time lost in completing the contract on the time specified.

The Engineer will furnish the Contractor a weekly statement showing the number of working days charged to the contract for the preceding week, the number of working days specified for completion of the project, the number of working days remaining to complete the contract, and the revised date for completion. The Contractor will be allowed ten (10) days from the date of this report in which to file a written protest of any alleged discrepancies in said weekly statement; otherwise, the statement shall be deemed to have been accepted by the Contractor as correct. If all work is satisfactorily completed on or prior to the revised date for completion as shown on the last weekly statement, a request by the Contractor for an extension will not be required. The Owner shall have the right at his discretion to extend the time for completion of the contract. Any extension of time requested by the Contractor for the consideration of the Owner shall be submitted in writing and shall be accompanied by the written consent to such extension by the surety on the bond.

8.06 DATE OF COMPLETION OF CONTRACT

Upon completion of all work and the incorporating of materials required under the provisions of the contract, the Engineer will report on the weekly statement, advising the Contractor of the date on which all work and materials were considered as being completed. Further requirements shall be as outlined in Section 9.06, Acceptance of Construction.

Notification to the Contractor of the date of completion will not constitute acceptance of the work by the Owner. The acceptance of the work by the Owner is further outlined in Sections 9.05 and 9.06.

8.07 UNAVOIDABLE DELAYS

Should the Contractor be delayed in the prosecution or completion of the work by the act, neglect, or default of the Owner, any of its officers or employees, any other contractor employed by the Owner upon the work, or by any damage caused by fire or other casualty for which the Contractor is not responsible, or by combined action of workmen, in no way caused by or resulting from default or collusion on the part of the Contractor, then the time herein set for the completion of the work shall be extended for a period equivalent to the work time lost by reason of any or all of the causes aforesaid. The extended time period shall be determined and fixed by the Owner, which determination shall be final, but no such allowance shall be made unless a claim therefor is presented in writing to the Owner within ten (10) days after the occurrence of such delay.

The Contractor shall cooperate with the Contractor of an adjoining or interdependent project to the fullest extent possible so that the operations of both will suffer a minimum of interference and delay. In case of disagreement between the Contractors, the decision of the Engineer shall be accepted as final. Any unavoidable delays to the Contractor resulting therefrom shall be adjusted as to contract time in accordance with specifications of this section.

In general, the number of working days allowed for completion of the project has been extended sufficiently to provide for the procurement of all materials necessary for construction and, unless otherwise noted in the special provisions, failure to procure the materials involved for any reason other than listed above will not be considered as an adequate reason for an extension of time.

8.08 FAILURE TO COMPLETE WORK ON TIME—LIQUIDATED DAMAGES

Time for completion of the work as provided by the contract is admitted to have been sufficiently advanced to allow resulting benefit to the Contractor from earlier completion of the work. Time, therefor, shall be of the essence of the contract. In case the contract is not completed within the time mentioned in the contract or by or prior to a date to which the period of completion may have been extended, the Contractor will pay to the Owner, as liquidated damages, the actual cost to the Owner of maintaining its engineering, inspection and other forces and equipment on the work after said time for completion, together with such other damages as may be suffered by the Owner because of the Contractor's failure to complete the work on time.

The Contractor does hereby authorize the Owner to deduct such costs and liquidated damages from the amount due or to become due the Contractor. The Contractor further agrees that any such deduction or payment shall not in any degree release the Contractor from further obligations and liabilities in respect to the fulfillment of the entire contract. Engineering charges or other liquidated damages shall not be assessed the Contractor for unworkable days caused by weather conditions or for any other days for which an extension of time will have been granted.

8.09 ASSIGNMENT OF CONTRACT AND SUBLETTING

The Contractor shall not assign this contract or any part thereof, or any moneys due or to become due thereunder, without the prior written approval of the Owner. The Contractor shall not sublet any part of this contract without first having obtained the written consent of the Engineer to do so.

Requests for permission to sublet, assign, or otherwise dispose of any portion of the contract shall be in writing and accompanied by the consent of the surety. In the event consent is given, it shall in no way release the Contractor from any responsibility, but he shall be held in all respects accountable for the same as if no consent had been given. The Contractor shall be required to give his personal attention to the work which is sublet.

8.10 FORFEITURE OF CONTRACT

Should the Contractor at any time refuse or neglect to supply a sufficiency of properly skilled workmen or of material of the proper quality, or fail in any respect to prosecute the work with promptness and diligence, or fail in the performance of any of the agreements herein contained, the Owner may at his option, after giving ten (10) days written notice to the Contractor, provide such sufficiency of labor or materials and deduct the cost thereof from any moneys due or thereafter to become due under this contract.

In the event of such refusal, neglect, or failure, the Owner may, by written notice to the Contractor and his surety or his representative, or, if the Contractor abandons the work undertaken under the contract, the Owner may, at his option with such written notice to the surety and without any written notice to the Contractor, transfer the employment of said work from the Contractor to the surety.

Upon receipt of such notice, the surety shall enter upon the premises and take possesison of all materials, tools, and appliances thereon for the purpose of completing the work included under this contract, and employ by contract or otherwise, any person or persons to finish the work and provide the material therefor, without termination of the continuing full force and effect of the contract.

In case of such transfer of employment to the surety, the surety shall be paid in its own name on estimates covering the work subsequently performed under the terms of the contract and according to the terms hereof, without any right of the Contractor to make any claim for the same or any part thereof. In lieu of the foregoing, if the Owner so elects, he may terminate the employment of the Contractor for said work and enter upon the premises and take possession of all materials, tools and equipment thereon for the purpose of completing the work included under the contract, and employ by contract or otherwise, any person or persons to finish the work and provide the materials therefor.

In case of the discontinuance of employment by the Owner as aforesaid, the Contractor shall not be entitled to receive any further balance of the amount to be paid under this contract until the work shall have been fully finished. At this time, if the unpaid balance of the amount to be paid under this contract exceeds the expense incurred by the Owner in finishing the work, and all damages sustained or which may be sustained by the Owner by reason of such refusal, neglect, failure, or discontinuance of employment, such excess shall be paid by the Owner to the Contractor. If such expense and damages shall exceed the unpaid balance, the Contractor and his surety and each thereof shall be jointly and severally liable therefor to the Owner and shall pay the difference to the Owner.

8.11 CONTRACTOR ORGANIZATION, SUPERINTENDENCE AND EQUIPMENT

All machinery and equipment shall be adequate for the purpose used and shall be kept in good workable condition and be operated by experienced operators.

The Contractor shall provide at all times during the progress of the work, competent and necessary superintendence. During the Contractor's absence, the superintendent shall have full authority to execute the orders or directions of the Engineer without delay and to promptly supply such materials, tools, plant equipment and labor as may be required.

All work under the contract shall be performed under the continuous supervision of competent personnel thoroughly experienced in the class of work specified.

Incompetent, careless or negligent employees or agents shall be forthwith discharged by the Contractor upon written request of the Engineer, and failure to comply with such request shall be sufficient grounds for termination of the contract.

The lack of proper supervision by the Contractor or by his supervisory personnel shall be just cause for termination of the contract, as set forth in Section 8.10.

Section 9—Measurement and Payment

9.01 MEASUREMENT

The determination of pay quantities of work performed under the contract will be made by the Engineer based upon the lines, grades, and cross section given, or measurements made by him or his assistants. All items will be computed in the units in the proposal.

9.02 SCOPE OF PAYMENT

The Contractor shall accept the compensation, as herein provided, in full payment for furnishing all materials, labor, tools and emquipment necessary to the completed work and for performing all work contemplated and embraced under the contract; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Owner, and for all risks of every description connected with the prosecution of the work; also for all expenses incurred in consequence of the suspension or discontinuance of the work as herein specified; and for completing the work according to the plans and specifications.

Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material. Payment will be made only for materials actually incorporated in the work. For payment of materials on site, see Section 9.05, Progress Payments.

The unit contract prices for the various bid items of the contract shall be full compensation for all labor, materials, supplies, equipment, tools and all things of whatsoever nature required for the complete incorporation of the item into the work the same as though the item were to read "In Place," unless the plans and special provisions shall provide otherwise.

9.03 PAYMENT FOR EXTRA WORK

Adjustments, if any, in the amounts to be paid the Contractor by reason of any change, addition, or deduction, shall be determined by one or more of the following methods:

(a) By an acceptable lump-sum proposal from the Contractor.
(b) By unit contract prices contained in the contract proposal, or by unit prices mutually agreed upon by the Contractor and the Owner.
(c) By force account.

It shall be the responsibility of the Contractor before proceeding with any change to satisfy himself that the change has been properly authorized in behalf of the Owner. No charge for extra work or any other change in the contract will be allowed unless the extra work or change has been authorized in writing by the Owner, and the compensation or method thereof is stated in such written authority.

9.04 FORCE ACCOUNT

If the Engineer orders in writing the performance of any work not covered by the plans or included in the specifications, and for which no item is provided in the contract and for which no unit price or lump sum basis can be agreed upon, then such extra work shall be done on a cost-plus (force account) basis as described below:

1. For all labor, including such foreman supervision which the Engineer may deem necessary upon any particular operation, the Contractor shall be reimbursed at the current local rate of wages agreed upon before starting the operation for each hour that labor and foreman supervision are actually engaged upon such work, and in addition thereto, the Contractor shall receive eighteen percent (18%) of the sum of wages to cover overhead and profit thereupon. Health and welfare benefits, travel time, and other fringe benefits will be considered as wages.

The same wage rates shall be paid on force account work as prevail on other work of the contract.

2. For all materials deemed necessary by the Engineer, the Contractor shall receive the actual cost of such materials, including freight charges, but exclusive of sales tax, as shown by originally receipted bills, to which cost shall be added a sum equal to eighteen percent (18%) thereof.

3. For any machine power tools or equipment which the Engineer may deem necessary or desirable to use, the Contractor shall be allowed a maximum rental rate in the amount as set forth in the current schedule of the Washington State Highway Commission's "Maximum Hourly Rental Rates for Force Account Work," for each and every hour that said tools or equipment are in use on such work. The rates in effect at the time of the performance of the force account work are the only rates allowable for equipment of modern design and in good working condition, and shall include and be full compensation for furnishing all fuel, oil lubrication, repairs, maintenance, insurance, and incidental expenses, except labor for operation thereof. To the sum of the amount due the Contractor for rental of tools and equipment shall be added an amount equal to eighteen percent (18%) of that sum.

In event the necessary equipment is not already at the site of the project, and it is not anticipated that it would be required for the performance of work under the terms of the contract, other than force account, the Contractor shall be paid an agreed amount for the necessary transportation of the equipment in and out. To the agreed amount shall be added an amount equal to eighteen percent (18%) of that sum.

4. The Contractor shall be allowed compensation for payments made to the State Department of Labor and Industries which are occasioned by force account work. These payments shall include Industrial Insurance premiums and fifty percent (50%) of the medical aid. The Contractor shall also be allowed compensation for payments made to the Tax Commission of the State of Washington for sales tax upon the purchase of materials used on force account work. Compensation for these premiums shall be in the amount of the actual payments made by the Contractor to which no percentage will be added.

5. For all force account work involving water systems, sanitary sewer systems and sewage disposal facilities, the Contractor is advised that the sale to him of necessary materials, supplies, etc., are sales for resale and are, therefore, not subject to the retail sales tax. The Contractor is required to collect from the Owner the retail sales tax as prescribed by law.

6. The compensation as herein provided shall be payment in full for all work done on a force account basis and shall cover all expenses of every nature, kind, and description, including overhead expenses, payments required under the Social Security Act, State Unemployment Compensation Act, Occupational Tax, and any other federal, state or city revenue act, together with all premiums on public liability and property damage insurance policies, use of small tools and equipment for which no rental is allowed, and profits.

7. The Contractor shall submit to the Engineer's office three (3) copies of an itemized statement of force work. This shall include a detailed explanation of the work, the purpose of the work, and the location, a complete breakdown of labor, materials, equipment, and taxes, in accordance with the above provisions. The statements should be submitted to the Engineer not later than two (2) weeks after completion of the force account work.

8. No claim for such force account work shall be allowed except upon specific written or verbal orders of the Engineer. No work shall be construed as force account work which can be measured under the specifications and paid for at the unit prices named in the contract.

9. The amount and cost of any force account work shall be computed by the Engineer, and the amount certified by him shall be final and conclusive and binding upon the Contractor. All claims for work done on force account basis shall be submitted with a progress or pre-final estimate, and shall be accompanied by the original receipted bills for materials, supplies, and freight. Materials and supplies furnished from the Contractor's stock shall be supported by an affidavit by the Contractor certifying to their value.

9.05 PROGRESS PAYMENTS, FINAL PAYMENT, RETAINED PERCENTAGE

The Contractor shall be entitled to monthly progress payments corresponding to the stage of the work. Progress estimates will be prepared by the Engineer not later than thirty (30) days after commencing work, and every thirty (30) days thereafter, if so entitled, for the duration of the construction. These shall be based upon an approximate estimate of quantities of work completed and considered acceptable, multiplied by the unit prices established in the contract.

It is provided, however, pursuant to the laws of Washington relating to liens on public works, that there shall be deducted from each monthly progress payment such percentages and amounts as the laws provide. The laws of the State of Washington presently require retention of 15% on all amounts due and payable when the contract price is less than $200,000, and 10% on all amounts due and payable in excess of $200,000 where the contract price exceeds that amount.

Cost of materials, properly stored, protected and insured at the site of the work will be paid on monthly estimates only when so provided for in the special provisions, and then only for the specific materials listed therein for partial payment. In preparing the monthly estimates, advancement will be made therein for ninety percent of the cost of such materials, as evidenced by invoices to the Contractor. Advancement will not be made for any item of material amounting to less than five hundred dollars ($500.00). All materials must conform to the requirements of the specifications; however, advancement for materials will not constitute acceptance, and any faulty material will be condemned although advancement may have been made for same in the estimates. Deductions at the same rates, and equal in amount to the advancements, will be made on the estimates as the material is used.

Quantities used for progress estimates shall be considered only as approximate and provisional, and shall be subject to recalculation, adjustment and correction by the Engineer in subsequent progress estimates and in final estimates. Inclusion of any quantities in progress estimates, or failure to disapprove the work at the time of progress estimate, shall not be construed as acceptance of the corresponding work or materials.

Payment of the retained percentage shall be withheld for a period of thirty (30) days following the final acceptance by the Owner, and shall be paid the Contractor at the expiration of said thirty (30) days in event no claims, as provided by law, have been filed against such funds; and provided further, that releases have been obtained from the State Department of Labor and Industries and also, except for contracts totaling less than $5,000.00, the Washington State Tax Commission, the State of Washington Employment Security Department, and all other departments and agencies having jurisdiction over the activities of the Contractor. In the event such claims are filed, the Contractor shall be paid such retained percentages less an amount sufficient to pay any such claims, together with a sum sufficient to pay the cost of such action, and to cover attorney fees.

9.06 ACCEPTANCE OF CONSTRUCTION

Acceptance of construction shall be defined as final approval of the project only in that it has been constructed, cleaned up, and completed in accordance with plans and specifications.

It is mutually agreed between the parties to the contract that approval of the final estimate by signature of the Engineer or other officer of the Owner shall constitute acceptance, on the date of such approval, of the work and materials included in such final estimate. It is provided further that such approval shall not constitute an acceptance of any unauthorized work, that no payment made under the contract except the final payment shall be evidence of the performance of the contract, either wholly or in part, and that no payment shall constitute an acceptance of unauthorized or defective work or improper material.

Projects will generally be accepted in respect to construction at such time as they are entirely completed; however, on projects consisting of several disconnected streets, sewer lines, or water lines, the Engineer may accept any of these separate sections if he so elects. On continuous street projects of less than twelve (12) city blocks, the Contractor shall be required to complete the entire project before acceptance. Street projects longer than twelve (12) blocks may be accepted in sections of six (6) blocks or more, as the Engineer may determine. Continuous sewer projects will not be accepted until completed in their entirety.

Section 12—Clearing and Grubbing

12–1 CLEARING

–1.01 DESCRIPTION

This item shall consist of clearing the areas shown on the plans or as described in the special provisions of all trees, brush, and other vegetation, down timber, rotten wood, rubbish, and other objectionable material. It shall include removing buildings, fences, lumber, and trash piles, and other obstructions interfering with the proposed work, and salvaging such of these materials as may be designated in the special provisions, burning or otherwise disposing of the debris as directed by the Engineer. All work under this item shall be done in accordance with these specifications and in conformity with the plans.

–1.02 LIMITS OF CLEARING

–1.02A Sewers and Water Mains (Clearing and Grubbing)

The limits of clearing, as well as grubbing operations, on sewer and water main projects are dependent to a considerable degree upon the Contractor's operations and it shall be his responsibility to determine these limits providing he does not go beyond right-of-way or easement lines. The clearing and grubbing shall be to such width as will provide for the excavation of the trench, storage area alongside the trench for material excavated as trench excavation and backfill, an area for pipe and material storage, and for any haul roads which may be necessary. Clearing and grubbing of waste sites required for sewer and water main construction shall be considered as part of the project clearing. Clearing and grubbing on sewer and water main projects shall be measured and paid for at the unit contract price for "Clearing and Grubbing," per lump sum.

–1.02B Streets

In developed and semi-developed areas where drivable streets exist and where the project calls for grading and/or paving, the limits of clearing will be outlined on the plans or in the special provisions.

In undeveloped areas where development is very scattered or nonexistent, clearing shall be performed for the entire width of the roadway section shown on the plans, plus ten (10) feet beyond the slope stakes, but not beyond right-of-way or easement lines indicated on the construction plans. Intersecting side streets shall be cleared to the width described above and for such distance along them as will provide for the construction required, as shown on the plans.

–1.03 CONSTRUCTION DETAILS

Within the limits described, all vegetable growth such as trees, shrubs, brush, logs, fences, upturned stumps and roots of down trees, and other similar items not specifically covered by unit prices shall be removed and disposed of. All trees shall be felled *within* the area to be cleared. Where the tree limb structure interferes with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility. Under all fills of more than five (5) feet, the tops of all stumps under eighteen (18) inches in diameter shall be "close cut" and the tops of all stumps eighteen (18) inches or more in diameter shall be cut off not higher than twelve (12) inches above the ground, unless otherwise required in the special provisions.

All buildings, fences, lumber piles, trash, and obstructions, except utility poles, within the area to be cleared shall be removed and disposed of by the Contractor. Any work pertaining to utility poles shall comply with Section 5.08.

Trees, shrubbery, and flower beds designated by the Engineer shall be left in place and care shall be taken by the Contractor not to damage or injure such trees, shrubbery or flower beds by any of his operations.

Removal of ornamental or danger trees may or may not be a separate item of work on a project.

The refuse resulting from the clearing operation shall be hauled to a waste site secured by the Contractor and shall be burned or buried in such a manner as to meet all requirements of State, county and municipal regulations regarding health, safety, and public welfare. When authorized by the proper fire authorities, the Contractor may dispose of such refuse by burning on the site of the project provided all requirements set forth by the authorities are met.

On easement through private property, such as is sometimes met in sewer construction, the Contractor shall not burn on the site unless specifically permitted in the special provisions, in which case he shall obtain permission as previously stated.

In all cases, the authority to burn shall not relieve the Contractor in any way from damages which may result from his operations. In no case shall any material be left on the project, shoved onto abutting private properties, or be buried in embankments or sewer trenches on the project.

Clearing operations shall be carried well in advance of the construction operations so as to permit a well planned schedule of work.

Where ornamental trees exist in parking areas and are not to be removed, it shall be the Contractor's responsibility to trim low limbs which will interfere with the normal operation of his equipment. The trimming shall be performed in a professional manner by competent personnel prior to his machine operations and in such a manner as the Engineer may direct.

The Contractor shall be responsible for all damages to existing improvements resulting from his operations.

–1.04 MEASUREMENT

–1.04A Acreage Basis

When shown in the bid proposal, clearing will be paid on an acre basis, in which case clearing will be measured by the acre for the area cleared within the bounds staked by the Engineer, provided however, that the area within the existing street or highway where no clearing is required shall be excluded from the measurement.

In determining the pay area of clearing for intermittent or isolated areas in any fifty (50) foot station, the minimum area shall be fifty (50) feet by fifty (50) feet. If there is no clearing in a fifty (50) foot station, such area shall be excluded from the measurement.

–1.04B Lump Sum Basis

When shown in the bid proposal, clearing shall be upon a lump sum basis, in which case the lump sum shall include all clearing within limits outlined herein, or as otherwise defined in the plans or special provisions.

–1.05 PAYMENT

When clearing is measured and paid for as a separate item it will be at one of the unit prices shown below:

"Clearing," per acre.

"Clearing," per lump sum.

The unit contract price for "Clearing," per acre, or "Clearing," per lump sum shall be full compensation for furnishing all labor, equipment and materials to complete the work as specified. See paragraph 2 of Section 12–3.03 when no pay item for "Clearing" is contained in the proposal.

12–2 GRUBBING

–2.01 DESCRIPTION

This item shall consist of grubbing the areas outlined herein or as otherwise defined in the special provisions. The work shall include the removal of all stumps, roots, vegetable matter, and all structures in or upon the ground, the removal of which is not prescribed under the item of "Clearing," such as wood curb, planking, existing wooden culverts, wooden catch basins, drains, and stairways, et cetera.

–2.02 LIMITS OF GRUBBING

–2.02A Sewers

Limits of grubbing for sewers shall be the same as the limits for clearing.

–2.02B Streets

Limits of grubbing for streets shall be the same as the limits for clearing except that in the case of undeveloped areas, the grubbing limits shall be five (5) feet beyond the slope stakes.

–2.03 PROTECTION OF EXISTING IMPROVEMENTS DURING GRUBBING OPERATIONS

When it is necessary to remove stumps and where there are surface or subsurface improvements, the Contractor shall be responsible for determining which of the agencies, public or private, have underground or service utilities in the vicinity of the stump to be removed; and further, he shall notify each agency and request its assistance in locating its services. The Contractor will not be responsible for the cost of locating services.

Where sewer, water, electric, telephone, steam, gas and similar underground services into residences will be imperiled by stump removal, the utility agency affected will cut the service and replace same at no cost to the Contractor. Where telephone cable and/or ducts, water mains, gas mains, steam mains, and sewer trunks exist and are likely to be damaged, special care shall be taken, and roots of stump shall be cut off in such a manner that the existing utility installations will not be damaged in any way.

Regardless of the cooperation of other agencies and utilities, the Contractor shall have the sole responsibility for any damage to underground services and utilities suffered by reason of his operations.

Repair of damage to surface improvements shall be the responsibility of the Contractor, excepting however, he will not be required to assume responsibility for walks, curbs, and curb and gutters which, previous to his operations, are considered by the Engineer to be beyond repair.

If the Contractor removes stumps for private property owners along the project, he shall be responsible for all damage resulting therefrom.

–2.04 CONSTRUCTION DETAILS

All stumps, roots, foundations and planking embedded in the ground within the limits described herein or otherwise described in the special provisions, and within specified limits of all embankments of five (5) feet or less below the elevation of the subgrade, shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two (2) feet below subgrade or two (2) feet below original ground, whichever is lower. Disposal requirements for grubbing shall be the same as those described for clearing.

Removal of sod and lawns which are not to be replaced shall be considered as incidental to other work of the project and no payment will be made therefor. Grubbing shall otherwise meet requirements previously outlined under "Clearing."

–2.05 MEASUREMENT

Measurement of grubbing shall be the same as described for clearing in Section 12–1.04.

–2.06 PAYMENT

When grubbing is measured and paid for as a separate item, it will be at one of the unit prices shown below:

"Grubbing," per acre.

"Grubbing," per lump sum.

The unit contract price for "Grubbing," per acre, or for "Grubbing," per lump sum shall be full compensation for furnishing all labor, equipment and materials to complete the work as specified. See paragraph 2 of Section 12–3.03 when no pay item for "Grubbing" is contained in the proposal.

12–3 CLEARING AND GRUBBING

–3.01 DESCRIPTION

This item shall consist of all clearing and grubbing hereinbefore described under the separate headings of "Clearing" and "Grubbing." It will include all areas for bridge sites, streets, highways, borrow pits, sewers, and related work whenever the special provisions and proposal provide for lump sum or per acre payment therefor.

–3.02 CONSTRUCTION DETAILS

The construction details outlined under the preceding specifications for "Clearing" and for "Grubbing" shall prevail in all respects.

–3.03 MEASUREMENT AND PAYMENT

There will be no specific unit of measurement under the lump sum item of "Clearing and Grubbing," and all work hereinbefore specified under the headings of "Clearing" and "Grubbing" shall be paid for at the unit contract price for "Clearing and Grubbing," per lump sum or per acre, which shall be full compensation for all work required by the specifications.

If the proposal does not include a pay item of any kind pertaining to the work of clearing and grubbing, then the work specified therefor shall be considered as incidental to the construction of the project and all costs thereof incurred by the Contractor shall be included in other items of the construction.

12–4 ORNAMENTAL AND DANGER TREES

–4.01 DESCRIPTION

Ornamental trees growing in areas that are to be graded or paved and which must be removed, shall be considered as part of the "Clearing and Grubbing." Trees other than those which have not been specifically shown on the construction plans or in the special provisions as part of the clearing and which are required to be removed, shall be considered as ornamental trees and their removal be paid for as such.

An ornamental tree is further defined as a woody perennial having a main stem (trunk) measuring 12 inches or more in circumference at a point 4 feet above average ground level. Where more than one stem exists, they shall be considered as individual trees as determined above. Trees of lesser dimensions, shrubs, and bushes which are not located in the areas to be cleared and grubbed but which are ordered to be removed, shall be paid for by force account.

It shall be the responsibility of the Contractor to preserve any tree for which the special provisions or plans so provide or for which the Engineer may direct the saving. If removal is required, the removal and disposition shall be by the same specifications as hereinbefore recited for clearing and grubbing, but the measurement and payment shall be upon the basis hereinafter defined.

In most cases, ornamental trees requiring removal will be shown on the plans. Failure to indicate them on the plans shall not, however, relieve the Contractor from responsibility of performing the work upon the unit price basis per each if there shall have been included in the proposal a range of circumferences pertaining to payment; otherwise he shall do the work upon a force account basis or upon a negotiated price basis.

Ornamental trees shall be removed by close cutting and removing only that portion of the stump which will interfere with the construction. The Contractor may be required to remove these trees any time after clearing and grubbing has been performed.

Danger trees are those trees which the Engineer determines shall be removed to eliminate danger. They shall be considered in the same category as for ornamental trees and measurement and payment will be made in the same manner by ranges of circumferences, force account, or negotiated price per each or otherwise as may be mutually agreed upon by the Engineer and the Contractor.

–4.02 MEASUREMENT, ORNAMENTAL AND DANGER TREES

Measurement shall be by four (4) ranges of circumferences measured at four (4) feet above ground and classified as follows:

12 inches to and including 36 inches, CLASS I
36 inches to and including 72 inches, CLASS II
72 inches to and including 126 inches, CLASS III
126 inches and more, CLASS IV

–4.03 PAYMENT

Payment will be made at the unit contract price per each of the following items:

1. "Remove Tree, Class I," per each.
2. "Remove Tree, Class II," per each.
3. "Remove Tree, Class III," per each.
4. "Remove Tree, Class IV," per each.

The unit contract price per each tree shall be full compensation for all labor, equipment, and materials required to perform the work in accordance with the specifications and directions of the Engineer.

Section 13—Street and Drainage Excavation

13–1 DESCRIPTION

This item shall consist of excavating and grading the roadway, side streets, alley and driveway approaches, sidewalk and parking areas, and alleys, and all work necessary for the completion of the cuts, embankments, slopes, roadway ditches, side street approaches, sidewalks and parking areas, alleys and subsidiary work, including disposal of all surplus material. All work shall be performed in accordance with the alignment, grades, and cross sections shown on the construction plans.

–1.01 CLASSIFICATION

Roadway excavation, comprising all materials within the roadway, parking and sidewalk areas, but excluding trench excavation and borrow pits, will be classified under headings of "Unclassified Excavation," "Common Excavation," and "Solid Rock Excavation," in accordance with the specifications therefor.

"Unclassified Excavation" shall include all materials otherwise classified under the heads of "Solid Rock Excavation" and "Common Excavation" as hereinafter defined, and shall comprise all materials of whatsoever nature or character excavated within the previously defined areas without further classification. Materials from borrow pits shall be classified in the same manner as roadway excavation.

"Solid Rock Excavation" shall include all solid rock in ledges, bedded deposits and unstratified masses and conglomerate deposits so firmly cemented as to present all the characteristics of solid rock and which cannot be removed without drilling and blasting, and all boulders containing a volume of more than one-half cubic yard. All solid rock layers with an overburden of shattered rock or solid rock layers interspersed with strata of clay or similar material will be classified as "Solid Rock Excavation" for the total depth of excavation in which the solid rock strata constitutes not less than 85 percent of the total depth.

"Common Excavation" shall include all other material not classified as solid rock.

Drainage excavation shall include all excavation encountered in the construction of open ditches and channel changes, except ditches that are a part of the roadway section. Drainage excavation shall be of two classifications: "Ditch Excavation" and "Channel Excavation." Each of the two classifications may be classified into "Common," "Solid Rock," or "Unclassified," according to the materials encountered under the specifications for roadway excavation.

Ditch Excavation shall include all excavation encountered in the construction of open ditches as hereinafter described, and which have a bottom width of less than eight (8) feet.

Channel Excavation shall include all excavation encountered in the construction of open ditches as is hereinbefore described, and which have a bottom width of eight (8) feet or more.

13–2 PROTECTION OF EXISTING IMPROVEMENTS

–2.01 SURFACE IMPROVEMENTS

The Contractor shall be responsible for the protection of existing surface improvements as described elsewhere in the various applicable sections of the specifications, and any damage resulting from his operations shall be his sole responsibility.

–2.02 SUBSURFACE IMPROVEMENTS

–2.02A General

Utilities of record will be shown on the construction plans insofar as it is possible to do so. Failure of the Owner to show the existence of subsurface objects or installations on the plans shall not relieve the Contractor from his responsibility to make independent check on the ground, nor relieve him from all liability for damages resulting from his operations unless otherwise provided in the special provisions or by exceptions hereinafter mentioned.

It shall be the responsibility of the Contractor to give proper written notification to the agencies that have utilities in place and to cooperate with these agencies in the protection and relocation of the various underground installations. These agencies will give assistance in the location of the various utilities, but this shall not relieve the Contractor from responsibility for any damage incurred, except in case where the installations are not located as closely as is normally possible with electronic pipe locator. In such case the Contractor will not be liable if he has proceeded with due caution.

–2.02B Lighting Cables

Where lighting cables exist within the areas to be excavated and are not more than six (6) inches below the final grade of the excavation, the Contractor shall not be responsible for any damage done, provided he has given proper and timely notification, and has cooperated to keep damage to a minimum.

–2.02C Sewers and Appurtenances

Sewer manholes and catch basins shall be protected and particular care shall be taken to prevent gravel, earth, and other debris from getting into the sewer. Where house services are damaged through no fault of the Contractor, they shall be repaired and payment will be made therefor in accordance with the unit contract price, or by force account as the Engineer may determine.

–2.02D Water Mains and Appurtenances

The Contractor shall be responsible for any damage to water mains and water facilities caused by his operations, except that he will be relieved therefrom under the following conditions: (1) He has not excavated below or beyond the required excavation lines and, (2) he has given proper and timely notice of his work plans and, (3) he has used reasonable care and has cooperated in minimizing the damages, and (4) except as may be modified hereinafter.

Any damage to water gates, hydrants, valve chambers and other surface appurtenances which results from the Contractor's operation shall be his sole responsibility.

–2.02E Private Utilities

Utilities other than those owned and operated by Owner are in streets pursuant to franchises or to rights claimed under the laws of the U. S. A. or the State of Washington, and therefore, the respective utility agencies are responsible for all adjustments and relocations of their facilities. These agencies will locate their facilities for the Contractor and assist him in their protection. The Contractor shall co-ordinate his work with that of the affected agencies and shall protect them from damage. The Contractor shall be liable for all damages to private utilities resulting from his operations, and hold the Owner harmless.

13–3 CONSTRUCTION DETAILS

–3.01 SIDE STREET, ALLEY AND DRIVEWAY APPROACHES

Approaches to the project shall be excavated to the limits indicated on the plans or to such limits as the

Engineer may direct. This excavation shall be made in conjunction with the street excavation and in such a manner as to provide for easy and safe access for local and emergency traffic at all times.

–3.02 EXCAVATION BELOW GRADE

Where the Engineer deems subgrade material to be unsatisfactory, excavation below grade will be required to such depths as he may direct. Excavation below grade shall be of the same classification as that above it provided it is removed in the same operation as the normal excavation. Where the Contractor has completed the roadway excavation and is required to move back to remove unsuitable material, or where the additional depth requires special equipment because of the presence of shallow utilities or other unforeseen conditions, the work shall be performed as directed and a payment for excavation below grade will be made on the basis of force account.

If excavation below grade is required because of negligence on the part of the Contractor, it shall be remedied by the Contractor at his own expense to the satisfaction of the Engineer.

–3.03 PARKING AND SIDEWALK AREAS

The class of excavation as specified shall include all excavation of parking and sidewalk areas and shall extend to the lateral and terminal limits shown on the construction plans. On parking strips in developed areas, the excavations shall be made and terminated to blend neatly with existing contours. Where parking strips are low, they shall be filled with soil comparable to that which exists, to such limits as the Engineer may direct.

–3.04 PAVEMENT REMOVAL

Pavement removal shall be accomplished and compensation be made therefor in accordance with the requirements of Section 52. Where existing streets are to be excavated and are presently surfaced with asphalt concrete or bituminous mats on earth or granular base, these surfaces shall be considered as part of the excavation unless otherwise specified in the special provisions. Where existing street pavements extend beyond the back of the new curb line, the Contractor will also be required to remove the pavement as part of the excavation. It shall be the Contractor's responsibility to determine the thickness of such surfaces before submitting his proposal.

–3.05 DISPOSAL OF EXCAVATED MATERIAL

Suitable excavated material shall be used for the making of all required project embankments. The more suitable portions of the excavated material shall be stored on or off the project, as the Contractor may elect, and used for backfilling of curbs and dressing up the parking areas, the cost of which shall be considered as incidental to the excavation. Excavated material in excess of that needed to complete all embankments and for backfilling curbs and dressing parking areas shall be wasted by an equitable distribution of the material to properties within the project limits, as directed by the Engineer. Any excess materials remaining shall be disposed of by the Contractor at his own expense.

The Contractor shall not waste any excavated material until he is certain there is sufficient material to complete all necessary project embankments and parkings. If an undue amount is wasted, the Contractor shall secure and furnish necessary borrow material at his own expense.

–3.06 DITCHES

All ditches shall be constructed as shown on the plans and shall be so graded as to conform to the natural flow of the water to inlets, catch basins, culverts or channels. Ditches from cuts shall be located in such manner as to bypass any part of the adjacent fill so that no damage will be caused thereto by running water.

–3.07 SELECTED MATERIAL

When called for on the plans or in the special provisions, or when ordered by the Engineer, suitable selected material encountered in excavating or widening the roadway prism or encountered in any other excavation within the street right of way, including the excavation of local borrow, shall be used for finishing the top portion of the subgrade or for structure backfill, or used as otherwise shown on the plans or in the special provisions, or as directed by the Engineer.

Unless otherwise specified in the special provisions, selected material shall be defined as material which is excavated from one or more of the above sources designated by the Engineer, and which is used for selective purposes by direction of the Engineer.

Selected material shall be placed on the roadbed in accordance with the requirements of Section 13-3.10E for constructing earth embankments, or Section 13-3.10F for embankments at trestles or bridge ends.

When the transporting of selected material directly from excavation to its final position on the roadway will be impracticable, the selected material shall be left in place until it can be placed in final position and no additional compensation will be made because of the delayed excavation. If, however, the conditions are such that the undisturbed selected material will hamper ordinary grading operations or cause unnecessary movements of equipment, the Engineer may allow the removal of sufficient selected material and the stockpiling thereof to enable practical hauling operations. If excavation and stockpiling of selected material is specified in the special provisions or is ordered by the Engineer, the excavation and stockpiling shall be at locations designated by the Engineer, and thereafter be removed from the stockpile and placed in final position upon the roadbed when directed by the Engineer.

Measurement and payment for selected material stockpiled as above provided shall apply in accordance with Sections 13-4 and 13-5 respectively, both for excavation and haul of the selected material from its natural position, and also from the stockpile. Measurement of the material taken from stockpile will be made of the neat line volume actually removed.

–3.08 SLIDES

Side slopes in cuts and on embankments shall be constructed as staked or reestablished by the Engineer. In case a slope finished to the lines as staked or reestablished by the Engineer shall slide back of the established slope onto the roadway prism, or out of an embankment before final acceptance of the work, such slide material shall be removed by the Contractor from the roadway, or be replaced in the embankment by him, at the unit contract price for the class of excavation involved, and the slopes shall be refinished as directed by the Engineer. The resloping will be paid for upon a force account basis as defined in Section 9.04.

In event the slide material cannot be measured accurately, or if the slide material will require a different type of equipment than that available on the project, payment therefor may be made on a force account basis when so authorized by the Engineer.

Materials to replace embankment slides shall be obtained from sources designated by the Engineer. Slopes undercut at the base or destroyed in any manner by act of the Contractor shall be resloped by him parallel to the damaged slope, or as reestablished by the Engineer, at his own cost.

–3.09 OVERBREAK

In all materials encountered in the performance of the contract, overbreak is that portion of any such material which is excavated, displaced or loosened outside and beyond the slopes, lines, or grades as staked or reestablished, with the exception of such material which occurs as slides as described hereinbefore, regardless of whether any such overbreak is due to blasting, to the inherent character of any formation encountered, or to any other cause. All overbreak as so defined shall be removed by the Contractor at his own expense and shall be disposed of by the Contractor in the same manner as provided for the surplus under the heading of "Excavation," but at his own expense and without any allowance for haul.

Whenever it is agreed to in writing and in advance between the Contractor and the Engineer, overbreak may be used in forming any embankment as planned to replace borrow which otherwise would have to be provided for. In this event payment will be made for

the volume of common borrow or solid rock borrow, as the case may be, which the overbreak replaces, at the respective contract prices per cubic yard for such borrow with the additional allowance for haul, if any, on such available borrow; provided however, that no allowance will be made for overbreak which is placed in the embankment as planned in lieu of available material coming from within the neat lines of the roadway prism.

–3.10 EMBANKMENTS

–3.10A Foundation Treatment

The materials composing the embankments must be entirely imperishable and wherever the natural surface upon which the embankment is to be placed is of such nature as, in the judgment of the Engineer, will impair the stability or usefulness of the street, the natural surface shall be stabilized or removed and disposed of as the Engineer may direct.

Where embankments are to be made on hillsides or where a new fill is to be applied upon an existing embankment, the slopes of the original ground or embankment (except rock embankments) shall be terraced or stepped by plowing deeply or by other approved means before filling is commenced.

If ordered by the Engineer, material at the point of transition from cut to fill or in areas upon which shallow embankments are to be placed shall be excavated to a minimum depth of two (2) feet below subgrade elevation for a lateral width three (3) feet greater than the traveled roadway and for such longitudinal distance as ordered by the Engineer. The excavated material shall be deposited in the lower portion of adjacent fills or wasted if directed by the Engineer. Payment for the excavated material shall be made at the unit contract price for the class of material involved, plus haul if included. No further compensation will be made.

If ordered by the Engineer, the earth remaining in the excavated area shall be loosened to a depth of eight (8) inches or such lesser depth as ordered by the Engineer, and then be compacted. Payment for compaction of the loosened material shall be made at the unit contract price per cubic yard for "Embankment Compaction".

Following preparation of the excavated area, the void shall be filled in layers with selected material from adjacent cuts and compacted as provided in the contract. Material used to backfill the excavated areas will be paid for at the unit contract price for the class of material involved. Such payment, plus payment for haul if provided for in the bid proposal, embankment compaction (of the method specified), and water shall be full compensation for all costs involved in excavating, loading, hauling and compacting the backfill materials.

–3.10A1 Unsuitable Foundation Excavation

When shown on the plans or when specified in the special provisions, unstable natural ground shall be excavated prior to the placement of embankment over the area. The unstable material may consist of peat, muck, swampy or unsuitable materials, including buried logs and stumps. The material shall be excavated by the Contractor as directed by the Engineer to give the constructed embankment full bearing on solid ground.

Materials excavated from the roadway or channel change prisms, the classification of which is covered by Section 13-1.01 will not be classified as unsuitable foundation excavation unless the removal must be accomplished by dragline operation or by special excavation methods requiring different equipment from that used for roadway excavation, in which case measurement and payment as "Unsuitable Foundation Excavation" on a per cubic yard basis will apply.

When no unit contract price is provided in the contract for "Unsuitable Foundation Excavation," such work as may be ordered by the Engineer shall be accomplished by supplemental agreement between the Contractor and Owner, or be performed as force account work.

–3.10A2 Displacement of Unsuitable Foundation Materials

Where shown on the plans or where specified by the special provisions, the roadway embankments to be constructed across low, swampy ground shall be constructed on solid ground to the elevation as indicated by the roadway section on the plans. To obtain this result the overburden of peat, muck, swampy or other unsuitable material lying above the elevation of solid ground shall be displaced or removed by the Contractor, as directed by the Engineer, to give the constructed embankment full bearing on the solid ground, as shown by the plans.

The Contractor shall displace the overburden of unsuitable materials in constructing the embankment by such methods as the Engineer may approve. The overburden material outside of the new embankment slopes which is upheaved through displacement by the fill shall be leveled off as directed by the Engineer, and left in a neat condition.

All costs and expense involved in accomplishing displacement and/or removal of unstable materials encountered below the existing surface of the ground, and for leveling the upheaved material outside of the embankment slopes, will be paid for on a force account basis. All other costs in connection with the work shall be considered incidental to the construction of the embankment and shall be included in the unit contract prices for the various pay items of work involved.

–3.10A3 Backfilling

Where soft or unstable materials are removed the area shall be drained, if possible, in order that the backfill may be compacted. Where drainage is impossible, backfill to be placed in water shall be granular in character except when otherwise provided in the special provisions.

–3.10B Accelerated Subsidence by Vertical Sand Drains

Where shown on the plans or where specified by special provisions the overburden of soft or unstable material lying above the elevation of firm ground shall be stabilized by the construction of vertical sand drains and a sand drainage blanket.

–3.10B1 Vertical Sand Drains Including Backfill

Prior to constructing the vertical sand drains, a working platform consisting of roadway excavated material or common borrow shall be constructed to a depth of two (2) feet, or as shown on the plans or as ordered by the Engineer, and shall be placed over the entire area where sand drains are to be constructed, and be capable of supporting light construction equipment. This platform will provide access to the areas for the construction of sand drains.

If the equipment used cannot be supported on the working platform without displacement of the underlying soft soil, the equipment shall be supported on mats. The material may be placed in one lift, but in such a manner that will cause a minimum of displacement of the underlying soil.

Vertical holes eighteen (18) inches in diameter shall be constructed to the underlying firm strata, or to such a depth as the Engineer may direct, and the holes backfilled as hereinafter provided. The holes may be constructed by driving or jetting a casing down to the required depth, or by other approved methods.

The holes shall be vertical and shall be accurately spaced as indicated on the plans or as staked by the Engineer. Holes drilled out of place or that are damaged in excavating or backfilling shall be backfilled and abandoned, if so ordered by the Engineer, and no compensation will be allowed for excavating and backfilling holes that are abandoned.

If holes are excavated by jetting a casing to the desired depth, the jetting shall be continued for a sufficient length of time after the casing has reached final depth to remove all solid material within the casing.

After the hole has been backfilled, the casing shall be removed.

Each hole shall be inspected and approved by the Engineer before any filling material is placed therein.

Any method of construction that, in the opinion of the Engineer, is appreciably disturbing the adjacent ground, shall be discontinued.

Materials removed in excavating the holes shall be uniformly distributed as a blanket, adjacent to and outside the limits of the roadway embankment, or wasted at a site designated by the Engineer.

Materials for use in backfilling sand drains shall consist of clean, coarse sand or fine gravel, shall be uniformly graded from coarse to fine, and shall be of such size that when tested on U. S. Standard sieves it will conform to the following:

Passing a ½ inch sieve	90% - 100%
Passing a ¼ inch sieve	65% - 100%
Passing a No. 10 sieve	40% - 100%
Passing a No. 50 sieve	3% - 30%
Passing a No. 100 sieve	0% - 4%
Passing a No. 200 sieve (wet sieving)	0% - 3%

It is the intent of these specifications that each hole be completely filled with backfill material. The Contractor shall use compressed air, or such other means as are necessary, to force the sand backfill from the casing in the event the sand does not fill the hole completely by gravity flow when the casing is removed.

–3.10B2 Sand Drainage Blanket

Before placing the sand drainage blanket the surface of the working platform shall be smoothed, and the surface of each drain shall be free of any clay or other material which may impede drainage.

The sand for the drainage blanket shall be spread uniformly over the area to a thickness of two feet above the working platform, or to such depth as directed by the Engineer.

Sand for the drainage blanket shall consist of granular material, free from wood, bark or other extraneous material and shall meet the following requirements for grading:

Passing 2½ inch square opening	90% - 100%
Passing ¼ inch square opening	30% - 100%

The portion passing ¼ inch shall meet the following requirements for grading:

Passing U. S. No. 10 sieve	50% - 100%
Passing U. S. No. 50 sieve	0% - 30%
Passing U. S. No. 100 sieve	0% - 7%
Passing U. S. No. 200 sieve (wet sieving)	0% - 3%

It shall be the responsibility of the Contractor to select or treat the material in such a manner as to meet fully the grading requirements as specified above.

–3.10C Embankment Construction

Embankment construction shall be divided into two classes, rock embankments and earth embankments. Rock embankments shall be all, or any part, of an embankment in which the material contains 10% or more by volume of gravel or stone four (4) inches or greater in diameter. Embankments of all other material shall be considered as earth embankments.

When embankments are constructed across wet or swampy ground which will not support the weight of heavy hauling and spreading equipment, the Contractor will be required to choose such methods of embankment construction and to use such hauling and spreading equipment as will least disturb the soft foundation. When soft foundations are encountered, the lower part of the fill may be constructed by dumping and spreading successive vehicle loads in a uniformly distributed layer of thickness not greater than that necessary to support the vehicle while placing subsequent layers, after which the remainder of the embankment shall be constructed in layers and compacted as specified.

It is not the policy of the Owner to allow an increase in the planned depth of embankment material over soft, wet, or swampy ground for the sole purpose of providing support for heavy hauling and spreading equipment, unless the Contractor proves to the satisfaction of the Engineer that the planned depth is inadequate to support lighter hauling vehicles. If it proves necessary for the Contractor to use smaller hauling vehicles or different methods of embankment construction than he had originally contemplated in order to comply with the foregoing, such shall not be the basis for a claim for extra compensation. The unit contract price for the various pay items involved shall be full compensation for all labor, materials and equipment necessary to perform the work as outlined herein.

At the time of compaction, the moisture content of that portion of the embankment material passing a one-fourth inch (¼") sieve shall be not more than three (3) percentage points above the optimum moisture content as determined in the "Compaction Control Test," specified in Section 13-3.10E5. Embankment material which contains less moisture than required for proper compaction with the compacting equipment being used shall be watered in the amount ordered by the Engineer.

Compaction of embankment material which contains excessive moisture shall not be started until the moisture content is reduced to the maximum amount specified heretofore. All costs and expenses involved in drying embankment materials shall be considered incidental to the various unit contract prices, unless a bid item or items for "Aeration Equipment" are included in the contract.

–3.10D Rock Embankment Construction

Rock embankments shall be constructed in layers not exceeding eighteen (18) inches in depth, except that when the average size of the fragments exceeds eighteen (18) inches, the layers may be as deep as required to allow their placement. Occasional fragments exceeding the average size shall be disposed of as directed by the Engineer instead of being incorporated in the embankment.

Each layer shall be compacted by routing the loaded and unloaded hauling equipment over the entire width of the roadway. In addition to compacting with hauling equipment, each layer shall be further compacted with at least one coverage of a 50-ton roller or four coverages of a 10-ton roller per six-inch depth of layer, or fraction thereof. The number of coverages for rollers weighing more than 10 tons and less than 50 tons shall be as directed by the Engineer. Rollers shall be so constructed that they will exert a reasonably uniform pressure over the area covered. Rolling may be omitted on any layer, or portion thereof when, in the opinion of the Engineer, it is not necessary.

The material shall be placed carefully so that the larger pieces of rock or boulders are well distributed. The intervening spaces and interstices shall be filled with the smaller stone and earth as may be available so as to form a dense, well compacted embankment. Each layer shall be compacted by routing the loaded transporting equipment over the entire width of the layer.

In making rock embankments, the Contractor will be required to bring the fills to within twelve (12) inches below grade, as designated by the Engineer, and to construct the remainder from fragmentary rock not to exceed six inches (6") in size from granular material to be obtained from the roadway excavations or from borrow pits as directed by the Engineer. The finer materials from rock excavations shall be saved as far as practicable for use in topping out rock fills and backfilling over the subgrade excavation in rock cuts.

–3.10E Earth Embankment Construction

Earth embankments shall be constructed in compacted layers of uniform thickness by one of the three methods, A, B and C, described in subsequent subsections. Under all methods the layers shall be carried up full width from the bottom of the embankment to avoid widening the edges after the center has been brought to grade.

On tangents, the center of embankment layers shall be constructed higher than the sides. Side hill embankments shall be constructed with the intersection with the original ground as the high point of the layer and shall uniformly slope to the outer side with a slope not to exceed 1 foot in 20 feet.

–3.10E1 Compacting Earth Embankments

Earth embankment shall be compacted with modern, efficient, compacting units satisfactory to the Engineer. The compacting units may be of any type provided they are capable of compacting each lift of the material to the specified density. The use of hauling equipment to obtain

partial compaction will be allowed but the Contractor will be required to compact the full width and depth of each layer of material to the required density. The right is reserved for the Engineer to order the use of any particular compacting unit discontinued if it is not capable of compacting the material to the required density in a reasonable time.

Embankments normally shall be constructed in successive horizontal layers not exceeding eight (8) inches in loose thickness when constructed by Method B or C as specified hereinafter. If approved by the Engineer, successive horizontal layers up to a maximum depth of eighteen (18) inches may be placed, provided the required density is obtained throughout the full width and depth of each layer. Unless otherwise stated in the special provisions, earth embankments shall be constructed by Method B.

–3.10E2 Method A

Under Method A, earth embankments shall be compacted in successive horizontal layers not exceeding two (2) feet in thickness, and each layer shall be compacted by routing the loaded haul equipment over the entire width of the layer. When permitted by the Engineer, side hill fills too narrow to accommodate the hauling equipment may be placed by end dumping until the embankment material can be spread to sufficient width to permit the use of the hauling equipment upon it. Thereafter, the remainder of the embankment shall be placed in layers and compacted as specified above. Suitable mechanical tampers shall be used to compact the layers adjacent to structures that are inaccessible to the loaded haul equipment.

–3.10E3 Method B

Under Method B, earth embankments shall be compacted in accordance with Section 13-3.10E1 and in addition thereto each layer in top two (2) feet shall be compacted to at least ninety-five (95) percent of the maximum density and each layer in the lower lifts to at least ninety (90) percent of the maximum density determined by the "Compaction Control Test" specified in Section 13-3.10E5.

At all locations that are inaccessible to a roller, the embankment shall be brought up in horizontal layers and compacted thoroughly with mechanical tampers. The horizontal layers shall not exceed eight (8) inches in loose thickness, except that the layers of the top two (2) feet shall not exceed four (4) inches in loose thickness.

–3.10E4 Method C

Under Method C, earth embankments shall be compacted in accordance with Section 13-3.10E1 and in addition thereto each layer shall be compacted to at least 95 percent of the maximum density as determined by the "Compaction Control Test" specified in Section 13-3.10E5. The moisture content of the earth at the time of compaction shall be uniform throughout the layer and shall be such that the specified density can be obtained, but in no case shall it vary more than three (3) percentage points above or below the optimum moisture content as determined in Section 13-3.10E5.

At all locations that are inaccessible to a roller the embankment shall be brought up in horizontal layers and compacted thoroughly with mechanical tampers. The horizontal layers shall not exceed eight (8) inches in loose thickness except that the layers of the top two (2) feet shall not exceed four (4) inches in loose thickness.

–3.10E5 Compaction Control Test

Optimum moisture content and maximum density for other than granular materials shall be determined in accordance with the Method of Test for Moisture-Density Relations of Soils, ASTM Designation D698, or in accordance with such other methods as may be outlined in the special provisions.

The maximum density for granular materials shall be determined in accordance with the Washington Method for compaction control test of granular materials developed by the Materials Laboratory of the Department of Highways, Olympia, Washington, or in accordance with such other methods as may be outlined in the special provisions. Instructions for using the Washington Method may be had without charge upon request to the Materials Laboratory, Department of Highways, 318 East State Street, Olympia, Washington.

–3.10F Embankments at Structures, Trestle and Bridge Ends

The work of filling around structures and the ends of trestles and bridges and the constructing of embankments shall be undertaken and completed as soon as possible after each structure is completed, or when ordered by the Engineer.

In filling around the structure, trestle and bridge ends, the Contractor shall bring the fill up equally on all sides of the bracing and the columns of the bridge to prevent distortion of the bents and columns. This method shall also be used in bringing up the fill on both sides of the bulkheads as shown in the sketch on the plans, or as directed by the Engineer. The embankments shall be constructed under the bridge to the height and dimensions as shown on the plans, or directed by the Engineer.

The embankment and backfill at both ends of all rigid frame concrete structures which do not have provisions for expansion shall be brought up and compacted simultaneously to prevent lateral displacement of the structure due to unbalanced earth loading.

All costs in connection with the above work shall be considered as incidental to the construction of the improvement and shall be included in the unit contract prices of the various pay items of work involved.

–3.11 BORROW

Borrow shall consist of the excavation and disposal, as directed by the Engineer, of suitable and satisfactory material obtained from borrow pits designated and measured by the Engineer for the construction of embankments, subgrade, parking strips and sidewalk areas, or shoulders and other facilities. The widening of street cuts and ditches will be considered as street excavation and not as borrow.

Borrow materials shall be secured from pits on the right of way designated by the Engineer, or from such other pits as may be shown on the plans or designated in the special provisions. The Contractor may secure borrow from sources other than those designated in the contract, provided that the material is approved by the Engineer and that he secure the pit at his own expense. The haul on the borrow from sources furnished by the Contractor, if haul is a pay item, will be paid for according to the actual amount of haul from the sources from which the borrow is taken, provided, however, that no allowance will be made for haul from such sources in excess of the quantity computed from the sources specified in the contract. The borrow material secured by the Contractor shall be classified in accordance with the specifications for "Street and Drainage Excavation"; provided, however, that borrow will not be classified in a classification higher than that estimated for borrow from the site designated by the plans and specifications.

Borrow pits shall be so excavated that they will drain to the nearest natural outlet or to an outlet indicated on the plans or designated by the Engineer. Where directed by the Engineer, separated borrow pits shall be connected by ditches. Excavation for connecting ditches will be classified and paid for as ditch or channel excavation. Side slopes of borrow pits in all cases shall be dressed to such slope as the Engineer may direct. A berm of not less than six (6) feet in width shall be left between the outside slope of the borrow pit and the right of way line. The berm must consist of original unbroken ground.

–3.12 STRIPPING QUARRIES AND PITS

Stripping of quarries and pits shall consist of the removal, after clearing and grubbing, of the surface material and overburden which is unsuitable for the kind of material to be borrowed or produced for use. The stripping shall be disposed of as directed by the Engineer.

Whenever the Contractor elects to obtain material from a source other than that provided by the Owner, or whenever the Contractor is required by the special provisions to provide a source of material, the clearing, grubbing, and stripping therefrom shall be performed as directed by the Engineer and all costs incurred therefor shall be considered as incidental to the project and shall be included by the Contractor in his unit contract prices of borrow or processed materials to be removed.

–3.13 COMPACTING CUT SECTIONS

When the density of the natural ground of a graded roadbed in a cut section, upon which a specified layer of surfacing or selected material is to be placed, is less than the requirements specified under Section 13-3.10 for the method of compaction used, the top two (2) feet of the graded roadbed shall be compacted in accordance with the requirements of Method B or Method C, whichever is specified. If ordered by the Engineer, the material shall be excavated to a depth of sixteen (16) inches and stockpiled temporarily, and the underlying eight (8) inches be then loosened, watered if necessary, and compacted to the required density. The excavated material shall then be replaced in successive layers as required under Section 13-3.10E1, watered if necessary and compacted to the required density.

Where the subgrade material is excavated and temporarily stockpiled, measurement and payment will apply as specified in Section 13-3.07.

When compaction of cut sections is ordered by the Engineer, payment for compaction shall be on a cubic yard basis as outlined in Sections 13-4 and 13-5. The quantity to be paid for shall include a layer eight (8) inches in depth across the full width of the compacted area below the lowest depth excavated, but shall not exceed a total depth of twenty-four (24) inches.

–3.14 AERATION EQUIPMENT

If test holes bored within the excavation or borrow areas show that substantial portions of either one contain moisture in excess of the optimum for proper compaction of embankments, the Owner will provide pay items for aeration equipment to reduce the moisture content of the embankment material prior to compaction. Aeration equipment may be used in the roadway excavation area, the borrow area, or on the embankments as the Engineer may direct.

Neither the exact extent of the excessively wet areas nor the climatic conditions that will prevail during construction can be determined accurately prior to construction. Consequently the Owner will assume no responsibility for the cost of aeration other than to pay the Contractor in accordance with the bid items of his proposal for furnishing and operating the equipment intended to accelerate evaporation of excess moisture.

The inclusion of bid items for aeration equipment shall not relieve the Contractor of the responsibility for employing such sound and workmanlike procedures in the prosecution of his work as are generally recognized to be effective in constructing embankments with wet materials. Open ditching to provide surface or subterranean drainage, or the placing of alternate layers of dry and wet material to reduce or control the moisture content of the composite layers, shall be considered as incidental to the excavation and all costs involved shall be included in the unit contract prices per cubic yard for "Common Excavation," per cubic yard for "Borrow (kind)," and per unit for "Haul" if "Haul" is included in the proposal.

The function of aeration equipment is to provide thin, loose layers of material from which moisture can evaporate. While certain aeration equipment has proved to be effective in reducing moisture content of embankment material, the Owner makes no claim as to the efficiency of any particular piece of equipment that may be provided as a pay item on any given project.

The Contractor shall furnish and operate such of the following equipment as may appear in the bid items, and as the Engineer shall deem best suited for the conditions encountered, and at such locations as he may direct:

Heavy duty power grader, with moldboard 12 feet long by 24 inches in height and ¾ inch thick, excepting however, that a 10 percent tolerance will be allowed for each dimension. Graders shall be equipped with V type scarifier having not less than nine (9) insert teeth.

Tamping roller with at least two (2) individually suspended drums with metal studs. The load on each tamper foot shall be not less than 135 pounds per square inch of area. The tamping roller shall be drawn by a suitable tractor. The tractor and tamping roller shall be considered a tamping roller unit.

Heavy duty rooter, and tractor capable of propelling the rooter while turning material eighteen (18) inches deep at a speed of not less than one and one-half (1½) miles per hour of material requiring aeration. The rooter and tractor shall be considered as an aerating unit.

Heavy duty gang plow having not less than five 16-inch bottoms, and tractor capable of propelling the gang plow while turning excavation material at least 9 inches deep at the rate of not less than 1½ miles per hour in fairly wet material.

Heavy duty tandem disk with 24-inch disks and cutting width of at least 7 feet, complete with tractor capable of propelling the assembly at not less than 2 miles per hour while turning fairly wet material to a depth of at least 6 inches.

The listing of the equipment described in this section, while considered most likely to be adaptable for the purposes described, will not preclude the use of other kinds or type of equipment upon a mutually agreed price between the Contractor and the Owner if, in the opinion of the Engineer, other equipment will be either as effective or more effective than that listed for bids.

The use of any of the above aerating equipment in tandem operation will not be permitted. The aerating equipment shall not be used for performing other work while used in aerating operations.

Measurement and payment for aeration equipment as above described shall be as outlined in sections 13-4 and 13-5. Payment for aerating will be made only when bid items for aeration equipment are included in the proposal unless, in the judgment of the Engineer, the provisions of Section 4.05 for changed conditions will apply.

–3.15 SNOW REMOVAL

Whenever the surface of a cut or the site of an embankment is covered with snow sufficiently deep to impair the utility of the work, the snow must be removed and deposited beyond the slope stakes at the Contractor's own expense. Work of this nature shall be at least one hundred (100) feet in advance of the excavation and placing of the embankment.

13–4 MEASUREMENT

Excavation will be measured by the cubic yard in its original position by cross-sectioning. Pay quantities will be computed to the neat lines of the cross sections as staked.

Borrow will be measured by the cubic yard in its original position in excavation and will be classified same as the classification for roadway and drainage excavation.

Stripping of quarries and pits will be measured by the cubic yard in its original position by cross-sectioning.

Unsuitable foundation excavation will be measured by the cubic yard in its original position by cross-sectioning.

Vertical sand drains will be measured by the vertical foot from the top of the working table to the bottom of the holes.

Sand borrow for drainage blanket will be measured by the cubic yard or by the ton, provided however, that moisture in excess of eight (8) percent will be deducted in ascertaining the pay quantities when measured by the ton.

Embankment compaction, except embankments constructed by Method A, will be measured by the cubic yard of compacted embankment material in place. Excavation material that is wasted, and excavation or borrow material placed under water by dredging operations, by end dumping, or by other methods in which the material is not compacted in layers in accordance with the provisions of sections 13-3.10D and 13-3.10E1, shall be

excluded from measurement and payment for compaction. Pay quantities will be computed upon the compacted portion of the embankment to the neat lines of the staked cross sections, and no allowance will be made for subsidence or settlement.

Compacting cut sections as required in Section 13-3.13 will be measured by the cubic yard of compacted material in place.

Aerating equipment will be measured for each assembly of equipment, to the nearest one-half hour for the actual periods of operation in aerating material. No allowance will be made for time consumed in making repairs to the equipment, for moving equipment to or from areas on which aeration is required, or when the towing equipment is performing other work.

13–5 PAYMENT

Payment will be made for such of the following bid items as are included and shown in any particular contract:

1. "Unclassified Excavation," or "Unclassified Excavation Including Haul," per cubic yard.
2. "Common Excavation," or "Common Excavation Including Haul," per cubic yard.
3. "Solid Rock Excavation," or "Solid Rock Excavation Including Haul," per cubic yard.
4. "Unclassified Ditch Excavation," per cubic yard.
5. "Common Ditch Excavation," per cubic yard.
6. "Solid Rock Ditch Excavation," per cubic yard.
7. "Unclassified Channel Excavation," per cubic yard.
8. "Common Channel Excavation," per cubic yard.
9. "Solid Rock Channel Excavation," per cubic yard.
10. "Unclassified Borrow," per cubic yard.
11. "Common Borrow," per cubic yard.
12. "Solid Rock Borrow," per cubic yard.
13. "Unsuitable Foundation Excavation," per cubic yard.
14. "Stripping Quarries and Pits," per cubic yard.
15. "Vertical Sand Drains," per vertical foot.
16. "Sand Borrow for Drainage Blanket," per ton or per cubic yard.
17. "Water," per M gallons.
18. "Embankment Compaction," per cubic yard.
19. "Heavy Duty Power Grader with Scarifier," per hour.
20. "Tamping Roller," per hour.
21. "Heavy Duty Rooter," per hour.
22. "Gang Plow and Tractor," per hour.
23. "Tandem Disc and Tractor," per hour.

The unit contract prices per cubic yard for such types and classes of excavation and borrow listed above from items 1 to 14 inclusive, shall be full compensation for excavating, loading, placing or otherwise disposing of the material as shown on the plans, as specified herein, or as directed by the Engineer, and shall include the removal and disposal, the wasting or stockpiling of forest debris or any top soil, organic matter or other deleterious matter from the surface of a cut or fill, as may be specified or as may be directed by the Engineer.

As compensation for hauling excavated material, when so shown as an item in the proposal, the unit contract price per unit for "Haul" shall apply as provided in Section 14, except that when the pay item for excavation is shown as "Including Haul," the unit contract price per cubic yard for the item specified shall include all costs of hauling the material the full distance as required.

Except where otherwise provided, the work prescribed under the heading of "Embankment" will not be paid for directly as a pay item but shall be considered as incidental work pertaining to the placement of the several classes of excavation and borrow.

The unit contract price per vertical foot for "Vertical Sand Drains" shall be full compensation for furnishing all labor, tools, equipment and materials necessary or incidental to excavating the drain holes and for selecting, loading, hauling and placing the sand backfill material as specified above.

The unit contract price per ton for "Sand Borrow for Drainage Blanket" shall be full compensation for selecting and/or processing of the material, and for hauling and placing the material as a blanket over the sand drains.

Water will be paid for as provided in Section 16.

Payment for "Embankment Compaction" per cubic yard shall be made at the unit contract price for all compacted embankment material placed up to finish subgrade elevation, excepting that excavated material that is wasted and excavation or borrow material placed under water, or placed by dredging operations, or by end dumping, or by any other method where compaction in uniform layers is not practicable, shall be excluded from the pay quantity, and excepting further that payment for "Embankment Compaction" will not be made for embankments constructed by Method A.

The unit contract price per cubic yard for "Embankment Compaction" shall be full compensation for all materials, labor, tools, equipment and incidentals required to complete the compaction of embankments in accordance with the specifications.

The quantities for embankment compaction represent the best judgement of the Owner as to the quantities that will be involved in compacting embankments and cut sections. The owner does not guarantee these estimated quantities, however, and the Engineer will be the sole judge as to the actual quantities required.

The unit contract prices per hour for the aerating equipment listed shall be full compensation for furnishing and operating the assemblies and for all rentals, supplies and labor to perform the work specified.

In the event solid rock is encountered on any project for which no payment item for its excavation is provided in the bid proposal, compensation for necessary removal shall be at the following schedule of unit prices:

Solid Rock Excavation or Solid Rock Channel Excavation:
For quantities of 1,000 cubic yards or less, $2.50 per cubic yard.
For additional quantities in excess of 1,000 cubic yards, $2.00 per cubic yard.
Solid Rock Ditch Excavation:
For all quantities, $5.00 per cubic yard.

Compensation will be made for "Haul" in accordance with Section 14 at the unit price bid. If a bid item for "Haul" is not included in the project, the above fixed prices for excavation of solid rock materials shall include all haul.

Clearing and grubbing of borrow pits and channel excavation areas will be paid for as specified in Section 12. Clearing and grubbing of ditch excavation areas shall be considered as incidental to the construction, and the costs thereof shall be included in the pay item of ditch or channel excavation involved.

Section 14—Haul

14–1 DESCRIPTION

On much of the municipal work of excavation the method and details of haul and the payment therefor will be specified in the special provisions and the pay item, if any, will be shown in the proposal.

On projects involving large volumes of excavated materials requiring more or less balancing of quantities from cuts into fills, the plans may provide for measurement and payment of haul upon the "unit" basis. The specifications which follow are adaptable to such a method of measurement and payment for haul only when the unit contract price per "unit" for "Haul" is included in the proposal.

Under these specifications, the Contractor will not be allowed to waste and borrow in lieu of hauling the material as required. No allowance will be made for cross haul of material unless specifically ordered by the Engineer.

14–2 MEASUREMENT

–2.01 HAUL QUANTITIES

Haul will be computed in "units" of 100 cubic yard stations for the transportation of excavated material. The quantity of cubic yard stations of haul is the product of the volume of the material measured in its original position in cubic yards by the distance transported, measured in stations of 100 feet. A cubic yard station of haul is, therefore, the equivalent of one cubic yard of material hauled one station. The measure of one "unit" of haul will represent 100 cubic yard stations.

The method of computing the haul shall be by the application of the mass diagram as shown on the Standard Mass Diagram, which is available for distribution upon request to the Director of Highways, Olympia, Washington.

Copies of the location mass diagram, when applicable for any particular project, will be made available to the Contractor upon request.

–2.02 ROADWAY AND AUXILIARY LANES

Haul quantities will be computed on the basis of transporting the materials along the center line or base line of the highway or street without regard for any lateral distance from the outer limits of the right of way. Quantities thus computed will include the roadway prism or prisms, auxiliary lanes, borrow obtained by the widening of cuts, and waste deposited within the right of way and contiguous areas designated for wasting. Auxiliary lanes include frontage roads, speed change lanes, paralleling and loop ramps, cross roads and other lanes supplementary to through traffic movements.

On multi-lane streets where more than one center line or base line along the through traffic lanes is shown on the plans, the line on which haul is to be computed will be indicated on the plans or described in the special provisions.

In the event haul is to be computed on any base line other than as hereinbefore specified, the lines will be described in the special provisions.

–2.03 BORROW OR WASTE

Haul on borrow or waste other than as included above will be computed in the following manner:

Quantities of excavation or embankment, as the case may be, will be computed normal to the long axis of the borrow pit or waste site. The distance of haul will be computed along the long axis, thence by the shortest and most practicable route to the street center line from the end of the axis nearest to the street center line, unless a haul route is designated on the plans or in the special provisions in which case the haul distance will be measured along the designated route. If the Contractor elects to use a route shorter than the computed or designated route, payment will be made on the basis of the length of route actually used.

14–3 PAYMENT

The contract price per unit of "Haul" shall be full compensation for all costs and expenses involved in the transportation of the materials.

Section 15—Subgrade

15–1 DESCRIPTION

The subgrade will be considered as those areas and surfaces of new or existing streets, alleys, driveways, sidewalks or other public places upon which additional materials are to be placed under contract, or which are to be constructed or prepared for the future placement thereupon of other materials in accordance with these specifications, the plans, the special provisions, and which will be staked for lines and grades by the Engineer.

No additional compensation will be made for any work required to accomplish the intent of this section except for payment at the unit contract prices for furnishing and compacting such additional material of the type ordered by the Engineer that may be necessary to bring the subgrade to the required line, grade and cross section.

All underground work contemplated in the area of the subgrade shall be completed and properly backfilled before subgrade work is started. This is intended to include work on the contract, work to be performed by the Owner, or by others.

These specifications are to be used in conjunction with requirements in those sections of the specifications having to do with specific types of base materials and pavements.

15–2 CONSTRUCTION DETAILS

–2.01 SUBGRADE FOR BASE MATERIALS

In advance of setting line and grade stakes, the subgrade area shall be cleared of brush, weeds, vegetation, grass and debris, all of which shall be satisfactorily disposed of. All depressions or ruts which contain water shall be drained. The subgrade shall then be bladed and dragged to remove inequalities and secure a uniform surface.

After the foregoing requirements have been complied with, the proper alignment and grades will be given by the Engineer. Where normal crown sections are being constructed, stakes will be set at convenient offsets at intervals not to exceed fifty (50) feet and at closer intervals where necessary, such as at street and alley intersections. It shall be the responsibility of the Contractor to set centerline grades which may be needed except in cases where the street grades are warped or otherwise do not conform with the typical section, in which case the Engineer will set the stakes.

If ordered by the Engineer, an existing subgrade shall be compacted to 95% of maximum density measured in accordance with Section 13–3.10E5, or such other density as required by the Engineer, by use of such compaction equipment as called for in the special provisions or as ordered by the Engineer. The compaction equipment shall comply with the requirements of Section 15–2.01A. Payment for compaction of subgrade shall be as outlined in Sections 15-3 and 15-4.

All soft, spongy, or yielding spots which may be ordered removed by the Engineer, shall be entirely removed and the space refilled with suitable material and thoroughly compacted. Removal of such unsuitable material will be paid for on a Force Account basis as provided in Section 9.04 unless the unsuitable area was caused by negligence of the Contractor in his operations. In such case, the removal, replacement and compaction shall be done by the Contractor at his own expense.

The final finishing shall be to a height above the finished subgrade cross sections as may be determined, by trial and experience, to be proper to ensure thorough compaction to the grade as staked, by rolling.

When ordered by the Engineer, the Contractor shall sprinkle the subgrade with water in such quantities as directed, which will be paid for at the unit contract price for "Water".

Grade and line, throughout the stages of constructing the subgrade, shall be secured from the reference stakes. The subgrade shall be maintained in the finished condition until the first course of surfacing is placed upon it.

–2.01A Compacting Equipment

When called for on the plans or in the special provisions, or when ordered by the Engineer, the Contractor shall furnish any one or more of the following compacting equipment as may be specified or required:

Variable Load Compactor: A variable load compactor shall consist of four (4) pneumatic-tired wheels in a single axial line but supported on one or more axles, together with a box or body which will permit loading within specified amounts. Each tire shall be not less than sixteen (16) inches in width and shall support air pressure up to ninety (90) pounds per square inch. All tires shall be of equal size and diameter, with treads satisfactory to the Engineer, and the pressure in the several tires shall

excluded from measurement and payment for compaction. Pay quantities will be computed upon the compacted portion of the embankment to the neat lines of the staked cross sections, and no allowance will be made for subsidence or settlement.

Compacting cut sections as required in Section 13-3.13 will be measured by the cubic yard of compacted material in place.

Aerating equipment will be measured for each assembly of equipment, to the nearest one-half hour for the actual periods of operation in aerating material. No allowance will be made for time consumed in making repairs to the equipment, for moving equipment to or from areas on which aeration is required, or when the towing equipment is performing other work.

13–5 PAYMENT

Payment will be made for such of the following bid items as are included and shown in any particular contract:

1. "Unclassified Excavation," or "Unclassified Excavation Including Haul," per cubic yard.
2. "Common Excavation," or "Common Excavation Including Haul," per cubic yard.
3. "Solid Rock Excavation," or "Solid Rock Excavation Including Haul," per cubic yard.
4. "Unclassified Ditch Excavation," per cubic yard.
5. "Common Ditch Excavation," per cubic yard.
6. "Solid Rock Ditch Excavation," per cubic yard.
7. "Unclassified Channel Excavation," per cubic yard.
8. "Common Channel Excavation," per cubic yard.
9. "Solid Rock Channel Excavation," per cubic yard.
10. "Unclassified Borrow," per cubic yard.
11. "Common Borrow," per cubic yard.
12. "Solid Rock Borrow," per cubic yard.
13. "Unsuitable Foundation Excavation," per cubic yard.
14. "Stripping Quarries and Pits," per cubic yard.
15. "Vertical Sand Drains," per vertical foot.
16. "Sand Borrow for Drainage Blanket," per ton or per cubic yard.
17. "Water," per M gallons.
18. "Embankment Compaction," per cubic yard.
19. "Heavy Duty Power Grader with Scarifier," per hour.
20. "Tamping Roller," per hour.
21. "Heavy Duty Rooter," per hour.
22. "Gang Plow and Tractor," per hour.
23. "Tandem Disc and Tractor," per hour.

The unit contract prices per cubic yard for such types and classes of excavation and borrow listed above from items 1 to 14 inclusive, shall be full compensation for excavating, loading, placing or otherwise disposing of the material as shown on the plans, as specified herein, or as directed by the Engineer, and shall include the removal and disposal, the wasting or stockpiling of forest debris or any top soil, organic matter or other deleterious matter from the surface of a cut or fill, as may be specified or as may be directed by the Engineer.

As compensation for hauling excavated material, when so shown as an item in the proposal, the unit contract price per unit for "Haul" shall apply as provided in Section 14, except that when the pay item for excavation is shown as "Including Haul," the unit contract price per cubic yard for the item specified shall include all costs of hauling the material the full distance as required.

Except where otherwise provided, the work prescribed under the heading of "Embankment" will not be paid for directly as a pay item but shall be considered as incidental work pertaining to the placement of the several classes of excavation and borrow.

The unit contract price per vertical foot for "Vertical Sand Drains" shall be full compensation for furnishing all labor, tools, equipment and materials necessary or incidental to excavating the drain holes and for selecting, loading, hauling and placing the sand backfill material as specified above.

The unit contract price per ton for "Sand Borrow for Drainage Blanket" shall be full compensation for selecting and/or processing of the material, and for hauling and placing the material as a blanket over the sand drains.

Water will be paid for as provided in Section 16.

Payment for "Embankment Compaction" per cubic yard shall be made at the unit contract price for all compacted embankment material placed up to finish subgrade elevation, excepting that excavated material that is wasted and excavation or borrow material placed under water, or placed by dredging operations, or by end dumping, or by any other method where compaction in uniform layers is not practicable, shall be excluded from the pay quantity, and excepting further that payment for "Embankment Compaction" will not be made for embankments constructed by Method A.

The unit contract price per cubic yard for "Embankment Compaction" shall be full compensation for all materials, labor, tools, equipment and incidentals required to complete the compaction of embankments in accordance with the specifications.

The quantities for embankment compaction represent the best judgement of the Owner as to the quantities that will be involved in compacting embankments and cut sections. The owner does not guarantee these estimated quantities, however, and the Engineer will be the sole judge as to the actual quantities required.

The unit contract prices per hour for the aerating equipment listed shall be full compensation for furnishing and operating the assemblies and for all rentals, supplies and labor to perform the work specified.

In the event solid rock is encountered on any project for which no payment item for its excavation is provided in the bid proposal, compensation for necessary removal shall be at the following schedule of unit prices:

Solid Rock Excavation or Solid Rock Channel Excavation:
For quantities of 1,000 cubic yards or less, $2.50 per cubic yard.
For additional quantities in excess of 1,000 cubic yards, $2.00 per cubic yard.

Solid Rock Ditch Excavation:
For all quantities, $5.00 per cubic yard.

Compensation will be made for "Haul" in accordance with Section 14 at the unit price bid. If a bid item for "Haul" is not included in the project, the above fixed prices for excavation of solid rock materials shall include all haul.

Clearing and grubbing of borrow pits and channel excavation areas will be paid for as specified in Section 12. Clearing and grubbing of ditch excavation areas shall be considered as incidental to the construction, and the costs thereof shall be included in the pay item of ditch or channel excavation involved.

Section 14—Haul

14–1 DESCRIPTION

On much of the municipal work of excavation the method and details of haul and the payment therefor will be specified in the special provisions and the pay item, if any, will be shown in the proposal.

On projects involving large volumes of excavated materials requiring more or less balancing of quantities from cuts into fills, the plans may provide for measurement and payment of haul upon the "unit" basis. The specifications which follow are adaptable to such a method of measurement and payment for haul only when the unit contract price per "unit" for "Haul" is included in the proposal.

Under these specifications, the Contractor will not be allowed to waste and borrow in lieu of hauling the material as required. No allowance will be made for cross haul of material unless specifically ordered by the Engineer.

14–2 MEASUREMENT

–2.01 HAUL QUANTITIES

Haul will be computed in "units" of 100 cubic yard stations for the transportation of excavated material. The quantity of cubic yard stations of haul is the product of the volume of the material measured in its original position in cubic yards by the distance transported, measured in stations of 100 feet. A cubic yard station of haul is, therefore, the equivalent of one cubic yard of material hauled one station. The measure of one "unit" of haul will represent 100 cubic yard stations.

The method of computing the haul shall be by the application of the mass diagram as shown on the Standard Mass Diagram, which is available for distribution upon request to the Director of Highways, Olympia, Washington.

Copies of the location mass diagram, when applicable for any particular project, will be made available to the Contractor upon request.

–2.02 ROADWAY AND AUXILIARY LANES

Haul quantities will be computed on the basis of transporting the materials along the center line or base line of the highway or street without regard for any lateral distance from the outer limits of the right of way. Quantities thus computed will include the roadway prism or prisms, auxiliary lanes, borrow obtained by the widening of cuts, and waste deposited within the right of way and contiguous areas designated for wasting. Auxiliary lanes include frontage roads, speed change lanes, paralleling and loop ramps, cross roads and other lanes supplementary to through traffic movements.

On multi-lane streets where more than one center line or base line along the through traffic lanes is shown on the plans, the line on which haul is to be computed will be indicated on the plans or described in the special provisions.

In the event haul is to be computed on any base line other than as hereinbefore specified, the lines will be described in the special provisions.

–2.03 BORROW OR WASTE

Haul on borrow or waste other than as included above will be computed in the following manner:

Quantities of excavation or embankment, as the case may be, will be computed normal to the long axis of the borrow pit or waste site. The distance of haul will be computed along the long axis, thence by the shortest and most practicable route to the street center line from the end of the axis nearest to the street center line, unless a haul route is designated on the plans or in the special provisions in which case the haul distance will be measured along the designated route. If the Contractor elects to use a route shorter than the computed or designated route, payment will be made on the basis of the length of route actually used.

14–3 PAYMENT

The contract price per unit of "Haul" shall be full compensation for all costs and expenses involved in the transportation of the materials.

Section 15—Subgrade

15–1 DESCRIPTION

The subgrade will be considered as those areas and surfaces of new or existing streets, alleys, driveways, sidewalks or other public places upon which additional materials are to be placed under contract, or which are to be constructed or prepared for the future placement thereupon of other materials in accordance with these specifications, the plans, the special provisions, and which will be staked for lines and grades by the Engineer.

No additional compensation will be made for any work required to accomplish the intent of this section except for payment at the unit contract prices for furnishing and compacting such additional material of the type ordered by the Engineer that may be necessary to bring the subgrade to the required line, grade and cross section.

All underground work contemplated in the area of the subgrade shall be completed and properly backfilled before subgrade work is started. This is intended to include work on the contract, work to be performed by the Owner, or by others.

These specifications are to be used in conjunction with requirements in those sections of the specifications having to do with specific types of base materials and pavements.

15–2 CONSTRUCTION DETAILS

–2.01 SUBGRADE FOR BASE MATERIALS

In advance of setting line and grade stakes, the subgrade area shall be cleared of brush, weeds, vegetation, grass and debris, all of which shall be satisfactorily disposed of. All depressions or ruts which contain water shall be drained. The subgrade shall then be bladed and dragged to remove inequalities and secure a uniform surface.

After the foregoing requirements have been complied with, the proper alignment and grades will be given by the Engineer. Where normal crown sections are being constructed, stakes will be set at convenient offsets at intervals not to exceed fifty (50) feet and at closer intervals where necessary, such as at street and alley intersections. It shall be the responsibility of the Contractor to set centerline grades which may be needed except in cases where the street grades are warped or otherwise do not conform with the typical section, in which case the Engineer will set the stakes.

If ordered by the Engineer, an existing subgrade shall be compacted to 95% of maximum density measured in accordance with Section 13–3.10E5, or such other density as required by the Engineer, by use of such compaction equipment as called for in the special provisions or as ordered by the Engineer. The compaction equipment shall comply with the requirements of Section 15–2.01A. Payment for compaction of subgrade shall be as outlined in Sections 15-3 and 15-4.

All soft, spongy, or yielding spots which may be ordered removed by the Engineer, shall be entirely removed and the space refilled with suitable material and thoroughly compacted. Removal of such unsuitable material will be paid for on a Force Account basis as provided in Section 9.04 unless the unsuitable area was caused by negligence of the Contractor in his operations. In such case, the removal, replacement and compaction shall be done by the Contractor at his own expense.

The final finishing shall be to a height above the finished subgrade cross sections as may be determined, by trial and experience, to be proper to ensure thorough compaction to the grade as staked, by rolling.

When ordered by the Engineer, the Contractor shall sprinkle the subgrade with water in such quantities as directed, which will be paid for at the unit contract price for "Water".

Grade and line, throughout the stages of constructing the subgrade, shall be secured from the reference stakes. The subgrade shall be maintained in the finished condition until the first course of surfacing is placed upon it.

–2.01A Compacting Equipment

When called for on the plans or in the special provisions, or when ordered by the Engineer, the Contractor shall furnish any one or more of the following compacting equipment as may be specified or required:

Variable Load Compactor: A variable load compactor shall consist of four (4) pneumatic-tired wheels in a single axial line but supported on one or more axles, together with a box or body which will permit loading within specified amounts. Each tire shall be not less than sixteen (16) inches in width and shall support air pressure up to ninety (90) pounds per square inch. All tires shall be of equal size and diameter, with treads satisfactory to the Engineer, and the pressure in the several tires shall

not vary from each other more than five (5) pounds per square inch.

The wheels shall be so mounted that they will not make locking contact at any time, and will permit free rocking and wheel oscillation so that equal bearing pressure will be applied to the ground at all times. The wheels shall be so mounted that the total weight of the vehicle and contents will be distributed equally to all wheels. The box or boxes shall be of sufficient capacity that a total maximum weight of not less than thirty-five (35) tons nor more than fifty (50) tons can be attained in the compactor.

The weight of the compactor shall be as approved by the Engineer to obtain maximum compaction. The compactor shall be drawn by a vehicle of sufficient horsepower to enable the unit to travel through a loose layer eighteen (18) inches thick at a speed of at least four (4) miles per hour. The towing vehicle and the roller meeting the above requirements shall be considered a variable load compactor unit.

Grid Roller: A grid roller shall consist of two or more cylindrical drums independently mounted on a common shaft in a rigid frame. Each drum shall have a minimum outside diameter of five feet (5') and a minimum width of two feet six inches (2'6"). The overall width of the roller exclusive of frame shall be not less than five feet six inches (5'6") of which not more than six inches (6") shall be used for center spacing between two roller drums. The face of the drums shall have the appearance of woven open-mesh made by interlacing bars of not less than one and one-fourth inch (1¼") nor more than one and three-fourths inches (1¾") diameter spaced on four and one-half inch (4½") to five and one-half inch (5½") centers. Net opening between the bars shall be not less than three inches (3") nor more than four inches (4").

The roller shall be so constructed that counterweights can be used to adjust the gross weight of the roller to not less than 30,000 pounds. The grid roller shall be drawn by a power unit capable of propelling the fully loaded roller through six (6) inches of loose embankment material at a speed of at least four (4) miles per hour.

The power unit used to draw the grid roller shall be used exclusively for that purpose at all times when material is being compacted. The power unit and the grid roller including counterweights, all meeting the above specifications, shall be considered a grid roller unit.

Pneumatic Tired Roller: The pneumatic tired roller shall have a minimum gross weight of 8 tons and a minimum width of 5 feet. Wobble wheel rollers will not be permitted. The tires shall be of equal size, diameter and ply rating with smooth treads. The inflation pressures of the several tires shall not vary more than 5 pounds per square inch from the designated pressure. Tires shall be so spaced that the entire gap between adjacent tires will be covered by the tire which follows, at all operating tire pressures.

The relationship between tire sizes, tire characteristics, ply rating, tire inflation pressures and operating weights per tire shall be such that the roller is capable of developing tire contact pressures on the roadway through the entire range of 40 and 80 pounds per square inch. The exact contact pressure to be used within that range shall be as directed by the Engineer.

Smooth-wheeled Power Roller: A smooth-wheeled power roller shall be a modern, self-propelled, three-wheeled roller weighing not less than ten (10) tons and providing a compression on the rear wheels of not less than 325 pounds per linear inch of tire width.

Vibratory Compactor: The vibratory compacting unit shall be a self-propelled multiple shoe vibratory such as the Jackson Multiple Vibratory Compactor, the Lima Roadpacker Model C, or equal. The unit shall have an adjustable compactor width from a minimum of eight (8) feet to a maximum of approximately thirteen (13) feet. Within range of width, the greatest number of compactor shoes commensurate with the width of the area being compacted shall be used as directed by the Engineer.

Tamping Roller: The tamping roller shall have at least two (2) individually suspended drums with metal studs. The load on each tamping foot shall be not less than 135 pounds per square inch of area. The tamping roller shall be drawn by a suitable tractor, and the tractor and tamping roller shall be considered as a tamping roller unit for measurement and payment.

Mechanical Tamper: A mechanical tamper shall be air or gasoline driven. The air-driven mechanical tamping unit shall consist of an air-driven tamper together with all necessary incidental equipment. The tamper shall be operated at an air pressure of not less than seventy-five (75) pounds per square inch. The tamping foot shall have an area of not less than nineteen (19) square inches nor more than twenty-nine (29) square inches. If approved by the Engineer, tampers conforming to the above and assembled in groups may be used, provided that the total tamping area of the assembly is not less than fifty-nine (59) nor more than eighty-five (85) square inches.

The gasoline-driven mechanical tamping unit shall be equipped with a tamping foot of not less than fifty-nine (59) nor more than eighty-five (85) square inches in area. The gasoline-driven tamper shall operate by alternately rising and falling approximately fifteen (15) inches and delivering a blow of not less than 250 foot-pounds with each fall.

A basic mechanical tamping unit shall have a tamping foot area of not less than nineteen (19) nor more than twenty-nine (29) square inches. An increase of fifty percent (50%) in the quantity of hours for "Mechanical Tamper" will be paid for units having a total tamping area between fifty-nine (59) and eighty-five (85) square inches during the time that such units are used for compaction.

–2.02 SUBGRADE FOR CEMENT CONCRETE PAVEMENT

Profile grade is the point of gradient or vertical curve at the position indicated on the Roadway Section. Before any paving material is placed, the subgrade shall be brought to the proper line, grade, and cross section and shall be so maintained until the concrete is placed, except that extra depth of subgrade for increased thickness of the pavement, for pavement anchors, for pavement headers, and for increased thickness at the edges of the pavement may be removed just before the concrete is placed.

The subgrade shall be brought to a firm unyielding surface by rolling the entire area to a width of at least one (1) foot outside the edge of the pavement with a compacting unit meeting the requirements of Section 15-2.01A. All portions of the surface on the subgrade which are inaccessible to the compactor shall be thoroughly compacted with a mechanical tamper.

All soft, spongy or yielding spots and all vegetable or other objectionable matter shall be entirely removed and the space refilled with suitable material and thoroughly compacted. The removal of such unsuitable material will be paid for on a Force Account basis, as provided by these specifications unless the unsuitable area is caused by negligent operations of the Contractor. In such case, the removal, replacement and compaction shall be done by the Contractor at his own expense.

The full width of the roadway shall be kept well sprinkled with water before and during process of rolling the subgrade. The subgrade shall be rolled both before and after the forms are set.

When the pavement is to be constructed over an old roadbed composed of gravel and macadam, the old gravel or macadam shall be scarified and the material shall be uniformly spread and rolled until thoroughly compacted.

The subgrade shall be thoroughly saturated with water from twelve (12) to forty-eight (48) hours before the concrete is to be placed, and shall be thoroughly wet just before the concrete is placed. The work of saturating the subgrade shall be started and continued at the direction of the Engineer.

The elevation of the subgrade from one and one-half (1½) feet inside of the edge of the proposed pavement or form to one (1) foot outside of the edge of the pavement or form shall be brought to an elevation that is not more than one (1) inch above or below the elevation for the finished subgrade over this area before stakes will be set for the forms.

–2.03 PROTECTION OF SUBGRADE

After preparing the subgrade as above specified, all unnecessary traffic shall be kept off. Should it be found necessary to haul the aggregate and cement over the prepared subgrade, the Contractor shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. All cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations shall be raked and hand tamped immediately preceding the placing of the concrete. All equipment used for transporting materials over the prepared subgrade shall be equipped with pneumatic tires.

Continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross section, will not be permitted. The Contractor shall protect the prepared subgrade from both his own and public traffic.

If, in the opinion of the Engineer, it should be necessary, the Contractor will be required, at his own expense, to plank the subgrade before hauling materials or equipment over it.

15–3 MEASUREMENT

Compaction of subgrades, except as provided for under other sections of these specifications, will be measured to the nearest one-half (½) hour of actual time consumed in compacting for the various types of equipment used. No allowance will be made for time consumed in making repairs to the equipment, for moving equipment to or from areas on the work on which compaction is required, or when the towing equipment is performing other work.

15–4 PAYMENT

Payment will be made for such of the following bid items as are included in the bid proposal:

1. "Variable Load Compactor," per hour.
2. "Grid Roller," per hour.
3. "Pneumatic-tired Roller," per hour.
4. "Smooth-wheeled Power Roller," per hour.
5. "Vibratory Compactor," per hour.
6. "Tamping Roller," per hour.
7. "Mechanical Tamper," per hour.
8. "Water," per M gallons.

When any work described in this section is required but no item of payment is provided therefor in the proposal, the work required shall be considered as incidental to the construction and all costs thereof shall be included by the Contractor in other pay items of the contract.

All other costs for labor, materials, tools, and equipment required for, or incidental to the preparation, shaping, maintaining, and protection of the subgrade, except as outlined in Section 15-1, shall be included in the unit contract price in place for the particular class of surfacing or paving involved. No additional payment will be made for the preparation, shaping, and protection of the subgrade.

Water, when required and used to secure adequate compaction of the subgrade, shall be measured and paid for in accordance with the provisions of Section 16. Water used in sprinkling the subgrade for maintenance purposes shall not be a pay item, unless ordered by the Engineer.

The compacting equipment described in Section 15-2.01A will be considered pay items when used for compacting subgrades as specified in Section 15-2.01. Compaction required in Section 39-3.15 will not be a pay item. The accepted hourly quantities for compacting at the contract price per hour for "Variable Load Compactor," "Grid Roller," "Pneumatic-tired Roller," "Smooth-wheeled Power Roller," "Vibratory Compactor," "Tamping Roller," and "Mechanical Tamper" shall be full compensation for all materials, labor, equipment, tools and incidentals necessary to complete the compaction of subgrades in accordance with these specifications.

The proposal quantities for any type of compacting equipment represent the best judgment of the Owner as to the amount of rolling and compacting that will be necessary to secure compaction of subgrades in accordance with these specifications. The Owner does not, however, guarantee these quantities, and the Engineer will be the sole judge as to the type of compacting equipment to be used and the number of hours required.

Towing different types of rollers in tandem will not be allowed; however, additional towed rollers of the same type for tandem use with fully powered units may be used when authorized in writing by the Engineer. Additional rollers, when so used, will be paid for by an increase of fifty percent (50%) in the number of hours for the type of roller and for the time each additional roller is used for subgrade compaction.

Section 16—Water

16–1 DESCRIPTION

–1.01 WATER FOR STREETS

Water for compacting embankment, constructing subgrade, placement of screened gravel and crushed surfacing, and for laying dust caused from grading operations or public travel, if ordered by the Engineer, shall be applied in the amounts and places designated by the Engineer and payment will be made therefore as described in Section 16-5. Water for sprinkling the subgrade between ribbons ahead of placing cement concrete pavement as required in sections 15 and 39 shall be considered as incidental to the construction of the pavement and the costs thereof shall be included by the Contractor in the unit contract price per square yard of "Cement Concrete Pavement", or other pay items of the contract.

–1.02 WATER FOR TRENCHES

Where water settling is required for compaction of trench backfill, with the exception of water main construction, the jetting method or the sluicing method shall be used. The method of water settling will be noted in the special provisions.

16–2 SOURCE OF WATER AND GENERAL REQUIREMENTS

–2.01 WATER SUPPLY

The Contractor shall make arrangements for and provide all necessary water at his own expense, unless otherwise provided in the special provisions.

If the Contractor purchases water from a water utility at a fire hydrant on or near the project, all arrangements shall be made by him at his own expense and payment be made the utility on basis of the actual quantity of water metered.

–2.02 REQUIREMENTS AND RESPONSIBILITY

The Contractor shall use only those hydrants designated by the agency in charge of water distribution and in strict accordance with its requirements for hydrant use.

The Contractor shall secure permission from and comply with all requirements of the water utility before obtaining water from the fire hydrants. The Engineer shall also be notified by the Contractor of such permission as soon as granted.

The Contractor shall use hydrant wrenches only to open hydrants. He shall also make certain that the hydrant valve is open "full", since "cracking" the valve causes damage to the valve. An approved auxiliary valve shall be provided on the outlet line for control purposes. Fire hydrant valves must be closed slowly to avoid a surge in the system which creates undue pressure on the water lines. The Contractor shall carefully note the importance of following these directions.

If one of the Contractor's employees shall knowingly or unknowingly use the wrong wrench on a hydrant and thereby damage the hydrant valve stem, the Contractor will be responsible. He shall immediately notify the water utility so that the damage can be repaired as quickly as possible.

Upon completing the use of the hydrants, the Contractor shall notify the water distribution agency, so that the hydrants may be then inspected for possible damage. Any damage resulting from the use of the hydrants by the Contractor will be repaired by the water agency and the cost thereof shall, if necessary, be withheld from the final payment to the Contractor.

The Contractor shall furnish all connectors, wrenches, valves, and small tools that may be necessary to meet the requirements of the water distribution agency pertaining to hydrant use.

Violation of these requirements will result in fines and will lay the Contractor liable for damage suits because of malfunctioning of damaged fire hydrants, in the event or fire.

16–3 CONSTRUCTION DETAILS

–3.01 GENERAL

The Contractor shall furnish all hose and equipment necessary for sluicing or jetting. Minimum size of hose shall be such as will provide 35 pounds per square inch pressure at the discharge where jetting is being performed. The jet shall be a rigid iron pipe with a minimum diameter of one (1) inch, and of such length as may be directed by the Engineer.

Where hauled water is required, the tank truck and/or trailer shall meet all safety and licensing regulations and shall be provided with a pump of such size and capacity as to provide for a discharge equivalent to that required for hydrant settling water.

–3.02 WATER FOR STREETS

Water upon streets shall be applied by sprinkling with tank trucks equipped with spray bars and suitable apparatus. When directed by the Engineer, sprinkling shall be done at night or in the early morning hours when evaporation loss is at a minimum.

–3.03 WATER FOR SETTLING TRENCHES

–3.02A Jetting

Jets shall be inserted at not more than four (4) foot intervals as measured in any direction through the entire width of the top of trench backfill. Penetration shall be to the crown of the pipe, to native ground on side slopes, and to the preceding lift. The jetting operations shall be completed as closely as is practicable to the pipe laying and backfilling operation. In excessively deep trenches and where the Engineeer may direct, the backfill shall be placed in two or more lifts and each be jetted separately.

Where the backfill has been placed and traffic has compacted the surface, the Contractor shall loosen and shape the surface with a motor patrol, as directed, before water settling is begun. Ponding will be required after the jetting only if and whenever the Engineer deems it to be necessary.

Hydrant settling water shall be utilized when hydrants or other sources of water exist within seven hundred (700) feet of the operations.

Hauled settling water shall be utilized when the water settling operation is more than seven hundred (700) feet from a hydrant.

–3.03B Sluicing

Sluicing of the backfill material shall be performed as the material is placed. The rate and manner of placing the backfill material shall be such as to provide for the sluicing of the entire depth of backfill into its final position.

Payment for sluicing shall be made in the same manner as for jetting.

16–4 MEASUREMENT

Water will be measured by unit of one thousand (M) gallons in tanks or tank trucks of known capacity, or by means of meters of a type approved by the Engineer, which shall be furnished and installed by the Contractor at his own expense.

16–5 PAYMENT

Payment will be made for such of the following bid items as are included in any particular contract:

"Water", per M gallons
"Hydrant Settling Water", per M gallons
"Hauled Settling Water", per M gallons

The unit contract price per one thousand (M) gallons of water shall be full compensation for furnishing all labor, materials, tools, equipment and doing all work incidental to furnishing, hauling and applying water as herein specified.

Section 17—Excavation For Structures

17–1 DESCRIPTION

The provisions of this section of the specifications concern the removal or excavation of all materials of whatsoever nature that is necessary for the construction of footings, bases or any other foundation work required to support pump stations, bridges, retaining walls, headwalls and similar structures, or for the placement of riprap and cribbing.

This section also contains the provisions which govern the construction and subsequent removal of all shoring, cribs, cofferdams or caissons; the pumping which may be necessary for the execution of the work, and the placement and compaction of all necessary backfill.

It is not intended that excavation for culverts, sewers and water mains and their appurtenances, manholes, inlets and catch basins, conduits and miscellaneous work covered elsewhere in these specifications or in the special provisions shall be considered as structure excavation.

Attention is called to the fact that the provisions of these specifications dealing with a separate payment for shoring and cribs apply only where an item for "Shoring and Cribs or Extra Excavation" appears on the plans and proposal for a specific structure. Where no such item is shown, the cost of any shoring and cribs that may be required shall be included in the unit contract price bid for structure excavation.

–1.01 CLASSIFICATION

Structure excavation will not be further classified into solid rock excavation or common excavation, nor into wet or dry excavation. Structure excavation shall include the necessary grubbing of structure sites which otherwise would not be grubbed, the excavation of any and all formations encountered inside the limits which define structure excavation, and the removal and disposal of all debris, including submerged or buried timber, and all pumping that may be necessary for draining and dewatering the excavation. It shall also include the furnishing of all equipment necessary for the performance of this work, the placement of all necessary backfill inside the limits which define structure excavation, as hereinafter specified, and the disposal of excavated material that is not required for backfill.

For those structures for which a bid item of shoring and cribs or extra excavation is shown on the plans, all work involved in the construction, placing and subsequent removal of shoring, cribs, cofferdams or caissons shall be classified and paid for as "Shoring and Cribs or Extra Excavation," lump sum. If excavation by means of an open pit is allowed and no shoring or cribs are required, the bid item for shoring and cribs will then cover the excavation of any and all material outside the limits which define structure excavations, including the removal and disposal of all debris or buried timber encountered outside such limits, the furnishing of all the equipment required, and the placement and compaction of all necessary backfill in the areas outside the limits that define structure excavation.

17–3 CONSTRUCTION DETAILS

–3.01 PRESERVATION OF CHANNEL

When foundations or substructures are to be constructed in or adjacent to running streams, no excavation shall be done outside of cribs, cofferdams, caissons or sheet piling, nor shall the natural stream bed ajacent to the structure be disturbed without the written permission of the Engineer. If any open pit excavation or dredging is permitted at the site of the structure before the placement of cribs or cofferdams, the Contractor shall, after the foundations are in place, backfill such excavations to the original surface of the stream bed with material satisfactory to the Engineer. The backfilling material shall be of such quality and shall be placed in such a manner that it will offer the same resistance to scour as the material removed.

Materials deposited from foundation excavations within the stream area shall be removed and the stream bed freed from obstruction thereby. On navigable streams the Contractor shall at all times maintain the depth of water and horizontal clearances required for the passage of water traffic. He shall also furnish and maintain all necessary channel signals and lights during the construction period.

–3.02 EXCAVATION IN OPEN PITS

When footings can be placed in the dry without the use of cofferdams and when cofferdams are not necessary for the preservation of conditions affecting the safety of the completed structure, the Engineer may permit the excavation of open pits without shoring, cofferdams or cribs. Such pits shall be constructed with side slopes sufficiently flat to prevent sliding or caving. The Contractor shall assume full responsibility for the prevention of slides adjacent to any such excavation, and in the event of any such slide the Contractor shall remove the additional material brought down by the slide at his own expense.

In case the material disturbed by a slide lies within an area upon which a portion of the structure is to be constructed, the Contractor shall excavate the disturbed material and backfill the excavated area to the original ground line with material satisfactory to the Engineer. This material shall be placed and compacted in the manner specified elsewhere herein. All costs in connection with excavating, backfilling, compacting and restoring such a slide area to its original position and condition shall be borne by the Contractor.

When water is encountered, ample provision shall be made for draining or pumping, and the excavation shall be accomplished by such means as will prevent stirring up or softening the bottom. Foundation material unduly disturbed or softened by the use of equipment in the bottom of the pit or by inadequate handling of water shall be removed by the Contractor at his own expense. Such material removed shall be replaced, at the Contractor's own expense, with material satisfactory to the Engineer. When the condition of the earth is such that the sides of the lower part of the excavation will stand vertically, back forms may be omitted with the approval of the Engineer, and the concrete for the footing may be deposited against the undisturbed earth. When back forms are omitted, the lower part of the excavation shall be made to the neat size of the footings, and if larger than neat dimensions, the cost of additional concrete shall be borne by the Contractor.

–3.03 DEPTH OF FOOTINGS

Foundation for all structures shall be excavated to the depth and lines indicated on the plans or established by the Engineer. The Engineer may require the Contractor to excavate below the elevations shown on the plans, or may order him to stop above the elevations shown, depending upon where suitable foundation material is encountered.

–3.04 PREPARATION FOR PLACING FOUNDATIONS

In solid rock or other hard material, the excavation shall be carried at least one foot into the rock or hard material to form a key for the concrete footing, or to such additional depth as shown on the plans. The bottom of the pit shall be cleaned of all loose material and cut to a firm surface, either level, stepped or serrated, as may be directed by the Engineer. The bottom of the foundation pit for an arch abutment shall be level or stepped as shown on the plans and the side of the pit back of the abutment shall be trimmed to true lines to permit placing of concrete against undisturbed material. When concrete is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation and the final removal of all loose or soft material shall be made just before the concrete is placed.

–3.05 SHORING, CRIBS AND COFFERDAMS

Except as provided in Section 17-3.02, all excavations shall be shored, braced, or protected by cofferdams in accordance with approved methods. No excavation or dredging shall be done before shoring, crib or cofferdams are placed, except with the written permission of the Engineer. If permission is given, it shall not relieve the Contractor of his obligation to anchor or otherwise hold the crib or cofferdam in place and secure it against tipping or displacement. Cofferdams or cribs for foundation construction shall, in general, be carried well below the bottom of the footings and shall be well braced and as watertight as practicable. The interior dimensions of the cofferdams shall be such as to give sufficient clearance for the construction of the forms and the inspection of the concrete exteriors, and to permit pumping outside of the forms.

Where piles are required, the cofferdam shall be of sufficient size to permit the driving of the piles in the exact positions shown on the plans without interference from the wales or bracing. Cofferdams or cribs which are tilted or moved laterally during the process of sinking shall be righted or enlarged so as to provide the necessary clearance, and shall be constructed so as to protect green concrete against damage from sudden rising of the stream and to prevent damage to the foundation by erosion. No timber or bracing shall be left in the cofferdams or crib in such a way as to extend into the substructure, without permission of the Engineer.

For substructure work, the Contractor shall submit four (4) sets of drawings showing his proposed method of cofferdam construction and other details left open to his choice or not fully shown on the Engineer's drawings. Such drawings shall be approved by the Engineer before construction is begun, but such approval shall not relieve the Contractor of responsibility for satisfactory results.

Upon completion of the work, all cofferdams and cribs shall be removed to the natural bed of the stream or channel, and on navigable streams they shall be removed to such elevations as required for depth of stream or channel to conform to the requirements of the regulations of the Corps of Engineers, U. S. Army. Removal shall be effected in such a manner as to not disturb or mar the finished concrete.

–3.06 PUMPING

When conditions are encountered which, in the opinion of the Engineer, make it impracticable to dewater the foundation pit before placing concrete, he may require the construction of a concrete foundation seal of such dimensions as may be necessary. The water shall then be pumped out and the rest of the concrete placed in the dry. When weighted cribs are used and the weight is utliized to partially overcome the hydrostatic pressure acting against the bottom of the foundation seal, special anchorage such as dowels or keys shall be provided to transfer the entire weight of the crib into the foundation seal.

During the placing of a foundation seal, the elevation of the water inside the cofferdam shall be controlled with respect to the water elevation outside in order to prevent any flow through the seal in either direction. The cofferdam shall also be vented at the elevation of the water on which the designed thickness of the seal is based.

Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of any portion of the concrete materials being carried away. No pumping will be permitted during the placing of the concrete or for a period of 24 hours thereafter, unless it be done from a suitable sump separated from the concrete work by a water-tight wall.

Pumping to dewater a sealed cofferdam shall not commence until the seal concrete has set sufficiently to withstand the hydrostatic pressure. In general, no seal of the gravity type shall be dewatered until the concrete has set for at least three (3) days, and no seal containing piling shall be dewatered until the concrete has set for at least ten (10) days. These periods may be extended if, in the opinion of the Engineer, it is necessary for the safety of the structure.

–3.07 INSPECTION

The Contractor shall notify the Engineer before starting any excavation. From time to time during the progress of excavation, the Engineer will examine the character of material taken out. He shall have authority to stop the excavation at any time to make bearing tests and the Contractor shall give any assistance the Engineer may need in making such tests.

Single bearing test periods shall not exceed 72 hours. Material and labor furnished by the Contractor for such

tests will be paid for on a force account basis except that the Contractor shall maintain the ordinary working conditions at the bottom of the excavation during test periods, at his own expense. When any foundation excavation is completed, the Contractor shall notify the Engineer, and no concrete or other permanent structural material shall be placed therein until permission to proceed is given by the Engineer.

–3.08 DISPOSAL OF EXCAVATED MATERIAL

The material obtained from structure excavation shall be used as the Engineer may require, either in construction embankments, or for backfilling over and around the structures after they are complete, or in case it is unsuitable or not required for either of these purposes it shall be disposed of as directed by the Engineer.

–3.09 BACKFILLING

All material used for backfill shall be of a quality acceptable to the Engineer and shall be free from large or frozen lumps, wood, or other extraneous matter. The backfilling of openings made for structures shall be considered as a necessary part of the excavation, although the Engineer may require that the material for use in making a backfill be obtained from a source entirely apart from the structure, in which case compensation will be on a force account or agreed price basis unless otherwise specified. Except as may be otherwise specified hereinafter, spaces excavated and not occupied by abutments, piers or other permanent structures shall be backfilled up to the surface of the surrounding ground, with a sufficient allowance for settlement and, in general, the top surface of the backfill shall be neatly graded.

Backfill in existing street areas or in areas that must support roadway embankment or which is a part of any roadway embankment, including backfill behind abutments and wing walls of all bridge structures, shall be placed in horizontal layers not more than six (6) inches thick, and each layer shall be tamped and compacted to 95% of the maximum density as determined by the "Compaction Control Test" in Section 13-3.10E5.

The use of mechanical tampers may be required for compacting backfill for certain items as shown in the individual specifications for such items, and as may be required in the special provisions or on the plans where greater density than that specified above is to be obtained. Mechanical tampers, when required, will be paid for as a separate bid item. Mechanical tampers shall comply with the provisions of Section 15-3.01A.

Special precautions shall be taken to prevent any wedging action against abutments and wing walls. If the excavation has sloping sides, the slope shall be broken up by stepping or serrating to prevent wedge action before the backfill is placed. Fill placed around culverts, piers and other underground utilities shall be deposited on both sides to approximately the same elevation at the same time.

The Engineer may order the backfill around piers and in front of abutments and wings to be of stone or lean concrete if the excavation has been in hard material exposed to erosion. Backfill of this nature will be paid for by force account unless otherwise provided for in the proposal. If the material used in making the backfill is too dry to permit proper compaction, the Engineer may require the addition of sufficient water to allow satisfactory compaction. Compensation for the use of water for this purpose shall be included in the contract prices for "Structure Excavation," and for "Shoring and Cribs or Extra Excavation."

No backfill shall be placed against any concrete structure until the concrete has set at least twentyone (21) days.

–3.10 APPROACH EMBANKMENT

When the contract for any bridge structure involves the placement of approach embankments, these shall be constructed and paid for in accordance with the specifications governing this class of work.

17–4 MEASUREMENT

The materials excavated will be measured in their original position by volume in cubic yards. The quantity measured for payment will include only the material excavated from within the limits hereinafter defined, regardless of whether the excavation is made within a cofferdam enclosure or in an open pit. Any additional excavation outside of these limits shall be considered as having been made for the Contractor's benefit and all costs in connection with such excavation shall be at expense of the Contractor.

The horizontal limits for measuring the structure excavation for payment shall be for material removed up to but not beyond one foot outside the vertical planes of the footings, as shown on the plans.

The bottom limits for measuring the excavation for footings shall be the elevation of the bottom of the footing, as shown on the plans or as otherwise established by the Engineer. In pile foundations, the material resulting from the swell due to driving piles will not be included in the measured quantity.

The upper limit for measuring excavation shall be the top surface of the ground, or the bed of the stream as it exists at the time the excavation is started. When the contract designates the removal of certain materials in advance of excavation for structures and for which there is a designated pay item in the same contract, or in a separate contract, the upper limit shall be the completed subgrade of the designated grading section, as shown on the plans.

No measurement will be made of the materials involved in shoring, cribs, cofferdams and caissons.

The use of mechanical tampers will be measured only when compacting backfill within the limits which define structure excavation, and will be measured by the hour to the nearest one-half (½) hour of actual time consumed in compacting backfill. No allowance will be made for time consumed in making repairs to the equipment, or in moving the equipment to or from the work on which compaction is required.

17–5 PAYMENT

Excavation for structures will be paid for under such of the following bid items as are included and shown in any particular contract:

1. "Structure Excavation," per cubic yard.
2. "Shoring and Cribs or Extra Excavation," lump sum.
3. "Mechanical Tampers," per hour.

–5.01 STRUCTURE EXCAVATION

Payment will be made at the unit contract price per cubic yard for "Structure Excavation" which price shall be full compensation for all necessary pumping, bailing, draining, the diversion of streams and all other work involved, including backfilling over and around structures to the original surface of the ground and disposing of all debris and surplus material, and for all necessary labor, materials, tools, and equipment. It shall also include the construction and subsequent removal of all cribs, cofferdams, caissons, and shoring, except where the construction of cribs, cofferdams, caissons and shoring is paid for under the bid item "Shoring and Cribs or Extra Excavation," per lump sum.

Payment for structure excavation carried below the elevations shown on the contract plans by order of the Engineer, will also be made at the unit contract price per cubic yard for structure excavations except as follows:

If there is no bid item of shoring and cribs for the structure and an increased depth greater than three (3) feet below the elevation shown on the contract plans is required, an allowance for extra cost may be made, based upon the actual cost to the Contractor of constructing, extending or reconstructing any shoring or cribbing that may be necessary to carry the excavation to the required depth below that shown on the plans. This extra cost to the Contractor will be paid for on the basis of "Force Account Work" as covered under Section 9.04.

No payment will be made for any material removed from below the elevations shown on the plans, or established by the Engineer, for the bottoms of the excavations. Any such material excavated below the established elevations shall be replaced by the Contractor at his own Expense. Replacement shall be made with concrete or other material acceptable to the Engineer.

–5.02 SHORING AND CRIBS

Payment for shoring and cribs will be made at the lump sum contract price, which shall be full compensation for the construction and subsequent removal of all shoring, cribs, cofferdams, and caissons, and for all necessary labor, materials, tools and equipment for performing such work.

No additional compensation over the contract price for shoring and cribs or extra excavation will be made for increased depth, to and including a depth of three (3) feet below the elevations shown on the contract plans; excepting, however, that if a depth greater than three (3) feet below the elevations shown is required, allowance for extra cost may be made, based upon the actual cost to the Contractor of constructing, extending or reconstructing any shoring or cribbing that may be necessary to carry the excavation to the required depth below that shown on the plans. This extra cost to the Contractor will be paid for on the basis of "Force Account Work" as covered in Section 9.04.

When the item "Shoring and Cribs or Extra Excavation," lump sum, is shown on the plans and proposal, and when with the written approval of the Engineer the actual installation of shoring, crib, cofferdam or caisson is not made, the Contractor will be paid in full for the bid item "Shoring and Cribs or Extra Excavation," lump sum, which price shall be full compensation for all excavation, backfill, backfill compaction, or other incidental work performed by him in lieu of constructing the shoring, crib, cofferdam or caisson.

–5.03 MECHANICAL TAMPERS

Payment for mechanical tampers will be made at the unit contract price per hour for "Mechanical Tamper," which price shall be full compensation for all materials, labor, equipment, tools and incidentals required to compact backfill materials (within the limits which define structure excavation) to the density required by the Engineer. (See Section 15.)

Section 21—Weighing Equipment

21–1 DESCRIPTION

Scales for the weighing of crushed surfacing materials, mineral aggregates for bituminous construction, concrete aggregates, and other road materials which are to be obtained from bunkers, stockpiles and local deposits and which are required to be measured and paid for on a weight basis as specified in the standard specifications or in the special provisions, shall be furnished by and at the expense of the Contractor.

The Contractor shall be responsible for maintaining the scales in accurate condition at all times.

–1.01 WEIGHING EQUIPMENT FOR AGGREGATES AND ROAD MATERIALS FROM BUNKERS

Aggregates and road materials proportioned or measured by the ton shall be weighed on beam or springless dial scales conforming to the following requirements:

1. At least that part of the total load weighed which is in fraction of one hundred pounds shall be indicated on a graduated dial.
2. The weighing equipment must be so arranged that the operator stands, when operating the bin gates, at such a position that he can conveniently shovel material from the weighing hopper. The weighing dial shall be in full view of the operator when he is in position to operate the gate which delivers material to the weighing hopper.
3. Clearances shall be provided between the scale parts and the hopper or bin structure to prevent displacement of the scale parts due to vibration or any other cause. There must be sufficient clearance between the top of the weighing hopper and any other part of the bin structure so that the scale operator can conveniently shovel material from the weighing hopper.
4. In the case of weighing hoppers mounted on platform scales, the arrangement shall be such that the center of gravity of the total load on the scale is in the same vertical line as the center of the scale platform.
5. Scales shall be of a type well suited for supporting a weighing hopper under an overhead bin or structure and shall be of a simple rugged design with the minimum number of parts and adjustments for maintaining an accuracy within the limits hereinafter specified.
6. The use of springs to carry part or all of the load in the weighing mechanism will not be permitted.

Equipment for weighing shall be accurate within one-half percent through the range of use. Each scale installation shall be provided with at least eight standard fifty-pound weights for calibrating and testing weighing equipment.

All working parts of scales, particularly knife edges, shall be protected to prevent any material except wind borne material from falling upon or against them.

–1.02 UNDERWEIGHTS

If an inspection of the scales discloses them to be underweighing, they shall be properly adjusted, and no additional payment will be allowed for tonnage previously weighed and recorded.

–1.03 WEIGHING EQUIPMENT FOR AGGREGATES AND ROAD MATERIALS FROM LOCAL DEPOSITS AND STOCKPILES

When crushed surfacing and mineral aggregates are manufactured from local deposits or taken from stockpiles, or when other road materials are taken direct from local deposits, they shall be weighed, when so provided in the specifications, on platform scales of sufficient capacity to weigh the gross weight of the maximum loads hauled with type registering beams to record each weighing in duplicate, and to be furnished by and at the expense of the Contractor. If material is shipped by rail, the car weights will be accepted, provided however, that the actual weight of the material only will be paid for and not the minimum car weights used for assessing freight tariffs.

The Owner will furnish a man, at no cost to the Contractor, who will operate the scales while the loading and hauling of materials is in progress. However, this provision will not relieve the Contractor of any costs or responsibility for the installation and the maintenance at all times of the scales and weighing equipment.

–1.04 WEIGHING EQUIPMENT FOR BULK PORTLAND CEMENT

If portland cement is handled in bulk, it shall be weighed on scales meeting the requirements specified for the weighing of concrete aggregates. The scales used for weighing cement shall be separate from those used for weighing other material. The cutoff gate from the storage bin shall be of a design permitting positive shut off of the flow of cement. The weighing hopper shall be designed to assure complete discharge readily. Adequate provision shall be made to prevent loss of cement between the weighing hopper and the batch box.

21–2 PAYMENT

All costs in connection with the weighing of crushed stone surfacing, portland cement, aggregates, and road materials shall be included in the unit contract prices for the various pay items of the project.

Section 22—Production From Quarry and Pit Sites

22–1 DESCRIPTION

The requirements set forth in this section shall apply to the manufacturing and producing of crushed stone and screened materials of the kind, quality and grading specified for use in the construction of portland cement and asphalt concrete, cement treated base, asphalt treated base, crushed stone and screened gravel surfacing courses, ballast and bank run gravel, gravel backfill, riprap, and bituminous surface courses of all descriptions.

22–2 MATERIALS

The raw materials in the quarry or pit shall be of a quality such that, after being subjected to the manufac-

turing processes specified, the products will comply with the specifications for the particular class of material to be produced or manufactured.

22–3 CONSTRUCTION DETAILS

–3.01 ACQUISITION OF SITES

Unless otherwise specified, the Owner will acquire and make available to the Contractor, without charge, the right to take stone from the quarries or pit sites specified in the special provisions and shown on the plans and to use such sites as may be required for his operations. The Owner will exercise its best judgment in the selection of quarry or pit sites; however, the failure of the quarry or pit to supply materials of uniform quality shall not constitute grounds for a claim against the Owner. The Contractor shall satisfy himself as to the grading and other characteristics of the raw material in the quarry or pit acquired by the Owner, and as to the nature and amount of work required to manufacture or produce materials that will meet all specified requirements.

The Contractor, if he so desires, may obtain the specified materials from other sources than those acquired by the Owner if they are approved by the Engineer, provided the material is of a quality equal to that in the source specified, in which event the Contractor, at his own expense, shall make all necessary arrangements for obtaining the materials and he shall satisfy himself as to the quantity of suitable material available.

If the Contractor elects to substitute a gravel deposit of an approved source for the manufacture of ballast, crushed surfacing or mineral aggregate in lieu of a ledge rock or talus source provided by the Owner in the contract plans, all pit-run material passing a one-half (½) inch square sieve, or larger if ordered by the Engineer, shall be removed prior to crushing so that the finished product will have approximately the same degree of fracture and stability as that which would have been obtained from the specified source.

Whenever the Contractor elects to obtain material from an approved source other than that provided him by the Owner, or whenever the Contractor is required by the special provisions to provide his own source of materials, the clearing, grubbing and stripping therefrom shall be performed as directed by the Engineer and all costs incurred therefor shall be considered as incidental to the project and shall be included by the Contractor in his unit contract prices of borrow or processed materials to be removed.

–3.02 PREPARATION OF SITE

Before blasting or crushing operations are commenced, the portion of the quarry or pit site from which the materials are to be taken shall be cleared, grubbed, and stripped free of vegetable growth, earth, sand, soft and unsound rock, and any material that will not make satisfactory surfacing. All combustible debris resulting from these operations shall be burned, and all other unsuitable materials and debris shall be removed and disposed of as directed by the Engineer. All overburden and unsuitable materials shall be conveyed to some point which will insure against the probability of any part of them becoming mixed with the stone which is to be crushed or produced. For the final stripping of a ledge quarry, the use of sluicing is recommended, and this method will be required unless the stone is satisfactorily cleaned by some other method.

The requirements for "Preparation of Site" as outlined above, insofar as they are applicable, shall obtain in the preparation of ledge rock, talus, gravel and sand, quarry or pit sites for all classes of materials which are required by the standard specifications to be produced in accordance with this Section 22. The quarry or pit site shall be cleared, grubbed and stripped free of all materials that will adversely affect the quality specified for the classes of products to be manufactured or produced.

–3.03 PRODUCTION

In the event that the grading or quality of the raw material in sources used for the manufacture of products covered by this Section 22 is such that the fracture, grading, or quality of the product specified cannot be obtained by utilizing the natural material, fine portions of the raw material shall be rejected to the extent necessary to produce finished products meeting all requirements of these specifications. All oversize gravel occurring in gravel pits up to and including boulders of ten inches in the greatest dimension shall be utilized in the manufacture of crushed materials. Failure of the Owner to include a scalping requirement in the special provisions shall not relieve the Contractor of the responsibility for rejecting fine portions of the raw material if such becomes necessary to produce finished products meeting all requirements of the specifications.

When scalping over a screen of a specified size is required in the special provisions, the scalping screen shall be of such size and capacity that substantially all of the material smaller than the specified scalping screen size will be removed by the scalping operation.

Washing and reclaiming of the reject material and subbsequent addition of this material to any finished products will not be allowed unless specifically authorized in writing by the Engineer.

If necessary to secure a product of the required quality, grading, and fracture, the materials shall be washed before and/or during crushing or screening. Washing will be required in the preparation of concrete aggregates. When specifically provided by the special provisions, the use of water will not be required in the production of mineral aggregates for the various types of bituminous surfaces. In such cases the mineral aggregate shall be cleaned by blowing with air until the resulting product meets the requirements for cleanliness and freedom from dust. If mineral aggregate is cleaned with air, it shall be produced only from such sources as will permit of ready removal of dust and coatings by this method.

When produced from a source provided by the Owner, all scalpings of material that is unsatisfactory under the specifications or special provisions shall be considered as reject material, subject to disposal as directed by the Engineer. Reject material shall be so placed that it will not foul the pit or quarry for any future operation.

Surplus screenings accumulated during the crushing and screening of specified roadway materials will be considered separate and distinct from reject material scalped ahead of the crushing operation. If the Contractor produces materials from a source provided by the Owner, the surplus screenings accumulated during the production of the specified materials shall be stockpiled at a location within the site provided and become the property of the Owner. The stockpiling shall be performed in an orderly and recoverable manner satisfactory to the Engineer. All costs incurred in producing, hauling and stockpiling the surplus screenings from a source provided by the Owner, except as provided for payment hereinafter, shall be considered as incidental to the production of the specified materials and shall be included by the Contractor in the pay items of the contract.

Surplus screenings accumulated during the manufacture of specified materials from a site provided by the Contractor shall become his own property, unless an item for surplus screenings has been included in the pay items of the contract.

If special provisions and proposal include an item of surplus screenings, the Contractor will be paid therefor to the extent of the quantity set out in the proposal and no more, and the screenings shall be stockpiled either in a separate pile or with other surplus screenings as the Engineer may direct.

In the event the Contractor provides his own source for the production of the materials, surplus screenings, when included as a bid item, shall be furnished and stockpiled at the site specified, the same as provided above. It is not the intent to require the Contractor to produce "Surplus Screenings" in an amount greater than they will be accumulated during the normal production of other materials from the pit.

The stockpile sites for the surplus screenings shall be prepared and constructed by the Contractor as outlined in Section 23-3.01.

In event the Contractor shall elect to stockpile surfacing material or concrete aggregate from a source owned or controlled by the Owner ahead of its placement upon the roadway, he may do so if the stockpiling is within the the area of the site provided by the Owner, and done in a manner approved by the Engineer. If he shall elect to stockpile such materials upon land leased by himself, he may do so upon approval of the Engineer and upon proof that the lease will extend for a period not less than one year beyond the completion date of his contract. All materials remaining after placing the amount required for the contract, whether upon the site provided or upon land leased by the Contractor, shall become the property of the Owner and all costs resulting from the production of such excess materials shall be considered as incidental to the production of the processed materials produced and placed on the roadway.

When more than one quarry or pit site is provided in the special provisions, the Contractor may obtain material from any one of the sources, and the Owner will specify the quantity of raw material which has been determined by tests to be available at each quarry or pit site. In the event that a Contractor sets up in a pit made available by the Owner and if the quantity from that site, when the pit is exhausted, is less than that stated by the Owner, then the provisions of Section 22-4 shall apply.

When the special provisions require material in a source provided by the Owner to be washed and/or scalped over a screen of a specified size, the scalping shall be performed after the pit or quarry-run material has passed through the primary crusher. If the native material in the source proves to be of better quality than anticipated by the Owner, or if the Contractor provides a more efficient processing operation than was anticipated by the Owner, he will be allowed to change the size of the scalping screen or make such other changes in the operation as he may elect, provided that the finished product has value of sand equivalent equal to or better than those obtained on the same product produced in the specified manner; and provided further, that the finished product meets all other requirements of the specifications. The requirement for washing concrete aggregate will not be relaxed under any conditions.

For the allowable moisture content for payment in manufactured materials see Section 22-4.

–3.04 FINAL CLEANUP

The quarry or pit site, upon completion of the Contractor's operations, shall be cleared of all rubbish, temporary structures and equipment, and shall be left in a neat and presentable condition at the expense of the Contractor.

22–4 PAYMENT

All costs in connection with the production of the materials to meet the requirements specified shall be considered as incidental to the production of the required pay quantities of materials and shall be included in the unit contract prices for the pay items of materials involved. Clearing and grubbing will be measured and paid in accordance with the provisions of Section 12. Stripping will be measured and paid for in accordance with the provisions of Section 13. "Surplus Screenings" will be considered as a pay item only when it is included in the bid proposal of any particular contract.

For payment purposes, bank run gravel and crushed or screened materials, depending upon their grading, shall be limited to the following water contents:

% By Weight Passing ¼-inch Sieve	*Maximum Water Content % By Weight*
Less than 20%	4%
More than 20%	8%

The maximum allowable water content in the manufactured aggregates shall be as specified above, and the addition of water by the Contractor to the screened or crushed product for the purpose of increasing the water content to the allowable maximum will not be permitted. Water content in excess of permissible amount, as determined by the Engineer, will be deducted from the tonnage of material to be paid for.

If, in the opinion of the Engineer, there should be insufficient suitable material in any quarry or pit site made available by the Owner, the Owner will acquire at its own expense an additional source, in which event the Contractor will be required to move his crushing plant to the new quarry or pit. Under such conditions the following schedule of allowances, insofar as they may be applicable, shall govern the compensation to be made by reason of the move:

1. Crushing plants with two (2) crushing units $2,000.00
2. Crushing plants with three (3) crushing units 2,500.00
3. Crushing plants with four (4) or more crushing units 3,000.00
4. The clearing, grubbing and preparing of the new quarries or pit sites as specified under the heading "Preparation of Site" will be paid for in the manner provided in these specifications for "Clearing," "Grubbing," and "Excavation."

In the event there is no bid item applicable, the payment for the preparation of the new site shall be on a "Force Account" basis.

In the event the moving of the plant due to shortage of the supply of material necessitates a longer haul on materials than required from the original quarry, the Owner will reimburse the Contractor for the additional haul at the rate of $0.14 per ton-mile of haul. The unit ton-mile, shall be considered to be the equivalent of one ton of material hauled a distance of one mile. The haul distance will be measured in one-half (½) mile units, fractional half miles being allowed as full half miles. For material hauled within one-half (½) mile, the haul will be one-half (½) ton-mile of haul. For material hauled beyond the first one-half (½) mile and within the first mile, the haul will be one (1) ton-mile of haul, and so on. Payment for haul computed on this basis shall be made at the unit contract price per ton-mile of haul, which price shall be full compensation for hauling the materials one (1) mile or fraction thereof as stated above, to any distance that may be required.

The above allowances, insofar as they may be applicable, shall be full compensation for all claims of any kind or description by reason of the necessity of changing from one site to another due to shortage of the supply from sources made available by the Owner. No additional compensation or allowance whatsoever will be made by the Owner on account of such moves. In advance of moving any crushing plant as outlined above, the Contractor shall first secure from the Engineer an order in writing to do so. The order shall set forth in detail the allowance based upon the above schedule. Should the Contractor fail to secure such aforementioned order, it shall be considered sufficient proof that the move was immaterial insofar as to costs, and no allowance or compensation will be made by reason of such move.

Section 23—Crushed Surfacing, Ballasting, and Stockpiling

23–1 DESCRIPTION

Surfacing and ballasting, unless otherwise specified, shall consist of the construction of one or more courses of crushed stone upon an existing roadway surface, or upon a subgrade properly prepared under the provisions of these standard specifications.

Surfacing materials and ballast may also be specified to be stored in stockpiles for future use on anticipated future projects.

The aggregate shall be graded in such a manner that, with the incorporation of a minimum amount of "filler" or "keystone" material, it will compact into a dense and unyielding mass which will be true to the line, grade and cross section shown on the plans. The Contractor shall furnish all materials unless otherwise specified in the special provisions.

23–2 MATERIALS

–2.01 CRUSHED SURFACING

Crushed surfacing shall be manufactured from ledge rock, talus or gravel in accordance with the provisions of Section 22. The materials shall be uniform in quality and substantially free from wood, roots, bark and other extraneous material, and shall meet the following test requirements:

Los Angeles Wear, 500 Rev. (ASTM Designation C 131) 35% maximum.

Crushed surfacing of the various classes shall meet the following requirements for grading and quality when placed in hauling vehicles for delivery to the roadway:

	Base Course	*Top Course and Keystone*
% Passing 1¼" square sieve ..	100	
% Passing ⅝" square sieve ...	50 to 80	100
% Passing ¼" square sieve ...	30 to 50	50 to 65
% Passing U. S. No. 40 sieve ..	3 to 18	5 to 23
% Passing U. S. No. 200 sieve (wet sieving)	7.5 max.	10 max.
All percentages are by weight.		
Sand equivalent (Section 6) ...		40 min.

When separated on ¼-inch, ⅝-inch, 1-inch and 1¼-inch sieves, the crushed surfacing shall contain in each size, including material passing ¼-inch, not less than seventy-five (75) percent by weight of particles with at least one fractured face produced by mechanical crushing.

The portion of crushed surfacing retained on a ¼-inch square sieve shall not contain more than 0.15% wood waste. Wood waste shall be defined as all material which has a specific gravity less than 1.0 after drying to constant weight.

The portion of crushed surfacing passing a U. S. No. 10 sieve shall not have wood waste that will result in more than 250 parts per million of organic matter by colorimetric tests when tested in accordance with Section 39-2.02B1 except that the color shall be measured after the sample has been in the test solution for one hour.

–2.02 BALLAST

Ballast shall consist of crushed, partially crushed or naturally occurring granular material from approved sources manufactured in accordance with the provisions of Section 22. In the manufacture of ballast all oversize material up to and including boulders of ten inches in the greatest dimension shall be utilized in the manufacture of the finished product.

The material from which ballast is to be manufactured shall meet the following test requirement:

Los Angeles Wear, 500 Rev. (ASTM Designation C 131) 40% maximum.

Ballast shall meet the following requirements for grading and quality:

% Passing 2½" square sieve	100
% Passing 2" square sieve	65 to 100
% Passing 1" square sieve	50 to 80
% Passing ¼" square sieve	30 to 50
% Passing U. S. No. 40 sieve	16 max.
% Passing U. S. No. 200 sieve (wet sieving)	9 max.
All percentages are by weight.	

Dust ratio:

$$\frac{\%\ \text{Passing}\ \#200\ \text{(wet sieving)}}{\%\ \text{Passing}\ \#40} \quad \text{⅔ max.}$$

Sand equivalent (Section 6) .....35 min.

The portion of ballast retained on a ¼-inch square sieve shall not contain more than 0.2% wood waste. Wood waste shall be defined as all material which has a specific gravity less than 1.0 after drying to constant weight.

The portion of ballast passing a U. S. No. 10 sieve shall not have wood waste that will result in more than 250 parts per million of organic matter by colorimetric test when tested in accordance with Section 39-2.02B1 except that the color shall be measured after the sample has been in the test solution for one hour.

23–3 CONSTRUCTION DETAILS

–3.01 STOCKPILING SURFACING MATERIAL

When specified, "Crushed Surfacing" and "Ballast" complying with these specifications, shall be placed in stockpiles at the points shown on the plans or as may be ordered by the Engineer. This work shall be designated and paid for as "Crushed Surfacing in Stockpile," per ton, and as "Ballast in Stockpile," per ton.

The stockpile sites shall be cleared of all vegetation, trees, brush, rocks or other debris, and a uniform ground surface made before the stockpile material is deposited upon the stockpile site.

Stockpiles shall be constructed on the previously prepared sites in accordance with the cross section stakes set by the Engineer, and when completed they shall be neat and regular in shape, occupying as small an area as is practicable, accessible for loading on a truck without obstructing the highway or street. Stockpiles shall be built up in layers not to exceed four (4) feet in thickness and the stockpile shall have a minimum height of eight (8) feet. The quantity of surfacing material to be piled at each site shall be the amount indicated on the plans or ordered by the Engineer.

Plank runways will be required for operating trucks on stockpiles when it is deemed necessary by the Engineer in order to avoid tracking dirt and other foreign matter on the crushed rock.

All costs in connection with the preparation of the stockpile sites and the construction of the stockpiles shall be included in the unit contract prices for the various types of material being stockpiled; except that "Clearing" and "Grubbing" of the site will be measured and paid for in accordance with Section 12 when such bid items are carried in and made a part of the particular project.

–3.02 SUBGRADE

The subgrade shall be constructed in the manner specified under Section 15.

–3.03 SHOULDERS

Shoulders shall be constructed in the manner shown on the cross section, made a part of the plans, and the material used shall conform to the same specifications and method for payment as like materials used and processed in the roadway itself.

–3.04 DEPTH OF LAYERS

Crushed surfacing, base course and top course, shall be constructed in layers not to exceed four (4) inches in depth. The methods employed for each layer shall be the same as specified elsewhere for that particular course. Ballast shall be constructed in layers as described in Section 23-3.16A.

–3.05 SPREADING MATERIALS

Spreading of the first course of surfacing shall begin at points farthest from the point of loading and each successive course shall begin at points nearest the point of loading. Each course shall be constructed continuously from the beginning point of the course unless otherwise directed by the Engineer. If the Engineer shall deem it necessary for further stability or other reason, he may require a succeeding course to be placed over any section of a previously placed course before the final completion of that course.

Unless otherwise provided in the special provisions, the surfacing, keystone and ballast may be spread by any method that will result in an even distribution of the material upon the roadway without perceptible separation in gradation. The method of spreading and the field operation shall be satisfactory to the Engineer at all times.

Should there occur during any stage of the surfacing or stockpiling a separation of the coarser from the finer materials causing serious lack of uniformity in the grading, the Contractor shall immediately make changes in the method of handling such as will prevent separation and meet approval of the Engineer.

–3.06 ROLLING

Rolling shall be accomplished by means of such of the equipment described in Section 15-2.01A as may appear in the various bid items of the contract.

Each course of surfacing shall be rolled until the material does not creep under the roller before a succeeding course of surfacing material is applied. For each surfacing operation the Contractor shall provide sufficient rolling equipment to fully comply with these specifications.

All rolling shall commence at the outer edges of the surfacing and continue toward the center. Under no circumstances shall the center of the road be rolled first.

–3.07 LOADING AGGREGATE FROM STOCKPILE

The use of dragline equipment to transport the aggregate from stockpiles to elevators or other loading devices will not be permitted.

–3.08 HAULING

Hauling shall be distributed over the roadway in such a manner as to be most effective in the compacting of the surfacing. Hauling over any of the surfacing in process of construction will not be permitted when, in the opinion of the Engineer, the effect will be detrimental. The Contractor shall not haul loads in excess of the legal load or speed limit. All loads shall be of uniform capacity when it is practicable.

In hauling any material upon which the measure of quantity is to be determined by vehicle load, the loads shall be the water measure capacity of the body.

–3.09 CORRECTION OF SURFACE DEFECTS

Should irregularities develop in any surface during or after rolling, they shall be remedied by loosening the surface and correcting the defects, after which the entire area, including the surrounding surface, shall be re-rolled until thoroughly compacted. The finished surface shall be true to the proper grade and crown before proceeding with the surfacing.

–3.10 FLOATING OR LOOSE STONE

Before placing the "Top Course" the preceding one shall be properly bound up and all floating or loose stone shall be removed from the surface.

–3.11 HOURS OF WORK

Normally, the Contractor shall so arrange his surfacing operations that the work will be carried on during the hours of daylight. However, when necessary to complete the project within the time specified, work may be undertaken during the hours of darkness provided the Contractor furnishes and operates during such period, an adequate and effective artificial lighting apparatus to ensure that all work undertaken can be carried on satisfactorily in the manner contemplated by the specifications.

–3.12 UNFAVORABLE WEATHER

When, in the opinion of the Engineer, the weather is such that satisfactory results cannot be secured, the Contractor shall suspend operations until the weather is favorable. No surfacing materials shall be placed in the snow or on a soft, muddy or frozen subgrade. The Owner shall not be liable for damages or claims of any kind or description by reason of suspending operations under directions of the Engineer.

–3.13 PATROLLING

All surfacing in progress of construction shall be bladed and otherwise worked as may be necessary to maintain the proper grade and cross section at all times, and to keep the surface smooth and thoroughly compacted. The cost of any or all of the above work shall be included in the prices bid for the surfacing materials involved.

–3.14 EQUIPMENT

The minimum amount of heavy equipment that will be considered necessary, in addition to crushing and hauling equipment, for the proper execution of these specifications shall be as follows:

1 Heavy duty self-propelled grader, of an approved type, equipped with scarifier, broom and not less than an 8-foot blade.

1 10-ton self-propelled three-wheel roller, or one (1) pneumatic-tired roller. Roller wheels may be weighted if necessary to secure specified weight per linear inch of tire width.

Other combinations and types of equipment may be substituted for the above if approved by the Engineer.

Additional equipment shall be supplied by the Contractor if required to properly care for the work. All equipment shall be kept in good repair at all times. The cost of furnishing and keeping all equipment in good repair shall be considered incidental to the performance of the contract and the cost shall be included in the unit contract prices for pay items of work involved.

Where the plans provide for the measurement and payment of surfacing material by the ton, the equipment for weighing the materials shall conform to the requirements of these specifications for "Weighing Equipment" as set forth in Section 21.

–3.15 WATER

Where specified on the plans or ordered by the Engineer, the Contractor shall apply water to any course or courses in accordance with Section 16.

–3.16 CONSTRUCTION OF COURSES

Whenever practicable any one course shall be completed in advance of laying the succeeding one. Any one course shall be completed as much in advance of the succeeding course as is practicable for good results and adequate inspection. The minimum lapse between courses shall generally be not less than one block, and preferably more. It shall be satisfactory to the Engineer.

–3.16A Ballast

Ballast shall be spread upon the prepared subgrade by the methods specified in Section 23-3.05, and to the depth, width and cross section shown on the plans, or as directed by the Engineer. The maximum depth of any course shall not exceed six (6) inches.

The surface of the course shall be lightly bladed and then rolled until thoroughly compacted. When the aggregate does not compact readily, due to lack of fines or natural cementing properties, keystone and water shall be added in such amounts as the Engineer may direct, and in the manner specified below.

Top course surfacing material to be used as keystone shall be spread evenly on top of the ballast, using spreader boxes or chip spreaders. Thereafter the surface shall be rolled, wetted and, if necessary, broomed lightly until the keystone is worked into the interstices of the ballast stone without excessive displacement. The operations of adding keystone, rolling, wetting and brooming shall be continued until the course has become thoroughly keyed and compacted, and will not creep or move under the roller.

Ballast shall not be placed on the roadway in loads of widely varying gradations.

The surface of the stone at all times shall be kept to the true line, grade and cross section by blading or brooming.

–3.16B Base Course

Crushed surfacing for the base course shall be spread upon the roadway or upon the preceding course in layers not exceeding four (4) inches in thickness, to the amount and in accordance with the cross section shown on the plans. After each layer has been spread by the methods specified under Section 23-3.05, and has been lightly bladed, if necessary, the surface shall be rolled until the material is thoroughly compacted. The completed course shall have uniform distribution as to gradation.

When the depth of the base course is greater than four (4) inches, the next layer shall be constructed in the same manner as has been outlined above. The final result shall be an unyielding course, free from inequalities, with a smooth, tight, even surface, true to the grade, line and cross section shown on the plans.

–3.16C Top Course

Crushed surfacing for the top course shall be spread upon the roadway or upon the preceding course to the

depth, grade and cross section shown on the plans, and by methods specified in Section 23-3.05. After spreading, the surface shall be lightly bladed and then rolled until the material is thoroughly compacted to line and grade shown on the plans, or as directed by the Engineer. Water shall be placed during the blading and rolling operations in the quantity directed by the Engineer.

The completed course shall have uniform distribution as to gradation, and all areas in which there is an excess of coarse or fine aggregate shall be removed and replaced with suitable material.

–3.16D Maintenance Rock

Maintenance rock, ½-inch minus, shall meet all requirements of Section 23-2.01 for crushed surfacing except that it shall meet the following specifications for grading:

% Passing ½" square sieve	100
% Passing ¼" square sieve	55 to 70
% Passing U. S. No. 40 sieve	10 to 30
% Passing U. S. No. 200 sieve (wet sieving)	10 max.

All percentages are by weight.

–3.17 RESURFACING

The existing surface shall be scarified and then bladed until it has the uniform grade and cross section shown on the plans. In shaping the existing surfacing, all material that may have been displaced by traffic or otherwise shall be bladed into the newly formed surfacing section. The cost of scarifying and shaping existing surfacing shall be considered as incidental to the construction and shall be included in the unit contract price for "Crushed Surfacing."

Crushed surfacing as called for on the plans shall be uniformly spread upon the existing surfacing at such points as may be necessary to secure the required depth and to remove irregularities which could not be accomplished with the existing surfacing. Both old and new surfacing, in advance of incorporating "Filler," shall be bladed until the two have been thoroughly mixed. The cost of mixing old and new surfacing shall be included in the unit contract price bid for the new material. Should there not be sufficient "Filler" in the existing road, "Filler" of the kind and in such quantities as the Engineer may direct, shall be incorporated in the manner hereinbefore described. The surface shall then be rolled as described under the heading of "Base Course" in Section 23-3.16B.

In event no new surfacing material is required in advance of placing the "Top Course," the surface of the existing road which has been scarified and bladed shall be rolled in the same manner as though new surfacing material had been added. The cost of such rolling shall be included in the unit contract price for the succeeding course of surfacing material.

–3.18 REMOVING AND REPLACING SURFACING MATERIAL

Whenever the special provisions require such work, the Contractor shall salvage as much as practicable of the existing surfacing and utilize it in the construction, as directed by the Engineer.

At such points as are indicated on the plans and at any other points where necessary, in order to secure satisfactory results, the existing surfacing shall be removed from the roadway and deposited in conveniently located piles. After the completion of the construction which necessitated such removal, the surfacing shall be uniformly spread upon the roadway and then shall be completed as provided for base course construction. Extreme care shall be taken to avoid an injurious amount of foreign material becoming mixed with the surfacing material. The moving of surfacing into piles and then back on the roadbed will be measured and paid for as provided in the special provisions of the project involved.

–3.19 FINAL CLEANING UP

After the surfacing is completed and before final acceptance of the work, the entire roadway shall be neatly finished and trimmed to the lines, grades and cross section as shown on the plans.

After all required material has been removed from any stockpile site during contract operations and if there should be a surplus remaining in the stockpile, the Contractor shall clean up the stockpile site, leaving the surplus material in neat and compact piles. Care shall be taken to keep the aggregate free from dirt and foreign matter. All cost and expense in connection with this operation shall be included in the unit contract prices for the various pay items of work involved in the contract.

–3.20 MAINTENANCE DURING SUSPENSION OF WORK PERIOD

The provisions of Section 8.04 shall apply to maintenance during suspension of work.

23–4 MEASUREMENT

Crushed surfacing materials will be measured by the ton in trucks at the point of loading, unless shown by the cubic yard in the proposal, in which case measurement will be made in trucks at the point of delivery in accordance with special provisions therefor. The provisions of Section 21 shall apply when measurement is by the ton.

Crushed surfacing materials for placement in stockpile will likewise be measured by the ton, unless the special provisions and proposal show measurement by the cubic yard, in which case the volume of pay material will be determined by cross sectioning the stockpile.

Top course surfacing material when used as keystone will be measured in the same manner as top course surfacing material, regardless of the classification of the course in which it is used.

Ballast consisting of crushed stone or naturally occurring granular material shall be measured in the same manner as crushed surfacing materials.

"Water" shall be measured as provided for in Section 16.

"Filler" will be measured in accordance with the provisions of Section 24.

Maintenance rock will be measured by the ton or by the cubic yard in trucks at the point of delivery.

Rolling equipment shall be measured as provided in Section 15.

23–5 PAYMENT

Payment wil be made for such of the following bid items as are included and shown in any particular contract:

1. "Crushed Surfacing, Top Course (or Base Course)," per ton, or cubic yard.
2. "Crushed Surfacing, Top Course (or Base Course) in Stockpile," per ton, or cubic yard.
3. "Crushed Surfacing, Top Course (or Base Course) from Stockpile," per ton, or cubic yard.
4. "Ballast," per ton, or per cubic yard.
5. "Ballast in Stockpile," per ton, or per cubic yard.
6. "Ballast from Stockpile," per ton, or per cubic yard.
7. "Water," per M gallons.
8. "(Kind) Filler," per ton, or per cubic yard.
9. "Maintenance Rock (size) in Stockpile," per ton, or per cubic yard.
10. "Smooth-wheeled Power Roller," per hour.
11. "Pneumatic-tired Roller," per hour.

Crushed surfacing materials shall be paid for at the unit contract price per ton of 2,000 pounds, or per cubic yard when so shown in the proposal.

Top course surfacing material when used as keystone shall be paid for as top course surfacing material, regardless of the classification of the course in which it is used.

Ballast consisting of crushed or naturally occurring granular material shall be paid for in the same manner as crushed surfacing materials.

Removing and replacing surfacing material shall be paid for at the unit contract price per cubic yard, when shown in the proposal.

"Water" shall be paid for at the unit contract price per thousand (1,000) U. S. gallons at the point of delivery on the road.

"Filler" will be paid for in accordance with the provisions of Section 24.

The unit contract price per ton or per cubic yard for "Maintenance Rock ½" Minus in Stockpile," shall be full compensation for furnishing all labor, materials, tools and equipment required to manufacture the material in accordance with these specifications, and to haul and place it in stockpiles at designated sites.

All costs involved in preparing stockpile sites shall be included in the unit contract price for maintenance rock, excepting however, that clearing and grubbing of the designated sites will be measured and paid for in accordance with Section 12 when such bid items are shown in the proposal of any particular project, and not otherwise.

All items of work and materials required by these specifications for which no payment is specified or provided, shall be considered incidental to and a part of the items for which payment is specified and the cost of such work and materials shall be included in the unit contract prices for the pay items shown on the plans.

The unit contract prices for the pay items enumerated shall be full compensation for furnishing all materials, labor, tools, and equipment necessary for the fulfillment of all the requirements of these specifications and those of any other pertinent specifications, in the execution of the work shown on the plans, or as ordered by the Engineer; also for all expense incurred in consequence of or discontinuance of the work covered by these specifications.

Section 24—Filler

24–1 DESCRIPTION

The term "Filler" as used in connection with the construction of gravel base, crushed stone surfacing courses and courses of naturally occurring granular material shall be classified into two classes, viz: (1) Crushed Stone Filler, and (2) Sand Filler. Where the term "Filler" is used in Section 23 of these specifications, it shall be construed to mean the class of filler specified in these specifications or the special provisions for the construction of various surfacing courses, or as called for on the plans.

Filler shall be obtained from approved sources. When sources of sand filler are designated in the special provisions, the Contractor may, after properly stripping the pit, place the naturally occurring material directly on the roadway without further treatment other than the removal of oversize particles. The Contractor shall, however, conduct his operations so as to avoid the inclusion of unsatisfactory material that may be present within the bounds of the pit site.

24–2 MATERIALS

The Owner will, when provided in the special provisions, acquire and make available to the Contractor without charge, the right to take "Filler" materials from the sources designated by the Engineer, and the right to use such sources as may be necessary for his operations.

Filler shall consist of naturally occurring sand or granular material manufactured from rock, gravel, or talus. Filler shall meet the requirements which follow for the two classes.

–2.01 SAND FILLER

Sand filler shall consist of sand screened from natural deposits and shall be composed of naturally occurring grains, preferably angular.

Sand filler shall meet the following requirements for grading and quality:

Passing ⅜" square sieve	100%
Passing ¼" square sieve	90% to 100%
Passing U. S. No. 10 sieve	40% to 75%
Passing U. S. No. 40 sieve	15% to 40%
Passing U. S. No. 200 sieve (wet sieving)	0% to 15%
Sand Equivalent (see Section 6)	40 Minimum

All percentages are by weight.

–2.02 CRUSHED FILLER

Crushed filler shall consist of the fine product resulting from crushing stone, and shall meet the following grading and quality requirements:

Passing ⅜" square sieve	100%
Passing ¼" square sieve	90% to 100%
Passing U. S. No. 10 sieve	40% to 75%
Passing U. S. No. 40 sieve	15% to 40%
Passing U. S. No. 200 sieve (wet sieving)	0% to 15%
Sand Equivalent (see Section 6)	40 Minimum

All percentages are by weight.

24–3 CONSTRUCTION DETAILS

Before commencing excavation in the filler pit, the Contractor shall remove all trees, brush, stumps, stripping and overburden as may be necessary to give access to the filler materials desired. The removal and disposal of overburden and debris shall be done in accordance with the instructions of the Engineer.

Stones, boulders, clods, and other unsuitable materials shall be left in the pit, and will not be included in the pay quantities.

Filler shall be spread uniformly on the road at the rate ordered. Unless this can be accomplished satisfactorily by other means, the Contractor shall use an approved adjustable mechanical spreader.

24–4 MEASUREMENT

Filler will be measured by weighing in trucks or by the cubic yard in trucks at the point of delivery. The proposal will indicate the measure of payment—by the ton, or by the cubic yard.

24–5 PAYMENT

Payment will be made for such of the following bid items as are included and shown in any particular contract.

1. "Sand Filler," per (ton, cubic yard).
2. "Crushed Filler," per (ton, cubic yard).
3. "Clearing and Grubbing," per acre, or lump sum.
4. "Stripping Quarries and Pits," per cubic yard.

Clearing and grubbing shall be measured and paid for in accordance with the provisions of Section 12. Stripping will be measured and paid for in accordance with the provisions of Section 13.

Payment for filler of the kind shown in the proposal shall be made at the unit contract price per ton or per cubic yard, whichever is designated in the proposal, for "(kind) Filler," which price shall be full compensation for furnishing all materials, labor, tools, and equipment, and for all other costs and expense necessary or incidental to excavating, loading, hauling the full distance and spreading on the roadbed as specified above, and for final cleaning up of the filler pit. No additional compensation will be made for haul.

Section 25—Screened Gravel Surfacing —One Course

25–1 DESCRIPTION

Screened gravel surfacing shall consist of screened gravel constructed on the properly prepared subgrade to the lines, grade and cross section shown on the plans or as directed by the Engineer. The screened gravel surfacing shall be so graded that it will readily compact into a dense unyielding mass.

25–2 MATERIALS

Screened gravel surfacing shall consist of crushed, partially crushed, or naturally occurring granular materials from approved sources, processed in accordance with the provisions of Section 22. It shall meet the following requirements for grading and quality:

% Passing ¾-inch square sieve	100
% Passing ¼-inch square sieve	50 to 65
% Passing U. S. No. 200 sieve (wet sieving)	5 maximum
Sand equivalent (Section 6)	35 minimum

25–3 CONSTRUCTION DETAILS

Immediately in advance of depositing the surfacing materials, the subgrade shall be prepared as specified in the specifications for subgrade for crushed surfacing in Section 23. Screened gravel surfacing shall be uniformly spread upon the prepared subgrade in amount, width and cross section shown on the plans or as directed by the Engineer, and shall then be bladed until the material shows a uniform grading.

If ordered by the Engineer, "filler" of the kind specified and conforming to the requirements of Section 24, shall be spread uniformly over the surfacing material in such quantities as the Engineer may direct. The filler shall then be mixed with the surfacing material by blading until a uniform product is obtained. The surfacing shall then be spread in such a manner that it will have a uniform depth, true to line and grade as staked by the Engineer. It shall then be rolled by either a smooth-wheeled power roller or by a pneumatic-tired roller.

The type of roller shall conform to the requirements set forth in Section 15-2.01A.

The type of roller to be used for any particular project shall be as set forth in the special provisions.

25–4 MEASUREMENT

Screened gravel surfacing will be measured by the ton at the point of loading if the quantity is enough to justify the use of scales, or it may be measured by the cubic yard in trucks at the point of delivery, in accordance with whichever unit of measure is shown on the plans and proposal.

25–5 PAYMENT

The unit contract price per ton or per cubic yard for "Screened Gravel Surfacing" shall be full compensation for all costs and expense necessary for preparing the subgrade, furnishing, screening, loading, hauling, spreading, blading and compacting of the surfacing material, and for incorporating filler and for all other costs and expense necessary or incidental to the completion of the work as specified above.

Filler will be measured and paid for as provided in Section 24.

Rolling equipment will be measured and paid for as provided in Section 15.

"Water" will be measured and paid for as provided in Section 16.

Section 26—Bank Run Gravel for Streets

26–1 DESCRIPTION

Where shown on the plans or where designated by the Engineer, embankments, shoulders and/or the top of embankments and the subgrade of cuts to a depth as shown on the plans or as designated by the Engineer, shall be composed of bank run gravel from approved sources prepared in accordance with Section 22. Bank run gravel is defined as naturally occurring material having characteristics such that when compacted in place on the roadway it will provide a course having greater supporting value than the subgrade on which it is placed.

26–2 MATERIAL

–2.01 CLASSES AND GRADING OF BANK RUN GRAVEL

Bank run gravel shall be substantially free from wood, roots, bark or other extraneous material. It shall have such characteristics of particle size and shape that it will compact readily to a firm, stable course.

The maximum size of stone shall not exceed the depth of the course being applied less one (1) inch, except that in no case shall the maximum size exceed eight (8) inches.

Bank run gravel shall be termed Bank Run Gravel Class A, or Bank Run Gravel Class B. The following requirements shall govern for the separate classes:

	Bank Run Gravel Class A	*Bank Run Gravel Class B*
Passing ¼" sieve	25% min. 75% max.	25% min. 75% max.
Passing U. S. No. 200 sieve (wet sieving)	5% max.	10% max.
Dust Ratio: $\frac{\%\ \text{Passing}\ \#200\ \text{(wet sieving)}}{\%\ \text{Passing}\ \#40}$	⅔ max.	⅔ max.
Sand Equivalent	50 min.	30 min.

–2.02 BANK RUN GRAVEL FROM SPECIFIED SOURCES

When sources of bank run gravel are designated in the special provisions the Contractor may, after stripping a sufficient area to yield the required quantity as provided in Section 22, place the naturally occurring material directly on the roadbed without further treatment except removal of oversize stone. He shall, however, work the pit in such a way that individual loads do not vary greatly from the average grading available in the deposit, and he shall avoid or waste material that is designated by the Engineer as unsuitable for the specified class of bank run gravel. The Contractor shall make as many moves of loading equipment within the specified pit area as may be necessary to fulfill the above requirement.

–2.03 BANK RUN GRAVEL FROM SOURCES PROVIDED BY THE CONTRACTOR

When bank run gravel is furnished from sources provided by the Contractor, the material shall be produced from approved sources in accordance with Section 22. The grading and quality shall be as specified in Section 26-2.01.

Bank run gravel for uses other than the support of portland cement concrete pavement shall meet the requirements of Section 26-2.01 and shall meet the following additional requirements thereto:

Stabilometer resistance value (Section 6)	68 minimum
Swell pressure (Section 6)	0.3 psi maximum

If bank run gravel from sources furnished by the Contractor has lower resistance value or higher swell pressure it may be used if approved by the Engineer, provided that the thickness of crushed surfacing is increased over that shown on the plans by such an amount as the Engineer determines necessary to compensate for the lower values. The bank run gravel shall be decreased in thickness by an amount equal to the required increased thickness of crushed surfacing. The volume of crushed surfacing required to compensate for resistance value lower than, or swell pressure higher than that specified above, shall be measured for payment as "Bank Run Gravel, Class A or Class B" and not as crushed surfacing. All costs incurred therefor shall be included by the Contractor in his unit contract price for "Bank Run Gravel, Class A or Class B".

If, as an alternate to sources provided in the special provisions, the Contractor shall elect to furnish bank run gravel from another source in which the material has a lower resistance value or higher swell pressure than that in the designated source, the thickness of crushed surfacing and bank run gravel shall be adjusted to compensate the lower values as outlined in the preceding paragraph.

When the Contractor furnishes the source, he shall remove the materials in such manner that all parts of the pit will be drained to a natural drainage course at its normal water level.

26–3 CONSTRUCTION DETAILS

–3.01 REMOVAL OF OVERBURDEN

Before any of the bank run gravel material is removed, the site shall be cleared and grubbed and all debris burned or disposed of as directed by the Engineer. The entire area from which bank run gravel is to be taken shall be stripped of all earth and any other material unsuitable as bank run gravel. All overburden materials shall be conveyed to some point, as directed by the Engineer, which will ensure against the probability of any part of them becoming mixed with the selected material.

–3.02 PREPARATION OF ROADBED

The surface of the roadbed upon which bank run gravel is to be placed shall be compacted as specified in Section 15-2.01, Subgrade for Base Materials. All loose stones shall be removed from the surface of the roadbed.

–3.03 CONSTRUCTION OF COURSES

The bank run gravel material shall be uniformly spread upon the prepared subgrade to the depth, width and cross section shown on the plans.

The maximum depth of any course shall not exceed eight (8) inches unless otherwise specified in the special provisions.

Each course shall be bladed and rolled until it is thoroughly compacted and true to line, grade and cross section before the material for the succeeding course is spread. Rolling shall be done by means of the equipment described in Section 15-2.01A.

–3.04 PIT OPERATIONS

Bank run gravel material shall be taken to the lines and grades staked by the Engineer from the portions of the pit which will furnish the most suitable material. Upon completion of the operation, the side slopes and floor of the pit shall be dressed to a uniform slope as directed by the Engineer. All debris and refuse shall be removed by the Contractor and the site left in a neat and presentable condition.

26–4 MEASUREMENT

Bank run gravel will be measured by the ton in trucks at the point of loading if the quantity is enough to justify the use of scales, or by the cubic yard measured in trucks at the point of delivery, in accordance with whichever unit is shown on the plans and proposal.

The pay quantity for bank run gravel produced from a source provided by the Owner shall be the actual quantity delivered and used on the roadway except that water content in excess of eight (8) percent by weight, including water absorbed by the material, shall be deducted from the tonnage to be paid for if payment by the ton is specified. Crushed surfacing used for compensating lower resistance value or higher swell pressure than bank run gravel produced from a source provided by the Owner, shall be measured and paid for as "Bank Run Gravel, Class A or Class B".

If bank run gravel from a source provided by the Contractor has lower resistance value or higher swell pressure than that specified, the pay quantity of "Bank Run Gravel, Class A or Class B" shall be the quantity of bank run gravel actually delivered and used on the roadway, less water in excess of eight (8) percent by weight, plus the quantity of crushed surfacing, if any, used to compensate for lower resistance value or higher swell pressure, as described in Section 26-2.03. In no such case shall the crushed surfacing used to compensate for lower values than that specified, be included in any pay item for crushed surfacing.

The quantity for bank run gravel shall not include waste material or any material not suitable for the purpose intended.

26–5 PAYMENT

Payment will be made for such of the following bid items as are included and shown in any particular contract:

1. "Bank Run Gravel (Class A or Class B)," per ton, or cubic yard.
2. "Clearing" and "Grubbing," per acre (or lump sum).
3. "Stripping Quarries and Pits," per cubic yard.
4. "Water," per M gallons.
5. "Smooth-wheeled Power Roller," per hour.
6. "Pneumatic-tired Roller," per hour.
7. "Grid Roller," per hour.

The unit contract price per ton or per cubic yard for "Bank Run Gravel (Class A or Class B)," shall be full compensation for furnishing all material, labor, tools, equipment and all other costs and expense necessary or incidental to the preparation of the roadbed, excavating, loading, hauling the full distance, placing and blading the bank run gravel and for which no other specific bid item is provided.

Clearing and grubbing for borrow pits will be measured and paid for in accordance with the provisions of Section 12.

"Stripping Quarries and Pits," will be measured and paid for in accordance with the provisions of Section 13.

"Water" will be measured and paid for in accordance with the provisions of Section 16.

Rolling equipment will be measured and paid for in accordance with the provisions of Section 15.

Section 27—Asphalt Materials

27-1 DESCRIPTION

–1.01 ASPHALT MATERIAL

Asphalt furnished under these specifications shall not have been distilled at a temperature high enough to injure by burning or to produce flecks of carbonaceous matter, and upon arrival at the work shall show no signs of separation into lighter and heavier components. Lots placed in storage for subsequent shipment shall be thoroughly mixed so there will be no appreciable difference in properties between individual shipments.

Asphalt of the grade specified shall fully comply with all of the requirements hereinafter set forth for each respective grade.

The particular grade or grades of asphalt to be used on any project will be those called for in the special provisions, on the plans, or in these specifications.

–1.01A Slow Curing Liquid Asphalt

		SC-70	SC-250	SC-800	SC-3000
Flash Point—Cleveland Open Cup	Min. °F.	150	175	200	225
Viscosity at 140° F., Kinematic, cs.		70–140	250–500	800–1600	3000–6000
Water Content	Max. %	0.5	0.5	0.5	0.5
Distillation:					
Total distillate at 680° F.	%	10–30	4–20	2–12	0–5
Float test on distillation residue at 122° F.	Seconds	20–100	25–110	50–140	75–200
Asphalt residue of 100 Penetration	Min. %	50	60	70	80
Ductility of Asphalt Residue at 77° F.	Min. Cm.	100	100	100	100
Solubility in Carbon Tetrachloride or Trichloroethylene	Min. %	99.5	99.5	99.5	99.5
Spot Test (Heptane-Xylene equivalent)	Max. %	35	35	35	35

–1.01B Medium Curing Liquid Asphalt

		MC-70	MC-250	MC-800	MC-3000
*Flash Point—Tag Open Cup	Min. °F.	100	150	150	150
Viscosity at 140° F., Kinematic, cs.		70–140	250–500	800–1600	3000–6000
Water Content	Max. %	0.2	0.2	0.2	0.2
Distillation, % by volume of total distillate to 680° F.:					
To 437° F.		0–20	0–10	.....	.....
To 500° F.		20–60	15–55	0–35	0–15
To 600° F.		65–90	60–87	45–80	15–75
Residue to 680° F.	Min. %	55	67	75	80
Properties of residue from distillation to 680° F.:					
Penetration at 77° F., 100 g., 5 sec.		120–250	120–250	120–250	120–250
†Ductility at 77° F., Cm., Minimum		100	100	100	100
Solubility in Carbon Tetrachloride or Trichloroethylene	Min. %	99.5	99.5	99.5	99.5
Spot Test (Heptane-Xylene equivalent)	Max. %	35	35	35	35

–1.01C Rapid Curing Liquid Asphalt

		RC-70	RC-250	RC-800	RC-3000
Flash Point—Tag Open Cup	Min. °F.	.....	80	80	80
Viscosity at 140° F., Kinematic, cs.		70–140	250–500	800–1600	3000–6000
Water Content	Max. %	0.2	0.2	0.2	0.2
Distillation, % by volume of total distillate to 680° F.:					
To 374° F. minimum		10	.....	.....	.....
To 437° F. minimum		50	35	15	.....
To 500° F. minimum		70	60	45	25
To 600° F. minimum		85	80	75	70
Residue to 680° F.	Min. %	55	65	75	80
Properties of residue from distillation to 680° F.:					
Penetration at 77° F., 100 g., 5 sec.		80–120	80–120	80–120	80–120
Ductility at 77° F., minimum Cm.		100	100	100	100
Solubility in Carbon Tetrachloride or Trichloroethylene	Min. %	99.5	99.5	99.5	99.5
Spot Test (Heptane-Xylene equivalent)	Max. %	35	35	35	35

* Flash point by Cleveland Open Cup may be used for products having a flash point greater than 175° F.

† If penetration of residue is more than 200 and its ductility at 77° F. is less than 100, the material will be acceptable if its ductility at 60° F. is not less than 100.

–1.01C1 Alternate Viscosity Requirements

At the option of the Owner, liquid asphalts may be tested for viscosity with the Saybolt Furol apparatus in lieu of the Zeitfuchs Cross-Arm Viscometer. If the Saybolt Furol apparatus is used, liquid asphalts shall meet the following requirements for viscosity:

GRADE LIQUID ASPHALT	Temperature	Saybolt Furol Viscosity in Seconds
SC, MC, or RC-70	122° F.	60 to 120
SC, MC, or RC-250	140° F.	125 to 250
SC, MC, or RC-800	140° F.	400 to 800
SC, MC, or RC-3000	180° F.	300 to 600

–1.01D Paving Asphalts

Paving asphalts shall be free from water and shall not foam when heated to 350° F. They shall conform to the following requirements:

		GRADE				
Specification		40–50	60–70	85–100	120–150	200–300
Penetration of Original Sample at 77° F., 100G., 5 Sec.		40–50	60–70	85–100	120–150	200–300
Flash Point, Pensky-Martens Closed. °F.	Min.	460	450	440	425	400
Penetration Ratio: Pen. 39.2°F., 200 G., 60 Sec. × 100 / Pen. 77°F., 100 G., 5 Sec.	Min.	25	25	25	25	25
Viscosity, Saybolt Furol, at 275° F.		120–430	100–325	85–260	70–210	50–150
Solubility in Carbon Tetrachloride, %	Min.	99.0	99.0	99.0	99.0	99.0
Spot test (Heptane-Xylene Equivalent), %	Max.	35	35	35	35	35
Thin Film Oven Test:						
Loss in Weight, %	Max.	0.75	0.80	0.85	1.00	1.50
Penetration of Residue, 77°F., 100G., 5 Sec., % of Orig. Pen.	Min.	52	50	47	44	40
Ductility of Residue, 77°F., Cm.	Min.	50	50	75	75	75

–1.01E Asphalt for Sub-Sealing and Crack Pouring

Asphalt for crack pouring and for sub-sealing under pavements shall be free from water and shall not foam when heated to 350° F. It shall conform to the following requirements:

Softening Point (Ring and Ball), °F.	160°–180°F.
Penetration of Original Sample:	
At 32° F., 200g., 60 sec.	15+
At 77°F., 100g., 5 sec.	25–40
At 115°F., 50g., 5 sec.	90—
Ductility at 77° F., cms.	3+
Flash Point (Cleveland Open Cup) °F.	425+
Solubility in Carbon Tetrachloride, %	99.0+
Loss on Heating, 325° F., 5 hrs., %	1.0—
Penetration After Loss on Heating, % of Original	70+

1.01F Emulsified Asphalt

	RAPID SETTING		SLOW SETTING	
	RS-1	RS-2	SS-1	SS-1H
Viscosity, Saybolt Furol:				
at 77° F., Sec.	20–100	.....	20–100	20–100
at 122° F., Sec.	.....	75–400	.....	.....
Residue by distillation, %	57 Min.	62 Min.	57 Min.	57 Min.
Settlement, 5 days, %	3 Max.	3 Max.	3 Max.②	3 Max.②
Demulsibility:①				
35 ml. of 0.02 N. $CaCl_2$, %	60 Min.	50 Min.	.....	.....
Sieve test (Ret. on #20) %	0.10 Max.	0.10 Max.	0.10 Max.	0.10 Max.
Modified miscibility with water	.....	.....	4.5 Max.	.....
Cement mixing test, %	.....	.....	2.0 Max.	2.0 Max.
Tests on Residue:				
Penetration at 77°F., 100g., 5 sec.	100–200	100–200	100–200	40–90
Solubility in CS_2, %	97.5 Min.	97.5 Min.	97.5 Min.	97.5 Min.
Ductility at 77°F., cm.	40 Min.	40 Min.	40 Min.	40 Min.

① The Demulsibility Test shall be made within 30 days from the date of shipment.

② If the sample of emulsified asphalt being tested fails to conform to the requirements for modified miscibility, the sample shall be tested for 5-day settlement and for miscibility. If the numerical difference between the average percentages of the asphalt residue in the 5-day settlement test is less than 3 and if the standard miscibility test shows no appreciable coagulation or visible separation in 2 hours, then the emulsified asphalt shall be considered as conforming to these specifications and shall be accepted.

–1.01G Test Methods

The properties enumerated above shall be determined in accordance with the following methods of test:

Test	*Designation*
1. Penetration	ASTM D-5
2. Penetration Ratio	Section 6
3. Residue of Specified Penetration	ASTM D-243
4. Viscosity, Saybolt Furol	ASTM D-88 E-102
5. Viscosity, Kinematic, Zeitfuchs Cross Arm	ASTM D-445
6. Flash, Cleveland Open Cup	ASTM D-92
7. Flash, Tag Open Cup	ASTM D-1310
8. Flash, Pensky Martens Closed	ASTM D-93
9. Thin Film Oven Test	ASTM D-1754
10. Loss on Heating	ASTM D-6
11. Ductility	ASTM D-113
12. Bitumen Soluble in Carbon Disulfide	ASTM D-4
13. Proportion of Bitumen Soluble in Carbon Tetrachloride	ASTM D-165
14. Float Test	ASTM D-139
15. Water	ASTM D-95
16. Distillation	ASTM D-402
17. Spot Test	AASHO T-102
18. Softening Point	ASTM D-36
19. Emulsified Asphalt	ASTM D-244

–1.01H Change in Grades

At any time during the progress of the work, the Engineer may order the use of other grades of asphalt materials in substitution of the grades specified in the special provisions if, in his judgment, the results contemplated by the specifications will be better attained thereby.

If the market price of the grade substituted is higher than that of the grade specified, the difference will be added to the unit contract price for asphalt, or if lower, it will be deducted from the unit contract price. Furthermore, in case any substitution so ordered makes it necessary to use a retort or superheater, where same is not required by the grade specified, the Contractor will be allowed $2.00 per ton (2,000 lbs.) in addition to the revised unit price for asphalt. No additional compensation will be made. If the contract is awarded for the use of asphalt that requires the use of a retort or superheater and substitution is made to a grade not requiring the use of such equipment, a deduction of two dollars ($2.00) per ton (2,000 lbs.) will be made from the revised unit price.

If the Engineer orders a change of paving asphalt, additional compensation, if any, will be limited to the actual additional cost of the asphalt based on invoices from the supplier. If the cost of the substituted paving asphalt is lower, the difference in its cost and that of the original material specified, based on invoices from the supplier, shall be deducted from monies due the Contractor.

–1.01I Notice of Shipment

The producer shall furnish a notice of shipment in triplicate at the time of shipment of each car load or other lot of asphalt cement. The original copy shall be mailed to the Engineer, the duplicate to the consignee and the triplicate with the shipment. The asphalt shall not be unloaded at the point of delivery until the Engineer has checked the notice of shipment. The notice shall contain the following information:

1. Name of shipper.
2. Date of shipment.
3. Car initial and number or suitable identification if shipped by other carrier.
4. Name of commodity.
5. Consignee and delivery point.
6. The contract number or Owner's purchase order number.
7. Point from which shipped.
8. Quantity contained. (When weighed on approved scales show gross, tare and net weights; otherwise show volume as loaded, temperature of loading, gallons at 60° F., and net tons.)
9. Certificate of grade. (Statement that material conforms to the specifications.)
10. Signature of shipper by authorized representative.

–1.01J Samples

The producer shall ship by prepaid express a sample of asphalt taken from each load or other lot that is shipped for use on work under the jurisdiction of the Owner. The sample shall consist of one quart, taken directly from the material after loading, properly labeled, which shall be forwarded promptly to the Engineer, or to a laboratory designated by him.

–1.01K Basis of Measurement

The quantity of asphalt to be paid for shall be the net amount determined by actual weight or by volume measurement. The method of measurement to be used in each instance shall be subject to determination by the Engineer. The apparatus used and the procedure employed in obtaining weight or volume measurements shall meet the approval of and shall be subject to inspection by the Engineer.

Deductions shall be made for any asphalt material included in the measurement that does not actually become incorporated in the work.

The unit of measurement for asphalt shall be a ton of two thousand (2,000) pounds. When measurement is made by volume, computations of weight shall be made in accordance with the following schedule:

Material	Gal. per ton at 60° F.	Material	Gals. per ton at 60° F.	Materials	Gals. Per ton at 60° F.
SC-70	255	MC-70	255	RC-70	255
SC-250	247	MC-250	247	RC-250	247
SC-800	244	MC-800	244	RC-800	244
SC-3000	241	MC-3000	241	RC-3000	241

The volume of asphalt, with the exception of emulsified asphalt, shall be converted from any temperature to the volume at 60° F., in accordance with the standard ASTM –IP Petroleum Measurement Tables specified in ASTM Designation D 1250.

For the purposes of payment the unit of measurement of emulsified asphalt shall be a ton of two thousand (2,000) pounds. When measurement is made by volume, two hundred forty (240) U. S. gallons of emulsified asphalt at a temperature of sixty degrees (60°) F. shall be considered as equivalent to a ton of two thousand (2,000) pounds. The volume of emulsified asphalt at any temperature shall be converted to the volume at 60° F., using the coefficient of cubical expansion of 0.00025 per degree F.

–1.01L Temperature of Application

Asphalt materials shall be heated to the temperature directed by the Engineer, but within the following limits, before they are applied to the roadway:

Material	App. Temp. Min. °F.	App. Temp. Max. °F.	Material	App. Temp. Min. °F.	App. Temp. Max. °F.	Material	App. Temp. Min. °F.	App. Temp. Max. °F.
SC-70	140	200	MC-70	140	190	RC-70	135	165
SC-250	180	270	MC-250	170	230	RC-250	155	205
SC-800	230	320	MC-800	185	245	RC-800	180	230
SC-3000	300	400	MC-3000	200	280	RC-3000	210	260

Emulsified Asphalt,
RS-1 .....Minimum 100° F. Maximum 130° F.
Emulsified Asphalt,
RS-2 .....Minimum 140° F. Maximum 170° F.
201-300 Penetration Paving
Asphalt .....Minimum 300° F. Maximum 400° F.
51-200 Penetration Paving
Asphalt .....Minimum 350° F. Maximum 400° F.
Asphalt for Subsealing and Crack
Pouring .....Minimum 350° F. Maximum 425° F.
Paving Asphalt for Use in Asphalt
Plants .....Minimum 250° F. Maximum 350° F.

The temperature of paving asphalts when loaded for transporting to destination shall not be greater than 400° F.

–1.01M Unauthorized Grades

The use of grades of asphalt other than those called for on the plans or in the special provisions, except as provided in Section 27-1.01H, will not be allowed. Any work which proves to be defective because of the use of unauthorized grades of asphalt shall be repaired or removed at the expense of the Contractor, if ordered by the Engineer.

–1.01N Anti-Stripping Additive

When called for on the plans or in the special provisions asphalt material shall be treated with an approved heat-stable anti-stripping additive before use:

Anti-stripping additive in the amount of 1% by weight of the asphalt, or less if ordered by the Engineer, shall be added to the asphalt at the point of shipment.

The anti-stripping additive shall be approved by the Engineer or laboratory prior to use.

Payment for the anti-stripping additive shall be incidental to the unit contract prices for the various items involved. No additional compensation shall be made.

Section 32—Bituminous Surface Treatment

32–1 DESCRIPTION

This specification shall apply to surfaces constructed by treating an existing crushed rock, screened gravel or bituminous roadway surface with asphalt and covering with mineral aggregate to obtain a surface thoroughly cemented to the roadway, having the contour and section shown on the plans and ensuring good riding and non-skid qualities.

32–2 MATERIALS

–2.01 ASPHALT

The particular asphalt to be used on any project will be those which are called for in the proposal or shown on the plans. Asphalt of the grade or grades specified shall comply with all the requirements set forth in Section 27, Asphalt Materials.

–2.02 MINERAL AGGREGATE

–2.02A General Requirements

Mineral aggregate to be used for bituminous surface treatment shall be of the type and size called for on the plans or in the proposal. Mineral aggregate may be obtained from Owner-owned stockpiles, produced from Owner-owned sources, or furnished by the Contractor, as may be called for on the plans or in the special provisions.

Any method of handling mineral aggregate which, in the opinion of the Engineer, causes segregation shall be corrected by the Contractor so that a uniform product will be incorporated in the work.

Mineral aggregate shall be manufactured in accordance with Section 22. It shall be manufactured from ledge rock, talus or gravel which meets the following test requirements:

Los Angeles wear, 500 Rev., ASTM Designation C 131 35% Max.

The finished product shall be clean, uniform in quality, and free from wood, bark, roots, and other deleterious materials.

Crushed screenings shall be substantially free from adherent coatings. The presence of a thin, firmly adhering film of weathered rock shall not be considered as coating unless it exists on more than fifty (50) percent of the surface area of any size between successive laboratory sieves.

The portion of mineral aggregate for bituminous surface treatment retained on a ¼-inch sieve shall not contain more than 0.1% wood waste by weight. Wood waste is defined as material with a specific gravity less than 1.0 after drying to constant weight.

The portion of mineral aggregate for bituminous surface treatment passing a U. S. No. 10 sieve shall not have wood waste that will result in more than 250 parts per million of organic matter by colorimetric tests when tested in accordance with Section 39-2.02B1, except that the color shall be measured after the sample has been in the test solution one hour.

–2.02B Test Requirements

Mineral aggregate for bituminous surface treatment shall conform to the requirements in the table below for grading and quality. The particular type or grading to be used shall be as shown on the plans. All percentages are by weight.

The requirements for grading shall apply at the time the aggregate is placed in the hauling vehicle for delivery to the project.

The crushed and screened cover stone and crushed screenings shall be damp when applied to the roadway. If the aggregates are dry and dusty in stockpile, the Contractor will be required to wet the stockpiles by spraying.

PASSING SIEVE	Crushed Cover Stone % Passing	Screened Cover Stone % Passing	CRUSHED SCREENINGS % Passing ⅜"-¼"	½"-¼"	¼"-0
¾" Square	100	100	100	.....	.....
⅜" Square	95-100	95-100	95-100	100	.....
½" Square	.....	.....	.....	95-100	.....
⅜" Square	.....	.....	.....	.....	100
¼" Square	30-50	30-50	0-10	0-15	90-100
U. S. No. 10	.....	.....	0-3	0-3	30-60
U. S. No. 100	.....	.....	0-1	0-1	0-10
U. S. No. 200 (wet sieving)	0-7.5	0-2	.....	.....	.....
Fracture (each size, including material passing ¼"), minimum %	75	.....	75	75	75
Sand Equivalent (section 6) Min.	40	40	.....	.....	.....
Modified immersion compression test, section 6, minimum % retained strength	70	70	70	70	70

32-3 CONSTRUCTION DETAILS

–3.01 PREPARATION OF UNTREATED ROADWAY

The existing roadway surface, including intersections and side street approaches, shall be shaped to a uniform grade and section shown on the plans or as directed by the Engineer, by using motor patrol graders equipped with scarifiers and weighing not less than ten (10) tons, by applying water in the amount directed by the Engineer with approved types of distributors, compacting the surface with pneumatic-tired and smooth-wheeled, three-wheel, or tandem rollers, one of which shall weigh not less than eight (8) tons. All equipment shall meet requirements outlined in Section 32-3.11.

The material on the existing street shall be loosened to a depth of approximately one (1) inch, scarifying if necessary. The material shall be drifted back and forth across the street, evenly distributed and compacted into an unyielding mass by blading, rolling, and watering. The grade shall be shaped so that all frame castings for manholes, monument boxes, gate valve boxes, catch basins, etc. within the roadway section to be treated, will extend one-half (½) inch to one (1) inch above the finished surface. Where existing oil mats are to be met, they shall be thoroughly swept and cleaned to provide proper connections, as the Engineer may direct.

Private driveways entering the street, if shown on the construction plans or indicated in the special provisions, shall be prepared in the same manner except that shaping shall be performed by hand methods to the extent that it is deemed necessary by the Engineer. The depth to which driveways shall be prepared from the street gutter line toward private property shall be as shown on the construction plans or as required in the special provisions.

Where intersections are so flat as to present potential drainage problems, and where street grades are one and one-half (1½) percent or less, the gutter grades will be staked by the Engineer, as required, at intersections, and at 50-foot intervals elsewhere. The roadway shall be graded and compacted to the exact grades as set by the Engineer. Where earth curbs are encountered, the curb shall be shaped in accordance with the section shown on the plans. Where concrete curbs or concrete curb and gutter are in place, grading shall be performed to meet the existing curbs and gutters. Any excess material encountered which cannot be incorporated into the roadway surface shall be removed and disposed of and will be paid for at the unit contract price per cubic yard for "Removal of Excess Surfacing Material."

Preleveling and patching shall be performed only when specified in the special provisions and in accordance with requirements specified therein.

–3.02 FIRST APPLICATION OF ASPHALT

Before the first application of asphalt is applied, the entire roadway, all side street approaches at intersections, alley approaches, and driveways shall be stable and unyielding, be of medium damp condition, be free from irregularities and material segregation, and be true to line, grade, and cross section. All castings shall be covered with heavy building paper and weighted down with sand or crushed material.

Where concrete curb or curb and gutter exist, the distributor shall be equipped with a splash board of such design as to prevent spraying thereon.

Asphalt shall be applied at the rate of 0.25 to 0.45 gallon per square yard as directed by the Engineer, at temperatures set forth in Section 27-1.01L. The pattern of application of shots, and width and length of application of shots of asphalt material shall be such as to provide proper coverage of crushed material within times specified hereinafter, provide proper widths to such dimensions as to facilitate the most satisfactory coverage with crushed cover stone, lapping of subsequent adjacent applications, and in such a manner as the Engineer deems most satisfactory for the particular project. Asphalt shall be applied to spandrels of intersections and driveways immediately ahead of, or behind the adjacent longitudinal street application.

Where earth curbs exist, the application of asphalt shall extend four (4) inches beyond the gutter line. On projects that have concrete curb and gutter existing, the application shall lap onto the gutter section, but not to exceed two (2) inches. In the case of vertical concrete curb, the application shall be placed as closely as possible without excessive splash onto the curb.

Hand sprayers shall be used to apply asphalt around castings and wherever else cover is insufficient.

After applying the first shot of asphalt and at such time as the Engineer may direct, crushed cover stone shall be evenly applied to the roadway surface at a rate of twenty-five (25) to thirty-three (33) pounds per square yard. The quantity of cover stone to be applied shall be held to an absolute minimum, providing for just enough material so the asphalt will be uniformly covered and will not pick up under traffic. Where the Contractor places cover stone in excess of the amount directed by the Engineer, he shall remove the excess material before application of the second shot at his own expense. The cover stone shall be applied over the freshly spread asphalt by trailer-type or self-propelled spreader boxes of an approved design. The cover stone shall be applied so that trucks and spreader boxes will not travel on the fresh asphalt and it shall be spread in one operation for each application of asphalt. Spandrels of intersections, driveways, and bare spots shall be covered by hand spreading from trucks immediately back of the spreader box application. Cover stone shall be spread in such a manner as to provide a four (4) to eight (8) inch strip of asphalt exposed to provide a lap with the next application of asphalt cement. Successive spreads of asphalt will then be applied and covered as described above.

As soon as the crushed cover stone has been applied to the first half of the street, the cover stone shall be well rolled with pneumatic-tired roller. Places inaccessible to the pneumatic-tired roller, such as spandrels of intersections and private driveways, shall be rolled with a self-propelled smooth-wheel roller weighing not less than eight (8) tons.

Where excess rock has been applied, it shall either be removed as previously specified or be drifted uniformly over the adjacent roadway by using an approved motor patrol grader equipped with a wire broom mold board, subject to approval of the Engineer. This type of brooming shall be held to a minimum, and where necessary it shall be very carefully performed so as not to disturb the mat in any way. Thin or bare spots in the spread of cover stone shall be corrected by hand spreading or by use of a grader as described above.

Rolling and brooming shall continue until the roadway is evenly covered and the cover stone is well compacted and "set" into the asphalt. This operation will continue, as directed, until the asphalt has cured to the extent that it will not "pick up" under traffic. Primarily, all rolling will be performed with pneumatic rollers, except as otherwise described above, and the final rolling shall be performed with a self-propelled smooth-wheel roller weighing not less than eight (8) tons.

To avoid laps and joints at transverse junctions of separate applications of asphalt, the Contractor shall spread sufficient building paper over the treated surface to assure proper functioning of spray jets when untreated surface is reached.

During that period following the first application of the bituminous surface treatment and prior to the second, the Contractor shall perform brooming, spotting, and rolling as may be necessary to prevent "pick up" or other damage to the surface.

–3.03 SECOND APPLICATION OF ASPHALT

The final application shall not be applied sooner than five (5) days from the date of completion of the first application of bituminous surface treatment, and the time may be extended for a period in excess of five (5) days if so directed by the Engineer. The roadway surface, including intersections and side street approaches, shall be prepared by use of an approved type of motor patrol grader, equipped with a wire broom mold board. All loose material shall be distributed over the entire roadway so as to provide a uniform thickness of material consisting primarily of coarse material not in excess of one rock thickness. Rotary brooms will not be permitted unless specifically called for in the special provisions. Castings and curbs shall again be protected as described in Section 32-3.02.

As directed by the Engineer, asphalt shall be applied at the rate of 0.2 to 0.35 gallon per square yard and crushed cover stone at the rate of 25 to 33 pounds per square yard. The manner of applying both materials, and the procedure of rolling and brooming shall be the same as for the first application described in Section 32-3.02.

–3.04 ADDITIONAL ASPHALT AND MINERAL AGGREGATE

If the application of asphalt or cover stone, or both, shall indicate the quantities placed on any particular portions of roadway to be too little or too much for the required results, the Engineer may direct the Contractor to make an additional application of one or both materials in accordance with these specifications, or his directions. Additional asphalt or mineral aggregate thus used will be paid for at the unit contract price for each of the materials used, and no further compensation will be allowed.

–3.05 PATCHING

Omissions by the distributor or damage to the treated surface of any coat shall be immediately covered by hand patching with asphalt in adequate quantities. Holes which develop in the surface shall be patched. All costs incurred in coating omissions and patching shall be included by the Contractor in his unit contract prices for the materials used and no additional compensation will be made for such work.

–3.06 CORRECTION OF DEFECTS

Defects such as raveling, low centers, lack of uniformity, or other imperfections caused by faulty workmanship shall be corrected as directed by the Engineer, and new work shall not be opened to traffic until such defects have been remedied.

All improper workmanship and defective materials resulting from overheating, improper handling or application shall be removed from the roadway by the Contractor and be replaced with approved materials and workmanship at his own expense.

–3.07 PROTECTION OF STRUCTURES

All curbs, curb and gutters, castings, guard rails, road signs, and other facilities shall be protected from splashing of the asphalt. All costs incurred by the Contractor in necessary protective measures shall be included by the Contractor in his unit contract prices for various pay items of the contract.

–3.08 UNFAVORABLE WEATHER

Asphalt may be applied to damp but not wet material. Subject to the determination of the Engineer, asphalt shall not be applied during rainfall or any imminent storms that might damage the construction. The Engineer shall determine whether the surface and materials are dry enough to proceed with construction.

In general, it is the policy of the Owner to prohibit the application of any asphalt when the ground temperature is lower than fifty degrees (50°) F. The Engineer may require the Contractor to delay the application of asphalt until the atmospheric and roadway conditions are satisfactory. No asphalt shall be placed which cannot be covered before darkness.

–3.09 MAINTENANCE

Unless otherwise provided in the special provisions, the Contractor shall, at his own expense, maintain the completed roadway for a period of five (5) days after the completion of all work on any one continuous section, adding screenings when surplus asphalt cement appears on the surface due to action of traffic or climatic conditions.

In the event of the Contractor's failure or neglect to faithfully perform this maintenance, resulting in injury to the surface, the Contractor shall make the necessary repairs at his own expense, to the satisfaction of the Engineer.

–3.10 PROGRESS OF WORK

The Contractor shall so organize his work that the entire operation will progress in an orderly and expeditious manner, satisfactory to the Engineer.

–3.11 ORGANIZATION AND EQUIPMENT

Personnel: The Contractor shall have on hand sufficient personnel and required equipment before commencing any stage of construction. Each stage of the construction shall be supervised by competent personnel, thoroughly experienced in the particular type of work. All operators of graders, distributors and trucks shall be experienced in the equipment they operate. Anyone of the Contractor personnel found to be incompetent in execution of his work by the Engineer, shall be replaced by the Contractor upon request of the Engineer.

Equipment: The equipment listed below will be the minimum required for this type of construction, and additional units must be secured if, in the opinion of the Engineer, it becomes necessary to fulfill the conditions of these specifications, or to complete the improvement within the time specified.

1 Asphalt cement heater capable of heating the asphalt cement to the required temperature.

1 Asphalt distributor of at least 1,000 gallon capacity which will distribute the asphalt cement uniformly at the required rate of application. It shall be insulated and equipped with an adequate heating device. It shall be equipped with a ten-foot (10') spray bar with extensions, pressure pump and gauge, volume gauge so located as to be observed easily by the inspector from the ground, a tachometer to control accurately the speed and spread of asphalt cement, and two thermometers, one to be installed permanently in the tank to indicate temperatures of the cement at all times. The power for operating the pressure pump shall be supplied by an independent power unit which will develop a minimum of twenty-five (25) pounds per square inch pressure at the spray bars.

Necessary asphalt patching equipment.

2 Asphalt thermometers.

Necessary insulated transfer supply tanks with a minimum capacity of 1,000 gallons.

Motor patrol graders as required, each equipped with 10-foot blades and wire broom moldboards, weighing not less than ten (10) tons for use on bituminous surface treatment.

1 Spreader box which may be self-propelled or be attached to the rear of the hauling truck. The spreader box must be supported on at least four (4) pneumatic-tired wheels, and equipped with a satisfactory device for metering and distributing the aggregate evenly over the roadway surface.

1 Multiple wheel pneumatic-tired 2-axle roller, having a width of not less than five (5) feet and not more than seven and five-tenths (7.5) feet, equipped with pneumatic tires of equal size and diameter with smooth or "Highway" treads, satisfactory to Engineer. The tires on the front and rear axles shall be staggered and the angle between the center line of the wheel and tire assembly and the center line of the axle shall be ninety (90) degrees throughout the complete revolution of the wheel on the axle. The air pressure in the several tires shall not vary from each other more than five (5) pounds per square inch.

The gross weight of each roller shall be not less than eight (8) tons nor more than eleven (11) tons. The weight of the rollers shall be as ordered by the Engineer within the above limits, to obtain maximum compaction. The rollers shall be towed by a rubber tired tractor or light truck. The above described roller may be towed or self-propelled if it meets all other requirements of these specifications.

1 Smooth wheeled power roller weighing not less than eight (8) tons.

1 Two-axle power patching roller.

Trucks of uniform capacity equipped with power hoists.

1 Loading device of adequate capacity to load trucks with mineral aggregate.

Hand push brooms.

1 Water tank truck of 1,000-gallon minimum capacity with 10-foot spray bar or splash plates.

All of the mobile equipment listed above except smooth-wheeled power rollers shall be equipped with pneumatic tires. All equipment shall be maintained in good working order to ensure the progress and quality of work.

The right is reserved for the Engineer to disapprove any equipment that in his opinion will not or does not accomplish the work satisfactorily.

–3.12 TRAFFIC AND DETOURS

Unless otherwise provided in the special provisions, the Contractor shall plan his operations on the basis that the project will be closed to all traffic during working hours except emergency vehicles such as fire and police departments and ambulance service. The project shall be opened to local traffic after working hours. The project will be opened to all traffic during the time between the first and second applications of light bituminous surface treatment and immediately after completing the last application.

Unless otherwise stated in the special provisions, the Contractor shall furnish and place all necessary detour signs. These shall be placed as directed each day at commencement of work and be removed at completion of the work each day. "Slow" signs and other necessary signs shall be furnished and placed on the project as directed. The cost of this work shall be considered as incidental to the construction and shall be included by the Contractor in the unit pay items of the contract. Further requirements shall be as outlined elsewhere in these general specifications, or in the special provisions.

–3.13 FINISHING AND CLEANUP

Finishing and cleanup shall be performed as specified in sections 4.08 and 57.

32–4 MEASUREMENT AND PAYMENT

Payment will be made for such of the following bid items as appear on the contract bid proposal and in accordance with requirements described hereinafter:

1. "Preparation of Untreated Roadway," per square yard.
2. "Asphalt (grade)," per ton.
3. "Crushed Stone Surfacing Top Course," per cubic yard, or per ton.
4. "Crushed Cover Stone," per cubic yard, or per ton.
5. "Water," per M gallons.
6. "Removal of Excess Surfacing Material," per cubic yard.
7. "Finishing and Cleanup," per lump sum, or per station (100').

–4.01 PREPARATION OF UNTREATED ROADWAY

Preparation of untreated roadway shall be a pay item on the bid proposal in all cases where bituminous surface treatment is a part of the contract.

The unit contract price per square yard for "Preparation of Untreated Roadway" shall be full compensation for all labor, equipment, and material necessary to perform the required blading, scarifying, processing, leveling, rolling, and all other work incidental to fulfilling the requirements of the specifications not otherwise covered by other pay items.

–4.02 ASPHALT

The unit contract price per ton for "Asphalt (particular type required)" shall be full compensation for furnishing, heating, hauling, and spreading. The quantity of asphalt shall be upon measurement described in Section 27-1.01K.

–4.03 CRUSHED STONE SURFACING AND CRUSHED COVER STONE

The measurement of aggregates to be furnished by the Contractor shall be by the cubic yard based on net volume at point of delivery, or by the ton in truck, whichever is shown on the bid proposal.

The unit contract price for these items shall be full compensation for furnishing the material, hauling, and placing in accordance with the specifications.

–4.04 WATER

Water shall be paid for in accordance with the unit contract price per M gallons for "Water," which shall be full compensation for hauling, placing, and also the furnishing of water unless the special provisions provide otherwise.

–4.05 REMOVAL OF EXCESS SURFACING MATERIAL

Where excess material is encountered on the roadway at any stage of the work and where, in the opinion of the Engineer it must be removed, it shall be paid for at the unit contract price per cubic yard for "Removal of Excess Surfacing Material," as measured in trucks at point of loading. Where excess material has been placed through carelessness or poor workmanship of the Contractor, no payment will be made for such removal.

–4.06 FINISHING AND CLEANUP

Whenever any contract has for its major purpose the construction of bituminous surface treatment, the payment for cleanup as described in the specifications shall be by a lump sum or per station (100') in accordance with the bid item for "Finishing and Cleanup," provided, however, that if the proposal does not contain a bid item for "Finishing and Cleanup," then in that event all cleanup work specified in the contract shall be considered as incidental to the construction and all costs thereof shall be included by the Contractor in his various unit contract prices of other items.

Whenever the light bituminous surface treatment is only a minor part of a contract which includes other types of work, the cleanup required for the light bituminous surface treatment part of the contract shall be considered as incidental to the general cleanup of the entire project and the cost thereof to meet the requirements of the specifications shall be included in the various unit contract prices of other items by the Contractor

–4.07 INCIDENTAL WORK

Any incidental work required to complete the bituminous surface treatment as specified herein, but which is not specifically mentioned in the foregoing specifications, shall be performed by the Contractor and shall be considered as incidental to the construction, and all costs therefor shall be included in the unit contract prices of the bid items.

Section 33—Bituminous Plant Mix Pavement

33–1 DESCRIPTION

These specifications shall apply to surfaces composed of mineral aggregate mixed with asphalt cement in a central mixing plant before placing the mix on the roadway. When spread on the roadway, the result shall be a homogeneous bituminous bound mat which, after thorough compaction, will have the width and thickness shown on the plans. It shall be uniform and smooth, having good riding qualities and a non-skid surface.

The various mineral materials may be furnished in whole or partial amounts by the Owner, or they may be required to be furnished by the Contractor. In the event any of the mineral materials are not provided by the Owner, it shall be understood that the Contractor will furnish mineral materials in the amounts required for the designated mix without compensation other than as covered by the unit contract prices. Mineral materials shall include coarse and fine mineral aggregates, and blending sand if necessary.

33–2 MATERIALS

–2.01 ASPHALT

The particular asphalt materials to be used on any project shall be those which are called for in the proposal, on the plans, or in the standard specifications. Asphalt of the grade or grades specified shall fully comply with all the requirements set forth in Section 27, entitled "Bituminous Materials."

–2.02 MINERAL AGGREGATE

–2.02A General Requirements

The material from which mineral aggregate for plant mix is manufactured shall meet the following test requirements:

Los Angeles Wear, 500 Rev., ASTM Designation C 131, 40% Max.

Mineral aggregate for plant mix shall be manufactured from ledge rock, talus or gravel in accordance with Section 22. It shall be clean, uniform in quality, and substantially free from wood, roots, bark, or other extraneous material. It shall not have deleterious coatings which, in the opinion of the Engineer, will not become detached during the mixing process.

–2.02B Test Requirements

Mineral aggregate for plant mix shall meet the following test requirements:

Fracture (each size, retained on ¼" sieve) by weight	50% Min.
Sand equivalent (Section 6)	40 Min.

The mineral aggregates, when combined in the proportions under Section 33-2.02D and mixed with asphalt cement of the proper grade and quantity, shall meet the following requirements:

Stabilometer value (Section 6)	25 Min.
Cohesiometer value (Section 6)	50 Min.
Modified immersion compression test, % Retained strength (Section 6)	70 Min.

–2.02C Grading of Mineral Aggregate

When mineral aggregate is to be placed in stockpiles for future use, the crushed material shall be separated and stockpiled in the two sizes of ¾" - ¼" and ¼" - 0. If there should be a deficiency in the grading of the ¼" - 0 stockpile material the Contractor may, with approval of the Engineer, provide for the deficiency in fines by furnishing and placing a separate stockpile adjacent thereto which will contain natural sand or fine screenings of the required quality and grading, and in such quantity as may be determined by the Engineer. Payment for the supplemental fine material in the amount designated by the Engineer will be made at the unit contract price per ton for "Mineral Aggregate (size) in Stockpile."

Except for the supplemental fine material mentioned above, the sizes of mineral aggregate to be stockpiled shall be graded as shown below.

Size designations ¾" to ¼" (quantity required equals approximately 35% by weight of total aggregate):

% Passing ¾" sieve (square opening)	100
% " ½" " " "	40–100
% " ¼" " " "	0– 30

Size designation ¼" to 0 (quantity required equals approximately 65% by weight of total aggregate):

% Passing ½" sieve (square opening)	100
% " ¼" " " "	70–100
% " U. S. No. 10 Sieve	45– 80
% " U. S. No. 200 Sieve	3– 12

When the mineral aggregates are furnished by the Contractor for use on the immediate contract, the grading shall meet the requirements of Section 33-2.02D.

–2.02D Proportions of Materials

The materials of which the bituminous mixture is composed shall be of such sizes and grading that, when proportioned and mixed together, they will produce a uniformly graded mixture which will conform to the quality requirements of Section 33-2.02B and to the grading requirements of the table that follows.

The percentages of aggregates below refer to the complete dry mix. The percentage of asphalt refers to the complete bituminous mix. All percentages are by weight.

% Passing ¾" sieve (square opening)	100
% " ½" " " "	80–100
% " ¼" " " "	45– 75
% " U. S. No. 10 sieve	30– 50
% Asphalt	4– 7

The exact proportions of the several constituents to be used in the production of the bituminous mixture will be fixed within the above limits by the Engineer to provide a pavement having stabilometer and cohesiometer values, and surface texture satisfactory to the Engineer. The proportions so fixed shall be changed only upon his order.

When mineral aggregate, or a source for the production of mineral aggregates is provided by the Owner, the approximate percentage of asphalt required in the mixture will be set forth in the special provisions. The percentage designated in the special provisions shall not be considered as precisely correct but shall be considered as informational only and the actual quantity of asphalt shall be that necessary to provide a mixture meeting the requirements of Section 33-2.02B.

It is provided, however, that if the total amount of asphalt used on the project, exclusive of waste, is more than the amount computed from the maximum percentage in the foregoing table of this section, the Owner will reimburse the Contractor for the cost of the extra asphalt, based on invoices by the supplier, and no further compensation will be made therefor.

Whenever mineral aggregates are furnished in stockpile by the Owner and there is a deficiency of fines in the grading of the ¼" - 0 size, the Owner will specify in the special provisions the additional requirements or proportions of natural sand or fine screenings to be incorporated in the mix by the Contractor. The additional fines shall be from a source approved by the Engineer and shall be suitable in quality and grading to supplement the gradation deficiencies of the ¼" - 0 material. The source of the additional fines will be furnished by the Owner without cost unless otherwise provided in the special provisions.

The pay item for the additional natural sand or fine screenings will be designated as "Blending Sand," the unit contract price per cubic yard of which shall include the costs at the source, hauling and incorporating the material in the mixed aggregate, satisfactory to the Engineer. Measurement will be by the cubic yard in trucks at the mixing plant, unless the special provisions provide other unit of measurement.

All asphalt plants shall be provided with adequate means for bin sampling, and a safe means for obtaining representative bin samples while the plant is in operation.

All continuous or volumetric proportioning asphalt plants shall be provided with adequate means for calibration. Means must be provided by the Contractor for weighing separately the discharge from each hot stone gate or metering device.

Asphalt of 85-100 penetration will be used unless otherwise provided in the special provisions, or directed by the Engineer.

–2.02E Stockpiling Mineral Aggregates

Preparation of stockpile sites, the stockpiling of mineral aggregates, and the removal of the materials from stockpiles shall conform to the requirements of Section 23-3.01.

33–3 CONSTRUCTION DETAILS

–3.01 PREPARATION OF BASE OR SUBGRADE

–3.01A Preparation of Asphalt, Concrete or Brick Surfaces

Before placing plant mix on an existing pavement, all fatty asphalt patches, grease drippings, and other objectionable matter shall be entirely removed from the existing pavement. All joint filler material which protrudes above the surface of the existing pavement shall be removed flush thereto. All types of existing pavement or bituminous surface shall be thoroughly cleaned by sweeping and flushing to remove dust and other foreign matter. Unless otherwise provided for in the special provisions, the Owner will perform any necessary flushing at no cost to the Contractor provided the need for flushing is not the result of the Contractor's operations, in which case the Owner will make a charge for such work.

When bituminous plant mix is to be constructed over an existing paved or oiled surface, all holes and small depressions shall be filled with an appropriate class of plant mix by hand shoveling. The surface of the patched

area shall then be leveled by raking and the patch thoroughly rolled with a modern smooth-wheeled eight (8) ton power roller or a two (2) axle power patching roller. All patching shall be performed as directed by the Engineer.

A tack coat of asphalt, applied at the rate of .02 to .05 gallons of retained asphalt per square yard, shall be applied uniformly to all surfaces upon which any course of plant mix is to be applied, including the first or leveling course, unless its omission shall have been directed by the Engineer.

The tack coat may consist of heated cutback asphalt consisting of fifty percent (50%) paving grade asphalt and fifty percent (50%) gasoline thoroughly mixed, or emulsified asphalt SS-1. The emulsified asphalt may be mixed with water at the rate of from one (1) to two (2) parts water to one (1) part of emulsified asphalt, as directed by the Engineer. The emulsified asphalt shall comply with the requirements of Section 27.

–3.01B Preparation of Untreated Roadway

The subgrade upon which the bituminous plant mix pavement is to be placed shall be constructed to conform with the typical roadway sections shown on the construction plans and shall be in conformance with the requirements in Section 15, entitled "Subgrade."

Where required in the special provisions, the roadway shall be primed as provided under Section 32, entitled "Bituminous Surface Treatment," excepting however, that one only application of asphalt and one only application of prime coat aggregate will be required.

–3.01C Removing Existing Pavement

Where shown on the plans or where designated by the Engineer, the existing pavement of the type shown on the plans shall be broken up, loaded, hauled and disposed of in accordance with requirements outlined in Section 52, entitled "Removal of Existing Street Improvements."

Care shall be taken not to damage any of the existing pavement left in place or other related facilities, and any damage due to negligence shall be made good or be replaced by the Contractor at his expense. Removal of existing pavement will be paid for upon the unit contract price per square yard of pavement removed unless otherwise provided in the special provisions. Bituminous mats of any kind less than two (2) inches in thickness shall not be considered as pavement and its removal shall be included in the quantities of and paid for at the unit contract price for excavation of the class shown on the plans and proposal.

–3.02 CONNECTIONS WITH EXISTING FACILITIES

Where the bituminous plant mix pavement is to be connected with any existing roadway surface, bridge, railway crossing or other facility, the Contractor will be required, under direction of the Engineer, to modify the existing roadway profile in such a manner as to produce a smooth riding connection to the existing facility.

Where it is necessary to remove existing asphalt surfaces or oil mat surfaces to provide proper meet lines and riding surfaces, the Contractor shall burn or chip the existing surface so that there will be sufficient depth to provide a minimum of one (1) inch of bituminous plant mix, and the waste material shall be disposed of to the satisfaction of the Engineer. Prior to placing the bituminous plant mix, the disturbed areas shall be tacked in accordance with requirements in Section 33-3.01A.

Meet lines shall be straight and the edges be vertical. The edges of the meet line cuts shall be painted with diluted cutback asphalt cement or SS-1 emulsion prior to the placing of bituminous plant mix. After placing the mix, the meet line shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately be covered with clean dry sand. Chipping or burning will be paid for at the unit contract price per square yard for "Chipping Existing Asphalt Surfaces."

Where it is required to remove sections of existing pavements such as portland cement concrete, cobblestone, brick and other rigid type, the removal shall be performed and be paid for as described in Section 52, entitled "Removal of Existing Street Improvements."

–3.03 PREPARATION AND HEATING AGGREGATES

For control of the cold aggregates before they are fed to the cold stone belt or elevator, each size designation or grading separation, except blending sand if needed, shall be fed to the cold stone belt or elevator by separate mechanical feeders of the plate vibrator or continuous belt type. A mechanical feeder may have one or more vertical divider plates for feeding two or more size designations through a single feeder if the feeder is equipped with individual gates that can be operated separately for each aggregate size.

Blending sand may be added to the ¼-0" or the ¾-0" material before it is fed to the cold stone feeders. The amount of blending sand added shall be as directed by the Engineer, and any method of mixing which does not result in a uniform product will not be allowed and shall be corrected to the satisfaction of the Engineer. The correction may include the addition of a separate mechanical feeder of the type outlined above.

Suitable means shall be provided for keeping the various grades of aggregate from becoming mixed in the stockpile.

The aggregates shall be heated to a temperature between 260 and 350 degrees F. and immediately thereafter shall be separated into two sizes or grades by means of a suitable screen having a minimum screen opening of approximately one-fourth (¼) inch and a maximum opening not to exceed three-fourths (¾) inch.

The screening mechanism of the plant shall be of the vibrator or shaker type. Each screen shall be of adequate dimension to ensure that aggregates in each bin will be separated within the limits set in these specifications.

Heating of aggregate shall be in a suitable rotary heater or drier equipped with a dust collector which can remove all excess dust contained in the aggregate and return such an amount, as may be directed by the Engineer, to the hot stone elevator.

Each size or grade of the heated aggregate shall be deposited in a separate bin. Each bin shall be provided with an overflow pipe of sufficient net opening as to prevent the overflowing of one bin into another.

Should the material in the coarse aggregate bin contain twenty (20) percent or in any other bin contain ten (10) percent or more of material which is undersize or oversize for that bin, the bin shall be drawn and the material rescreened.

Fine aggregate passing the U. S. No. 10 sieve shall be collected and conveyed to the center of the bin in such a manner that segregation within the bins is eliminated.

–3.03A Operation of Asphalt Plant

When the asphalt plant is erected at a site for the primary purpose of producing mixtures for a project, as much of the dust and smoke from the plant shall be eliminated as will cause no inconvenience to property owners in the area or damage to their property. The Contractor will be required to install a satisfactory precipitation device or to use such other methods as may be necessary to control the dust and smoke to the satisfaction of the Engineer.

All costs in connection with protective measures mentioned above shall be considered as incidental to the construction and shall be included in the unit contract price per ton for "Bituminous Plant Mix."

–3.03B Plant Capacity

On projects involving production of asphalt concrete or bituminous plant mix, the asphalt plant shall have a minimum capacity rating by the manufacturer as shown in the following:

For projects involving 3,000 tons or more:	
Batch type plants.....	2,000 pounds per batch
Continuous mix type plants	90 tons per hour
For projects involving less than 3,000 tons:	
Batch type plants.....	1,000 pounds per batch
Continuous mix type plants	45 tons per hour

–3.04 HEATING ASPHALT

The asphalt shall be heated in insulated tanks so designed that the heating will be uniform throughout the entire mass and be positively controlled at all times. Under no circumstances shall a flame from oil or other fuel be permitted to come in direct contact with the heating kettles. The asphalt circulating system shall be of adequate size to give proper and continuous circulation of asphalt throughout the operating periods. An armored thermometer reading from 200° F. to 400° F. shall be fixed in the asphalt line at a suitable location near the weigh bucket discharge valve.

The asphalt shall be heated to between 250° F. and 350° F.

–3.05 PROPORTIONING

The aggregates shall be proportioned in a weigh box mounted on approved multiple beam or springless dial charging scales, the different sizes of aggregate being weighed into the weigh box one at a time or simultaneously into individual weigh hoppers in the proportions directed by the Engineer.

If no provision is made to weigh the mineral filler in the weigh box with the other aggregates, the proportions of mineral filler and/or collector dust shall be determined on a weight basis and shall be measured separately from the other aggregates. After the exact proportions of mineral filler and collector dust have been determined for one batch, the material or materials may be added to the mixer by volume measurement. After measuring, it may be added to the aggregates either in the weigh box or in the mixer. If added in the mixer, it shall be added at the center of the mixer at the time mixing is started.

The Engineer may order the mineral filler to be added to the aggregates in the weigh box if there is any indication of improper or incomplete mixing of the filler when added directly to the mixer.

The asphalt shall be weighed on separate dial or beam scales limited in capacity to two times the weight of asphalt required for one mixer batch. The graduations on the scales shall be not more than one (1) pound. If a beam scale is used it shall be equipped with a "Tell Tale" dial with graduations of not more than one (1) pound.

The asphalt may also be proportioned by a device which sprays it into the mixer through six or more nozzles, and which weighs or proportions the material for each batch by a positive rotating meter which is calibrated in pounds. The metering device shall have an established background of service and shall be approved by the Engineer.

The number of pounds of each size or grade of aggregates, pounds of mineral filler, and pounds of asphalt to be used in each mixer batch shall be as the Engineer directs. The quantities directed by the Engineer shall be such, however, that the proportions of the different materials will be within the limits hereinbefore specified.

The scales used for weighing aggregate, filler and asphalt shall conform to the requirements of Section 21, entitled "Weighing Equipment." The use of springs to carry part or all of the load in the weighing mechanism for the measuring of aggregate, filler and asphalt will not be permitted. The main weigh box shall be equipped with a discharge gate so arranged that, as the aggregates are discharged into the mixer, the different sizes of aggregates will be blended together uniformly.

Volumetric proportioning may be used instead of weight proportioning as described above.

The equipment to be used shall have an established background of service in accomplishing the required gradation control of aggregates and uniformity of mix, and shall meet with approval of the Engineer. The volumetric proportioning device for the mineral aggregate shall be equipped with accurately controlled, calibrated gates or other satisfactory device for each bin of the various sizes of aggregates and shall be so designed that the flow of aggregates from each bin can be accurately determined and controlled.

The volumetric proportioning device for the asphalt shall be a rotating positive displacement, asphalt metering pump and satisfactory spray nozzle arrangement at the mixer. The driven speed of the pump shall be synchronized with the flow of aggregates from the various bins and the device shall be easily and accurately adjustable to vary the quantity of asphalt delivered to the mixer so that the resulting mixture will be uniform and homogeneous.

–3.06 MIXING

The mixing of the bituminous plant mix shall be done in a mixer of the pugmill type. The mixer shall be in first-class condition and the number, type, arrangement, and speed of rotation of the paddles shall be such as will quickly produce a thoroughly and uniformly mixed material.

The properly proportioned hot aggregate and mineral filler shall be placed in the mixer first. The hot asphalt shall then be added and the mixing commenced. The mixing period, after the hot aggregate has been placed in the mixer, shall be at least thirty (30) seconds, and as much longer as may be necessary to produce a homogeneous mixture of unvarying appearance and texture. Any mixture which shows an excess or deficiency of asphalt, or uneven distribution of it due to insufficient mixing, shall be wasted.

The weight of the batch shall not be greater than the manufacturer's rated capacity of the mixer.

–3.07 HAULING

The bituminous plant mix shall leave the mixing plant at a temperature between 260° F. and 350° F., and when deposited on the road shall have a temperature not lower than 250° F. The exact temperature range, within the above limits, shall be as directed by the Engineer.

After the bituminous plant mix has been mixed as specified, it shall be transported to the place of deposit in suitable dump trucks of sufficient size and design to easily contain the load. When required by the Engineer, each load shall be covered with a suitable tarpaulin to prevent unnecessary loss of heat while in transit. The sides and bottoms of the trucks shall be lubricated with a mixture of water and light oil or diesel oil before receiving a load of mixture. Excess water and oil shall not be left in the bottom of the trucks.

Hauling trucks, which contact the paving machine during the dumping or spreading process at any point other than the pushing rollers on the paving machine, will not be allowed.

The speed and weight of hauling trucks shall be regulated so that, in the opinion of the Engineer, no damage will occur to any portion of the work under way. Any damage to the prime coat or the bituminous mat caused by contractor equipment shall be repaired by the Contractor at his own expense.

–3.08 SPREADING AND FINISHING

Unless otherwise provided in the special provisions, each course of the pavement shall be spread with a mechanical, self-propelled spreading and finishing machine equipped with a hopper or mixture compartment to receive the mixture from the hauling trucks, and a screed or cutoff device that oscillates in a horizontal motion or vibrates vertically when striking off the course or lift under construction.

The spreading machine shall be of a type and design approved by the Engineer. It shall have a runner length or wheel base of at least six feet (6'). It shall be operated in such a manner as to distribute the mixture to proper cross section, width, and thickness without segregation of aggregates.

Paving machines shall be equipped with a removable level on the bar immediately above the crown control. An eight (8) foot steel-shod, wood level board shall be provided with each paving machine.

Where cutoff plates are used on the paving machine, they shall be so constructed and installed as to remain in the exact desired vertical and horizontal position. When cutoff plates dig into the subgrade or mark the base course, the work shall cease immediately and not be resumed until necessary adjustments and repairs have been made.

Where bleeder plates are used in lieu of finisher extensions, they shall be used at and on the side adjacent to the concrete gutter. They shall not be used unless specific permission is granted by the Engineer.

The spreading machine shall place the mixture uniformly dense throughout, smooth, and free from inequalities and irregularities. Any failure of the machine to

produce a smooth and uniform spread of the mixture shall be corrected immediately to the satisfaction of the Engineer.

Small segregated or nonuniform surface areas shall be immediately corrected by hand methods whereby the finer portions of the mix are raked into the segregated areas, and the larger particles raked off and wasted.

The spreading machine shall be capable of placing a uniform layer of bituminous plant mix to the depth shown on the plans or to the depth ordered by the Engineer. The forward motion of the machine shall be so regulated that no irregularities will result in the surface smoothness of the mat due to excessive forward speed, and so that, in the opinion of the Engineer, the forward rate is such as to enable good workmanship on phases of the work immediately following.

Areas which are inaccessible to the spreading and finishing machines may be paved by hand methods, as directed by the Enginer, but hand raking shall be kept to a minimum. The raking must be done carefully and skillfully in such a manner that segregation and back patching will be kept to a minimum.

Workmen shall not be allowed to walk or stand on the finished mixture before it has been rolled. Provisions must be made for breaking up any partially compressed masses of mixture after they are discharged from the truck.

–3.09 COMPACTING

The Contractor will be required to furnish two (2) smooth-wheeled power rollers and one (1) self-propelled pneumatic-tired roller on each project to roll and compact the pavement mixture. The smooth-wheeled rollers shall weight not less than eight (8) tons and may be either of the three-wheeled or tandem type, provided however, that at least one (1) smooth-wheeled roller of the tandem type shall be placed on each project. The compression wheels on all three-wheeled rollers shall each be not less than twenty (20) inches wide, and all rollers shall be so constructed that they will be capable of rolling a true plane.

The self-propelled pneumatic-tired roller shall be multiple wheel two (2) axle roller having a width of not less than five (5) feet and not more than seven and five-tenths (7.5) feet, equipped with pneumatic tires of equal size and diameter, with smooth or "Highway" treads, satisfactory to the Engineer. The tires on the front and rear axles shall be staggered. The air in the tires shall not vary from each other more than five (5) pounds per square inch. The gross weight of the roller shall not be less than four (4) tons nor more than eleven (11) tons, and the weight of the roller shall be within the above limits as ordered by the Engineer to obtain maximum compaction. The angle between the center line of the wheel and the center line of the axle shall be ninety (90) degrees throughout the complete revolution of the wheel and axle.

Additional rollers shall be furnished and operated by the Contractor if, in the opinion of the Engineer, they are necessary to compact the pavement mixture satisfactorily. For small contracts consisting of a total of eight hundred (800) tons of mixture or less, the Contractor will be required to furnish one (1) only smooth-wheeled tandem roller with a minimum weight of eight (8) tons when it is demonstrated to the satisfaction of the Engineer that one roller will handle the work satisfactorily.

All rollers shall be in good condition, and the reversing mechanism so maintained that the roller is capable of changing directions smoothly. The rollers shall be kept in continuous motion while on the hot mat and operated in such a manner that all parts of the pavement receive equal compression. Roller shall be operated by competent and experienced personnel.

All rolling shall proceed as directed by the Engineer, but in general shall be longitudinal, with the drive wheel forward in direction of the paving machine, starting near the edge of the pavement and proceeding toward the center of the roadway, overlapping on successive trips by not less than one-half (½) and not more than three-fourths (¾) the width of the rear wheel of the three-wheeled roller. The initial rolling shall start as closely behind the laying machine as the temperature and condition of the mat will allow. Rolling shall continue until all roller marks are eradicated. Alternate trips of the roller shall be of slightly different lengths.

The motion of the roller shall be slow enough at all times to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected immediately by the use of rakes and fresh mixture when required. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excess water or oil will not be permitted.

Immediately after spreading, each course of the pavement mixture shall be compacted by rolling. The initial, or "breakdown" rolling shall be accomplished with either type of smooth-wheeled roller. The pneumatic-tired roller shall be used to knead and compact the pavement mixture following the initial rolling and preceding the final rolling. Care shall be exercised in the use of the pneumatic-tired roller to ensure that the pavement mixture is sufficiently cooled to avoid "picking up" of the mixture on the tires of the roller, and also to ensure that the pneumatic-tired rolling is completed before the mixture becomes too cool to allow satisfactory finish rolling. Final, or finish rolling, shall be done with a tandem-type smooth wheeled roller.

The surface of the mixture, after compaction, shall be smooth and true to section and grade. Any mixture which shows an excess or deficiency of asphalt or uneven distribution of asphalt due to insufficient mixing, or which becomes loose, broken, raveled, mixed with dirt, or is in any way defective, shall be removed and be replaced with fresh hot mixture and be immediately compacted to conform with the surrounding area at the Contractor's expense.

Areas of one square foot or more showing an excess or deficiency of asphalt, or any part of the finished pavement which, in the opinion of the Engineer, is faulty because of poor workmanship or defective materials shall be removed and replaced with fresh hot mixture at the expense of the Contractor.

Areas inaccessible to the rollers shall be compacted by tamping with mechanical or hand tampers.

–3.10 PRELEVELING FOR BITUMINOUS PLANT MIX

Preleveling of uneven or broken surfaces over which bituminous plant mix is to be placed may be required by the Engineer, and if required may be accomplished by the use of plant mix placed with a motor patrol grader, a paving machine, by hand raking, or by a combination of these methods, as directed by the Engineer.

The unit contract price per ton for "Bituminous Plant Mix," shall be full compensation for all costs involved in furnishing all labor, material, tools, and equipment necessary in preleveling the surface as specified.

–3.11 CONSTRUCTION OF COURSES

The bituminous plant mix pavement shall be constructed in one or more courses as shown on the plans, or as required in the special provisions.

Where more than one course is specified, the first course shall include widening of the existing pavement (if specified) and leveling up of all irregularities in the surface of the existing pavement or foundation as described in Section 33-3.10. The leveling shall be to such elevations that when a uniform wearing surface is placed upon it, the finished pavement will conform to the grade and cross section shown on the plans.

Longitudinal joints in the leveling and wearing courses shall be offset a minimum of six (6) inches, so that one joint is not directly above the other. In construction of two-lane pavement, the longitudinal joint shall be offset in such a manner that the longitudinal joint in the wearing course will coincide with the center line of the pavement.

The depth of courses shall be as shown on the plans, or as stated in the special provisions. In general, no course shall be laid to a depth greater than two and one-half (2½) inches. When the required depth exceeds that thickness the mat shall be constructed in two or more courses.

A motor patrol grader may be used to spread the first course for widening an existing pavement, where the widened strip does not exceed six (6) feet in width, but mechanical spreaders of approved design shall be used to spread all other courses, except for inaccessible small areas, as described in Section 33-3.08.

–3.12 JOINTS

The placing of the top or wearing course shall be as nearly continuous as possible.

In placing the top or wearing course, the work shall be scheduled in a manner as to provide for full width pavement at the conclusion of the day's work. Where this is beyond the control of the Contractor, he shall barricade and protect all cold longitudinal joints until work is resumed again. Heavy building paper shall be placed wherever cold transverse joints are necessary, or as the Engineer may direct. Upon resuming work, the paper and asphalt thereon shall be removed and the joint neatly trimmed to a straight and vertical face. Before placing mixture against them, contact surfaces of cold longitudinal or transverse joints, castings, curbs and concrete gutters shall be painted with a thin and uniform coating of cutback asphalt or with SS-1 emulsified asphalt.

Immediately following the completion of the top or wearing course, all joints where the asphalt concrete meets existing asphalt concrete pavements, portland cement concrete pavements, oil mats, concrete curb, concrete gutter, etc., shall be painted with a cutback asphalt cement or an SS-1 emulsified asphalt as described in Section 33-3.02, and shall immediately be covered with clean dry sand. The painted strip shall be directly over the joint and shall not extend more than one and one-half (1½) inches on either side of the joint. No painting shall be performed when the pavement is wet or damp.

–3.13 ADJUSTMENT OF EXISTING CASTINGS TO FINISH GRADE

This work shall consist of the adjustment of all castings, such as manhole frame and covers, catch basin frame and covers, frames and covers for various types of gate valves, etc., to conform with the finished grade of the new asphalt concrete pavement. The adjustment of these various appurtenances to underground facilities shall not be performed until the top or wearing course has been completed. The adjustment of these facilities shall be so scheduled as to minimize the interference with traffic. The work involved in these adjustments and method of compensation shall be in accordance with requirements contained in Section 53, entitled "Adjustment of New and Existing Utility Structures to Finish Grade."

–3.14 SURFACE SMOOTHNESS

The finished surface of the top or wearing course shall be of uniform texture, smooth, true to crown and grade, and free from defects of all kinds. The finished surface shall not vary more than one-eighth (⅛) inch from the lower edge of a ten (10) foot straightedge placed on the surface parallel to the center line, excepting at intersections where, in the opinion of the Engineer, this may be impracticable. No portion of the finished pavement shall vary more than one-fourth (¼) inch from a template cut to exact section shown on the plans or as staked by the Engineer, when placed at right angles to the center line on the finished surface.

When deviations in excess of the above tolerances are found, the surface shall be corrected by the addition of asphalt mixture to low places or the removal of material from high places, followed by further rolling. This shall be done as soon after the first rolling as possible and before the pavement mixture becomes chilled. Correction of defects shall be performed until there are no deviations anywhere greater than the allowable tolerances.

–3.15 HEATER-PLANING BITUMINOUS PAVEMENT

–3.15A General

Where shown on the plans or where directed by the Engineer, the existing bituminous pavement shall be planed in accordance with the specifications that follow.

This item shall consist of planing or shaving the surface irregularities from the existing bituminous pavement to produce a smooth surface by means of equipment hereinafter specified. The finished surface shall be free from gouges, grooves, ridges and other imperfections of workmanship.

The temperature at which the work is performed, the nature and condition of the equipment, and the manner of performing the work shall be such that the pavement will not be torn, broken, burned or otherwise injured by the planing operation.

All cuttings or other debris resulting from the heater-planing operations shall be disposed of by the Contractor to the satisfaction of the Engineer. Unless otherwise provided, the Contractor shall provide his own site for disposal of these waste materials and no additional compensation will be made therefor.

–3.15B Equipment

The planing shall be performed with a pavement planing machine of a type that has operated efficiently on work comparable with that to be done under the contract.

The machine shall have a furnace for heating the pavement, the heat developer to be controlled from the operator's station. It shall have a blade for cutting the high spots from the pavement, the blade to be controlled from the operator's station so that the proper depth of cut may be maintained at all times. The position of the blade shall be such that the cuttings will be delivered in a single windrow. The planing operation shall be performed continuously by the forward motion of the machine. The width of heating and cutting shall be not less than four (4) feet, and the effective wheel base of the machine be not less than eighteen (18) feet.

–3.16 MISCELLANEOUS DETAILS OF CONSTRUCTION

Unless otherwise directed by the Engineer, the construction of each course of plant mix pavement shall commence at the point farthest away from the mixing plant and shall progress toward the plant so that no hauling will be done over freshly placed pavement.

Construction of one course or lift upon another shall not proceed until the preceding course or lift has completely cooled and set.

Bituminous plant mix shall not be deposited on the road if the rolling cannot be completed before darkness. The placing of asphalt plant mixture at night will not be permitted unless otherwise provided for in the special provisions.

No traffic other than that necessary for construction purposes shall be allowed on any course of the pavement until the course has completely cooled and set.

–3.17 SAMPLES

When called upon to do so, the Contractor shall, without charge, provide the Engineer with test samples of bituminous plant mix cut from the completed pavement or the individual courses thereof. He shall also, when requested, provide the Engineer with test samples of the uncompressed asphalt concrete mixtures, and of any of the materials incorporated in the work.

–3.18 FINISHING AND CLEANUP

Finishing and cleanup shall be performed as specified in sections 4.08 and 57.

–3.19 UNFAVORABLE WEATHER

Asphalt for "Prime Coat" shall not be applied when the atmospheric temperature is lower than fifty (50) degrees F. except by permission of the Engineer.

Bituminous plant mix shall not be placed when the air temperature is lower than forty (40) degrees F., during rain storms, rainy weather, or when the subgrade is wet or frozen except by permission of the Engineer. All bituminous work shall be performed during clearing or fair weather.

–3.20 MAINTENANCE OF TRAFFIC AND TRAFFIC SIGNS

The maintenance of traffic and the handling and care of traffic signs shall meet requirements outlined in Section 7.15 entitled "Maintenance of Traffic."

–3.21 ORGANIZATION AND EQUIPMENT

All work under the contract shall be performed under the continuous supervision of competent personnel thoroughly experienced in the class of work specified.

Incompetent, careless or negligent employees or agents shall be forthwith discharged by the Contractor upon written request of the Engineer, and failure to comply with such request shall be sufficient grounds for suspending the work pending compliance, or for termination of the contract.

All machinery and equipment shall be adequate for the purpose used, and shall be kept in good workable condition and be operated by experienced operators.

33-4 MEASUREMENT AND PAYMENT

Payment will be made for such of the following bid items as are included and shown in any particular contract:

1. "Preparation of Untreated Roadway," per square yard, per mile, or per lump sum.
2. "Asphalt (grade) Prime Coat," per ton.
3. "Prime Coat Aggregate," per cubic yard, or per ton.
4. "Asphalt for Tack Coat," per ton.
5. "Bituminous Plant Mix," per ton.
6. "Mineral Aggregate (size) in Stockpile," per ton.
7. "Blending Sand," per cubic yard.
8. "Water," per M gallon.
9. "Finishing and Cleanup," per lump sum, or per station (100').
10. "Remove (type) Pavement (class)," per square yard.
11. "Chipping Existing Asphalt Surface," per square yard.

–4.01 PREPARATION OF UNTREATED ROADWAY

Measurement will be made to the nearest one-hundredth (0.01) mile, or to the nearest ten (10) square yards, as the bid unit may apply.

The unit price per square yard, per mile, or per lump sum for "Preparation of Untreated Roadway" shall be full compensation for all labor, tools, and equipment to do the work described under Section 33-3.01B with the exception, however, that all costs involved in labor, materials, and equipment for patching the roadway prior to placement of bituminous plant mix shall be included in the unit contract price per ton for "Bituminous Plant Mix," or other pay items of the contract.

–4.02 ASPHALT PRIME COAT

The unit contract price per ton for "Asphalt (grade) Prime Coat" shall be full compensation for furnishing and applying the asphalt, including heating, hauling, and applying to the roadway, and other incidental work to accomplish the requirements described in Section 33-3.01B. The quantity of asphalt shall be determined as described in Section 27-1.01K.

–4.03 PRIME COAT AGGREGATE

The unit contract price per cubic yard for "Prime Coat Aggregate" shall be full compensation for loading and hauling aggregate from stockpiles or other designated sources to the place of deposit, spreading the mineral aggregate in the quantities required by the Engineer, and cleaning up the stockpile site.

Prime coat aggregate, unless otherwise specified in the special provisions shall conform to the requirements of Section 32-2.02 for crushed cover stone, or of Section 33-2.02 for mineral aggregate ¼" - 0.

The quantity of prime coat aggregate to be paid for shall be the quantity actually loaded, hauled, and used in construction of the prime coat.

Measurement will be made by the cubic yard at the point of delivery on the roadway. The volume shall be the "strike off" capacity of the truck body.

–4.04 ASPHALT FOR TACK COAT

The unit contract price per ton for "Asphalt for Tack Coat" shall be full compensation for all costs of material, labor, tools, and equipment necessary for the application of the tack coat as specified. Water added to emulsion will not be paid for as emulsified asphalt. The pay quantity shall be the amount of undiluted emulsion used as tack coat.

–4.05 BITUMINOUS PLANT MIX

The unit contract price per ton for "Bituminous Plant Mix" shall be full compensation for furnishing all labor, equipment, materials, and supplies required in the construction of the bituminous plant mix surface, complete in place, including the preparation of any existing cement concrete, brick, or bituminous pavement, and all other work incidental to fulfilling the requirements described in Section 33-3 and not set forth as bid items of any particular contract.

In event the Contractor is required to furnish the mineral aggregate, all costs of furnishing, hauling, and processing mineral aggregates and blending sand into the complete mix shall be included in the unit contract price per ton for "Bituminous Plant Mix," except that blending sand when set up as a bid item will be paid for in the manner hereinafter described.

If any of the mineral aggregates are furnished in stockpile by the Owner, the cost of hauling and incorporating those mineral aggregates in the mix, and all costs of furnishing, hauling, and incorporating the necessary blending sand, and any additional mineral aggregate shall be included in the unit contract price per ton for "Bituminous Plant Mix," excepting however, blending sand when set up as a bid item will be paid for in the manner hereinafter described.

–4.06 MINERAL AGGREGATES IN STOCKPILE

The unit contract price per ton for "Mineral Aggregate (size) in Stockpile" shall be full compensation for all costs in connection with the preparation of the stockpile site, the quarry, crushing, screening, washing, cleaning, loading, hauling, and placing of the mineral aggregate in stockpiles as sites designated in the plans or special provisions, and for all other expenses incidental thereto, excepting however, that clearing, grubbing, and stripping of quarries or pits made available to the Contractor by the Owner for the manufacture of mineral aggregate will be paid under the provisions of sections 12 and 13.

–4.07 BLENDING SAND

The unit contract price per cubic yard for "Blending Sand" shall be full compensation for all costs in connection with the furnishing, hauling, and incorporating blending sand in the mixed aggregate, as required by the Engineer. Unless otherwise specified, measurement will be by the cubic yard in trucks at the plant.

If there is a bid item for blending sand and the Contractor elects to provide mineral aggregates from a source other than that provided by the Owner, and if it becomes necessary in the opinion of the Engineer to use blending sand for proper grading of the aggregates, then in that event the Contractor shall furnish and incorporate sufficient quantities of blending sand to meet the requirements as determined by the Engineer. The pay quantity will be the amount actually used up to, but not exceeding the quantity set up in the contract. If there is no bid item for blending sand and the Contractor furnishes mineral aggregates from a source other than that provided by the Owner, whatever amount of blending sand as may be needed to meet the requirements as determined by the Engineer, shall be furnished by the Contractor at his own expense.

–4.08 WATER

Water will be measured by the M gallons and be paid for as provided in Section 16.

–4.09 FINISHING AND CLEANUP

Cleanup shall be paid for by the Lump Sum, or per station (100'). The unit contract price shown in the proposal shall be full compensation for all costs incurred by the Contractor in performing the cleanup in accordance with the plans and specifications in Section 57, and directions of the Engineer.

–4.10 REMOVING EXISTING PAVEMENT

The unit contract per square yard for "Remove (type) Pavement (class)" shall be full compensation for removing the existing pavement and disposing of it as specified.

–4.11 CHIPPING EXISTING ASPHALT SURFACE

The unit contract price per square yard for "Chipping Existing Asphalt Surface," shall be full compensation for removing and disposing of material as specified in Section 33-3.02.

–4.12 INCIDENTAL WORK

Any incidental work required to complete the bituminous plant mix pavement specified herein, but which is not specifically mentioned in the foregoing specifications of Section 33, shall be performed by the Contractor and shall be considered as incidental to the construction, and all costs therefor shall be included in the unit contract prices of the bid items.

Section 34—Asphalt Concrete Pavement

34-1 DESCRIPTION

These specifications shall apply to pavements and wearing surfaces consisting of one or more courses of asphalt concrete. The number of courses and the cross section of each course for any project shall be as indicated on the plans.

Asphalt concrete shall be composed of asphalt and mineral aggregate which, with or without the addition of mineral filler and blending sand as may be required, shall be mixed in the proportions hereinafter specified to provide a homogeneous and workable mixture.

The various mineral materials may be furnished in whole or partial amounts by the Owner for the manufacture of asphalt concrete, when the special provisions so provide; otherwise the Contractor shall furnish them. In the event any of these mineral materials are not provided by the Owner, it shall be understood that the Contractor will furnish mineral materials in the amounts required for the designated mix without compensation other than as covered by the bid items in the contract. Mineral materials shall include coarse and fine mineral aggregates, mineral filler and blending sand.

Asphalt concrete surfaces shall be so constructed that the finished pavement will conform to the cross section, line and grade shown on the plans and will also have acceptable riding surface and non-skid qualities.

34-2 MATERIALS

–2.01 ASPHALT

The particular asphalt materials to be used on any project shall be 85-100 penetration unless otherwise provided for in the special provisions or on the plans. Asphalt of the grade or grades specified shall comply with all the requirements set forth in Section 27, entitled "Bituminous Materials."

–2.02 MINERAL AGGREGATE

–2.02A General Requirements

The material from which mineral aggregate for asphalt concrete is manufactured shall meet the following test requirements:

Los Angeles Wear (ASTM Designation C 131) 500 Rev. 40% Max.

Mineral aggregate for asphalt concrete shall be manufactured from ledge rock, talus, or gravel in accordance with the provisions of Section 22. It shall be uniform in quality, substanially free from wood, roots, bark, or other extraneous materials, and free from adherent coatings. The presence of a thin, firmly adhering film of weathered rock will not be considered as coating unless it exists on more than fifty (50) percent of the surface area of any size between consecutive laboratory sieves.

Mineral aggregate removed from deposits contaminated with various types of wood waste shall be washed, processed, selected or otherwise treated to remove as much of the wood waste as possible from the finished product. The Engineer may require the material to be washed if, in his judgment, an undue amount of wood contamination will otherwise be present in the finished product.

Mineral aggregate retained on a ¼-inch square sieve will be considered free from wood waste if the oven-dried aggregate does not contain more than 0.1% by weight of material with a specific gravity less than 1.0.

Mineral aggregate passing a U. S. No. 10 sieve shall not have wood waste that will result in more than 250 parts per million of organic matter by colorimetric tests when tested in accordance with Section 39-2.02B1, except that the color shall be measured after the sample has been in test solution one hour.

–2.02B Test Requirements

Mineral aggregate for asphalt concrete shall meet the following test requirements:

Fracture (each size, coarser than U. S. No. 10) 75% Min.

Sand-equivalent (Section 6), 45 Min.

When mineral aggregate is combined within the limits set forth under Section 34-2.03 and mixed with the grade and amount of asphalt cement recommended by the Engineer, it shall meet the following requirements:

Stabilometer value (Section 6), 30 Min.

Cohesiometer value (Section 6), 100 Min.

Modified immersion compression (M.I.C.) test (Section 6), % Retained Strength, 70 Min.

–2.02C Grading of Mineral Aggregate

Mineral aggregate for Class A or Class B asphalt shall be produced or furnished in the following sizes as they apply to the class of asphalt concrete to be produced: 1¼" to ¼", ⅜" to ¼", and ¼" to 0. Each size shall be stockpiled separately regardless of whether it is being produced for future work on other contracts or for immediate use.

Stockpiles for Future Use

The various sizes of mineral aggregate to be stockpiled for future use on other contracts shall be graded as follows:

Size designation 1¼" to ¼" for Class A (quantity required equals approximately 50% of total mineral aggregate).

%	Passing 1¼" sieve (square opening)	100
%	" 1 " " " "	85-100
%	" ⅜" " " "	45- 70
%	" ¼" " " "	0- 25

Size designation ⅜" to ¼" for Class B (quantity required equals approximately 35% of total mineral aggregate).

%	Passing ⅜" sieve (square opening)	100
%	" ½" " " "	75-100
%	" ¼" " " "	0- 25

Size designation ¼" to 0 for all classes (quantity required equals approximately 50% of total aggregate for Class A, 65% for Class B, and 100% for Class C).

%	Passing ½" sieve (square opening)	100
%	" ¼" " " "	75-100
%	Passing U. S. No. 10 sieve (square opening)	50- 75
%	Passing U. S. No. 200 sieve (square opening)	3- 12

Stockpiles for Immediate Use

Whenever the materials are to be stockpiled by the Contractor for use in the immediate work, he shall furnish the Engineer with representative samples of the manufactured material as soon as production is under way, and he shall also furnish samples of available blending sand, thus to determine whether the materials produced, when combined with blending sand if need be, will meet the grading and fracture requirements for the completed mix. Thereafter, other samples shall be furnished during the plant operations as may be required by the Engineer.

Materials stockpiled for immediate use shall meet the following requirements for grading:

Size Designation 1¼" to ¼" (for Class A).

% Passing 1¼" sieve (square opening)....	100
% " 1 " " " "	85-100
% " ⅝" " " "	45- 70
% " ¼" " " "	0- 25

Size Designation ⅝" to ¼" (for Class B).

% Passing ⅝" sieve (square opening)....	100
% " ½" " " "	75-100
% " ¼" " " "	0- 25

Size Designation ¼" to 0 (for classes A, B and C).

% Passing ½" sieve (square opening)....	100
% " ¼" " " "	70-100
% " U. S. No. 10 sieve.....	40- 75
% " U. S. No. 200 sieve.....	2- 12

The Contractor shall so control the separation and stockpiling of coarse and fine mineral aggregate that the quantity of material passing the ¼" sieve in the coarse aggregate (1¼" to ¼" and ⅝" to ¼") will not vary more than 10% throughout the entire stockpile.

The material in each separate stockpile, including mineral aggregate ¼"-0 (but not including sand), shall meet the test requirements in the first paragraph of Section 34-2.02B.

The grading of the stockpiled materials shall be such that when they are recombined in appropriate proportions, along with blending sand if necessary, the completed mixture will meet all pertinent requirements of Section 34-2.03. It shall be the responsibility of the Contractor to furnish such blending sand as may be required to bring the completed mix within the above prescribed gradation limits.

–2.02D Mineral Filler

Mineral filler shall be portland cement or commercially ground stone dust, and shall be approved by the Engineer. It shall be free of lumps and extraneous material and shall meet the following requirements:

Passing U. S. No. 10 sieve.....	100%
Passing U. S. No. 200 sieve, not less than.....	75%
Particles smaller than .025 mm., not less than..	50%
Particles smaller than .005 mm., not more than	35%
Plasticity index, ASTM Designation D 424, not more than	2
Specific gravity, not less than.....	2.50

The determination of percentage of particles smaller than .025 mm. and .005 mm. shall be by means of the hydrometer method, ASTM Designation D 422.

–2.02E Blending Sand

In the production of mineral aggregates for asphalt concrete there is often a deficiency of material passing the U. S. No. 40 sieve. When this occurs, blending sand in sufficient amount to make up the deficiency shall be provided by the Contractor.

Blending sand shall be clean, hard, sound material, either naturally occurring sand or crusher fines, and must be capable of being readily coated with asphalt cement. Although the exact grading requirements for the material will vary, depending upon the grading of the mineral aggregate with which it is to be mixed, it must meet the following general grading requirements:

Passing U. S. No. 40 sieve, not less than.....	85%
Passing U. S. No. 200 sieve (wet sieving), not more than	25%
Sand equivalent, minimum.....	40

Blending sand must be tested by the Engineer before it will be approved for use.

If the project carries a bid item for blending sand and the Contractor elects to provide mineral aggregates from sources other than those provided by the Owner, the Contractor will be compensated for the actual quantity of blending sand used, but not to exceed the quantity set forth in the contract.

–2.03 PROPORTIONS OF MATERIALS

The materials of which asphalt concrete is composed shall be of such sizes and gradings that, when proportioned and mixed together, they will produce a uniformly graded mixture which will conform to the requirements given in the table which follows.

The percentages of aggregate include mineral filler, when used, and refer to the complete dry mix. The percentages of asphalt refer to the complete asphalt concrete mixture. All percentages are by weight.

GRADING AND ASPHALT CEMENT PERCENTAGES

Percentages by Weight Passing Sieves

	Class A	Class B	Class C
1¼" Sieve (square opening)..	100	.....	.....
1 " Sieve (square opening)..	90-100	.....	.....
⅝" Sieve (square opening)..	67- 86	100	.....
½" Sieve (square opening)..	60- 80	90-100	100
¼" Sieve (square opening)..	40- 62	55- 75	85-100
U. S. No. 10 Sieve.....	25- 40	32- 48	50- 75
U. S. No. 40 Sieve.....	10- 23	11- 24	20- 40
U. S. No. 80 Sieve.....	6- 14	6- 15	8- 23
U. S. No. 200 Sieve.....	2- 7	2- 8	3- 11
Mineral filler (wearing courses only)	.....	1.0-2.0	1.0-2.0
Asphalt cement % of total mixture	3.5- 7	4.5-7.5	5- 10

Aggregate gradings within the above ranges shall be such that there will be a minimum of 3% of the total aggregate retained between any successive pair of sieves finer than the U. S. No. 10. The gradings shall be of such uniformity that the fractions of aggregate passing the ¼" and No. 10 sieves during the run of any day will conform to the following limitations:

Maximum variation in percentage of material passing ¼" sieve.....	10
Maximum variation in percentage of material passing U. S. No. 10 sieve.....	8

The exact proportions of the several constituents to be used in the production of the bituminous mixture shall be determined by the Engineer within the above limits to provide a pavement having stabilometer and cohesiometer values and surface texture satisfactory to the Engineer. The proportions so fixed shall be changed only by his order.

When mineral aggregates or a source for the production of mineral aggregates is provided by the Owner, the approximate percentage of asphalt required in the mixture for the particular class of pavement will be noted in the special provisions under the heading "Asphalt Concrete Pavement Asphalt Content." The percentage shown under this heading shall be considered as informational and tentative only and the actual quantity of asphalt used shall be such a percentage as will meet the requirements for the mixture as set forth in these specifications.

No claim for additional compensation will be allowed in event the percentage of asphalt required in the mixture is greater than that indicated under the heading "Asphalt Concrete Pavement Asphalt Content."

If the total amount of asphalt used on the entire project, exclusive of waste, is greater than the amount computed from the maximum percentage in the foregoing table, the Owner will reimburse the Contractor for the cost of the extra asphalt, based on invoices by the supplier.

In taking mineral aggregates from stockpiles, the Contractor shall use only the amount of material required by these specifications, loading it in a manner to avoid separation of sizes or the admixture of any dirt or foreign material. The Contractor shall clean up the remainder of the stockpile, leaving it in a uniform and compact pile with a minimum of waste.

–2.04 STOCKPILING MINERAL AGGREGATES

Preparation of stockpile site, the stockpiling of mineral aggregates and the removal of the materials from stockpiles shall conform to the requirements of the specifications for stockpiling surfacing materials in Section 23-3.01.

34-3 CONSTRUCTION DETAILS

–3.01 PREPARATION OF BASE OR SUBGRADE

–3.01A Preparation of Asphalt, Concrete or Brick Surfaces

Before placing asphalt concrete on an existing pavement, all fatty asphalt patches, grease drippings, and other objectionable matter shall be entirely removed from the existing pavement. All joint filler material which protrudes above the surface of the existing pavement shall be removed flush thereto. All types of existing pavement or bituminous surface shall be thoroughly cleaned by sweeping and flushing to remove dust and other foreign matter. Unless otherwise provided for in the special provisions, the Owner will perform any necessary flushing at no cost to the Contractor, provided the need for flushing is not the result of the Contractor's operations, in which case the Owner will make a charge for such work.

A tack coat of asphalt applied at the rate of .02 to .05 gallon per square yard of retained asphalt shall be applied uniformly to all surfaces on which any course of asphalt concrete is to be placed, including the first or leveling course of asphalt concrete, unless its omission is specifically directed by the Engineer.

The tack coat may be heated cutback asphalt consisting of fifty percent (50%) paving grade asphalt and fifty percent (50%) gasoline thoroughly mixed, or emulsified asphalt, mixing grade. The emulsified asphalt may be mixed with water at the rate of from one (1) to two (2) parts water to one (1) part of emulsified asphalt as directed by the Engineer. The emulsified asphalt shall be Type SS-1 and comply with the requirements of Section 27.

When asphalt concrete pavement is to be constructed over an existing paved or oiled surface, in addition to the preparation as outlined hereinbefore, all holes and small depressions shall be filled with an appropriate class of asphalt concrete mix by hand shoveling. The surface of the patched area shall then be leveled by raking and the patch thoroughly rolled with an eight (8) ton power roller, or a two (2) axle power patching roller. All patching shall be as directed by the Engineer.

–3.01B Preparation of Untreated Roadway

The subgrade upon which the asphalt concrete is to be placed shall be constructed to conform with typical roadway sections shown on the construction plans and in conformance with requirements in Section 15, "Subgrade."

Where required in the special provisions, the roadway shall be primed as provided under Section 32, entitled "Bituminous Surface Treatment," except that one only application of asphalt and one application of prime coat aggregate will be required.

–3.01C Removing Existing Pavement

Where shown on the plans or where designated by the Engineer, the existing pavement of the type shown on the plans shall be broken up, loaded, hauled, and disposed of in accordance with requirements outlined in Section 52, "Removal of Existing Street Improvements."

–3.02 CONNECTIONS WITH EXISTING FACILITIES

Where the bituminous pavement is to be connected with an existing roadway surface, bridge, railway crossing or other facility, the Contractor will be required, under direction of the Engineer, to modify the existing roadway profile in such a manner as to produce a smooth riding connection to the existing facility.

Where it is necessary to remove existing asphalt surfaces or oil mat surfaces to provide proper meet lines and riding surfaces, the Contractor shall burn or chip the existing surface so that there will be sufficient depth to provide a minimum of one (1) inch of asphalt concrete, and the waste material shall be disposed of to the satisfaction of the Engineer. Prior to placing the asphalt concrete, these areas shall be tacked in accordance with requirements previously described in Section 34-3.01A. Meet lines shall be straight and the edges be vertical. The edges of meet line cuts shall be painted with diluted cutback asphalt or SS-1 emulsion prior to placing asphalt concrete. After placing the asphalt concrete, the meet line shall be sealed by painting with a cutback asphalt or SS-1 emulsion and immediately covered with clean dry sand. Chipping or burning will be paid for at the unit contract price per square yard for "Chipping Existing Asphalt Surface."

Where it is required to remove sections of existing pavements such as portland cement concrete, cobblestone, brick and other rigid type, the removal shall be performed and paid for as described in Section 52, "Removal of Existing Street Improvements."

–3.03 PREPARATION AND HEATING AGGREGATES

For control of the cold aggregates before they are fed onto the cold stone belt or elevator, each size designation or grading separation of the cold aggregates, as well as blending sand, shall be fed onto the cold stone belt or elevator by separate mechanical feeders of the plate, vibratory, or continuous belt types. A mechanical feeder may have one or more vertical divider plates for feeding two (2) or more size designations through a single feeder if the feeder is equipped with individual gates that can be operated separately for each aggregate size.

Partition walls or other means shall be provided for keeping the various grades of cold aggregates from becoming mixed in the stockpile.

The aggregates, exclusive of mineral filler, shall be heated to a temperature between 260 and 350 degrees F., and immediately thereafter shall be separated into three (3) sizes or grades for classes A and B, and two (2) sizes or grades for Class C asphalt concrete. At least one of the above sizes or grades shall be aggregate containing material passing the U. S. No. 10 sieve. Aggregate coarser than the U. S. No. 10 shall be separated as may be necessary to produce the specified mixture between such limits as may be necessary to produce the mixture specified, under direction of the Engineer.

The screening mechanism of the plant shall be of the vibrator or shaker type. The screens and storage bins shall be protected from the weather by adequate enclosures and shall be of sufficient capacity to furnish the necessary amounts of all aggregates, when operating at the maximum rated capacity of the plant, with no undue delay for material. Each screen shall be of adequate size so that the aggregates in each bin will be separated within the limits set forth in these specifications.

Heating and drying of the aggregates shall be done in a suitably designed rotary drier. The drier shall be capable of preparing aggregates to specifications requirements at a rate equal to the maximum rated capacity of the plant.

The plant shall be equipped with an adequate exhaust system, including an exhaust fan and dust collector. The exhaust system shall be so constructed as to furnish adequate draft through the drier and the screen and bin enclosures to eliminate leakage of dust and smoke. The dust collector shall be capable of collecting fine material passing through the exhaust system and wasting or returning the material collected to the plant.

The plant shall be equipped with an approved dial scale mercury actuated thermometer, an electric pyrometer or other approved thermometric instrument so placed at the discharge chute of the drier as to register the temperature of the heated aggregates automatically. This device shall be in full view of the drum fireman or the head feeder.

The right is reserved for the Engineer to pass upon the efficiency of the above instruments, and for better regulation of temperature of the aggregates he may direct the replacement of the instrument by some approved temperature recording apparatus and may further require daily charts of the regulator to be filed with the Engineer.

Each size or grade of the heated aggregate shall be deposited in a separate bin. Each bin shall be provided with an overflow pipe of sufficient net opening so placed as to prevent the overflow from one bin into another.

Should the material in the coarse aggregate bin contain twenty (20) percent or in any other bin ten (10) percent or more of material which is undersize or oversize, the bin shall be drawn and the material rescreened.

Segregation of fine aggregate passing the U. S. No 10 sieve shall be prevented by collecting and conveying it to the center of the bin. The bin for this material shall be equipped with two aprons fastened to opposite sides of the bin, at the upper edges. The aprons shall be at right angles to the center line of the screen and shall slope downward toward the center line of the bin at an angle of approximately forty-five degrees (45°). An opening on the center line of the bin of from four (4) to six (6) inches shall be left between the lower edges of the aprons.

–3.03A Operation of Asphalt Plant

When the asphalt plant is erected at a site for the primary purpose of producing mixtures for a project, dust and smoke from the asphalt plant shall be eliminated to the extent that they will cause no inconvenience to property owners in the area or damage to their property. The Contractor will be required to install a satisfactory precipitation device or use such other methods as may be necessary to control the dust and smoke to the satisfaction of the Engineer.

All costs in connection with this shall be considered as incidental to the construction and shall be included in the unit contract price per ton for "Asphalt Concrete."

–3.03B Plant Capacity

On projects involving production of asphalt concrete or bituminous plant mix, the asphalt plant shall have a minimum capacity rating by the manufacturer as shown in the following table:

For projects involving 3,000 tons or more:	
Batch-type plants	2,000 pounds per batch
Continuous mix-type plants	90 tons per hour
For projects involving less than 3,000 tons:	
Batch-type plants	1,000 pounds per batch
Continuous mix-type plants	45 tons per hour

–3.04 HEATING ASPHALT

The asphalt shall be heated in insulated tanks so designed that the heating will be uniform throughout the entire mass and be positively controlled at all times. Under no circumstances shall a flame from oil or other fuel be permitted to come in direct contact with the heating kettles. The asphalt circulating system shall be of adequate size to give proper and continuous circulation of asphalt throughout the operating periods. An armored thermometer, reading from 200° F. to 400° F., shall be fixed in the asphalt line at a suitable location near the weigh bucket discharge vaive.

The asphalt shall be heated between 250° F. and 350° F.

–3.05 PROPORTIONING

The aggregates shall be proportioned in a weigh box mounted on approved multiple beam or springless dial charging scales, the different sizes of aggregate being weighed into the weigh box one at a time or simultaneously into individual weigh hoppers, in the proportions directed by the Engineer.

If no provision is made to weigh the mineral filler in the weigh box with the other aggregates, the proportions of mineral filler and/or collector dust shall be determined on a weight basis and shall be measured separately from the other aggregates. After the exact proportions of mineral filler and collector dust have been determined for one batch, the material or materials may be added to the mixer by volume measurement. After measuring, it may be added to the aggregates either in the weigh box or in the mixer. If added in the mixer, it shall be added at the center of the mixer at the time mixing is started.

The Engineer may order the mineral filler to be added to the aggregates in the weigh box if there is any indication of improper or incomplete mixing of the filler when added directly to the mixer.

The asphalt shall be weighed on separate dial or beam scales limited in capacity to two times the weight of asphalt required for one mixer batch. The graduations on the scales shall be not more than one (1) pound. If a beam scale is used it shall be equipped with a "Tell Tale" dial with graduations of not more than one (1) pound.

The asphalt may also be proportioned by a device which sprays the asphalt into the mixer through six or more nozzles, and which weighs or proportions the material for each batch by a positive rotating meter which is calibrated in pounds. The metering device shall have an established background of service and shall be approved by the Engineer.

The number of pounds of each size or grade of aggregates, pounds of mineral filler, and pounds of asphalt to be used in each mixer batch shall be as the Engineer directs. The quantities directed by the Engineer shall be such, however, that the proportions of the different materials will be within the limits hereinbefore specified.

The scales used for weighing aggregate, filler and asphalt shall conform to the requirements of Section 21, "Weighing Equipment." The use of springs to carry part or all of the load in the weighing mechanism for the measuring of aggregate, filler and asphalt will not be permitted. The main weigh box shall be equipped with a discharge gate so that, as the aggregates are discharged into the mixer, the different sizes of aggregates will be blended together uniformly.

Volumetric proportioning may be used instead of weight proportioning as described above. The equipment to be used shall have an established background of service in accomplishing the required gradation control of aggregates and uniformity of mix, and shall meet with approval of the Engineer. The volumetric proportioning device for the mineral aggregate shall be equipped with accurately controlled, calibrated gates or other satisfactory device for each bin of the various sizes of aggregates and be so designed that the flow of aggregates from each bin can be accurately determined and controlled.

The volumetric proportioning device for the asphalt shall be a rotating, positive displacement, asphalt metering pump and satisfactory spray nozzle arrangement at the mixer. The driven speed of the pump shall be synchronized with the flow of aggregates from the various bins and the device shall be easily and accurately adjustable to vary the quantity of asphalt delivered to the mixer so that the resulting mixture will be uniform and homogeneous.

–3.06 MIXING

The mixing of the asphalt concrete shall be done in a mixer of the pugmill type. The mixer shall be in first-class condition, and the number, type, arrangement and speed of rotation of the paddles shall be such as will quickly produce thoroughly and uniformly mixed asphalt concrete.

The properly proportioned hot aggregate and mineral filler shall be placed in the mixer first. The hot asphalt shall then be added and the mixing commenced. The mixing period, after the hot aggregate is placed in the mixer, shall be at least thirty (30) seconds, and as much longer as may be necesary to produce a homogeneous mixture of unvarying appearance. Any mixture which shows an excess or deficiency of asphalt, or an uneven distribution of cement due to insufficient mixing, shall be wasted.

The weight of the batch of mixed materials shall be no greater than the manufacturer's rated capacity of the mixer.

–3.07 HAULING

The asphalt concrete mixture shall leave the mixing plant at a temperature between 260° F. and 350° F., and when deposited on the road it shall have a temperature not less than 250° F. The exact temperature range within the above limits shall be as directed by the Engineer.

After the asphalt concrete mixture has been mixed as specified, it shall be transported to place of deposit in suitable dump trucks of sufficient size and design to easily contain the load. When required by the Engineer, each load shall be covered with a suitable tarpaulin to prevent unnecessary loss of heat while in transit. The sides and bottoms of the trucks shall be lubricated with a mixture of water and light oil or diesel oil before receiving a load of mixture. Excess water and oil shall not be left in the bottom of the trucks.

Haul trucks which contact the paving machine during the dumping or spreading process at any point other than the pushing rollers on the paving machine will not be allowed.

The speed and weight of haul trucks shall be regulated so that, in the opinion of the Engineer, no damage will occur to any portion of the work under way. Any damage to the prime coat or the bituminous mat caused by contractor equipment shall be repaired by the Contractor at his own expense.

–3.08 SPREADING AND FINISHING

Unless otherwise provided in the special provisions, each course of the pavement shall be spread with a mechanical, self-propelled spreading and finishing machine equipped with a hopper or mixture compartment to receive the mixture from the haul trucks, and a screed or cutoff device that oscillates in a horizontal motion or vibrates vertically when striking off the course or lift under construction.

The spreading machine shall be of a type and design approved by the Engineer. It shall have a runner length or wheel base of at least six (6) feet. It shall be operated in such a manner as to distribute the mixture to proper cross section, width, and thickness without segregation of aggregates.

Paving machines shall be equipped with a removable level on the bar immediately above the crown control. An eight (8) foot, steel-shod, wood level board shall be provided with each paving machine.

Where cutoff plates are used on the paving machine, they shall be so constructed and installed as to remain in the exact desired vertical and horizontal position. When cutoff plates dig into the subgrade or mark the base course, the work shall cease immediately and not be resumed until necessary adjustments and repairs have been made.

Where bleeder plates are used in lieu of finisher extensions, they shall be used at and on the side adjacent to the concrete gutter. They shall not be used unless specfic permission is granted by the Engineer.

The spreading machine shall place the mixture uniformly dense throughout, smooth, and free from inequalities and irregularities. Any failure of the machine to produce a smooth and uniform spread of the mixture shall be corrected immediately to the satisfaction of the Engineer.

Small segregated or non-uniform surface areas which occur shall be immediately corrected by hand methods whereby the finer portions of the mix are raked into the segregated areas and the larger particles raked off and wasted.

The spreading machine shall be capable of placing a uniform layer of asphalt mix to the depth shown on the plans or ordered by the Engineer. The forward motion of the machine shall be so regulated that no irregularities will result in the surface smoothness of the mat due to excessive forward speed of the spreading machine and so that, in the opinion of the Engineer, the forward rate is such as to enable good workmanship on phases of the work immediately following.

Areas which are inaccessible to the spreading and finishing machines may be paved by hand methods, as directed by the Engineer, but hand raking shall be kept to a minimum. The raking must be done carefully and skillfully in such a manner that segregation and back patching will be kept to a minimum.

Workmen shall not be allowed to walk or stand on the finished mixture before it has been rolled. Provisions must be made for breaking up any partially compressed masses of mixture after they are discharged from the truck.

–3.09 COMPACTING

Unless otherwise required in the special provisions, the Contractor shall furnish two (2) self-propelled smooth-wheeled power rollers and one (1) self-propelled pneumatic-tired roller on each project to roll and compact the pavement mixture. The smooth-wheeled rollers shall weigh not less than eight (8) tons, and may either be of the three-wheeled or tandem type, provided however, that at least one (1) smooth-wheeled roller of the tandem type shall be furnished on each project. The compression wheels on all three-wheeled rollers shall each be not less than twenty (20) inches wide, and all rollers shall be so constructed that they will be capable of rolling a true plane.

The self-propelled pneumatic-tired roller shall be multiple wheel two (2) axle roller having a width of not less than five (5) and not more than seven and five-tenths (7.5) feet, equipped with pneumatic tires of equal size and diameter, with smooth or "Highway" treads satisfactory to the Engineer. The tires on the front and rear axles shall be staggered. The air in the tires shall not vary from each other more than five (5) pounds per square inch. The gross weight of the roller shall not be less than four (4) tons nor more than eleven (11) tons.

The weight of the roller shall be within the above limits, as ordered by the Engineer, to obtain maximum compaction. The pneumatic-tired roller shall be self-propelled. The angle between the center line of the wheel and the center line of the axle shall be ninety (90) degrees throughout the complete revolution of the wheel on the axle.

Additional rollers shall be furnished and operated by the Contractor if, in the opinion of the Engineer, they are necessary to compact the pavement mixture satisfactorily. For small contracts consisting of a total of eight hundred (800) tons of mixture or less, the Contractor may be required to furnish one only smooth-wheeled tandem roller with a minimum weight of eight hundred (800) tons of mixture or less, the Contractor may be required to furnish one only smooth-wheeled tandem roller with a minimum weight of eight (8) tons when it is demonstrated to the satisfaction of the Engineer that one roller will handle the work satisfactorily.

All rollers shall be in good condition, and the reversing mechanism so maintained that the roller is capable of changing directions smoothly. The rollers shall be kept in continuous motion while on the hot mat and operated in such a manner that all parts of the pavement receive equal compression. Rollers shall be operated by competent and experienced personnel.

All rolling shall proceed as directed by the Engineer, but in general shall be longitudinal with the drive wheel forward in the direction of the paving machine, starting near the edge of the pavement and proceeding toward the center of the roadway, overlapping on successive trips by not less than one-half (½) and not more than three-fourths (¾) the width of the rear wheel of the three-wheeled roller. The initial rolling shall take place as closely behind the laying machine as the temperature and condition of the mat will allow. Rolling shall continue until all roller marks are eradicated. Alternate trips of the roller shall be of slightly different lengths.

The longitudinal joint between a compacted spread and a fresh spread shall be carefully compacted by running the roller on the compacted spread so that six (6) to eight (8) inches of the roller wheel extends onto the spread. Rolling shall continue, as directed by the Engineer, until all roller marks are eradicated.

The motion of the roller shall be slow enough at all times to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller or from any other cause, shall be corrected immediately by the use of rakes and fresh mixture when required. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excess water will not be permitted.

Immediately after spreading, each course of the pavement mixture will be compacted by rolling. The initial, or "breakdown" rolling shall be accomplished with either type of smooth-wheeled roller. The pneumatic-tired roller shall be used to knead and compact the pavement mixture following the initial rolling and preceding the final rolling. Care shall be exercised in the use of the pneumatic-tired roller to ensure that the pavement mixture is sufficiently cooled to avoid "picking up" of the mixture on the tires of the roller, and also to ensure that the pneumatic-tired rolling is completed before the mixture becomes too cool to enable satisfactory finish rolling. Final, or finish rolling, shall be done with a tandem-type, smooth-wheeled roller.

The surface of the mixture, after compaction, shall be smooth and true to section and grade. Any mixture which shows an excess or deficiency of asphalt cement or uneven distribution of asphalt cement due to insufficient mixing, or which becomes loose, broken, raveled, contaminated

with dirt, or is in any way defective, shall be removed and replaced with fresh hot mixture and be immediately compacted to conform with the surrounding area, all at the Contractor's expense.

Areas of one square foot or more showing an excess or deficiency of asphalt, or any part of the finished pavement which, in the opinion of the Engineer, is faulty because of poor workmanship or defective materials shall be removed and replaced with fresh hot mixture at the expense of the Contractor.

Areas inaccessible to the rollers shall be compacted by tamping with mechanical or hand tampers.

–3.10 PRELEVELING FOR ASPHALT CONCRETE

Preleveling of uneven or broken surfaces over which asphalt concrete is to be placed may be required by the Engineer, and if required may be accomplished by the use of asphalt concrete (of class included in the project) placed with a motor patrol grader, a paving machine, by hand raking, or by a combination of these methods as may be directed by the Engineer.

The unit contract price per ton for "Asphalt Concrete Pavement, Class ....." shall be full compensation for all costs and expense involved in furnishing all labor, material, tools and equipment necessary in preleveling the surface as specified.

–3.11 CONSTRUCTION OF COURSES

The asphalt concrete pavement shall be constructed in one or more courses as shown on the plans or as required in the special provisions.

Where more than one course is specified, the first course shall include the widening of the existing pavement (if specified) and leveling up of all irregularities in the surface of the existing pavement or foundation as described in Section 34-3.10. The leveling shall be to such elevations that when a uniform wearing surface is placed the finished pavement will conform to the grade and cross section shown on the plans.

Longitudinal joints in the leveling and wearing courses shall be offset a minimum of six (6) inches, so that one joint will not be directly over the other.

Appropriate classes of leveling or base mixtures shall be used to level up old pavements and in no case shall any one course of Class B mixture exceed a compacted depth of two (2) inches, nor shall the maximum compacted thickness of any one course of Class A mixture be more than three (3) inches. Where the maximum compacted thickness of the mixture will be in excess of the depth as specified above for the particular class of mixture, the pavement shall be constructed in two (2) or more courses with thickness of each satisfactory to the Engineer.

Mechanical spreading and finishing equipment shall be used in all cases, as described hereinbefore, except in areas where use of such equipment is impracticable. A motor patrol grader may be used to spread base course for widening an existing pavement where the widening does not exceed six (6) feet in width, or for leveling up small depressed areas where "spot-leveling" is required.

–3.12 JOINTS

The placing of the top or wearing course shall be as nearly continuous as possible.

In placing the top or wearing course, the work shall be scheduled in a manner to provide for full width pavement at the conclusion of the day's work. Where this is beyond the control of the Contractor, he shall barricade and protect all cold longitudinal joints until work is resumed again. Heavy building paper shall be placed wherever cold transverse joints are necessary, or as the Engineer may direct. Upon resuming work, the paper and asphalt thereon shall be removed and the joint neatly trimmed to a straight and vertical face. Before placing mixture against them, contact surfaces of cold longitudinal or transverse joints, castings, curbs and concrete gutters shall be painted with a thin, uniform coating of cutback asphalt or SS-1 emulsified asphalt.

Immediately following the completion of the top or wearing course, all joints where the asphalt concrete meets existing asphalt concrete pavements, portland cement concrete pavements, oil mats, concrete curb, concrete gutter, etc., shall be painted with a cutback asphalt or an SS-1 emulsified asphalt as described in Section 34-3.02, and shall immediately be covered with clean dry sand. The painted strip shall be directly over the joint and shall not extend more than one and one-half (1½) inches on either side of the joint. No painting shall be performed when the pavement is wet or damp.

–3.13 ADJUSTMENT OF EXISTING CASTINGS TO FINISH GRADE

This work shall consist of the adjustment of all castings, such as manhole frame and covers, catch basin frame and covers, frames and covers for various types of gate valves, etc., to conform with the exact finished grade of the new asphalt concrete pavement. The adjustment of these various appurtenances to underground facilities shall not be performed until the top or wearing course has been completed. The adjustment of these facilities shall be so scheduled as to minimize the interference with traffic. The work involved in these adjustments and method of compensation shall be in accordance with requirements contained in Section 53 entitled "Adjustment of New and Existing Utility Structures to Finish Grade."

–3.14 SURFACE SMOOTHNESS

The finished surface of the top or wearing course shall be of uniform texture, smooth, true to crown and grade, and free from defects of all kinds. The finished surface shall not vary more than one-eighth (⅛) inch from the lower edge of a ten (10) foot straightedge placed on the surface parallel to the center line, excepting at intersections where, in the opinion of the Engineer, this may be impracticable. No portion of the finished pavement shall vary more than one-fourth (¼) inch from a template cut to exact section shown on the plans or as staked by the Engineer, when placed at right angles to the center line on the finished surface.

When deviations in excess of the above tolerances are found, the surface shall be corrected by the addition of asphalt mixture to low places or the removal of material from high places, followed by further rolling. This shall be done as soon after the first rolling as possible and before the pavement mixture becomes chilled. Correction of defects shall be performed until there are no deviations anywhere greater than the allowable tolerances above mentioned.

–3.15 HEATER-PLANING BITUMINOUS PAVEMENT

–3.15A General

Where shown on the plans or where directed by the Engineer, the existing bituminous pavement shall be planed in accordance with the specifications that follow.

This item shall consist of planing or shaving the surface irregularities from the existing bituminous pavement to produce a smooth surface by means of equipment hereinafter specified. The finished surface shall be free from gouges, grooves, ridges and other imperfections of workmanship.

The temperature at which the work is performed, the nature and condition of the equipment, and the manner of performing the work shall be such that the pavement will not be torn, broken, burned or otherwise injured by the planing operation.

All cuttings or other debris resulting from the heater-planing operations shall be disposed of by the Contractor to the satisfaction of the Engineer. Unless otherwise provided, the Contractor shall provide his own site for disposal of these waste materials and no additional compensation will be made therefor.

–3.15B Equipment

The planing shall be performed with a pavement planing machine of a type that has operated efficiently on work comparable with that to be done under the contract.

The machine shall have a furnace for heating the pavement, the heat developer to be controlled from the operator's station. It shall have a blade for cutting the high spots from the pavement, the blade to be controlled from the operator's station so that the proper depth of cut will be maintained at all times. The position of the blade shall be such that the cuttings will be delivered in a single windrow. The planing operation shall be performed continuously by the forward motion of the machine. The width of heating and cutting shall be not less than four (4) feet, and the effective wheel base of the machine be not less than eighteen (18) feet.

–3.16 MISCELLANEOUS DETAILS OF CONSTRUCTION

Unless otherwise directed by the Engineer, the construction of each course of asphalt concrete pavement shall commence at the point farthest away from the mixing plant and progress toward the plant so that no hauling will be done over freshly placed pavement.

Construction of one course or lift upon another shall not proceed until the preceding course or lift has completely cooled and set.

Asphalt concrete mixture shall not be deposited on the road if the rolling cannot be completed before darkness. The placing of asphalt concrete mixture at night will not be permitted unless otherwise provided for in the special provisions.

No traffic other than that necessary for construction purposes shall be allowed on any course of the pavement until the course has completely cooled and set.

–3.17 SAMPLES

When called upon to do so, the Contractor shall, without charge, provide the Engineer with test samples of asphalt concrete cut from the completed pavement or the individual courses thereof. He shall also, when requested, provide the Engineer with test samples of the uncompressed asphalt concrete mixtures, and of any of the materials incorporated in the work.

–3.18 FINISHING AND CLEANUP

Finishing and cleanup shall be performed as specified in sections 4.08 and 57.

–3.19 UNFAVORABLE WEATHER

Asphalt cement for "Prime Coat" shall not be applied when the atmospheric temperature is lower than fifty (50) degrees F. except by permission of the Engineer.

Asphalt concrete shall not be placed when the atmospheric temperature is lower than forty (40) degrees F., nor during rain storms, rainy weather, or when the subgrade is wet or frozen, except by permission of the Engineer. All bituminous work shall be performed during clearing or fair weather.

–3.20 MAINTENANCE OF TRAFFIC AND TRAFFIC SIGNS

The maintenance of traffic and the handling and care of traffic signs shall meet requirements outlined in Section 7.15, "Maintenance of Traffic."

–3.21 ORGANIZATION AND EQUIPMENT

All work under the contract shall be performed under the continuous supervision of competent personnel thoroughly experienced in the class of work specified.

Incompetent, careless or negligent employees or agents shall be forthwith discharged by the Contractor upon written request of the Engineer, and failure to comply with such request shall be sufficient grounds for suspending the work pending compliance, or for termination of the contract.

All machinery and equipment shall be adequate for the purpose used, and shall be kept in good workable condition and be operated by experienced operators.

34–4 MEASUREMENT AND PAYMENT

Payment will be made for such of the following bid items as appear on the contract bid proposal and in accordance with requirements defined hereinafter:

1. "Preparation of Untreated Roadway," per square yard, or per lump sum.
2. "Asphalt (grade) Prime Coat," per ton.
3. "Prime Coat Aggregate," per cubic yard, or per ton.
4. "Asphalt for Tack Coat," per ton.
5. "Asphalt Concrete Pavement Class A," per ton.
6. "Asphalt Concrete Pavement Class B," per ton.
7. "Asphalt Concrete Pavement Class C," per ton.
8. "Mineral Aggregate (size) in Stockpile," per ton.
9. "Blending Sand," per cubic yard.
10. "Mineral Filler," per ton.
11. "Water," per M gallon.
12. "Finishing and Cleanup," per lump sum, or per station (100').
13. "Remove (type) Pavement," per square yard.
14. "Chipping Existing Asphalt Surface," per square yard.
15. "Heater-Planing Bituminous Pavement," per hour.

–4.01 PREPARATION OF UNTREATED ROADWAY

The unit contract price per square yard, or per lump sum, for "Preparation of Untreated Roadway" shall be full compensation for all labor, tools, and equipment required to do the work described under Section 34-3.01B with the exception, however, that all costs involved in labor, materials, and equipment for patching the roadway prior to placement of asphalt concrete shall be included in the unit contract price per ton for "Asphalt Concrete Pavement" of the class used for patching.

–4.02 ASPHALT—PRIME COAT

The unit contract price per ton for "Asphalt Cement (grade or type) Prime Coat" shall be full compensation for furnishing, heating, hauling, and spreading, as outlined in Section 32, entitled "Bituminous Surface Treatment." The quantity of asphalt cement shall be determined by reference to Section 27.

–4.03 PRIME COAT AGGREGATE

The unit contract price per cubic yard, or per ton for "Prime Coat Aggregate" shall be full compensation for furnishing and placing aggregate from stockpiles or other designated sources to the place of deposit, spreading the aggregate in the quantities required by the Engineer, and for cleanup of the stockpile site.

Prime coat aggregate, unless otherwise specified in the special provisions, shall conform to the requirements of Section 23-2.01 for Crushed Stone Surfacing Top Course, and Section 32-2.02 for Crushed Cover Stone, and of Section 33-2.02C for Mineral Aggregate ¼ - 0.

The quantity of prime coat aggregate to be paid for shall be the quantity actually loaded, hauled and used in construction of the prime coat.

Measurement will be made by the cubic yard (or per ton) at the point of delivery on the road. Volume measurement shall be the "strike off" capacity of the truck bodies.

–4.04 ASPHALT FOR TACK COAT

The unit contract price per ton for "Asphalt for Tack Coat" shall be full compensation for all costs of material, labor, tools, and equipment necessary for the application of the tack coat as specified. The pay quantity shall be the amount of undiluted emulsion used as tack coat. Water added to emulsion will not be paid for as tack coat.

–4.05 ASPHALT CONCRETE PAVEMENT

The unit contract price per ton for "Asphalt Concrete Pavement" of the class specified shall be full compensation for the furnishing of all labor, equipment, materials, and supplies required in the construction of each class of asphalt concrete pavement complete in place, including the preparation of any existing portland cement concrete, brick or bituminous surface, or pavement base, and all other work incidental to fulfilling the requirements described in Section 34-3 and not otherwise set forth as bid items.

In the event the Contractor is required to furnish the mineral aggregates, all costs of furnishing, hauling and processing mineral aggregates, blending sand and mineral filler into the complete mix shall be included in the unit contract price per ton for "Asphalt Concrete Pavement" of the class specified; excepting however, that mineral filler and blending sand, when set up as bid items, will be paid for in the manner hereinafter described.

If any of the mineral aggregates are furnished in stockpile by the Owner, the cost of hauling and incorporating those mineral aggregates in the mix, and all costs of furnishing, hauling, and incorporating the necessary

blending sand, mineral filler, and any additional mineral aggregate shall be included in the unit contract price per ton for "Asphalt Concrete Pavement," of the class specified; excepting however, that mineral filler and blending sand, when set up as bid items, will be paid for in the manner hereinafter described.

–4.06 MINERAL AGGREGATES IN STOCKPILE

The unit contract price per ton for "Mineral Aggregate (size) in Stockpile" of the various size designations shall be full compensation for all costs in connection with the preparation of the stockpile sites, the quarrying, crushing, screening, washing, cleaning, loading, hauling, and placing of the mineral aggregate in stockpiles at sites designated in the plans or special provisions, and for all other expenses incidental thereto; excepting however, that clearing, grubbing, and stripping of quarries or pits made available to the Contractor by the Owner for the manufacture of mineral aggregate will be paid for by items under the provisions of other sections pertinent thereto, unless provided otherwise in the special provisions.

–4.07 BLENDING SAND

The unit contract price per cubic yard for "Blending Sand" shall be full compensation for all costs in connection with the furnishing, hauling, and incorporating blending sand in the mixed aggregates, as required by the Engineer. Unless otherwise specified, measurement will be made by the cubic yard in trucks at the plant.

If there is a bid item for blending sand and the Contractor elects to provide mineral aggregates from a source other than that provided by the Owner, and if it becomes necessary, in the opinion of the Engineer, to use blending sand for proper grading of the aggregates, then in that event the Contractor shall furnish and incorporate sufficient quantities of blending sand to meet the requirements as determined by the Engineer. The pay quantity will be the amount actually used up to, but not exceeding, the quantity set up in the contract. If there is no bid item for blending sand and the Contractor furnishes mineral aggregates from a source other than that provided by the Owner, whatever amount of blending sand as may be needed to meet the requirements as determined by the Engineer, shall be furnished by the Contractor at his own expense.

–4.08 FURNISHING MINERAL FILLER

The unit contract price per ton for "Mineral Filler" shall be full compensation for all costs in connection with the furnishing, hauling and incorporating mineral filler in the asphalt mixture, as required by the Engineer.

–4.09 WATER

Water will be measured by the M gallons and paid for as provided in Section 16, entitled "Water."

–4.10 FINISHING AND CLEANUP

Finishing and cleanup will be paid for by the Lump Sum or per station (100'). The unit contract price, as shown in the proposal, shall be full compensation for all costs incurred by the Contractor in performing the finishing and cleanup in accordance with the plans and specifications, and directions of the Engineer.

–4.11 REMOVING EXISTING PAVEMENT

The unit contract price per square yard for "Remove (type) Pavement" of the type shown on the plans and specified in the proposal, shall be full compensation for removing the pavement and disposing of it as specified in Section 52, "Removal of Existing Street Improvements."

–4.12 HEATER-PLANING BITUMINOUS PAVEMENT

The unit contract price per hour for "Heater-Planing Bituminous Pavement" will be paid for the actual time consumed in heater-planing and shall be full compensation for furnishing all tools, equipment, labor, materials, supplies, and incidentals necessary to accomplish the work in accordance with the specifications. The unit contract price shall include also the removal and disposal of all cuttings and debris, and all other costs required to accomplish the work. No allowance will be made for time consumed in making repairs to the equipment or for moving the equipment to or from the work.

–4.13 CHIPPING EXISTING ASPHALT SURFACE

The unit contract price per square yard for "Chipping Existing Asphalt Surface," shall be full compensation for removing and disposing of material as specified in Section 34-3.02.

–4.14 INCIDENTAL WORK

Any incidental work required to complete the asphalt concrete pavement as specified herein, but which is not specifically mentioned in the foregoing specifications of Section 34, shall be performed by the Contractor and shall be considered as incidental to the construction, and all costs therefor shall be included in the unit contract prices of the bid items.

Section 35—Extruded Asphalt Concrete Curb

35–1 DESCRIPTION

Extruded asphalt curb shall be constructed at such locations as shown on the plans and to the cross section shown on the standard drawing No. 24.

35–2 MATERIALS

The extruded asphalt concrete curb shall consist of a hot-mix asphalt concrete Class B mix conforming to the provisions of Section 34-2.03. The grade of paving asphalt shall be penetration 85-100 unless otherwise specified in the special provisions or by the Engineer.

35–3 CONSTRUCTION DETAILS

The asphalt pavement shall be dry and cleansed of loose or deleterious material. Immediately after cleaning the pavement surface, a tack coat of cut-back or emulsified asphalt shall be applied to the asphalt curb area of the pavement at the rate of .08 to 0.20 gallons per fifteen linear feet of curb area, depending on the width of curb and age of pavement. Care shall be taken to prevent applying too wide or too heavy a tack coat.

–3.01 EQUIPMENT FOR LAYING CURB

The machine for laying the curb shall be of the self-propelled type equipped with a material hopper, distributing screw, and adjustable curb forming devices capable of laying and compacting the hot-mix asphalt concrete to the lines, grades and cross section as shown on the plans, and in an even homogeneous manner free of honeycombs.

–3.02 MIXING AND PLACING

The asphalt concrete mixture shall be homogeneously mixed to conform with Section 34-3.06 and shall be delivered to the hopper of the laying machine at a temperature of not less than 200 F. nor more than 300 F. Each hopper load of the asphalt concrete mix shall be run through the curb laying machine, properly adjusted to form and properly compact the asphalt concrete curb.

–3.03 JOINTS

Unless conditions warrant, asphalt concrete curb construction at the specified temperature shall be a continuous operation in one direction so as to eliminate curb joints. However, where conditions are such that this is not possible, the joints between successive days work shall be carefully made in such a manner as to ensure a continuous bond between the old and new sections of the curb. All contact surface of the previously constructed curb shall be painted with a thin, uniform coat of hot bituminous material immediately prior to placing the fresh asphalt concrete curb material against the old joint.

–3.04 CURING

The newly laid curb shall be protected from traffic by barricade or other suitable means until the heat of the asphalt concrete mixture has been dissipated and the mixture has attained its proper degree of hardness.

–3.05 FURTHER PROVISIONS

Section 34 of the specifications shall apply where specific details are required and where such provisions have not been included in this section of the specifications.

35–4 MEASUREMENT AND PAYMENT

The extruded asphalt concrete curb will be measured by the linear foot along the front face of the curb and returns.

Payment will be made for the following bid item when included and shown in any particular contract:

1. "Extruded Asphalt Concrete Curb," per linear foot.

The unit contract price for the above item shall be full compensation for all costs of labor, tools, equipment and materials and for complete installation in accordance with the plans and specifications.

Section 39—Cement Concrete Pavement

39–1 DESCRIPTION

The work covered by this section of the specification pertains to the construction of portland cement concrete pavements in streets, alleys or other public rights of way.

Portland cement concrete pavements shall be constructed in accordance with the details shown on the construction plans and in conformance with these standard specifications unless otherwise provided in the special provisions for the improvement.

39–2 MATERIALS

The cement, fine and course aggregates, water, reinforcing steel, joint fillers and other materials used shall conform to the following requirements:

–2.01 CEMENT

–2.01A General Requirements

Cement shall be classfied as (a) portland cement, (b) air-entraining portland cement and (c) high-early-strength cement.

–2.01B Storage on the Work

Cement shall at all times be adequately protected from rain and dampness. Any cement which in the opinion of the Engineer contains lumps that will not be pulverized in the mixer will be rejected.

High-early-strength cement stored by the Contractor for a period longer than 30 days, or portland cement stored by the Contractor for a period longer than 60 days, shall be held for retest. If the cement has lost strength during the period of storage, as shown by tests of the Engineer, sufficient additional cement shall be added to the mix at the Contractor's expense to overcome such loss, or the cement may be rejected. The amount of cement to be added to the mix shall be determined by the Engineer and shall be final and binding upon the Contractor.

–2.01C Sampling and Acceptance

The Engineer reserves the right to make tests upon samples of cement taken at any time or by any method, standard or otherwise, and to base acceptance or rejection upon the results of these tests regardless of previous tests and decisions.

–2.01D Portland Cement

Portland cement shall conform to the requirements for Type II cement of the Standard Specifications for Portland Cement, AASHO Designation M85; except that a maximum of fifty-five (55) percent of tricalcium silicate (3 CaO SiO_2) will be permitted; also that the content of alkalies shall not exceed seventy-five hundredths (0.75) percent by weight calculated as Na_2O, plus $0.658K_2O$. Alkalies shall be determined in accordance with ASTM Designation C 114. It shall meet the requirements of the above specifications both for tensile strength and compressive strength and for time of setting by both the Gillmore and Vicat methods.

–2.01E Air-Entraining Portland Cement

Air-entrained portland cement shall meet the requirements for Type IIA cement of the specifications for air-entrained portland cement AASHO Designation M134, except that a maximum of fifty-five (55) percent of tricalcium silicate (3 CaO SiO_2) will be permitted, and also that the content of alkalies shall not exceed seventy-five hundredths (0.75) percent by weight, calculated as Na_2O plus $0.658K_2O$. Alkalies shall be determined in accordance with ASTM Designation C 114. It shall meet the requirements of the above specifications for time of setting by both the Gillmore and Vicat methods.

–2.01F High-early-strength Cement

High-early-strength cement shall not be in cloth bags. High-early-strength cement shall conform to the requirements for Type III cement of the standard specifications for portland cement AASHO Designation M85, except that the content of alkalies shall not exceed seventy-five hundredths (0.75) percent by weight calculated as Na_2O, plus $0.658K_2O$. Alkalies shall be determined in accordance with ASTM Designation C 114. It shall meet the requirements of the above specifications both for tensile strength and compressive strength and for time of setting by both the Gillmore and the Vicat methods. In addition to the above requirements, the compressive strength of 6-inch by 12-inch concrete cylinders prepared and tested as described below shall be not less than four thousand (4,000) pounds per square inch when tested at the age of 72 hours.

The compressive strength shall be the average value obtained from tests of not less than four (4) cylinders, each of which has been proportioned and mixed individually on a different day. Compressive strength shall be determined in accordance with ASTM Designation C 39. There shall be no kneading of the concrete with the hands during the mixing.

Each cylinder shall be made from a batch of concrete containing the following weights of materials:

High-early-strength cement	5.00 lbs.
Washed sand from Steilacoom, Washington.	10.00 lbs.
Washed gravel from Steilacoom, Washington	16.00 lbs.
Clean water, in quantity to give a slump of 2 inches ± ½ inch	

The aggregates used in the above test shall conform to the requirements for concrete aggregates of these specifications and they shall be grades as follows:

SAND

Passing U. S. No. 4 sieve.....	100%
Passing U. S. No. 8 sieve.....	76%
Passing U. S. No. 16 sieve.....	55%
Passing U. S. No. 30 sieve.....	35%
Passing U. S. No. 50 sieve.....	9%
Passing U. S. No. 100 sieve.....	1%

A variation of two (2) in the percentage passing any sieve will be permitted but the sum of the percentages passing all sieves shall not be more than 280 nor less than 270.

GRAVEL

Passing 1¼" square opening.....	100%
Passing 1" square opening.....	75%
Passing ¾" square opening.....	50%
Passing ⅜" square opening.....	12%
Passing U. S. No. 4 sieve.....	0%

–2.01G Low-Alkali Cement

When the special provisions state that low-alkali cement shall be used, the percentage of alkalies in the cement shall not exceed six-tenths (0.60) percent by weight calculated as Na_2O, plus $0.658K_2O$. This limitation shall apply to portland cement, air-entraining portland cement and high-early-strength cement. Alkalies shall be determined in accordance with ASTM Designation C 114.

–2.02 CONCRETE AGGREGATES

Concrete aggregates shall be manufactured from ledge rock, talus or sand and gravel in accordance with the provisions of Section 22, Production from Quarry and Pit Sites.

–2.02A General Requirements

Aggregates shall possess such characteristics of shape and size that concrete, prepared from a mixture of fine and coarse material in the proportions specified, will be of satisfactory workability in the opinion of the Engineer. Regardless of compliance with all other provisions of these specifications, if the concrete is not of a workable character, or when finished does not exhibit a proper surface, either the fine or the coarse aggregate or both shall be rejected or altered as required by the Engineer.

If, in the judgment of the Engineer based on previous experience or on laboratory tests, concrete aggregates from a given source are detrimentally reactive with alkalies in portland cement, they shall be used in concrete in combination with low-alkali cement only.

–2.02B Fine Aggregate

Fine aggregate shall consist of sand or other inert materials, or combinations thereof approved by the Engineer, having hard, strong, durable particles, free from adherent coating. Fine aggregate shall be thoroughly washed to remove clay, loam, alkali, organic matter or other deleterious matter.

–2.02B1 Deleterious Substances. The amount of deleterious substances in the washed aggregate shall not exceed the following values:

(1) Amount finer than No. 200 sieve (wet sieving) 2% by weight
(2) Particles of specific gravity less than 1.95 1% by weight
(3) Organic matter, by colorimetric test, shall not be darker than 250 parts per million unless other tests prove a darker color to be harmless.

–2.02B2 Grading. Fine aggregate for concrete pavement shall be of one class or gradation only, known as Paving Class.

Fine aggregate shall be regularly graded from coarse to fine and when tested by means of U. S. Standard sieves shall conform to the following requirements expressed as percentages by weight:

	Maximum	*Minimum*
% passing No. 4	100	95
% passing No. 6	98	82
% passing No. 8	86	68
% passing No. 16	65	47
% passing No. 30	42	27
% passing No. 50	20	12
% passing No. 100	7	2
% passing No. 200 (wet sieving)	2	0

In individual tests, variations under the minimum or over the maximum will be permitted as follows provided the average of three consecutive tests is within the above limits:

Sieve Number	*Permissible % of Variation in Individual Tests*
No. 30 and coarser	2
No. 50 and finer	0.5

–2.02B3 Use of Substandard Gradings. Fine aggregate (Paving Class) with more than the maximum percentage passing any sieve may be accepted provided the cement content of the finished concrete is increased at the Contractor's expense, one-third (⅓) of one (1) percent for each one (1) percent the fine aggregate passing each sieve is in excess of the maximum.

Under no circumstances shall fine aggregate be used which has a grading finer than the following:

Passing No. 8	95%
Passing No. 16	80%
Passing No. 30	60%
Passing No. 50	20%
Passing No. 200 (wet sieving)	2%

–2.02B4 Mortar Strength. Fine aggregate shall develop in the mortar strength test at an age of 14 days a compressive strength of not less than ninety-five (95) percent Ottawa sand, as determined by ASTM Designation C 109.

–2.02C Coarse Aggregate

Coarse aggregate shall consist of gravel, crushed stone, or other inert material or combinations thereof approved by the Engineer, having hard, strong, durable pieces free from adherent coatings. Coarse aggregate shall be thoroughly washed to remove clay, loam, bark, sticks, alkali, organic matter, or other deleterious material. When required by the Engineer, coarse aggregate shall be hand picked to remove harmful material.

–2.02C1 Deleterious Substances. The amount of deleterious substances shall not exceed the following values:

Amount finer than No. 200 sieve (wet sieving)	0.5% by weight
Pieces of specific gravity less than 1.95	2.0% by weight
Clay lumps	0.5% by weight
Shale	2.0% by weight
Wood waste	0.05% by weight

Wood waste is defined as all material which, after drying to constant weight, has a specific gravity less than 1.0.

–2.02C2 Wear in Los Angeles Machine. Coarse aggregate shall not have a percentage of wear in the Los Angeles machine in excess of thirty-five (35) after 500 revolutions.

–2.02C3 Grading. Coarse aggregate when tested by means of laboratory screens shall conform to one or more of the following gradings as called for elsewhere in the specifications, special provisions, or on the plans.

	Grading No. 1		Grading No. 2		Grading No. 3		Grading No. 4		Grading No. 5	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Passing 2½" sq. opening	98	100	.....	.....	95	100	.....	.....	.....	.....
Passing 2" sq. opening	92	100	.....	.....	75	100	.....	.....	.....	.....
Passing 1½" sq. opening	72	87	100	100	30	60	100	.....	.....	.....
Passing 1¼" sq. opening	58	75	95	100	0	15	95	100	.....	.....
Passing 1" sq. opening	.....	.....	.....	.....	.....	.....	.....	.....	100	.....
Passing ¾" sq. opening	27	47	40	70	0	1	0	20	95	100
Passing ⅜" sq. opening	3	14	5	20	.....	.....	0	2	10	40
Passing U. S. No. 4 sieve	0	1	0	2	.....	.....	.....	.....	0	4

The above values are in percentages by weight.

In individual tests a variation of four (4) under the minimum percentages or over the maximum percentages will be allowed. The average of three (3) successive tests shall be within the percentages stated above. Coarse aggregate shall contain no piece of greater size than five (5) inches measured along the line of greater dimension.

–2.02C4 Use of Substandard Gradings. Coarse aggregate containing more than the maximum percentage passing any screen may be accepted provided the cement content of the finished concrete is increased at the Contractor's expense, one-fourth (¼) of one (1) percent for each one (1) percent the amount passing each of the three-eighths (⅜) inch, three-quarters (¾) inch and one and one-half (1½) inch screens is in excess of the maximum. Coarse aggregate shall not be used under any circumstances when the amount passing any screen exceeds the following:

¾" square opening	70%
⅜" square opening	30%

–2.02C5 Concrete Strength. Concrete made from the coarse aggregate, graded to comply with the requirements of these specifications, combined with the specified proportions of cement and the fine aggregate proposed for use with the coarse aggregate, or the washed sand from Steilacoom, Washington, shall develop compressive and flexural strengths at age of 14 days of not less than ninety (90) percent of that developed by concrete made from the same cement and washed sand and gravel from Steilacoom of the same grading, and mixed in the same proportions and to the same consistency.

–2.02D Test Methods for Concrete Aggregates

The properties enumerated in these specifications shall be determined in accordance with the following methods of test:

–2.02D1 Sampling: ASTM Designation D 75.

–2.02D2 Amount of Material Finer than No. 200 Sieve in Aggregates: ASTM Designation C 117.

–2.02D3 Organic Impurities: ASTM Designation C 40.

–2.02D4 Compressive Strength of Concrete: ASTM Designation C 39.

–2.02D5 Flexural Strength of Concrete: ASTM Designation C 78.

–2.02D6 Percentage of Particles of Less than 1.95 Specific Gravity: AASHO T 150.

–2.02D7 Clay Lumps in Aggregates: ASTM Designation C 142.

–2.02D8 Abrasion of Coarse Aggregate by Use of the Los Angeles Machine: ASTM Designation C 131.

–2.02D9 Mortar Strength: Compressive Strength of Concrete Mortars, ASTM Designation C 109.

–2.03 MIXING WATER

–2.03A Requirements

Water for use with cement in mortar or concrete shall be reasonably clear and free from oil. It shall not contain chlorides calculated as sodium chloride in excess of 2,500 parts per million, nor sulphates calculated as sodium sulphate in excess of 1,000 parts per million. It shall not contain any impurities in amount sufficient to cause unsoundness or marked change in time of setting in the cement with which it is mixed nor a reduction in mortar strength of more than five (5) percent compared to the results obtained with distilled water.

–2.03B Test Methods

The properties enumerated above shall be determined in accordance with AASHO Method of Test No. T 26.

–2.04 REINFORCING STEEL

–2.04A Deformed Steel Bars

Deformed steel bars for concrete reinforcement shall conform to the requirements of ASTM Designation A 15, Billet-Steel Bars for Concrete Reinforcement, intermediate grade, except that the bars shall be made only by the open-hearth process or the electric furnace process. The form of the deformed bars shall conform to ASTM Designation A 305, Minimum Requirements for Deformations of Deformed Steel Bars for Concrete Reinforcement.

–2.04B Wire Mesh

Wire mesh for concrete reinforcement shall conform to the requirements of the standard specifications for Welded Steel Wire Fabric for Concrete Reinforcement, ASTM Designation A 185. All wire mesh shall be of an approved kind and quality of manufacture.

–2.04C Cold Drawn Wire

Cold drawn wire shall conform to the requirements of ASTM Designation A 82, Cold-Drawn Steel Wire for Concrete Reinforcement.

–2.05 TIE BARS

Tie bars shall conform to the requirements of the standard specifications for Billet-Steel Bars for Concrete Reinforcement, ASTM Designation A 15. Bars shall be made by the open-hearth process or the electric-furnace process.

Bars shall be intermediate grade, deformed bars. The form of the deformed bar shall be subject to approval by the Engineer.

Tie bars shall be free from rust, loose mill scale, dirt, grease or other defects affecting the strength or bond with the concrete.

–2.06 PREMOLDED JOINT FILLER

–2.06A Contraction and Longitudinal Joints

Premolded joint filler for use in contraction and longitudinal joints shall be not less than three-sixteenth (3/16) inch in thickness and shall consist of a suitable asphalt mastic encased in asphalt-saturated paper or asphalt-saturated felt. It shall be sufficiently rigid for easy installation in summer months and not too brittle for handling in cool weather.

–2.06B Expansion (Through) Joints

Premolded joint filler for use in expansion (through) joints shall conform to the standard specifications for Preformed Expansion Joint Fillers for Concrete, AASHO Designation M153, and shall be Type III.

–2.07 COTTON MATS

Cotton mats shall conform to the standard specifications for AASHO Designation M73, Cotton Mats for Curing Concrete.

–2.08 WHITE PIGMENTED CURING COMPOUNDS

White pigmented curing compounds shall consist of finely ground white pigment and vehicle, ready-mixed for immediate use without alteration other than stirring. It shall adhere firmly to concrete either partially set or hardened. It shall meet the requirements that follow.

The compound shall provide a uniformly white appearance and shall effectively obscure the original color of concrete when applied at the rate of 200 square feet per gallon. When tested with the Pfund Cryptometer, Model E, Black Plate, Wedge Constant 0.007 inch and viewed in light of approximately 50-foot candles intensity the scale reading shall not exceed 40.

The compound shall dry to touch in not more than 8 hours when applied to a glass plate at a film thickness of 0.006 inch and exposed at an atmospheric temperature of 70°.

The viscosity of the compound at a temperature of 77° F. shall not exceed 60 Krebs units when tested by means of the Krebs-Stormer viscosimeter, ASTM Designation D 562.

The compounds shall be of such composition that the coating formed by its application on concrete surfaces will provide an effective seal for at least 10 days. There shall be no evidence that new concrete surfaces are softened by reaction with the compound.

When tested for moisture retaining effectiveness, as described in Section 6.03 of these specifications, the loss of moisture shall not exceed two (2) grams per specimen.

–2.09 TRANSPARENT CURING COMPOUNDS

Transparent curing compounds shall meet the following requirements:

The compound shall be a liquid that, at the time of application, is free from suspended matter. It shall be sufficiently low in viscosity to result in an even, uniform coating when applied by spraying.

The compound shall be sufficiently transparent and free from permanent color to result in no pronounced change in color from that of the natural concrete at the conclusion of the curing period. The compound shall, however, contain a dye of color strength sufficient to render the film distinctly visible on the concrete for a period of at least four (4) hours after application.

When tested for moisture retaining effectiveness as described in Section 6.03, the loss of moisture shall not exceed two (2) grams per specimen.

–2.10 WATERPROOF PAPER

Waterproof paper shall meet the requirements of AASHO Designation M139.

–2.11 WHITE POLYTHYLENE SHEETING

White polyethylene sheeting shall meet the requirements of AASHO Designation M171.

–2.12 FORMS

Forms may be of wood or steel at option of the Contractor and for each kind shall comply with the specifications that follow.

–2.12A Wood Forms

The lumber for pavement forms shall have the dimensions shown on the plans. All lumber shall be "construction" grade Douglas fir, West Coast Lumber Inspection Bureau, or "common structural" per grading of Western Pine Association. Wood forms shall be surfaced on four sides and be in lengths of not less than fourteen (14) feet except for driveways, etc. The Engineer reserves the right to regrade and to reject any lumber that does not comply with the specifications.

–2.12B Metal Forms

Metal forms shall be fabricated of rolled steel plate not less than 7/32 inch in thickness. The forms shall be equipped with rigid joint locks and at least three stake pockets in each 10-foot section of form. When the form is set in place, it shall have sufficient rigidity so that neither the weight of the paving equipment moving on the form nor the weight of the concrete between the forms will cause visible springing or warping of the forms. Any variation from a true plane in the top of the form when tested with a 10-foot straightedge shall not be greater than ⅛ inch in 10 feet and any variation in alignment when tested with a 10-foot straightedge shall not exceed ¼ inch in 10 feet.

The height of the metal form shall be at least equal to the thickness of the pavement and the width of the base shall be at least 8 inches for a form 8 inches or more in height. Or, the form may be less by two (2) inches if the difference is made up with a wooden strip attached to the base in a manner that will make it an integral part of the form. The width of the wooden strip shall conform to the minimum widths of bases for forms of various heights shown below:

HEIGHT	BASE WIDTH
8″	8″
9″	8″
10″	8″
11″	9″
12″	10″

Metal forms shall be free of warps, bends, twists or other defects which would impair their usefulness. Defective forms, whether installed on grade or only stored on the work site, shall be removed if so ordered by the Engineer.

–2.13 JOINT-SEALANTS

Joint sealants used in sealing pavement joints shall meet the requirements of one of the following: (1) AASHO Designation M 173, Concrete Joint Sealer, Hot Poured Elastic Type, (2) ASTM Designation D 1850, Concrete Joint Sealer, Cold Application Type, excepting however, that the tests for evaluation of bond requirements in the above mentioned specifications shall be in accordance with the method used by and available from the Materials Laboratory, Department of Highways, 318 East State Street, Olympia, Washington.

Unless otherwise stated in the special provisions, the Contractor will have the option of using either of the two types above noted.

Upon request by the Engineer, joint sealing materials shall be tested by an independent laboratory. In such case, a certificate shall be furnished by the laboratory stating that the materials have been tested and that they fully conform to the requirements of this section of the specifications.

39–3 CONSTRUCTION—CONCRETE MIXES

–3.01 CLASSIFICATION AND USE

The class of concrete refers to the nominal number of sacks of cement per cubic yard, although this designation does not constitute a guarantee of yield. The figure in parenthesis indicates maximum aggregate size. Example: 5(3) is 5-sack mix with maximum of 3″ aggregate.

CLASS	USE
3(1½)	Pavement base for asphalt.
4(1½)	Class A Pipe Bedding.
5(1½)	Concrete pavements, driveways, alley returns, curbs, curb and gutter, sidewalks, manhole bases, catch basin bases, pavement patching, water chambers and vaults.
5(3)	Concrete pavements, driveways and alley returns.
6.5(1½) H.E.S.	Pavement patching.

Mortar mix for jointing and plastering shall be as described in the applicable sections.

H.E.S. indicates high-early-strength cement and may be required, at the option of the Engineer, for any of the above classes of mix. Wherever called for, it shall be measured and payment be made as hereinafter provided in this Section 39.

–3.01A Cement Content for Designed Age Requirements

The designed age of paving concrete shall be 14 days unless otherwise noted in the special provisions. For a given design age, each yard of concrete shall contain not less than the cement content shown in Table I, Standard Mixes Using Portland Cement. The pavement thickness shall be increased as indicated in the table if an increase in thickness is necessary in order to meet the design requirements.

Table I

STANDARD MIXES USING PORTLAND CEMENT

1.25 BBL. MIX

DESIGNED AGE MIX	Bbls. of Std. Portland Cement Per Cu. Yd. of Concrete	Increase in Thickness of Pavement at All Points In Inches
14 Days (Std.)	1.25	none
10 Days	1.35	none
8 Days	1.50	none
6 Days	1.67	none
4 Days	2.00	none

When called for on the plans or the special provisions, or by direction of the Engineer, high-early-strength cement shall be combined with standard cement in the proportions given in Table II, Alternate Mixes Using High-early-strength Cement and Portland Cement.

(For use of high-early-strength cement with portland cement see page 65)

Table II

ALTERNATE MIXES USING HIGH-EARLY-STRENGTH CEMENT AND PORTLAND CEMENT

(Each mix to contain 1.25 bbls. cement per cubic yard)

DESIGNED AGE MIX (Days)	MIXER CAPACITY RATED 27E + 10% (Batch of 5 Sacks of Cement)		MIXER CAPACITY RATED 34E + 10% (Batch of 7 Sacks of Cement)	
	Sacks of Portland Cement in Each Batch	Sacks of High-early-strength Cement in Each Batch	Sacks of Portland Cement in Each Batch	Sacks of High-early-strength Cement in Each Batch
14 (Std.)	5	0	7	0
12	4	1	6	1
10	3	2	4	3
8	.....	.....	3	4
7	2	3	2	5
6	1	4	1	6
4	0	5	0	7

The Contractor may at his option choose any of the design age mixes given in tables I and II unless a specific age is specified in the special provisions. Extra compensation for high-early-strength cement will be allowed only when provided in the special provisions, or when the Engineer directs its use.

–3.02 AIR-ENTRAINED CONCRETE

Air-entrained concrete shall be used, unless otherwise provided for in the special provisions.

Either air-entrained portland cement or an air-entraining admixture shall be added at the mixer. Both the air-entrained cement and the air-entraining admixture shall conform to requirements of Section 39-2.01E.

The volume of air in freshly mixed concrete shall conform to that specified in Table III which follows:

Table III

AIR CONTENT OF FRESHLY MIXED CONCRETE

Maximum Size of Coarse Aggregate (Inches)	Air Content Percent by Volume
1½, 2, and 3	5 ± 1
¾ and 1	6 ± 1
⅜ and ½	7½ ± 1

If the measured air content is found above or below the values contained in Table III, the Contractor shall immediately make changes in mixing or materials as will be necessary to comply with the requirements for air content.

If an air-entraining agent is used, it shall be introduced at the nominal rate of one fluid ounce per sack of cement, but the rate shall be varied, if necessary, to comply with the requirements for air content.

An automatic dispenser, accurate to 10%, which will introduce into the mixing water the specified amount of air-entraining agent for each cycle of mixing, shall be connected to the mixer.

Aggregates shall be adjusted to compensate for increased yield resulting from air-entrainment so that the specified amount of cement is contained in each cubic yard of concrete. Adjustment shall be made by decreasing the weight of fine aggregates only, unless otherwise directed by the Engineer.

Other admixtures: Calcium chloride or any other admixture for any purpose other than air-entrainment may be added only upon the approval of the Engineer and under his supervision.

–3.03 MEASURING OF MATERIALS

–3.03A AGGREGATES

The fine aggregate and each size of coarse aggregate shall be measured by weighing. Corrections shall be made for variations in weight of material due to moisture content and specific gravity. The quantities of aggregates used in each batch shall be such that the cement can be measured in full sacks unless it is weighed in bulk.

The equipment for weighing aggregates shall conform to requirements set forth in Section 21, Weighing Equipment.

–3.03B CEMENT

Cement handled in bulk shall be weighed on scales meeting requirements specified in Section 21. Adequate precaution shall be taken to prevent loss of cement between the batch box and the mixer.

–3.03C WATER

–3.03C1 Water Cement Ratio

CLASS	Max. Water in Gals. Per Sack Cement (94 lbs.)
3(1½)	11.0
4(1½)	8.2
5(1½)	6.5
5(3)	6.5
6.5(1½) H.E.S.	5.1

The slump of the above mixes shall be as specified in Section 39-3.06. If, however, it is necessary to do so for placing purposes, additional water may be used provided additional cement is added to maintain the water cement ratio as shown above.

The amount of water required for the type of work and method of compaction shall be determined by the Engineer; however, the water-cement ratio must not be exceeded.

–3.03C2 Water Measuring Equipment

Water measuring equipment shall consist of a supply tank and a measuring tank. The supply tank shall be open to the air and shall receive water from the supply main. The water used for mixing concrete shall not be used to cool the mixer motor. The measuring tank shall receive water by gravity from the supply tank only. It shall be equipped with a riser pipe extending to the top of the supply tank, or shall have other adequate means of permitting free flow of air above water.

The valves on the supply and discharge lines to and from the measuring tank shall be so arranged that it will be impossible for both to be open at the same time or for the water to pass directly from the supply line to the mixer. The measuring tank shall be provided with an easily read device, at all times exposed to view, that will accurately indicate within one (1) quart the volume of water delivered to the mixer.

–3.04 PROPORTIONING MATERIALS

Fine and coarse aggregates shall be proportioned by weight except that if the project is small, volumetric proportioning may be used with permission of the Engineer. In proportioning, the unit of measure for cement will be by the sack—94 pounds.

Weights of fine and coarse aggregate are based on a bulk specific gravity, saturated surface dry, of 2.67. When volume measurements are used, one cubic foot of sand shall be taken as equivalent to 100 pounds of sand, and one cubic foot of gravel shall be taken as equivalent to 105 pounds of gravel. Corrections must be made for contained moisture in the aggregate and variation in specific gravity.

Concrete mixes shall be proportioned as specified in the following table. The weight of each size of aggregate is the estimated quantity to be used with one sack of cement (94 lbs). Unless otherwise stated in the special provisions, the Contractor will have the option of furnishing either Class 5(1½) or Class 5(3) when 5-sack concrete is specified. With approval of the Engineer, the proportion of aggregate may be altered to give better workability.

CLASS OF CONCRETE	3(1½)	4(1½)	5(1½)	5(3)	6.5(1½)
Sacks of Cement per Cubic Yard	3	4	5	5	6.5
Pounds of Dry Fine Aggregate	473	346	260-310	260	210
Pounds of No. 2 Coarse Aggregate	710	521	.....	273	280
Pounds of No. 3 Coarse Aggregate	.....	.....	.....	137	.....
Pounds of No. 4 Coarse Aggregate	.....	.....	180-205	....	.....
Pounds of No. 5 Coarse Aggregate	.....	.....	180-205	....	.....

–3.05 TRANSPORTING MATERIALS

Materials shall be transported from the batch plant to the mixer in suitable batch trucks of approved design. The trucks shall meet all legal load restrictions when hauling on a public highway or street. Trucks shall be of sufficient size to prevent spillage from the trucks or from one compartment to another at any time during loading, hauling or dumping operations, and they shall be capable of dumping the entire batch into the mixer skip without spillage of cement or aggregates on the subgrade.

Transportation of cement in the same compartment with the aggregates will be permitted if the aggregates are fed simultaneously with the cement into the truck compartment to avoid loss of the dry cement while en route to the job site. The Engineer may order suitable tarpaulins or other protective covers to be placed over the loaded batch trucks if he deems it necessary to prevent loss of cement or aggregates.

–3.06 CONSISTENCY OF CONCRETE

The concrete materials shall be mixed with the required amount of water to give a stiff, workable mix. The consistency shall be such that the concrete will not crumble and handling will not cause the mortar to separate from the aggregates. Additional water to improve workability or prevent the formation of honeycomb or rock pockets may be added only if approved by the Engineer.

The consistency of the concrete will be evaluated by either of two test methods: Method of Test for Slump of Portland Cement Concrete, ASTM Designation C 143, and the Method of Test for Ball Penetration in Portland Cement Concrete, ASTM Designation C 360. The slump of concrete, with machine compaction measured with the slump cone (ASTM Designation C 143), shall not exceed two (2) inches when placed without vibration, and with vibration the slump shall not exceed one and one-half (1½) inches.

The slump of concrete placed by hand shall not exceed three and one-half (3½) inches.

–3.07 CONCRETE MIXED AT ROAD SITE

The materials shall be mixed in a batch mixer in first-class condition having a rating not less than 27-E + 10% and of the boom and bucket type, approved by the Engineer. Mixing shall continue after all materials are in the drum for at least fifty (50) seconds before any part of the batch is discharged from the drum.

The drum shall be completely emptied before receiving materials for the next batch. The drum shall revolve at the rate of speed specified for the particular mixer used but it shall make not less than fourteen (14) nor more than twenty (20) revolutions per minute.

Every concrete mixing machine shall be equipped with a suitable timing device. The mechanism of such timing device shall be so constructed as to automatically be put into operation as soon as all materials are in the drum and to lock the mixer so as to prevent discharge until the specified mixing time has elapsed. This timing device shall be tested each day before beginning work and shall be regulated only in the presence of the Engineer or his representative.

The interior of the drum of the mixer shall be kept free of incrustations of concrete. The pick-up and throw-over or mixing blades in the drum shall be replaced when they show a wear of more than three-fourths (¾) of an inch. The wear of blades shall not exceed the tolerance recommended by the manufacturer.

The boom bucket shall have discharge doors at right angles to the boom and be kept in good order so that mortar will not leak out when the doors are closed.

Concrete mixers shall not be operated with a batch in excess of the rated capacity of the mixer. The mixture shall be homogeneous and a mixer that discharges concrete with separation of gravel from mortar shall not be used.

–3.08 READY MIXED CONCRETE

Ready mixed concrete may be used if the concrete delivered to the job site will meet the requirements of these specifications and the special provisions.

All cement used in the ready mixed concrete shall comply with specifications in Section 39-2.

The Engineer reserves the right to make tests upon samples of cement taken at any time and by any method, standard or otherwise, and to base acceptance or rejection on the results without regard to prior tests.

Ready mixed concrete may be produced by either a stationary mixer or a truck mixer. After the mixing, the concrete may be agitated by agitator truck or mixer truck. Agitators and mixers shall be identified as to uses, capacity in volume of concrete, and speed of rotation of mixing drums or blades. Stationary mixers shall be equipped with timing devices which will prevent the premature discharge of the concrete batch, and truck mixers shall have counters which will record the revolutions of the drum or blades.

Mixers and agitators must be capable of producing concrete, when delivered to the job site, that is thoroughly mixed with a satisfactory degree of uniformity and with the specified slump. Slump tests made at the one-quarter or three-quarter points of the load, if differing by more than two (2) inches, shall be cause to discontinue use of the equipment until the condition is corrected.

Ready mixed concrete shall be mixed and delivered by one of the following operations:

1. *Central-mixed Concrete:* Concrete mixed at central location and transported to job site in agitator truck or truck mixer operated at the agitator speed specified by the equipment manufacturer. Mixing time shall be sixty (60) seconds.

2. *Shrink - mixed Concrete:* Concrete is partially mixed by stationary mixer and mixing is completed by truck mixer. Stationary mixing time shall be thirty (30) seconds and truck mixer shall make not less than fifty (50) nor more than 100 revolutions of the drum or blades at the equipment manufacturer's designated speed; further mixing at agitator speed.

3. *Transit-mixed Concrete:* Concrete is completely mixed by truck mixer, with mixing as specified above for truck mixer under "Shrink-mixed Concrete." Truck mixers shall be equipped with accurate revolution counters.

Concrete transported by agitator or truck mixer shall be completely discharged at the job site within one hour after water is added to the cement and aggregates, or after the addition of cement to the aggregates, or when the concrete has been subjected to a maximum of 250 revolutions of the drum or blades, whichever comes first. A lesser time will be required whenever the weather accelerates the stiffening of the concrete. When a truck mixer is used to mix the concrete, the mixing shall begin within thirty minutes after the cement is intermixed with the aggregates.

All equipment used in producing ready-mixed concrete shall be maintained in first class condition. Equipment, deemed by the Engineer to be inadequate to produce the quality of concrete required under these specifications, shall be removed from service until restored to proper operation conditions or be replaced by acceptable equipment.

Mixing and transporting equipment shall be adequate in quantity to deliver the required amount of concrete to the job site. The rate of delivery shall be such that the concrete can be properly handled, placed and finished. The interval between batches shall not be more than thirty (30) minutes. Delivery shall be made in a manner that will minimize rehandling and prevent damage to concrete previously placed.

–3.09 BATCH METERS

All concrete mixing machines used in paving shall be equipped with a timing device as described in Section 39-3.07, Concrete Mixed at Road Site.

–3.10 RETEMPERING

Concrete shall be mixed only in such quantities as are required for immediate use and shall be used while fresh before initial set has taken place. Any concrete having initial set before placing and finishing shall be wasted and not used for the work. No retempering of concrete (remixing with water or other materials) will be allowed.

–3.11 REMIXING CONCRETE

Concrete which has stiffened but not yet set may be used after remixing provided it is plastic enough to be compacted. No water or other materials shall be added in remixing.

–3.12 SUBGRADE

After the forms have been securely set to exact grade and alignment, the subgrade between the forms shall be brought to true cross section by dragging a subgrade template as many times as may be necessary to secure a true subgrade. The power drawn subgrade template, when so ordered by the Engineer, shall be followed by a subgrade check template drawn by hand. The subgrade shall be kept damp at the time the concrete is placed. The amount of sprinkling required to moisten the subgrade shall be determined by the Engineer.

If preliminary subgrade is high it shall be cut to grade, and if low, the low places shall be filled to grade with sand or native material dampened and compacted as directed by the Engineer.

Before forms are set, the preliminary subgrade will be established under the location of the forms to an elevation within one inch (1″) above or below the elevation of the finished subgrade. This preliminary subgrade shall be graded and compacted for the entire area to a width that extends at least one foot (1′) outside the edges of the proposed pavement except where existing utilities interfere. The subgrade shall be brought to an unyielding surface by rolling with compacting units meeting the requirements as described in Section 15.

Subgrade for driveways, alley or street returns and other similar areas not accessible to mobile compacting units may be compacted by hand or mechanical tampers, as directed by the Engineer.

Where thickened edge is indicated it shall be graded and compacted to exact section specified.

Wherever possible, vehicles shall be kept off the finished subgrade. If vehicles must travel on the subgrade ahead of the paving, a power drag shall be carried immediately ahead of the concrete placement. Where ready-mix trucks back up on the subgrade, the power drag may be lifted every 25 feet to allow the trucks to dump the concrete. The drag must be replaced after the concrete is dumped on the 25 foot length of subgrade previously prepared. Irregularities shall be smoothed and raked to remove ruts, cuts and breaks in the subgrade surface and shall be hand or mechanically tamped preceding the placing of the concrete.

Continued use of sections of prepared subgrade by hauling which ruts it or deforms it from the true cross section will not be permitted. The Contractor shall protect the prepared subgrade from damage by his own operations and by public travel.

The Contractor shall plank such portion of the subgrade at his own expense as the Engineer may deem to be necessary to protect it against damage from trucking and equipment and to preserve the subgrade in proper shape and condition for the placing of concrete thereupon.

No concrete shall be placed until the subgrade is approved by the Engineer.

–3.13 FORMS

Forms may be of wood or metal or any other material at the option of the Contractor, provided the forms as constructed result in a pavement of specified thickness, cross section, grade and alignment as shown on the plans.

–3.13A Wood Forms

The lumber for pavement forms shall be surfaced four (4) sides and in lengths not less than fourteen feet (14′) except for driveways, etc. The forms must be set to line and grade upon blocks of wood 2″ x 6″ x 10″ spaced at 4-foot intervals. Blocks for tandem ends of forms shall be 2″ x 6″ x 16″ placed to form a common support where the forms butt each other. Forms shall be kept to true alignment by stakes driven into the ground alongside the inside and outside edge of the forms at intervals of not to exceed five feet (5′). The forms shall be nailed to the outside stakes. The inside stakes shall be removed after the concrete has been deposited against the sides of forms. Back of forms shall be banked with earth one foot (1′) wide and two (2) inches from top when oscillating screeds are used.

Forms shall be supported adequately to prevent deflection or movement under load of power machinery. Additional support under wood forms can be achieved by using 3″ x 6″ x 10″ concrete pads of 5-sack mix in lieu of wood blocks spaced at 3-foot intervals, placed at least 48 hours before paving. Top of forms shall not deviate more than ⅛-inch in 10 feet. Alignment of the forms shall be within ¼-inch in 10 feet. The forms may be removed on the following day if the concrete is sufficiently set to withstand removal without danger of chipping or spalling. When forms are removed before the expiration of the curing period, the edges of concrete shall be protected with moist earth or sprayed with curing compound. Forms shall be examined before re-using and must be free of defects which would impair their usefulness.

–3.13B Metal Forms

Forms shall be drilled in advance of being placed in line and grade to accommodate tie bars where they are specified for the center joint or other joints.

Pins for staking forms shall be ⅞ inch diameter and 18 inches long. Greater lengths shall be provided as required by field conditions.

Forms shall be set at least one-half day maximum run in advance of point where concrete is being placed. Forms may be removed the following day provided the concrete is sufficiently set to withstand removal without danger of chipping or spalling. When forms are removed before the end of curing period, the edges of concrete shall be protected with moist earth or sprayed with curing compound.

Steel forms must be cleaned and oiled before they are re-used each time. After forms are set, additional blocking, concrete pads or tamping under forms shall be done if determined necessary by the Engineer and the alignment and grade shall be checked immediately before placing concrete.

Curb forms may be set immediately after the concrete is finished and brushed where curbs are constructed integrally with the pavement. Curb forms and slab forms shall not be removed until the curb is completed.

–3.14 COMPACTION AND COMPACTING EQUIPMENT

The pavement subgrade shall be rolled under the location of the forms before the forms are set and then rolling shall continue between the forms simultaneously with the fine grading. Rolling and compacting shall be done with a smooth wheeled power roller, self-propelled, three-wheeled and weighing not less than ten (10) tons and providing a compression on the rear wheels of not less than 325 pounds per linear inch of tire width. The cost of such rolling shall be included by the Contractor in the unit contract prices for various items of the work.

Rolling with trucks will not be acceptable.

When called for on the plans or in the special provisions or when ordered by the Engineer, the Contractor shall furnish any one or more of the rolling equipment described in Section 15-2.01A, i.e.: variable load compactor, grid roller, pneumatic-tired roller, vibratory compactor and mechanical tamper.

-3.15 PLACING CONCRETE

The concrete shall be placed upon the prepared subgrade between the forms to the required depth and cross section in a continuous operation between construction or expansion joints.

The concrete shall be thoroughly consolidated against and along all forms or adjoining pavements by such means as will prevent gravel pockets along the edges of the finished pavement. Any gravel pockets found after removing the forms shall be repaired by thoroughly cleaning and removing loose material, and then wetting all exposed surfaces after which a mortar of one part cement and two parts paving sand shall be worked into the rock pocket. The surface shall then be floated to conform with the adjacent edge.

When integral curb is being constructed with the pavement, fresh concrete for the integral curb shall be placed at such time as will enable the top section of the curb to be consolidated, finished, and bonded to the pavement slab while the concrete is plastic.

Where curb is not being placed integral with the pavement slab, reinforcing steel dowels shall be placed in the base section for the curb in the manner described in Section 40-3.01C.

Prior to placing concrete around manholes, catch basins, gate chambers, etc., a temporary cover fitting below the rim of the ring casting shall be provided to prevent the concrete from flowing into them.

-3.15A Placing Concrete at Expansion Joints

The concrete shall be deposited on the subgrade as near to the expansion joint assembly as possible without disturbing it. Concrete shall then be hand placed along each side and full length of the joint, taking care to maintain equal pressure on each side of joint assembly. Concrete shall then be spaced and vibrated the full length of the joint. If rock pockets are exposed at end of expansion joints after forms are removed, they shall be repaired.

-3.15B Placing Concrete With Reinforcing Steel Bars or Wire Mesh

Concrete shall be placed in two courses. The first course shall be struck off at elevation established for reinforcing steel bar or wire mesh, or as designated on the plans. Immediately prior to placing the reinforcement, the concrete shall be brought to a fairly even surface by means of a template conforming to the depth of the reinforcement.

Reinforcing steel bars or wire mesh shall be placed on the bottom course before the concrete attains initial set. No more than 45 minutes shall elapse between mixing of the first course and placement of the second course.

Reinforcement shall be free of dirt, mill scale, oil, grease or other foreign material that may impair bond. Steel, coated with rust, may be used if the oxidations are not deep or loose coated.

Successive mats of steel or wire mesh shall be securely lapped together and tied so that longitudinal bars will lap 40 diameters and wire mesh will lap 6 to 12 inches.

Reinforcing steel or wire mesh shall be laid as a continuous mat. Continuity shall be maintained between expansion joints. Steel shall terminate within four inches of the joint.

Concrete may be placed in one lift, provided a method is used to position and secure the reinforcing bars or wire mesh at the designated locations in the slab.

If the concrete is placed in two courses where reinforcement is used, all dirt, sand or dust which collects on the base course shall be removed before the top course is placed.

-3.16 COMPACTING CONCRETE

Concrete may be compacted by (1) hand methods, (2) machine methods and (3) combined machine and vibrators method.

The Contractor shall at all times have all necessary equipment on the job for hand compacting.

-3.16A Hand Compacting

Concrete shall be spread evenly with shovels and spaded along the forms with a perforated spade after which it shall be struck off with a metal shod tamping rod. The rod shall be cut to exact crown of the roadway and be fitted with handles at each end and of such depth or trussed to be rigid. The strike-off rod shall be operated with a combined tamping, crosswise and sawing action to produce a smooth surface free from depressions or inequalities. A small amount of mortar must be kept ahead of and extending substantially along the entire length of the rod. Excessive swinging of the rod will not be permitted.

The concrete shall be struck off again with a "second strike rod" operated in the same manner as the first rod and following not closer than twenty (20) feet behind the first. The second strike rod may be eliminated on alley pavements having the "V" section of the center. The second rod may also be eliminated on small pours of pavement of substandard width, unless use of the rod is required by the Engineer.

-3.16B Machine Compacting

The machine used for compacting shall be self-propelled and designed to run on the side forms. Movable parts shall be capable of adjustment and they shall be adjusted so as to produce accurately the roadway sections shown on the plans. The machine shall be equipped with two reciprocating screeds. The tops of the forms shall be kept clean with a suitable device attached to the machine.

The travel of the machine on the forms shall be maintained true without lift, wabble or other variations which might prevent a precise strike off.

The machine shall be put in forward motion as soon as concrete is deposited on the subgrade. On the first pass, a roll of concrete about 7 inches deep shall be carried ahead of the screed. Screeds and tampers shall be operated so as not to disturb expansion joints and caps. They shall be raised sufficiently to clear joints and caps when passing over them.

Machines shall be operated prior to placing longitudinal and transverse dummy joints.

Machines shall be operated at least twice and as many more times as may be necessary to compact concrete free from rock pockets, and to a section that can be finished properly.

Care must be exercised not to overwork the concrete and bring an excess of mortar to the surface.

If the machine is equipped with a tamper, it shall be operated only when directed by the Engineer. Normally, its use will be omitted.

On all trips after the first, the machine shall be operated over sections about sixty (60) feet in length. The machine shall be backed behind the section to be compacted and then put in forward action, lowering the screed gradually until it is in position as it reaches the section to be compacted.

Two strips, two (2) inches thick, twenty (20) feet long and the width of the forms, shall be provided to keep the machine off previously placed concrete when starting operations at any time. They shall be hardwood faced with metal of at least ⅜-inch thickness. They shall be tapered from full thickness at a point five (5) feet from one end to one-eighth (⅛) inch at the same end. Three holes, one each end and one in the center shall be provided to nail or fasten strips to top of forms.

-3.16C Combined Vibration and Machine Compacting

The combined vibration and compaction equipment shall be demonstrated to the satisfaction of the Engineer as being capable of consolidating the concrete across the full width of the pavement into a homogeneous mass, free of rock pockets, and without separation of mortar and aggregates.

The equipment shall consist of the machine described in Section 39-3.16B, Machine Compacting, or an approved spreading machine to which is attached a vibrating unit composed of individual internal vibrators spaced not more than 29 inches apart. The vibrators shall be spaced equidistantly, and the distance from the side forms to the nearest vibrator shall not exceed 14 inches. The vibrators shall be carried behind and independent of the strike-off screed of the spreading machine, or ahead of an independent of the strike-off screed of the first compacting machine.

The vibrating unit shall not rest upon the side forms nor impart vibration to the strike-off screeds. The individual vibrators shall be attached to a frame in a manner which will permit adjustment of both the depth of penetration into the concrete and the angle of the vibrator with the horizontal.

The entire vibrating unit shall allow raising the vibrator tips completely clear of the concrete surface.

The vibrators shall be capable of vibrating at rates between 4,800 and 8,000 impulses per minute when inserted in the concrete. All vibrators shall be synchronized to vibrate at a frequency specified by the Engineer, within the limits established.

On the first trip over the freshly placed concrete the vibration equipment shall be submerged in the concrete to ensure adequate consolidation. Unless otherwise directed by the Engineer, the vibration equipment shall be operated on the first pass only. The vibration equipment shall not be operated when the machine is not in motion except when vibrating near an expansion joint.

After the first pass with vibration, one or more trips without vibration shall be made as described in Section 39-3.16B, Machine Compacting.

Two hardwood strips faced with metal shall be provided as described in Section 39-3.16B.

When combined vibration and machine compacting is used, the cement content of the specified concrete mix may be reduced by ten one-hundredths (0.10) barrel per cubic yard, except that no reduction will be permitted for mixes calling for 1.25 barrels per yard or less, provided it can be demonstrated to the satisfaction of the Engineer that:

(1) The equipment can compact and strike off concrete containing the full amount of cement specified in Section 39-3, Concrete Mixes, or the special provisions and with the water content reduced by 7%.

(2) With the cement content reduced, the water requirements must not exceed that for a mix with the full cement content and compacted without vibration.

(3) The workability of concrete with a reduced cement content will allow finishing of the surface free of depressions or inequalities of any kind.

As often as the Engineer may require, the Contractor shall make trial runs with concrete containing the full amount of cement as specified in Section 39-3, Concrete Mixes, or as specified in the special provisions, compacting with and without vibration to determine the relative water contents required.

-3.17 WATER

Water for all construction needs shall be furnished by the Contractor unless otherwise provided in the special provisions. Water quality shall conform to requirements of Section 39-2.03.

-3.18 JOINTS

Transverse and longitudinal joints for street pavement may be contraction joints, construction or expansion joints. When the pavement abuts an existing pavement, the locations of the joints in the new pavement shall coincide with the joints in the existing pavement unless otherwise shown on the plans or specified in the special provisions. Location of joints for new pavements where existing pavements are not involved shall be constructed as shown on the plans and in accordance with these specifications.

-3.18A Formed Transverse Contraction Joints

Standard spacing of transversely formed contraction joints along straight sections of streets between through expansion joints or between intersections or other irregular areas, shall be at intervals of fifteen (15) feet across the full width of the pavement and at right angles to the center line of roadway. Where the spacing between through expansion joints are not in even multiples of 15 feet for transverse joints, the last several spaces approaching the expansion joint or header shall be varied by shortening the spaces, as directed by the Engineer. On horizontal curves the spacing of fifteen (15) feet shall be along the outer edge of the pavement.

For intersections and other irregular areas, the arrangement of contraction joints shall be placed in accordance with standard intersection patterns, or as directed by the Engineer. The area of any one irregular pattern formed by contraction joints in intersections shall not exceed two hundred twenty-five (225) square feet and the greatest dimension thereof shall not exceed sixteen and one-half (16½) feet.

When paving a second lane adjacent to the previously paved lane, the contraction joints shall be matched with the former.

Where uncontrolled cracks are existing in the first lane, they shall be matched as nearly as possible in the second lane. Should the uncontrolled cracks in the existing paved lane be too frequent or in random locations and impossible to match with a uniform spacing in the second lane, then in that event the two lanes shall be completely separated by ⅜-inch joint material extending from the surface to one (1) inch below the bottom of the concrete being placed.

Where full joint material is required to separate two paving lanes, its location shall be noted on the plans or in the special provisions and the cost thereof will be paid for at the unit bid price per linear foot.

Where integral curb or doweled curb is placed along with the concrete pavement, premolded joint filler material shall be placed in the full section of the curb in true alignment with the pavement joint and in perpendicular position.

-3.18B Construction of Formed Contraction Joints

Formed contraction joints shall be constructed by imbedding a preformed joint material. Preformed or premolded joint filler shall be kept on a flat surface in storage before insertion in the concrete. Warped materials shall be discarded. Filler shall be cut to exact sections of the joint. The transverse joints of two contiguous lanes must meet at a common point at the center line. The length of the premolded joint filler shall extend to within ¼-inch of both edges of any panel.

Transverse contraction joints (dummy joints) shall be placed after compaction and finishing of concrete have been completed and before initial set. A groove shall be cut into the surface at the location of joint, using a tool provided with stops (tee iron) to prevent cutting the groove deeper than the planned depth of the joint filler. The tool must be maintained free of concrete deposits and shall be rigid enough to withstand repeated applications of cutting the groove to uniform depth across the slab or for cutting the groove for the longitudinal contraction joints.

The joint filler shall then be forced into the groove until the top is flush with pavement surface, with a deviation of not more than ⅛ inch below the surface. The joint filler shall not protrude above the surface and the groove shall be reformed if necessary to provide complete insertion of the joint filler. The joint filler shall be at right angles to the surface and always in a straight line.

Preformed joint filler shall not be less than 3/16 inch thick and a minimum depth of two (2) inches in the concrete. For slabs having thickness of more than eight (8) inches, the depth of contraction joints shall be one-fourth (¼) of the depth of slab.

Preformed joint material for contraction joints shall meet the requirements as outlined in Section 39-2.06.

After the joint filler has been imbedded in the concrete, the surface of the pavement shall be finished against the filler strip with hand floats to restore the surface finish. While performing this operation, the filler strip must be maintained in a vertical or normal position, true to alignment. After finishing, the entire area of the joint shall be true to grade and smoothness without any irregularities.

No payment will be made for contraction joint material or its placement, and all costs thereof shall be included in the unit contract price per square yard for "Cement

Concrete Pavement (class, inches)." Exception is made, however, that if there should be alternate bid items in the proposal for transverse contraction (dummy) joints and sawed contraction joints, then in that event the bid proposal will include an item per linear foot for "Transverse Contraction Joint", the price for which shall include all costs for the furnishing and placing of the joint filler in accordance with these specifications.

–3.18C Sawed Contraction Joints

Sawed contraction joints shall be constructed by sawing a vertical groove in the hardened concrete on an approved schedule after placing and before development of random cracks in the concrete slab. Transverse contraction joints shall be sawed before the longitudinal joints are sawed.

Sawed longitudinal joints in general are not critical as to a specific time schedule after hardening of the concrete and may be delayed under favorable conditions before an incidence of longitudinal random cracking begins. The Engineer shall direct the time schedule for sawing contraction joints.

Any scheduling for the sawing of joints that results in premature or uncontrolled cracking shall be revised immediately, under direction of the Engineer, by adjusting the time interval between placing of concrete and the sawing of joints. After the schedule has been approved, the sawing shall proceed as a continuous operation day and night until all joints have been completed.

Transverse joints shall be sawed at 60-foot intervals or such other spacing as directed by the Engineer, as soon as the cut can be made without undue raveling of the concrete. Intermediate joints shall be sawed thereafter. Two or more sawing units may be required to accomplish the sawing in order to minimize random cracking. Standby equipment shall be on the job to ensure continuous sawing as specified regardless of any breakdown of equipment.

Where curing membrane is used, the area disturbed by sawing of joints shall be resprayed immediately upon completion of the sawing operation and care shall be exercised to prevent the curing compound from getting into the groove. Joint sealing compound will not adhere to concrete if curing compound is present.

The depth of sawed transverse contraction joints shall be a minimum of one and one-half (1½) inches. Longitudinal joints shall be sawed to a depth of not less than one-fourth (¼) the depth of the slab.

After the curing period the joints shall be cleaned and sealed with joint sealants meeting requirements in Section 39-2.13. Excess sealing material shall be cleaned off the surface of the pavement before opening to traffic.

–3.18D Transverse Construction Joints

Transverse construction joints shall be made at the end of ench day's paving, or when placing of concrete is discontinued for more than 45 minutes, by placing a header board transversely across the subgrade. The header board shall be located to conform to the spacing for the transverse contraction joints (or an expansion joint) and shall be left in place until the paving is resumed. If the location of the header board is to be a contraction joint, then the header shall have fastened to the concrete side a wedge-shaped strip of wood to form a key in the concrete. Thickened edge must be constructed at the construction joint header to provide ample depth of concrete above and below the keyway. Where preformed contraction joints are used, the joint made by the construction joint header shall have a two-inch strip of joint material imbedded against the hardened concrete when paving is resumed.

Where sawed contraction joints are specified, the construction joint made by the header may be sealed or may have a two-inch strip inserted as specified herein.

No separate payment shall be made for construction joints or for the premolded joint material, extra concrete, or sealing compounds required for the construction joints. All costs therefor shall be included in the unit contract price per square yard for "Cement Concrete Pavement".

–3.18E Transverse Expansion Joints

Transverse expansion joints are placed only where shown on the plans or where directed by the Engineer.

Transverse expansion joints shall be constructed with premolded material, three-fourths inch (¾") in thickness and conforming to Section 39-2.06B. They shall extend the full width of the pavement and from one inch (1") below the subgrade to one inch (1") below the top of the pavement. The joint alignment must be at right angles to the pavement center line unless otherwise specified.

The filler material shall be held accurately in place during the placing and finishing of the concrete by a bulkhead, a holder, a metal cap or any other approved method. The joint must be at right angles to the paved surface and the holder must be in place long enough to prevent sagging of the material, especially on streets having steep grades.

In multiple lane construction, the joints shall be matched so as to form a continuous alignment over all lanes.

Expansion joints shall extend continuously through all curbs, special care being exercised to preserve alignment perpendicular to the pavement in the curb section.

A wood filler strip or metal cap shall be placed on the top of the premolded joint filler to form the groove one inch (1") deep, and it shall remain in place until after the finishing and the concrete is sufficiently set to resist sloughing into the groove. The joint filler must be stapled together at the ends to preserve continuity. Immediately after removal of side forms, the edges of the pavement shall be carefully inspected and wherever the joint filler is not fully exposed, the concrete shall be chipped down until the edge of the filler is fully exposed for the entire depth.

No additional payment will be made for expansion joint material or its placement. All cost therefor shall be included in the unit contract price per square yard for "Cement Concrete Pavement" of the required class and thickness.

–3.18F Sealing Expansion Joints

After the pavement is cured and before any traffic, the space above the top of expansion joint filler strip shall be thoroughly cleaned of all loose material. The groove three-fourths inch (¾") wide shall be completely free of any projecting concrete from the sides and the groove shall be continuous across the slab to each edge. It shall then be filled level with the pavement surface with joint sealant meeting the requirements of Section 39-2.13.

The joint sealant material shall be heated and placed in complete accord with the manufacturer's instructions. Burned material will be rejected. The expansion joint groove shall be dry at the time of pouring the sealing compound. No additional payment will be made for the sealing filler or its application and the cost thereof shall be included in the unit contract price per square yard for "Cement Concrete Pavement" of the required class and thickness.

–3.18G Longitudinal Contraction Joints

The joints shall be constructed in true alignment with respect to their proper location on center line or parallel thereto as is shown in a succeeding subsection. No payment will be made for contraction joint material and its placement except in case of alternate bids as described in Section 39-3.18B.

–3.18H Standard Location for Longitudinal Joints

Standard location for longitudinal joints, whether contraction or construction, shall be as shown below unless otherwise specified in the plans and special provisions:

Width Curb to Curb	*Joint Locations*
25 Feet	Center line
32 Feet	Center line
36 Feet	Center line and 10 feet each side of center line
40 Feet	Center line and 12 feet each side of center line
44 Feet	Center line and 12 feet each side of center line

In the event the roadway is divided into two lanes, the construction joints shall be located on the center line of the roadway unless otherwise approved by the Engineer. In separate lane construction, a joint filler ⅜ inch by 2 inches shall be placed between the two lanes when the second lane is constructed.

–3.18I Longitudinal Expansion Joints

Longitudinal expansion joints shall be placed where shown on the plans or where required for concrete pavement between or along retaining walls, curbs or other structures. Unless otherwise shown on the plans, longitudinal expansion joints shall be three-eighths inch (⅜") thick and of a width equal to the full depth of the pavement.

The furnishing and placing of longitudinal expansion joints, using premolded joint filler material, shall be considered as incidental to the construction of the pavement and the cost thereof shall be included in other bid items of the work unless otherwise covered in the special provisions and proposal.

–3.19 FINISHING CONCRETE

Hand finishing or machine finishing of the entire pavement surface will be permitted unless otherwise provided in the special provisions.

On all vertical curves and at irregular intersections, modified tools shall be provided as necessary to secure a smooth, uniform contour and surface.

All tools shall be kept in first-class working order and shall be inspected daily. Worn or defective tools will not be permitted. A sufficient number of tools shall be provided for the work to proceed efficiently.

–3.19A Hand Finish

After the concrete has been struck off and consolidated, it shall be smoothed by longitudinal floating. The float, operated from foot bridges spanning the pavement, shall then be operated with a sawing movement parallel to the pavement center line and at the same time be passed transversely from one side of the pavement to the other. Movement ahead shall be in successive advances not greater than one-half the length of the float. The float shall be constructed as shown on the standard drawing.

Floating shall continue until all irregularities are removed. Longitudinal floating shall follow the compaction of the concrete by not less than thirty (30) feet, unless directed otherwise by the Engineer. Free water on the pavement shall be removed with the float or other suitable tool. Floating shall not be considered completed as long as excess water is prevalent on the surface.

After the final passage of the longitudinal float, the floating shall be continued with long-handled floats operated from outside the pavement slab. The float shall have a minimum size of 42 inches in length and six (6) inches in width.

After floating, the surface shall be scraped with a straightedge at least ten (10) feet in length which shall have a long handle for operating at the edge of the pavement. The straightedge shall be operated to correct irregularities in the pavement surface and to remove water and laitance.

Contraction joints shall be placed after all floating has been completed in accordance with provisions of Section 39-3.18A, Formed Transverse Contraction Joints.

Irregularities in the pavement surface resulting from the installation of the contraction joint shall be removed by light floating followed by scraping with the 10-foot straightedge.

After all finishing is completed, the surface smoothness shall be checked with a straightedge ten (10) feet long, mounted to a long handle to permit operation from outside the pavement. The straightedge shall be placed on the surface of the pavement parallel to the center line and at intervals of no more than five (5) feet across the full width of the pavement.

Depressions shall be filled with fresh concrete or the humps scraped off and then refloated and straight-edged.

The surface of the pavement, at conclusion of the finishing operation, shall not vary from a true surface when tested with a ten-foot testing straightedge more than one-eighth (⅛) inch in ten (10) feet.

On street pavements having grades above 15%, or on alleys, the straightedge tolerance may be relaxed at the discretion of the Engineer.

–3.19B Machine Finishing

Before any work is commenced, the Contractor shall have available on the work site all of the necessary tools for hand finishing

The finishing machine shall be of a type approved by the Engineer. It shall be self-propelled and designed to operate on the side forms. Floats shall be of an adequate size and set at an angle which will effectively eliminate all unevenness and produce a smooth, uniform texture without wasting mortar from the surface. A full-length roller shall be located at one end of the machine to embed the aggregate and work a slight excess of mortar to the surface. A water supply and spraying device shall be mounted on the machine to keep the roller clean and add water to the surface as required.

A finishing machine equipped with a power-driven floating screed shall be adjustable to both the crown and plane of the finished pavement surface. The screed shall oscillate longitudinally during its travel transversely across the pavement. The machine shall be operated in the forward direction so that the screed will pass over the same section of pavement at least twice during its transverse travel.

The finishing machine shall be moved over the pavement as many times as is necessary to give the pavement a smooth even texture surface, conforming to the exact crown and cross section specified on the plans.

The floating shall not be considered complete until all free water is removed from the surface.

The finishing operations shall be performed at a time and over such lengths of the pavement surface as existing conditions necessitate. All finishing operations are subject to strict control by the Engineer, and shall be performed to his satisfaction.

The surface smoothness of the completed pavement shall be tested with a ten-foot straightedge and shall meet the surface smoothness requirements specified in Section 39-3.19A.

–3.19C Edging

Before the final finishing is completed and before the concrete has taken the final set, the pavement shall be edged as indicated below.

LOCATION	RADIUS
Edge of pavement	One-half (½) inch
Formed longitudinal contraction joints	One-fourth (¼) inch
Longitudinal construction joints	One-fourth (¼) inch
Transverse construction joints	One-fourth (¼) inch
Formed transverse contraction joints	One-fourth (¼) inch
Through joints	One-half (½) inch
Curbs—back edge	One-half (½) inch
Curbs—front edge	One (1) inch

Particular attention shall be given to edge at the appropriate time. The concrete shall have attained a partial set and all free water shall have disappeared so that the edged joints will be clearly defined, with no tearing or slump of the edges.

–3.19D Final Finish

The pavement surface, after edging, shall be given a uniform, gritty texture true to grade and cross section. The final finish shall be accomplished by one of the methods described hereinafter, or as otherwise directed by the Engineer to achieve the specified surface texture.

Burlap Finish: A burlap drag at least three (3) feet wide and the length of the pavement section shall be dragged forward over the pavement surface. The burlap drag shall be wet and clean when in use. The burlap shall not be left on the pavement surface between dragging operations.

Brush Finish: After edging, the pavement shall be brushed transversely with a fiber or wire brush of a type approved by the Engineer.

Before using either the drag or the brush, the concrete shall have set sufficiently that the surface is not grooved or gouged in the finishing operation.

–3.19E Surface Smoothness

The surface of the concrete pavement shall be finished true to grade and cross section with a smooth even-textured surface. The surface smoothness shall be tested at intervals of five (5) feet transversely across the pavement section. Each succeeding test with the straightedge in the longitudinal direction shall overlap the preceding test section by five (5) feet.

If, in the opinion of the Engineer, the surface smoothness of the pavement after curing is found to exceed the tolerances permitted in Section 39-3.19A by more

than 50%, the high spots shall be ground off until the tolerance is met. If, in the opinion of the Engineer, the surface tolerance cannot be met by grinding, then the pavement shall be removed and replaced at the expense of the Contractor.

–3.20 CURING AND PROTECTION

The concrete pavement shall be protected against excess loss of moisture, rapid temperature change, rain, water and mechanical injury during and immediately following the placing and finishing operations.

The concrete pavement shall be cured for the minimum number of days listed below, exclusive of the day the concrete is placed.

Portland cement ..... 5 days
High-early-strength cement ..... 3 days

Moist curing by sprinkling or by saturated mats, waterproof paper, white polyethylene sheeting, liquid membrane or a combination of these may be used for curing medium and shall be applied in a manner and in quantity appropriate to the particular conditions as approved by the Engineer. Pavement edges which are exposed by the removal of the forms shall be protected by the immediate application of a curing medium or moist earth.

All curing materials shall be free of all substances which are considered to be harmful to portland cement. The curing medium shall be capable of preventing checking, cracking and dry spots regardless of conditions existing at the time of placement. Concrete placement will not be permitted unless curing materials are on the job site and ready for immediate application. Failure to comply with all provisions of the curing procedures hereinafter specified shall be sufficient reason to suspend all concrete operations.

–3.20A Sprinkling System

The sprinkling system shall keep the entire surface of the concrete pavement continuously wet, twenty-four (24) hours a day. Care shall be taken to avoid damage to the surface of the pavement during placement of the equipment. The water flowing off the pavement shall be wasted in a manner satisfactory to the Engineer.

–3.20B Saturated Mats

Cotton mats shall be placed over the entire area of the concrete pavement and kept saturated during the full curing period. The mats shall be lapped at all joints, and they shall be securely held in place to prevent displacement. The material which composes the mats shall conform to the requirements of Section 39-2.07.

–3.20C Waterproof Paper

The wet concrete shall first be wetted with a fine spray of water and then completely covered with a waterproof paper, lapping all joints at least twelve (12) inches. The paper shall be weighted sufficiently to prevent displacement. All tears and holes shall be repaired promptly. The waterproof paper shall conform to the requirements contained in Section 39-2.10.

–3.20D White Polyethylene Sheeting

White polyethylene sheeting shall conform to requirements contained in Section 39-2.11. The installation and maintenance of the sheeting shall be as specified for "Waterproof Paper".

–3.20E White Liquid Membrane Curing Compound

White pigmented curing compound shall conform to the requirements in Section 39-2.08. The entire surface of the pavement shall be sprayed uniformly with sufficient compound to obscure the natural color of the concrete, but not less than one gallon for each 200 square feet of area. The curing compound shall be applied immediately after the finishing is completed and all free surface water has disappeared, or after initial curing when other methods are used in combination with the liquid curing compound.

If hair checking occurs before the finishing operations are completed, the Engineer may require a fog spray as defined in Section 39-3.20H. Any mortar scraped from the pavement surface shall be wasted. When it becomes necessary to fill depressions in the pavement surface, concrete shall be brought from the mixer. Whenever the pavement surface has been disturbed after the initial application of the curing membrane, it shall be restored by respraying.

The curing compound shall be applied with pressure spraying equipment having a feed tank equipped with a mechanically driven agitator and operated with sufficient air to properly atomize the compound.

If forms are removed from the pavement prior to the end of the curing period, curing compound shall be applied to the exposed surfaces within a period of one hour.

Curing compound shall not be applied either immediately before or after a rainfall. If the curing membrane is damaged by rain, it shall be restored to the original condition by respraying.

Provision shall be made for the Engineer to ascertain the rate at which the curing compound is being applied to the pavement. The compound shall be drawn directly from manufacturer's containers bearing the manufacturer's name, brand and lot number. Before placing the compound in the spray tank, it shall be agitated thoroughly to disperse the pigment. The compound shall not be diluted with solvent or altered in any way from its original condition. If the compound has become chilled, it shall be heated but not above 100 degrees Fahrenheit.

After the compound has been applied, the curing membrane shall be protected against damage from any source, including traffic by foot or other. If any traffic is permitted, a protective cover approved by the Engineer shall be placed over the pavement not less than 24 hours after application of the compound.

The Contractor shall have readily available protective covering such as waterproof paper or plastic membrane sufficient to cover concrete pavement that can be placed in one full day.

The Contractor shall assume all liabilities for and protect the Owner from any damages or claims arising from use of materials or processes described herein.

–3.20F Transparent Liquid Curing Compound

The use of transparent liquid curing compounds shall be restricted to areas not exceeding 1,000 square yards. The compound shall meet requirements contained in Section 39-2.09. Sufficient pigment shall be present so that the sprayed compound is easily discernible. The application and the curing shall be the same as for "White Liquid Membrane Curing Compound" in Section 39-3.20E.

–3.20G Emulsified Asphalt

Concrete pavement when laid as a base for an asphalt wearing course shall be cured by spraying with an asphalt emulsion type SS-1 cut back with one or two parts of water for one part of asphalt emulsion. The amount of asphalt emulsion to be applied shall be as directed by the Engineer but not to exceed 0.10 gallon of retained asphalt per square yard.

–3.20H Curing in Hot Weather

In periods of low humidity, drying winds, or high temperatures, a fog spray shall be applied to concrete as soon after placement as conditions warrant in order to prevent the formation of shrinkage cracks. The spray shall be continued until conditions permit the application of a liquid curing membrane or other curing media. The Engineer shall make the decision when the use of a fog spray is necessary.

–3.21 COLD WEATHER WORK

Concrete shall not be placed when the temperature is below forty (40) degrees Fahrenheit, nor shall concrete be placed on a frozen subgrade.

If, during a period of concrete placement and curing, the temperature is expected to drop to thirty (30) degrees Fahrenheit within twenty-four (24) hours in the opinion of the Engineer, all concrete not already cured for at least twenty-four (24) hours shall be covered with an insulating material in a manner and to a depth which will prevent freezing of the concrete. The insulating material shall be such that it will not stain or injure the concrete. The curing period shall be extended as much

time as the Engineer may determine the conditions justify.

Concrete damaged by frost action shall be replaced at the Contractor's expense.

–3.22 CONCRETE PAVEMENT CONSTRUCTION IN SINGLE LANE

Unless otherwise shown on the plans or in special provisions, the pavement shall be constructed in single lanes. Concrete shall not be placed in a succeeding lane sooner than 48 hours after finishing of the first lane. Whenever possible, the mixer shall be operated on the subgrade or on the shoulder adjacent to the lane being paved.

If the Engineer shall deem conditions to be such as to justify the operation of a mixer and trucks upon newly paved concrete because of lack of space elsewhere, he may give permission to do so, but only under the following restrictions:

1. The concrete in the new lane shall have reached its designed age as given in Section 39-3.01A and acquired a modulus of rupture of not less than five hundred (500) pounds per square inch as measured by test beams cast at the time the concrete is placed.
2. The surface of the new pavement shall be protected from scarring and abrasion by operating the mixer on mats, skids or other protective devices satisfactory to the Engineer. Any accumulation of concrete, sand, and gravel, or other debris deposited on the new pavement as a result of operating the mixer thereon shall be completely removed as directed by the Engineer.
3. Suitable cushioning material shall be placed on the bottom of the mixer skip so that the pavement is protected against severe local shocks when the skip is lowered to the pavement to receive a new charge of materials. Lowering the skip in a careless manner will not be permitted.
4. The Contractor shall replace at his own expense any panels on the new pavement that are cracked or broken as a result of operating the mixer thereon.

A protective ramp shall be constructed at the pavement edge where vehicles may be driven on and off the pavement. The forms shall be left on the outside edge of the first lane at all turnouts until the pavement is opened to traffic.

When tie bars are specified, they shall be placed before the concrete is struck off during the last pass with the strike-off screed whether hand or machine operated. The tie bars shall be protected from traffic by bending down and back against the side form. Prior to placing the adjacent lane, the tie bars shall be straightened.

A metal strip three (3) inches wide by one-eighth (⅛) inch thick and at least five (5) feet in length shall be placed on the complete pavement lane near to the common joint with the adjacent lane to be paved, and the concrete placed in the adjacent lane shall be struck off from the plate, whether by machine or hand placement.

All roadways, shoulders, and subgrade in use by the Contractor shall be kept adequately dampened to prevent dust upon the freshly placed concrete.

–3.23 CONCRETE BASE PAVEMENT

Cement concrete pavement, which is intended as a base for an asphalt wearing course, shall be constructed in accordance with the appropriate sections of these specifications for finished concrete pavement with the following exceptions:

(1) The surface tolerance shall be three-eighths (⅜) inch to ten (10) feet.

(2) The surface of the concrete base, if hand compacted, may be struck off with only one strike-off rod. Brushing of the surface of concrete base will not be required.

(3) The curing compound shall be an asphalt emulsion.

(4) Dummy or through joints shall not be constructed unless required in the special provisions.

–3.24 VIBRATING SCREED CONCRETE PAVEMENT CONSTRUCTION

The construction of cement concrete pavement by "vibrating screed" method will be permitted only when specifically provided for in the special provisions. When this type of construction is authorized, those sections of the specifications pertaining to the placing and finishing of cement concrete pavement shall be ignored. All other applicable sections of the specifications shall remain in force except as hereinafter mentioned.

This type of pavement construction is intended for use on small paving projects where the size of the project would not justify mechanized construction and where the location of the streets and the vehicular speeds will not require the degree of smoothness established for the types of cement concrete pavement construction set forth in this section and other sections of these specifications.

–3.24A Materials

All materials appurtenant to or incorporated into cement concrete pavement constructed by the vibrating screed method shall conform to the applicable requirements set forth under Section 39-2.

–3.24B Construction Details

All work preparatory to the placement of concrete shall be accomplished as specified in the applicable subsections herein.

The type of vibrating screed which the Contractor proposes to use, whether roller or beam, shall be subject to approval by the Engineer. Upon request by the Engineer a test section of pavement shall be placed for the purpose of demonstrating the capabilities of the screed to satisfactorily compact and strike off the concrete to the established grade and section.

Concrete with a slump of between one and two inches shall be uniformly distributed between the forms and it shall then be compacted and screeded to the level of the top of the forms by means of the vibrating screed. Particular care shall be taken to prevent the formation of honeycomb or rock pockets due to inadequate consolidation. Supplementary compaction by hand spading or mechanical vibration of the concrete adjacent to the forms will be required if the concrete cannot otherwise be adequately compacted.

The vibrating screed shall be operated over the freshly placed concrete in successive passes only a sufficient number of times to obtain maximum compaction. Over-vibration of the concrete resulting in an excess of mortar at the surface of the pavement will not be permitted.

After the final passage of the vibrating screed, the surface of the concrete shall be at the established pavement grade and cross section and be sufficiently smooth as to require only a very moderate amount of hand finishing for smoothness satisfactory to the Engineer.

The pavement shall then be hand-floated with long-handled wood floats, at least 42 inches long by six (6) inches wide, operated from the side of the pavement in a transverse direction across the pavement surface. Thereafter, a 10-foot scraping straightedge having the form of a long slender tube shall be worked across the pavement surface in a transverse direction until a tight, smooth and water-free surface is produced. Hand finishing shall be restricted to a minimum necessary to obtain surface smoothness acceptable to the Engineer.

Transverse and longitudinal joints shall then be constructed as described in Section 39-3.18. The 10-foot scraping straightedge shall be used to remove any irregularities in the pavement surface caused by construction of the joint.

The surface smoothness and uniformity of the pavement shall be checked immediately behind the finishing by placing a 10-foot straightedge on the pavement and measuring the maximum deviation of the surface below the bottom of the straightedge. The maximum allowable tolerance shall be as specified in Section 39-3.19A.

The concrete pavement shall then be given the final surface finish and edging as specified in Section 39-3.19C and curing as required in Section 39-3.20.

–3.25 TEMPORARY TRAFFIC CROSSINGS AT NEW PAVEMENTS

Temporary traffic crossings shall be constructed at all locations shown on the plans. They shall be constructed in accordance with the construction plans or as described in the special provisions.

–3.26 BARRICADES AND SAFEGUARDS

The Contractor shall, at his own expense, provide and maintain for full 24 hours of the day all necessary safeguards such as watchmen, warning signs, barricades and night lights. He shall channelize traffic during construction and prevent any traffic upon the pavement until it is ready to be opened to travel at the direction of the Engineer. The Contractor, in all cases, shall hold the Owner harmless for any and all damages to persons and property resulting from any of his operations or neglect of his responsibilities.

–3.27 OPENING PAVEMENTS TO TRAFFIC

The Contractor shall not open newly constructed cement concrete pavements to traffic until directed by the Engineer. Ordinarily, the pavement shall have reached its design age before opening to vehicular traffic.

Streets with curbs shall not be opened until the curb has cured for at least 72 hours. If the curb has not attained the design age specified for the pavement, the Contractor shall place form lumber on the pavement two feet away from the curb, or standard barricades may be erected and maintained when directed by the Engineer. The curb protection shall remain in place until the concrete has reached the full design age, unless otherwise directed by the Engineer.

–3.28 CLEANUP

In addition to the cleanup specified in Section 4.08 and Section 57, the Contractor shall, before final acceptance of the work, flush the pavement clean and remove the debris. He shall also clean out all open culverts and drains, inlets, catch basins, manholes and water main valve chambers, within the limits of the project, of dirt and debris of any kind which is the result of the Contractor's operations. The cleaning and disposal of such waste material shall be considered as incidental to the construction and all costs thereof shall be included in the unit contract prices of various items of the work, unless there is included in the proposal an item for "Finishing and Cleanup," per lump sum, or per station (100').

39–4 MEASUREMENT AND PAYMENT

Payment will be made for such of the following bid items as are included in any particular contract:

(1) "Cement Concrete Pavement (class, thickness)," per square yard.
(2) "Cement Concrete Base Pavement (class, thickness)," per square yard.
(3) "Extra Concrete for Thickened Edge 30" x 3"," per linear foot.
(4) "Extra Concrete for Thickened Edge 30" x 2"," per linear foot.
(5) "Steel Reinforcing Bars," per pound.
(6) "Sawing Contraction Control Joints (depth)," per linear foot.
(7) "Temporary Pavement Crossings," per each.
(8) "Extra for Furnishing High-early-strength Cement," per barrel.

–4.01 CEMENT CONCRETE PAVEMENT

Payment for "Cement Concrete Pavement" and "Cement Concrete Base Pavement" shall be at the unit contract price for the specified class and thickness, complete in place.

Measurement for payment shall be by the square yard of concrete in place, including the area underneath curbs. No deduction will be made for castings in pavement.

The unit contract price shall be full compensation for subgrade preparation, furnishing of all labor, tools, equipment, materials excepting reinforcing steel, and for constructing, curing and protecting the cement concrete pavement.

All work, material and equipment not included in a separate unit contract price item shall be considered as incidental to the construction of the pavement and the costs thereof shall be included in the unit contract price per square yard of the cement concrete pavement.

–4.02 EXTRA CONCRETE FOR THICKENED EDGE

Measurement and payment of "Extra Concrete for Thickened Edge," (30" x 3" or 30" x 2") shall be by the unit contract price per linear foot as measured along the face of the thickened edge.

The unit contract price per linear foot shall be full compensation for excavation and all costs of labor, tools, equipment and materials required in shaping the subgrade to the required section, and for constructing the thickened edge of the same mix and consistency as the pavement with which it will become an integral part.

–4.03 STEEL REINFORCING BARS

Steel required for pavement reinforcement will be paid for at the unit contract price for "Steel Reinforcing Bars" which shall be full compensation for furnishing and placing steel reinforcement as detailed on the construction plans. Measurement for payment will be by the pound of steel reinforcement in place.

Reinforcing steel shown on the standard drawings and required for ties of the pavement to driveway, curb, and curb and gutter will not be paid for under the item of "Steel Reinforcing Bars," per pound. Such steel shall be considered as incidental to the construction of the pavement and all costs thereof shall be included in the unit contract price per square yard of "Cement Concrete Pavement."

–4.04 SAWING CONTRACTION CONTROL JOINTS

Measurement for payment will be by the linear foot of contraction joint sawed, cleaned and sealed in accordance with the plans and specifications.

The unit contract price per linear foot for sawing joints shall be full compensation for all labor, equipment and materials required to saw joints to the depth specified, and the unit contract price shall include all costs of labor and material for the sealing of the sawed joint as specified.

–4.05 EXTRA FOR FURNISHING HIGH-EARLY-STRENGTH CEMENT

If the Engineer shall direct that high-early-strength cement be used on any part of the work in lieu of standard portland cement, extra compensation will be made the Contractor in an amount per barrel equal to the difference between the price paid by him for standard portland cement and the price paid by him for high-early-strength cement.

–4.06 TEMPORARY PAVEMENT CROSSINGS

The unit contract price per each for "Temporary Pavement Crossings" shall be full compensation for all costs in connection with constructing, maintaining and removing temporary crossings over the pavement, including the approaches thereto, and for the removal of the spans after the pavement is ready for traffic. Payment will be made for each span installed regardless of whether it be a new one, or a span removed from a previous location on the project.

–4.07 COMPACTING EQUIPMENT

Compaction of subgrade and other parts of the contract will be a pay item only when so provided in the special provisions. Measurement and payment for such of the equipment as may be required on the project will be measured by the hour for the following items described in Section 15-2.01A, when any are included in the proposal:

1. "'Variable Load Compactor," per hour.
2. "Grid Roller," per hour.
3. "Pneumatic-tired Roller," per hour.
4. "Smooth-wheeled Power Roller," per hour.
5. "Mechanical Tamper," per hour.
6. "Vibratory Compactor," per hour.

Section 40—Cement Concrete Curb, Curb and Gutter

40–1 DESCRIPTION

The construction of cement concrete curb, and curb and gutter shall be in conformance with these specifications and with the standard drawings 1, 2, 3, 4, 5 and 6 which become a part thereof insofar as they are applicable to any particular project.

–1.01 CLASSIFICATION AND USE

The several types of curb and the general use of each and also curb and gutter are described in subsections which follow and which supplement requirements on the standard drawings. The particular type of curb shall be that specified in the plans and proposal. Neither extruded curb nor extruded curb and gutter shall be used unless so provided in the plans or special provisions.

–1.02 CEMENT CONCRETE CURBS

–1.02A Curb, Type A and Type B

Type A and Type B curbs are constructed in conjunction with cement concrete pavement as shown on standard drawings 3 and 4. Two methods of construction, as noted below, are allowed under the specifications:

(1) Formed curb with either steel or wood forms and
(2) extruded curb. Two slightly differing cross sections are shown on standard drawings 3 and 4. Extruded curb may be constructed if so provided in the plans or special provisions, and constructed with a cross section conforming to either Type A or Type B.

–1.02B Low Curb, Type C and Type D

Type C curb is used primarily in conjunction with concrete pavements for alleys and in industrial areas.

Type D curb may be used in business areas and as a drop curb in the construction of driveways. See standard drawing 5 for details of construction for Type C and Type D curbs.

–1.02C Separate Curb, Type E

Type E curb is a separate curb having limited application in repair work or in special situations where the other types of curb are not suitable. See standard drawing 6 for details of construction.

–1.02D Transitional Curb

The transitional curb is used in the construction of concrete driveway and alley returns as shown on standard drawings 8, 9, 12 and 13. If two curbs of differing sections are joined together by a length of curbing with a cross section that varies continuously throughout its length, it will not be considered as transitional curb. Payment for such a curb as just described shall be at the same unit price rate as for the type of curb being constructed.

–1.03 CURB AND GUTTER

Curb and gutter shall be used on all asphalt paved streets unless otherwise noted in the special provisions. Construction may be accomplished by using either steel or wood forms as shown on standard drawings 1 and 2. Curb and gutter may also be constructed by the extruded method if so provided in the special provisions.

40–2 MATERIALS AND FORMS

–2.01 CONCRETE

Concrete shall conform to the requirements for Class 5(1½) in sections 39-3.03 and 39-3.04.

–2.02 REINFORCING STEEL AND STEEL DOWELS

Reinforcing steel and steel dowels shall conform to the requirements contained in Section 39-2.04A.

–2.03 PREFORMED EXPANSION AND DUMMY JOINT FILLER

Dimensions of joint filler shall be as shown on the standard drawings and the material shall conform to the requirements of Section 39-2.06.

–2.04 CURING COMPOUNDS

Curing compounds shall comply with the requirements of sections 39-2.08, 39-2.09 and 39-3.20.

–2.05 FORMS

–2.05A Wood Forms

Forms shall conform to the dimensions specified on the standard drawings 1 through 6. The lumber for forms shall be surfaced on four (4) sides (S4S), and be "construction grade", Douglas Fir, West Coast Lumber Inspection Bureau, or be "common structural", per grading of Western Pine Association.

Form lumber shall vary from 12 to 16 feet in length, be free of warp and the ends true. Any form lumber which has defects which would impair the appearance or structural utility of the completed curb, or curb and gutter, shall not be used.

Where short radius forms are required, one-inch sound lumber (S4S) or plywood may be used.

–2.05B Steel Forms

The type of steel forms shall be subject to the approval of the Engineer. The forms shall extend the full height of the curb section and they shall be free of warps, bends, twists or other defects which would impair the appearance or utility of the completed work. When set in place, the forms shall possess adequate strength and rigidity to remain true to established line and grade within the limits and tolerances of Section 40-3.01A.

All metal forms except those for exposed surfaces shall have slots at the top and be spaced at one foot intervals so that metal spacer plates can be placed at intervals of one foot or more, as directed by the Engineer.

Forms shall consist of sections ten (10) feet in length and each section over six inches in height shall have not less than three stake pockets, one at each end and one in the center. Forms six inches or less in height will not require the center stake pocket. Stake pockets shall accommodate not less than a ⅞-inch diameter steel stake. There shall be provision for keying the form to the stake to allow positioning of the form to line and grade without depending upon the support of the subgrade.

The form stake shall be not less than seven-eighths (⅞) of an inch in diameter. The length shall be not less than eighteen (18) inches and stakes of greater length shall be available on the job site as field conditions necessitate.

Form sections shall be held tightly together by means of a sliding joint which will make a tight, rigid joint, free of any movement. The face form shall conform to the particular section shown on standard drawings 1 through 6 and it shall be free of holes or protuberances which would mar the face of the curb. The face form shall be connected to the back form by hangers or connections to the divider plates. Additional bracing or support to the form shall be as directed by the Engineer.

40–3 CONSTRUCTION DETAILS

–3.01 CURBS

–3.01A Erecting Forms

Forms, wood or steel, shall be staked securely in place, true to line and grade. A 2-inch by 6-inch by 12-inch (2" x 6" x 12") block of wood shall be placed at, and spanning each joint of the form. Additional blocks shall be placed if so directed by the Engineer.

Sufficient support shall be given to the form to prevent movement in any direction, resulting from the weight of the concrete or the concrete placement. Forms shall not be set until the subgrade has been compacted within one inch of the established grade. Forms shall be clean and well oiled prior to setting in place. When set, the top of the form shall not depart from grade more than one-eighth (⅛) inch when checked with a ten-foot straightedge. The alignment shall not vary more than one-eighth (⅛) inch in ten (10) feet. Immediately prior to placing the concrete, forms shall be carefully inspected for proper grading, alignment and rigid construction. Adjustments and repairs as needed shall be completed before placing concrete.

–3.01B Placing Concrete

The subgrade shall be properly compacted and brought to specified grade before placing concrete. The subgrade shall be dampened to a depth of at least three (3) inches immediately prior to the placement of the concrete. Concrete shall be spaded and tamped thoroughly into the forms to provide a dense, compacted concrete free of rock pockets. The exposed surfaces shall be floated, finished and brushed longitudinally with a fiber hair brush approved by the Engineer.

The rate of concrete placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these specifications.

If concrete is to be placed by the extruded method, the Contractor shall demonstrate to the satisfaction of the Engineer that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade.

The concrete shall meet the strength requirements as set forth in Section 39.

–3.01C Dowels and Keyways

Dowels and keyways shall be placed in the pavement slab as detailed on standard drawings 2, 3 and 4.

Keyways shall be formed by forcing a pointed stick, two inches square, into the plastic concrete midway between each set of dowels. The dowel bars shall be set while the concrete is still plastic enough to not require hammering them into place.

In lieu of the straight dowel bar, three-eighths (⅜) inch dowel bar bent into the shape of a "U" may be used. Dimensions of this alternate dowel are shown on standard drawings 2, 3 and 4. When this type of dowel is used, the keyway may be omitted.

–3.01D Stripping Forms and Finishing

If wood forms are used, the curb face form shall be stripped within 24 hours unless directed otherwise by the Engineer. Inspect curb face and correct all irregularities to the satisfaction of the Engineer. Back forms and front forms for gutter section may be stripped at a later time, as the Engineer may direct.

If the forms are steel, curb face form shall be stripped within a few hours in order to complete the finishing procedure while the concrete is still workable.

The curb face form shall be removed at a time specified by the Engineer and the remainder of the forms may be removed at a later date. Forms shall not be removed until the concrete is set sufficiently to retain its true shape. With Type A curb, trowel the face of curb with tool cut to the exact section of curb, while maintaining the shape, grade and alignment. Exposed surfaces of combined curb and gutter shall be finished in the same manner as Type A and Type B curbs. After troweling, the surface of the curb or curb and gutter shall be brushed with a fiber hair brush. Water shall not be sprinkled on the concrete when finishing the curb.

–3.01E Curing

White pigmented or transparent curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent curing compound shall contain a color dye of sufficient strength to render the film distinctly visible on the concrete for a minimum period of four (4) hours after application.

In curb and gutter, where the gutter section and curb section are placed separately, the surface of gutter directly beneath the curb section shall be covered with a protective cover in order to protect this area from the curing agent at the time the gutter is sprayed. This cover must remain in place until the curb is placed. Care shall be taken in the placing of this cover in order to keep the steel dowels from puncturing the cover.

If, at any time during the curing period any of the forms are removed, a coat of curing compound shall be applied immediately to the exposed surface. The curing compound shall be applied in sufficient quantity to obscure the natural color of the concrete. Additional coats shall be applied if the Engineer determines that the coverage is not adequate. The concrete shall be cured for the minimum period of time set forth in Section 39-3.20.

–3.01F Expansion and Dummy Joints

Joints shall be constructed in the manner and at the locations shown on standard drawings 1 through 6. They shall be cleaned and edged as shown on the drawings and as further specified in Section 39. All expansion and contraction joints shall extend entirely through the curb section above the pavement surface. Joint filler in the curb shall be normal to the pavement and in full butt contact with pavement joint filler.

–3.01G Curb Drains

Curb drains shall be placed to vent all existing drains. Additional curb drains shall be placed as directed by the Engineer.

Curb drains shall be three (3) inches in diameter and shall be formed with metal, plastic or other suitable tubular material approved by the Engineer. Curb drains will be paid for by the unit contract price per each.

–3.01H Finished Work

The work shall be performed in a manner which results in a curb or curb and gutter constructed to specified line and grade, uniform in appearance and structurally sound. Curbs found with unsightly bulges, ridges, low spots in the gutter or other defects shall be removed and replaced at the Contractor's expense if the Engineer considers them to be irreparable. When checked with a ten (10) foot straightedge, grade shall not deviate more than one-eighth (⅛) inch, and alignment shall not vary more than one-eighth (⅛) inch.

–3.02 TYPE A AND TYPE B CURB

Types A and B curb may be constructed concurrently with the concrete pavement, or construction may be delayed until after the pavement slab has been placed and cured, unless otherwise noted in the special provisions. Dowels shall be placed as shown on standard drawings 3 and 4.

Types A or B curb, when placed separately, may be constructed with conventional forms as described herein, or by the extruded method if so provided for in the special provisions. If constructed by the extruded method, the curb shall conform in all respects to the requirements of Section 40-3.01H.

In transporting concrete over the new pavement slab to construct Type A or Type B curb, if ready-mix concrete trucks are used, the concrete shall have attained a compressive strength of 2,500 lbs. or a flexural strength of 500 psi using test specimens cured under the same conditions as the concrete pavement.

If concrete buggies are used, at least 48 hours shall have elapsed between the placing of the new pavement slab and the start of curb construction. Damage to the liquid curing membrane on the pavement surface resulting from the curb construction shall be repaired by spraying the damaged area with curing compound.

–3.03 TYPE C AND TYPE D LOW CURB

Type C low curb shall be constructed at the time the concrete pavement is placed.

Where Type D low curb is used as a driveway crossing, and if the curb is to be constructed separately, then the concrete pavement or concrete gutter section shall be blocked out to provide for later installation of the curb. For details of construction see standard drawings 9 and 10.

–3.04 TYPE E SEPARATE CURB

Type E curb may have the batter on the front or on the back side, whichever the Engineer may direct. See standard drawing 6 for construction details. Excavation required shall be considered as incidental to the cost of the curb and no payment will be made therefor.

–3.05 TRANSITIONAL CURB

Transitional curb shall be constructed monolithically with the pavement slab on which it is located. The curb shall be carefully shaped to blend in with existing or new construction. Dowels and keyways are not required.

–3.06 CURB AND GUTTER

If wood forms are used in the construction of curb and gutter, the curb shall be placed separate from the gutter. Steel dowels and keyways shall be provided as described in Section 40-3.01C and the cost thereof shall be considered as incidental to the construction of curb and gutter, and no separate payment will be made therefor. The curb may be constructed integral with the gutter, if approved by the Engineer.

Where steel forms are used, the curb and gutter shall be cast monolithically. Dowels or keyways are not required.

Curb and gutter may be constructed by the extruded method only if such construction is called for in the special provisions. The curb and gutter may be extruded as a unit, or the curb may be extruded upon the gutter section in which case steel dowels and keyways shall be provided as specified in Section 40-3.01C.

40–4 MEASUREMENT AND PAYMENT

Measurement and payment will be made for such of the following bid items as may appear in the proposal:

1. "Cement Concrete Curb, Type A," per linear foot.
2. "Cement Concrete Curb, Type B," per linear foot.
3. "Cement Concrete Curb, Type C," per linear foot.
4. "Cement Concrete Curb, Type D," per linear foot.
5. "Cement Concrete Curb, Type E," per linear foot.
6. "Cement Concrete Curb and Gutter, Type A," per linear foot.
7. "Cement Concrete Curb and Gutter, Type B," per linear foot.
8. "Cement Concrete Transitional Curb," per linear foot.
9. "Curb Drain," per each.
10. "Extra for Furnishing High-early-strength Cement," per barrel.

Concrete curb and curb and gutter will be measured by the linear foot along the face of curb for the actual length constructed.

Curbs types A, B, C, D and the transitional curb do not include the pavement slab upon which they are placed. That portion of the pavement slab underneath the curb will be paid for as concrete pavement.

The unit contract prices for the above items shall be full compensation for furnishing all labor, materials, equipment, work and incidentals necessary to construct the various types of curb, and curb and gutter in accordance with the requirements of the specifications. Excavation, select materials, and other work items will be paid for by applicable bid items in the proposal.

Section 41—Cement Concrete Driveway and Alley Returns

41–1 DESCRIPTION

Cement concrete driveway and alley returns shall be constructed at the locations shown on the construction plans and where directed by the Engineer, and shall be in accordance with these specifications and standard drawings Nos. 7 to 13, inclusive.

The number of private driveways may be increased over that shown on the construction plans, if required by the Engineer. Sufficient notice of the additional installations shall be given by the Engineer to enable the Contractor to schedule the private driveways along with other construction in the same general area without moving equipment back for the purpose.

–1.01 CLASSIFICATION AND USAGE

The classification of driveway and alley returns are defined below and are consistent with the standard drawings. The use of driveway and alley returns is shown on the standard drawings related thereto. Driveway returns can, however, be used as alley returns if so desired.

–1.01A Cement Concrete Driveway, Type A

Type A driveway shall be used in conjunction with the construction of cement concrete pavement when called for in the bid proposal. Construction details are shown on standard drawing No. 7.

–1.01B Cement Concrete Driveway, Type B

Type B driveway shall be used in conjunction with the construction of asphalt concrete pavement when called for in the bid proposal. Construction details are shown on standard drawing No. 8.

–1.01C Cement Concrete Driveway, Type C

Type C driveway shall be used in conjunction with cement concrete pavement which incorporates the drop curb type of curb construction. This type will be used when called for in the bid proposal. Construction details are shown on standard drawing No. 9.

–1.01D Cement Concrete Driveway, Type D

Type D driveway shall be used in conjunction with asphalt concrete pavement which incorporates the drop curb type of curb construction. This type will be used when called for in the bid proposal. Construction details are shown on standard drawing No. 10.

–1.01E Cement Concrete Alley Return, Type A

Type A alley return shall be used in conjunction with cement concrete pavement when called for in the bid proposal. Construction details are shown on standard drawings Nos. 11 and 12.

–1.01F Cement Concrete Alley Return, Type B

Type B alley return shall be used in conjunction with asphalt concrete pavement when called for in the bid proposal. Construction details are shown on standard drawings Nos. 11 and 13.

41–2 MATERIALS

The portland cement concrete, joint filler, forms, reinforcing steel and curing materials shall conform to requirements outlined in Section 39, "Cement Concrete Pavement."

41–3 CONSTRUCTION DETAILS

–3.01 EXCAVATION AND SUBGRADE

Excavation for driveways and alley returns shall be considered as "Unclassified Excavation," as defined in Section 13-1.01, unless otherwise provided for in the special provisions.

Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and backfilled with selected materials which shall be compacted to the satisfaction of the Engineer. Payment will not be allowed for excavation below grade, nor for the additional backfill materials required to compensate for excavation below the required depth.

Before forms are set, the subgrade shall be graded to within one (1) inch of established grade.

–3.02 FORMS AND FINE GRADING

Forms for the straight sections of the driveway or alley return shall have a minimum thickness of two (2) inches; however, plywood or one (1) inch lumber may be used for the radii. All forms shall be securely staked and blocked to true line and grade.

A template shall then be set upon the forms for fine grading the subgrade so it will conform to the section required. Low areas in the subgrade shall be backfilled with selected materials or suitable native material, as directed by the Engineer. The backfill shall then be compacted to the satisfaction of the Engineer. High areas in the subgrade shall be cut down to meet the grade requirements. The subgrade shall be thoroughly dampened prior to the placement of the concrete. Water for wetting the subgrade shall be considered as incidental to the construction and no payment will be made therefor.

–3.03 PLACING AND FINISHING CEMENT CONCRETE PAVEMENT

The concrete shall be spread uniformly between the forms and thoroughly compacted with an approved type

of strikeboard. Through joints and dummy joints shall be located and constructed in accordance with applicable standard drawings. In the construction of through joints, the premolded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Dummy joints shall be formed with a tee bar by first cutting a groove in the concrete to a depth equal to, but not greater than the joint filler material and then working the premolded joint filler into the groove. Premolded joint filler for both through and dummy joints shall be positioned in true alignment and at right angles to the center line of the driveway or alley return.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a steel float. Joints shall be edged with one-fourth (¼) inch radius edger and the driveway or alley return edges shall be tooled with one-half (½) inch radius edger.

The surface shall be brushed in a transverse direction in relation to the center line of the driveway or alley return with a fiber hair brush of approved type.

Additional requirements for placing and finishing concrete in cold weather shall be as outlined in Section 39-3.21.

Driveways and alley returns shall not be constructed at the same time the pavement is placed unless authorized by the Engineer.

–3.04 CURING AND PROTECTION

The curing materials and procedures defined in Section 39, Cement Concrete Pavement, shall be used. The curing agent shall be applied immediately after brushing and shall be maintained for a period of five (5) days.

Before placing any concrete, the Contractor shall have on the job site enough protective paper to cover the pour of an entire day, in event of rain or other unsuitable weather conditions.

The driveway or alley return shall be protected against damage or defacement of any kind until it has been accepted by the Owner. Driveways or alley returns, not acceptable in the opinion of the Engineer because of damage or defacement, shall be removed and replaced at the expense of the Contractor.

Additional requirements for curing in hot weather shall be as defined in Section 39-3.20H. Additional requirements for curing in cold weather shall be as outlined in Section 39-3.21.

41–4 MEASUREMENT

Measurement for cement concrete pavement will be by the square yard for the class and thickness of pavement placed, including the area underneath the curb.

Measurement for cement concrete transitional curb will be by the linear foot for curb constructed.

Measurement for cement concrete curb Type D will be by the linear foot, radius point to radius point through the driveway for curb constructed.

41–5 PAYMENT

Payment will be made for such of the following bid items as are included in the contract:

1. "Cement Concrete Pavement (thickness, class)," per square yard.
2. "Cement Concrete Transitional Curb," per linear foot.
3. "Cement Concrete Curb Type D," per linear foot.

The unit contract prices shall be full compensation for all labor, tools, equipment and materials required to perform the work as specified. Any work which is essential to the construction but for which no bid item is included in th proposal shall be considered as incidental and the costs thereof shall be included in the pay items of the proposal.

Excavation, selected materials, water and compaction will be measured and paid for in accordance with applicable sections of the specifications only if they are set up among the items in the proposal; otherwise, the work and materials involved shall be considered as incidental to the construction and the costs therof shall be included in the bid items of the proposal.

Section 42—Cement Concrete Sidewalks

42–1 DESCRIPTION

Cement concrete sidewalk is constructed in two types, Type A and Type B as shown on the standard drawing No. 14. Construction of either type shall be in compliance with the details on the standard drawing and with these specifications.

42–2 MATERIALS

Cement and other concrete materials, joint filler, forms and curing materials shall conform to the requirements of applicable subsections in Section 39, "Cement Concrete Pavement." Reinforcing steel, when called for on the plans, shall conform to the requirements in Section 39-2.04.

The concrete mix shall be Class 5(1½), as specified in Section 39-3.01.

42–3 CONSTRUCTION DETAILS

–3.01 EXCAVATION AND SUBGRADE

Excavation for sidewalks shall be considered as "Unclassified Excavation," as described in Section 13-1.01, unless otherwise provided for in the special provisions. Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and then backfilled with selected materials. Payment will not be allowed for excavation below grade and for backfill materials required when such excavation is caused by negligence of the Contractor.

Embankments shall be compacted by Method B as specified in Section 13-3.10E3. Equipment used for the compaction of this embankment shall meet requirements described in Section 15-2.01A. In areas that are inaccessible to normal compaction equipment, approved tampers shall be used.

Before the forms are set, the subgrade shall be graded to within one (1) inch of established grade and the area between the sidewalk and the adjacent private property line shall be shaped to line, grade, and section shown on the construction plans.

–3.02 FORMS AND FINE GRADING

Forms shall conform to requirements outlined in Section 39. Wood forms shall be two (2) inches by four (4) inches and in lengths of not less than ten (10) feet. Steel forms may be used upon approval of the Engineer. Forms shall be staked to a true line and grade. A subgrade template shall then be set upon the forms and the fine grading completed so that the subgrade will be a minimum of three and five-eighths (3⅝) inches below the top of the forms.

Low areas in the subgrade shall be backfilled with select materials or with suitable native material as directed by the Engineer. The backfill shall then be compacted to the satisfaction of the Engineer and any high areas in the subgrade shall be cut down to meet the subgrade requirements specified above. The subgrade shall be thoroughly dampened prior to the time the concrete is placed. No payment will be made for water and the work of placing and cost thereof shall be considered as incidental to the construction of the concrete sidewalk.

–3.03 PLACING AND FINISHING CEMENT CONCRETE SIDEWALK

The concrete shall be spread uniformly between the forms and thoroughly compacted with a steel shod strikeboard. Through joints and dummy joints shall be located and constructed in accordance with standard drawing No. 14. In construction of through joints, the premolded joint filler shall be adequately supported until the concrete is placed on both sides of the joint.

Dummy joints shall be formed by first cutting a groove in the concrete with a tee bar of a depth equal to, but not greater than the joint filler material, and then working the premolded joint filler into the groove. Premolded joint filler for both through and dummy joints shall be positioned in true alignment at right angles to the line of the sidewalk and be normal to and flush with the surface. Where the sidewalk will be contiguous with the curb, it shall be constructed with a thickened edge as shown on standard drawing No. 14.

After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a steel float. Joints shall be edged with a ¼-inch radius edger and the sidewalk edges shall be tooled with a ½-inch radius edger.

Depending on the type, the sidewalk shall be divided into panels by scoring one-fourth (¼) inch deep in the manner shown on standard drawing No. 14.

The surface shall be brushed with a fiber hair brush of an approved type in a transverse direction except that at driveway and alley crossings it shall be brushed longitudinally. The placing and finishing of all sidewalk shall be performed under the control of the Engineer, and the tools used shall meet with his approval.

Additional requirements for placing and finishing concrete in cold weather shall be as outlined in Section 39-3.21.

–3.04 CURING AND PROTECTION

The curing materials and procedures outlined in Section 39-3.20 shall prevail, except that white pigmented curing compound shall not be used on sidewalks. The curing agent shall be applied immediately after brushing and be maintained for a period of five (5) days.

Before commencing the placing of any concrete sidewalk, *the Contractor shall have* on the job site sufficient protective paper to cover the pour of an entire day, in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the Owner. Sidewalk which is not acceptable to the Engineer because of damage or defacement, shall be removed and replaced at the expense of the Contractor.

Additional requirements for curing in hot weather shall be as outlined in Section 39-3.20H. Additional requirements for curing in cold weather shall be as outlined in Section 39-3.21.

42–4 MEASUREMENT

Measurement for cement concrete sidewalk will be by the square yard for all surface of concrete walk placed. Measurement for thickened edge of sidewalk will be by the linear foot for the distance thickened.

42–5 PAYMENT

Payment will be made for such of the following bid items as are included in the contract:

1. "Cement Concrete Sidewalk Type A," per square yard.
2. "Cement Concrete Sidewalk Type B," per square yard.
3. "Type A Thickened Edge for Sidewalk," per linear foot.
4. "Extra for Furnishing High-early-strength Cement," per barrel.

The unit contract prices shall be full compensation for all labor, tools, equipment and materials required to perform the work as specified. Any work which is essential to the construction but for which no bid item is included in the proposal shall be considered as incidental and the costs thereof shall be included in the pay items of the proposal.

Excavation, selected materials, water and compaction will be measured and paid for in accordance with applicable sections of the specifications only if they are set up among the items in the proposal; otherwise, the work and materials involved shall be considered as incidental to the sidewalk construction and the costs thereof shall be included in the bid items of the proposal.

Section 43—Cement Concrete Combined Sidewalk Curb and Gutter

43–1 DESCRIPTION

Cement concrete combined sidewalk, curb and gutter shall be constructed at the locations shown on the construction plans or where directed by the Engineer, and shall be in accordance with standard drawing No. 15 and the provisions of this section.

43–2 MATERIALS

Portland cement concrete, joint filler, forms and curing materials shall conform to the requirements in Section 39, "Cement Concrete Pavement".

The concrete mix shall conform to the requirements in Section 39-3.01 for Class 5(1½).

Reinforcing steel and dowels shall conform to requirements set forth in Section 39-2.04.

43–3 CONSTRUCTION DETAILS

–3.01 GENERAL

The curb and gutter section shall be placed prior to the placement of the sidewalk section unless otherwise directed by the Engineer. Basic construction shall conform to Section 42, "Cement Concrete Sidewalk", and Section 40, "Cement Concrete Curbs, Curb and Gutter".

–3.02 EXCAVATION AND SUBGRADE

Excavation and subgrade shall be as defined in Section 42-3.01.

–3.03 FORMS AND FINE GRADING

Forms and fine grading shall be as defined in sections 42-3.02 and 40-3.01A.

–3.04 PLACING AND FINISHING CONCRETE

Placing and finishing concrete shall be as defined in sections 42-3.03 and 40-3.01B.

–3.05 DOWELS AND KEYWAYS

Dowels and keyways, where called for in the special provisions or directed by the Engineer, shall be as defined in Section 40-3.01C and as shown on standard drawing No. 2.

–3.06 STRIPPING FORMS AND FINISHING

Stripping forms and finishing shall be as defined in Section 40-3.01D.

–3.07 CURING AND PROTECTION

Curing shall be as defined in sections 42-3.04 and 40-3.01E.

43–4 MEASUREMENT

For purposes of measurement and payment, the "Cement Concrete Combined Sidewalk, Curb and Gutter" shall be considered as three component sections.

The first component, "cement concrete sidewalk," shall comprise that portion of the combined section beginning six (6) inches behind face of curb and shall be the actual square yards of sidewalk constructed.

The second component, "curb and gutter," shall comprise that portion of the combined section beginning at back of curb and through the gutter section, and shall be the actual linear feet of curb and gutter constructed.

The third component, "thickened edge," shall comprise the triangular portion of the combined section below the bottom of sidewalk and butting the back of the curb and gutter section. The thickened edge shall be actual length in linear feet of thickened edge constructed.

43–5 PAYMENT

Payment will be made for such of the following bid items as are included in any particular contract:

1. "Cement Concrete Sidewalk Type A," per square yard.
2. "Cement Concrete Sidewalk Type B," per square yard.
3. "Cement Concrete Curb and Gutter Type A," per linear foot.
4. "Cement Concrete Curb and Gutter Type B," per linear foot.
5. "Type B Thickened Edge for Sidewalk," per linear foot.
6. "Extra for Furnishing High-early strength Cement," per barrel.

The unit contract prices for the above items shall be full compensation for all labor, materials and equipment and incidentals in the construction of them in accordance with specifications and standard drawing.

Excavation, selected materials, water and compaction will be measured and paid for in accordance with specifications in applicable sections only when they are included in the bid proposal; otherwise, the work and materials involved shall be considered as incidental to the construction and all costs thereof shall be included in bid items of the proposal.

Section 44—Precast Concrete Traffic Curb Class I, Traffic Buttons, and Extruded Traffic Curb

44–1 DESCRIPTION

Precast concrete traffic curb Class I, precast traffic buttons, and extruded traffic curb shall be constructed in accordance with the design standards or as shown on the plans and shall be placed in locations shown on the plans, or as directed by the Engineer.

44–2 MATERIALS

–2.01 PRECAST CONCRETE TRAFFIC CURB CLASS I, AND TRAFFIC BUTTONS

The cement, fine and coarse aggregates, and reinforcing steel shall conform to the following requirements:

The cement shall conform to the requirements for either Type I or Type III of the standard specifications for Portland Cement, ASTM Designation C 150.

The aggregate shall be a granular material uniformly graded up to a maximum size of ⅜ inch and shall contain sufficient fine fractions to permit securing the type of surface finish specified herein. The aggregate shall be approved by a materials laboratory or by the Engineer before it is used.

Reinforcing steel shall conform to the requirements of Section 39–2.04.

–2.02 ALUMINUM COVERED TRAFFIC BUTTONS

Aluminum covered traffic buttons shall conform to the details shown on the standard drawing No. 27, and to the following additional material requirements:

The cement shall conform to the requirements for either Type I or Type III of the standard specifications for Portland Cement, ASTM Designation C 150.

The aggregate shall be a granular material uniformly graded up to a maximum size of three-eighths (⅜) inch.

The cement concrete mix shall be composed of not less than one (1) part portland cement to approximately two (2) parts of sand and three and one-fourth (3¼) parts of coarse aggregate adjusted to secure proper workability. The contractor will be allowed to use a different concrete mix if approved by the Engineer, provided that it develops not less than 4,000 pounds per square inch compressive strength when tested at the age of 28 days.

–2.03 EXTRUDED TRAFFIC CURB

Extruded traffic curb shall be constructed with a cement concrete mix that will have a dense, uniform texture which will not sag or displace behind the machine.

The concrete mix shall be proportioned as follows:

Sacks of cement per cubic yard	6.5
Pounds of dry fine aggregate per sack of cement	245
Pounds of dry ¾" maximum coarse aggregate per sack of cement	238
Slump (ASTM Designation C 143)	Not over one inch

The ¾" maximum coarse aggregate shall meet all requirements of Section 39 except that it shall meet the following requirements for grading:

Passing 1" square screen	100%
Passing ¾" square screen	95–100%
Passing ⅜" square screen	20– 40%
Passing U. S. No. 4 sieve	0– 3%

The Contractor will be allowed to use a different concrete mix if approved by the Engineer, provided that it develops not less than 4,000 pounds per square inch compressive strength at 28 days. It is the intent of these specifications to provide a concrete mix having such characteristics of mobility and workability that it can be extruded without slumping, deforming or displacing. The finished curb shall have a dense, smooth and uniform surface texture and shall develop a minimum of shrinkage cracks upon curing.

44–3 CONSTRUCTION DETAILS

–3.01 PRECAST CONCRETE TRAFFIC CURB AND TRAFFIC BUTTONS

–3.01A MANUFACTURE

–3.01A1 Proportioning

The cement concrete mix shall be composed of not less than one (1) part portland cement to approximately two (2) parts of sand and three and one-fourth (3¼) parts of coarse aggregate (1:2:3¼). The ratio of fine and coarse aggregates may be adjusted to secure proper workability.

The compressive strength of the concrete shall not be less than 3,500 pounds per square inch when tested at the age of 14 days.

–3.01A2 Mixing

The mixers shall be kept in good repair and be equipped with an automatic timing device and a positive device for regulating the quantity of water added to each batch. Such device must be approved by the Engineer before use.

After all materials, including water, have been placed in the mixer, the materials shall be mixed for a period of not less than 1¾ minutes, or as much longer as may be necessary to produce a thorough and uniform mixture of the concrete. No water shall be added to any batch after the completion of the initial mixing period. Each batch of concrete shall be completely emptied from the mixer before placing more materials in it. A batch which has not been placed within 30 minutes from the time water was first added, shall not be used.

The amount of water in the concrete shall be kept at a minimum consistent with the manufacture of dense curb, free from air bubbles and surface defects in excess of the tolerance limits herein specified.

–3.01A3 Forms

Forms shall be of concrete or steel. The use of forms or molds made of plaster of paris, wood, or other absorptive material will not be permitted.

Bulkheads shall be tight fitting so that there is no leakage of mortar between the bulkhead and form.

The materials and methods used for lubricating the forms shall be such as will not result in discoloration of the curb at any time. A minimum quantity of lubricant shall be used and all excess shall be removed.

–3.01A4 Placing Concrete

The concrete shall be consolidated by external vibration, or by other means if approved by the Engineer, so as to produce a dense concrete throughout having a minimum of air bubbles and honey-combing.

Reinforcing steel shall be placed and maintained in its proper position as shown in the standard drawing Nos. 25 and 27.

Curb or buttons shall not be manufactured in an atmospheric temperature of less than 50° Fahr.

–3.01A5 Removal of Forms

The curb shall be removed from the molds or forms in accordance with the instructions pertaining thereto, or by some other method acceptable to the Engineer. Failure to remove the curb from the molds in accordance with the instructions issued by the Engineer, or removal by any method which, in the opinion of the Engineer, is detrimental to the curb will be cause for rejection of the curb.

The loosening of the curb or buttons from the molds shall be carefully performed to avoid excessive shock and straining of the curb and buttons. When, in the opinion of the Engineer, undue shock is required to remove the curb from the molds, the stripping operation shall be deferred until such time as the curb may be removed without breakage.

–3.01A6 Curing Concrete

Immediately after the concrete has been placed and consolidated in the mold each unit shall be placed in a curing room fitted with water sprays and maintained at a relative humidity of not less than 90% and a temperature of not less than 60 degrees, nor more than 100 degrees Fahr. Each unit shall remain in the curing room for a period of not less than ten (10) days except that if high-early-strength cement is used the period in the curing room may be reduced to five (5) days.

–3.01A7 Finish

The buttons shall be white. Both curb and buttons shall have a smooth, glassy finish on all exposed surfaces.

Excess honey-combing in the back of the curb may be cause for rejection of the curb. Honey-combing areas in the back of the curb which, in the opinion of the Engineer, are not detrimental to the curb need not be patched. The workmanship of the bottom finish shall be such that no mechanical interlocking of the mortar bed and the curb bottom or anchor groove will occur.

–3.01A8 Surface Treatment

As soon as the units have been taken out of the curing room the curb shall be placed in a drying room and thoroughly surface dried to a depth of at least one-fourth (¼) inch, and then one coat of an approved water-repellent compound shall be flowed on with a brush.

When the first coat has dried, a second coat of water-repellent compound shall be applied. The water-repellent compound shall be approved by a materials laboratory, or by the Engineer before it is used.

The water-repellent compound shall be a clear, penetrating type silicone resin base compound containing no filler or other material which will leave a film on the surface of the masonry after it is applied. It shall be of such consistency that it can be readily applied by brush or spray to the masonry at atmospheric temperature down to –20° Fahr.

The average absorption of three test specimens treated with the water-repellent compound, when tested in accordance with the methods used in the materials laboratory, shall not exceed two percent (2%) after being partially immersed in water for 72 hours immediately after curing.

The average moisture vapor transpiration (breathing) of three test specimens, when tested in accordance with the methods used in the materials laboratory, shall not be less than 50% at seven days.

–3.01A9 Dimensions and Shape

The curb shall be manufactured according to the dimension and shape shown on the standard drawing within a tolerance of ¼" in length and ⅛" in alignment.

–3.01A10 Curb Lengths

The curb shall be made and laid in pieces not less than five (5) feet nor greater than nine (9) feet in length, except in special instances where shorter lengths are required. However, no curb piece less than four (4) feet in length shall be laid without the approval of the Engineer. Circular curbing shall be made only for such radii as called for on detail plans. For radii from 100 feet to 600 feet the curb shall be in straight pieces with beveled ends as shown on plans, the length of which shall vary between four and eight feet, as required. For any radius greater than 600 feet the curb pieces shall be straight and the ends shall be square.

–3.01A11 Defective Curb

Not more than two (2) percent of the top area in any one piece of curb shall be defective and not more than five (5) percent of the total length of the top corners of reflecting faces in any one piece of curb shall be broken or rounded. There shall be not more than 30 air holes in any linear foot of curb nor more than 50 in any three (3) linear feet of curb. All curb having defects in excess of any of the above will be rejected immediately upon inspection after removal from the forms. However, failure to reject the curb at that time will not assure its final acceptance. Ninety (90) percent of the curb laid shall have not more than ten (10) percent of the maximum allowable number of defects specified above.

An air hole shall be defined as any hole ½ inch or larger in diameter or depth.

All defects within the limits herein permitted, apparent upon removal of forms, shall be repaired immediately thereafter.

The sum of the lengths of the lines of discoloration caused by a cracked mold in any one piece of curb shall not exceed fifty (50) percent of the length of the curb, and the maximum length of any single line of discoloration shall not exceed eighteen (18) inches. Seventy-five (75) percent of the curb laid shall be entirely free from lines of discoloration. The employment of means involving the use of heat to obliterate lines of discoloration will not be permitted. Any means utilized to obliterate lines of discoloration shall be subject to the approval of the Engineer.

The repairing of molds which are chipped or broken shall be done in such a manner that the broken or chipped areas will not be apparent on the curb made in these molds.

All curb in which surface checking develops during the first five (5) days after manufacture will be rejected.

Hidden air holes at or immediately below the exposed surface of the curb, in excess of the limits specified herein, which are disclosed by testing the surface by means of a rubber hammer will be cause for rejection of the curb.

All curb in which cracking is in evidence immediately after removal from the molds will be rejected. A crack is defined as any separation of the concrete of a continuous length greater than three (3) inches.

All curb which varies in dimensions, alignment, or surface contour in excess of the tolerance specified herein will be rejected.

Not more than one (1) square inch of gray concrete shall be apparent in any one location in the exposed surface of the curb and the total area of the gray concrete showing through shall not exceed four (4) square inches for any piece of curb. Not more than 16 square inches of the exposed surface of any piece of curb shall be discolored by reason of the gray concrete mixing with the white concrete. At least 75 percent of the curb pieces laid shall be entirely free from discoloration.

Failure to comply with the plans, specifications or instructions of the authorized representative of the Owner in the manufacture and laying of any curb will be cause for rejection of such curb.

–3.01A12 Repairing Curb

Curb having defects which are not sufficient cause for its rejection shall be neatly repaired immediately after removal from the molds, in a manner subject to the approval of the Engineer. However, no patching or other repairs shall be made without the permission of the inspector. Patches shall be undercut if, in the opinion of the inspector, this operation is necessary to cause the patch to remain.

All holes larger than one-sixteenth (1/16) inch diameter in the exposed surface of acceptable curb or buttons shall be filled with cement mortar.

–3.01A13 Identification Marking

The date of manufacture, the length and the identification number corresponding to the detail layout shall be stenciled in black paint on the back or end of each piece of curb.

Rejected curb or buttons shall be marked on the back or end surfaces in a practicable and semi-permanent manner to identify each cause of rejection.

–3.01A14 Shipping

No unit of curb or buttons shall be shipped from the manufacturing plant prior to 21 days after manufacture, excepting however, that if Type III cement has been used the units may be shipped 14 days after manufacture.

–3.01A15 Samples

The Contractor shall submit, for the approval of the Engineer, an advance sample of curb or button which shall be at least equivalent in color, surface texture, and bottom finish to the standard as set forth in these specifications. No repairing of any kind shall be done to the advance sample. Upon approval, the advance sample shall be stored at the plant or site of manufacture in a location readily accessible to the inspector where there is adequate daylight for examination. The advance sample shall be protected from damage and discoloration, and shall be used as a standard of comparison for color, surface texture, and bottom finish for all curb manu-

factured. All curb and buttons furnished for this contract shall be at least equivalent thereto in the foregoing respects.

–3.01A16 Inspection at Plant

The inspection at the plant will be made just prior to shipment, at which time examination will be made of the alignment, contour, color, cracks, surface damage or discoloration, broken corners or edges, and any other defects which may have developed, and to check with the laboratory test reports for strength. Intermediate inspections, however, may be made to determine surface checking and hidden air holes if it is impractical to examine for these defects at the final inspection.

–3.01B INSTALLATION OF CURBS

–3.01B1 Nosings

Where curb nosings are to be placed on asphalt pavement the Contractor will be required to construct a recess two (2) inches deep and six (6) inches in width, continuous under each nose piece only. No recess will be required except under nose pieces.

–3.01B2 Joints

Except where expansion joints are to be placed as designated by the Engineer, all joints between adjacent pieces of curb shall be filled with mortar composed of one part portland cement and two parts sand.

–3.01B3 Bedding

The curb shall be firmly bedded for its entire length and breadth on a mortar bed composed of one (1) part portland cement and two (2) parts of concrete sand. The anchor grooves in the bottom of the curb shall be entirely filled with the mortar.

–3.01B4 Alignment

The alignment and the top surface of adjoining sections of curb shall be true and even within a maximum tolerance of one-sixteenth (1/16) inch.

–3.01B5 Cleaning Pavement

Before the cement mortar bed is laid, all dirt shall be cleaned from the pavement surface by washing.

All old pavements and any portion of new pavements constructed under this contract, which are covered with oil or grease within the curb limits, shall be further cleaned as follows:

1. The concrete shall be flushed with water.
2. While the concrete is still wet, sodium metasilicate, complying with the requirements as specified elsewhere herein shall be evenly distributed over the pavement surface at a rate of 1 to 2 pounds per 100 square feet of pavement surface.
3. The sodium metasilicate shall remain on the pavement for at least 15 minutes. Where patches of oil, tar or grease occur these areas shall be scrubbed with a brush or broom.
4. The pavement surface shall be thoroughly rinsed.

–3.01B6 Sodium Metasilicate

Sodium metasilicate shall comply with ASTM Designation D 537.

–3.01B7 Layout Design

Before starting manufacture of curb for any project, the manufacturer shall make a complete detailed layout of each island and submit the same in duplicate to the Engineer for his approval. The Engineer will mark necessary corrections on the drawings and return one to the manufacturer. The manufacturer shall then make corrected layout drawings and furnish one copy to the Engineer and two copies to the Contractor.

–3.01C INSTALLATION OF BUTTONS

Precast concrete traffic buttons shall be attached to the pavement by placing a tack coat of hot asphaltic cement on the pavement and firmly pressing the traffic buttons onto it.

–3.02 EXTRUDED TRAFFIC CURB

Where the extruded curb is to be constructed, the existing pavement shall be swept clean of all drippings from cars, grease, dirt and any other matter found objectionable by the Engineer.

The curb shall be placed, shaped and compacted true to line and grade with an approved machine capable of shaping and thoroughly compacting the material to the required cross section as shown on the plans. Where the length of curb is more than 200 feet, drainage openings two (2) feet in width shall be provided at 200-foot intervals along the curb.

The extruded traffic curb shall be protected from traffic for a period of 48 hours by the use of sufficient portable barricades, and by lighted bombs or flashing light of a type approved by the Engineer, during the hours of darkness.

All additional costs required to hand form the curb at the terminals shall be included in the unit contract price per linear foot.

–3.02A Joints in Extruded Curb

Through joints shall be made at all points of tangents to returns, and not to exceed 15-foot intervals elsewhere. The through joints shall be made by hand sawing through the entire curb section so it will be clearly opened throughout while the concrete is yet in plastic state. The cut shall be neatly dressed. No filler will be required. The work of sawing and dressing joints shall be considered as incidental to the construction of the extruded traffic curb and all costs incurred shall be included in the unit contract price per linear foot of "Extruded Traffic Curb."

44–4 MEASUREMENT

Type A traffic curb will be measured along the front face of the curb and returns. Type C traffic curb will be measured along the axis of the curb. Nosing pieces and dividers will be measured as Type A and Type C, respectively. The unit of measurement for curbs shall be the "linear foot."

Precast traffic buttons will be measured by "each."

Aluminum-covered traffic buttons will be measured by "each."

Extruded traffic curb will be measured by the "linear foot," along the axis of the curb.

44–5 PAYMENT

Payment will be made for such of the following bid items as are included and shown in any particular contract:

1. "Type A Precast Traffic Curb Class I," per linear foot.
2. "Type C Precast Traffic Curb Class I," per linear foot.
3. "Precast Concrete Traffic Button," per each.
4. "Aluminum-covered Traffic Button," per each.
5. "Extruded Traffic Curb," per linear foot.

The unit contract price for each of the above bid items shall be full compensation for all costs of labor, tools and materials and for complete installation in accordance with the standard drawings and specifications.

Section 45—Block Precast Traffic Curb Class II

45–1 DESCRIPTION

Block precast traffic curb shall be constructed at the location shown on the plans and in accordance with the details as shown on the standard drawing No. 26. In construction of the block precast traffic curb, the Contractor shall have the option of using either length of block shown in the standard drawing, provided the same length of block is used throughout the entire project.

45–2 MATERIALS

The curb units shall be made from portland cement and high quality sand and gravel, the proportions of which will be left to the discretion of the producer as long as the unit develops a minimum compressive strength of 4,000 psi at 28 days when tested for end loading.

45–3 CONSTRUCTION DETAILS

The proportions of sand, gravel and cement, the type of forms used, and the method of compacting the concrete in the forms shall all be such that a dense, smooth and uniform a surface as is practicable for a concrete masonry unit will be obtained on the finished curb units. The faces that are to be exposed shall be free from chips, cracks, air holes, honeycomb or other imperfections except that if there be no more than five (5) percent of the curb units having slight cracks, small chips not larger than ½ inch, or air holes not more than ½ inch in diameter or depth, the imperfections will not be deemed grounds for rejection.

Special reflector blocks shall be installed at spacings noted in the block precast traffic curb detail shown in the standard drawing.

–3.01 INSTALLATION

The curb shall be installed in accordance with Section 44–3.01B except that the joints between the adjacent units will not be filled with mortar.

After the curb is installed, it shall be covered with one full brush coat of water-repellent compound, meeting the requirements of Section 44–3.01A8. The surface of the curb shall be dry when the water-repellent compound is applied.

45–4 MEASUREMENT

Block precast traffic curb will be measured by the linear foot along the front face of the curb and returns. Type C traffic curb will be measured by the linear foot along the axis of the curb. Nosing pieces and dividers will be measured as Type A and Type C, respectively.

45–5 PAYMENT

Payment will be made for such of the following bid items as are shown in any particular contract:

1. "Block Precast Traffic Curb, Class II, Type A," per linear foot.
2. "Block Precast Traffic Curb, Class II, Type C," per linear foot.

The unit contract price for each of the above items shall be full compensation for all costs of labor, tools and materials and for complete installation in accordance with the standard drawings and specifications.

Section 46—Illuminated Terminal Nosing

46–1 DESCRIPTION

The work to be performed consists of furnishing and installing all necessary materials to complete in place the illuminated terminal nosing Type 1 or Type 2 as shown on the plans and as specified in the standard drawings Nos. 28, 29, 30 and 31, and specifications.

Included in the work is the furnishing and placing of the terminal nose castings, lamp box, conduit, pull boxes or junction boxes, as specified herein, in the special provisions, or as shown on the plans.

Unless otherwise noted, the location of the illuminated terminal nosings, pull boxes or junction boxes and conduit shown on the plans are approximate and the exact location will be established by the Engineer in the field.

–1.01 REGULATIONS AND CODE

All electrical equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA) or the Radio Manufacturers Association, whichever is applicable. In addition to the requirements of these specifications, the plans and the special provisions, all material and work shall conform to the requirements of the National Electrical Code, hereinafter referred to as the Code; the Rules for Electrical Construction and Installing Electric Wires and Equipment, of the Department of Labor and Industries, State of Washington; the American Society for Testing Materials (ASTM); the American Standards Association (ASA), and any local ordinance which may apply.

Wherever reference is made in these specifications or in the special provisions to the Code, the rules or the standards mentioned above, the reference shall be construed to mean the code, rule or standard that is in effect at the date of advertising of these specifications.

Attention is directed to the provisions of Section 7.10, Permits and Licenses, of these specifications.

–1.02 INDUSTRY CODES AND STANDARDS

The following electrical industry codes and standard procedures are listed for reference purposes:

National Electrical Manufacturers' Association (NEMA), 155 East 44th Street, New York 17, New York.
National Board of Fire Underwriters—National Electrical Code (NEC), 85 John Street, New York 7, New York.
Underwriters' Laboratories (UL), 207 East Ohio Street, Chicago 11, Illinois.
Institute of Traffic Engineers (ITE), 2029 K Street, Washington 6, D. C.
Edison Electric Institute (EEI), 420 Lexington Avenue, New York 17, New York.
Insulated Power Cable Engineers' Association (IPCEA) 283 Valley Road, Montclair, New Jersey.
American Society for Testing Materials (ASTM), 1916 Race Street, Philadelphia 3, Pennsylvania.
American Standards Association (ASA), 70 East 45th Street, New York 17, New York.
American Wood Preservers' Association (AWPA), 839 Seventeenth Street, Washington 6, D. C.

46–2 MATERIALS

–2.01 GENERAL

Unless otherwise indicated on the plans or specified in the special provisions, all materials shall be new.

Where existing systems are to be modified, the existing material shall be incorporated in the revised system, salvaged, or abandoned as specified in the special provisions, or as ordered by the Engineer.

–2.02 INSPECTION

All material shall be subject to inspection after delivery to the site and during installation in the work. Failure of the Engineer to note faulty material during construction shall not relieve the Contractor of the responsibility for removing or replacing any such material at his own expense.

Inspection or sampling of certain materials may be made at the factory or warehouse prior to delivery to the site, when required by the Engineer.

Material which has been rejected previous to delivery shall not be delivered to the work, and all material which has been rejected at the work shall be immediately removed from the site.

–2.03 TERMINAL NOSE CASTING

The casting shall be malleable iron casting, ASTM Designation A 47 or steel casting, ASTM Designation A 27, Grade 60-30.

The lamp box and cover shall be No. 16 gage galvanized sheet metal, or aluminum sheeting of equivalent thickness.

The terminal nose casting together with the lamp box and fittings shall be made in accordance with the detail plans or standard drawings Nos. 28 and 29 for Type No. 1 and Type No. 2.

–2.04 CONDUIT

Conduit to be installed underground, on the surface of poles, or in structures shall be rigid metal type, conforming to Article 346 of the Code.

Exterior and interior surfaces of all steel conduit and fittings shall be uniformly and adequately zinc coated. The interior as well as the exterior of a six-inch sample cut from the center of a standard length of conduit shall withstand four dips in the Preece Test in accordance with ASTM Designation A 239.

Each length shall bear the label of Underwriters' Laboratories, Inc. Installation shall conform to appropriate articles of the Code.

–2.05 PULL BOXES, JUNCTION BOXES

Metallic pull boxes may be cast iron or welded 3/16 inch thick or cast aluminum of the sizes noted on the plans. Boxes used shall not be of dissimilar metal to the conduit used in any given electrical system. Boxes shall be watertight with lids securely gasketed to exclude water. Boxes installed underground shall have screened drains installed as detailed on the plans. Cast iron or steel boxes shall be hot-dipped galvanized conforming to the applicable portions of ASTM Designation A 153.

Where indicated on the plans, concrete pull boxes shall be used and shall be constructed as detailed on the standard drawings Nos. 30 and 31. Where concrete pull boxes or junction boxes are to be placed in areas subject to traffic load, a steel or cast iron cover of approved design to withstand such loads shall be used. Such pull boxes or junction boxes shall be installed on a suitable concrete footing to withstand traffic loads. Covers shall be inscribed as specified on the plans.

46–3 CONSTRUCTION DETAILS

–3.01 GENERAL

All electrical construction shall be carried out by competent crews under the direction of able foremen of the Contractor, or by the manufacturer's representatives where so required in the special provisions. All workmanship shall be complete and in accordance with the latest accepted standards of the industry, as determined by the Engineer, and the special provisions.

Failure of the Engineer to note faulty workmanship during construction shall not relieve the Contractor of the responsibility for correcting the faults at his own expense.

–3.02 EXCAVATING AND BACKFILLING

The excavations required for the installation of conduit, foundations, poles and other appliances shall be performed in such a manner as to cause the least possible injury to the streets, sidewalks, and other improvements. The trenches shall not be excavated wider than necessary for the proper installation of the electrical appliances and foundations. Excavating shall not be performed until immediately before installation of conduit and other appliances. The material from the excavation shall be placed in a position where the least damage and obstruction to vehicular and pedestrian traffic, and the least interference with the surface drainage will occur.

All surplus excavated material shall be removed and disposed of by the Contractor in accordance with Section 13, or as directed by the Engineer.

The excavations shall be backfilled in conformance with applicable requirements of Section 17.

Excavations after backfilling shall be kept well filled and maintained in a smooth and well drained condition until permanent repairs are made.

At the end of each day's work and at all other times when construction operations are suspended, all equipment and other obstructions shall be removed from that portion of the roadway open for use by public traffic.

Excavations in the street or highway shall be performed in such a manner that not more than one traffic lane is restricted in either direction at any time.

–3.03 REMOVING AND REPLACING IMPROVEMENTS

Improvements such as sidewalks, curbs, gutters, portland cement concrete and asphalt concrete pavement, bituminous surfacing, base material, and any other improvements removed, broken or damaged by the Contractor, shall be replaced or reconstructed with the same kind of materials as found on the work, or with materials of equal quality. The new work shall be left in a serviceable condition satisfactory to the Engineer.

Whenever a part of a square or slab of existing concrete sidewalk or driveway is broken or damaged, the entire square or slab shall be removed and the concrete reconstructed as above specified.

The outline of all areas to be removed in portland cement concrete sidewalks and pavements shall be cut to a minimum depth of 1½ inches with a saw, prior to removing the sidewalk and pavement material. Cut for remainder of the required depth may be made by a method satisfactory to the Engineer. Cuts shall be neat and true with no shatter outside the removal area.

–3.04 CONDUIT

Installation of conduit shall conform to appropriate articles of the Code, and these specifications.

The size of conduit used shall be as shown on the plans. Conduits smaller than one-inch electrical trade size shall not be used, unless otherwise specified, except that grounding conductors at service points may be enclosed in ½-inch diameter conduit.

Conduit installed under the travelled way, including auxiliary lanes, shall be a minimum of one and one-fourth (1¼) inch diameter. No smaller size diameter shall be used except by written permission of the Engineer.

It shall be the option of the Contractor, at his own expense, to use larger size conduit if desired, and where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted.

The ends of all conduits shall be well reamed to remove burrs and rough edges. Field cuts shall be made square and true so that the ends will butt or come together for the full circumference thereof. Slip joints or running threads will not be permitted for coupling conduit. When a standard coupling cannot be used, an approved threaded union coupling shall be used.

The threads on all conduit shall be well painted with a good quality of lead or rust preventative paint before couplings are made up. All couplings shall be screwed up until the end of the conduits are brought together, so that a good electrical connection will be made throughout the entire length of the conduit run. Where coating on conduit has been injured in handling or installing, such injured places shall be thoroughly painted with rust preventative paint.

All conduit ends shall be threaded and capped with standard pipe caps until wiring is started. When caps are removed, the threaded ends shall be provided with approved conduit bushings.

Conduit stubs from bases shall extend at least six inches from face of foundation and at least 18 inches below top of foundation.

Conduit stubs, caps, and exposed threads shall be painted with rust preventative paint.

Conduit bends, except factory bends, shall have a radius of not less than six times the inside diameter of the conduit. Where factory bends are not used, conduit shall be bent without crimping or flattening, using the longest radius practicable.

Conduit shall be laid to a depth of not less than 18 inches below the curb grade in the sidewalk areas and to a depth of not less than 18 inches below the finished grade in all other areas, except that conduit may be laid on top of and secured to the existing pavement in curbed dividing strips. Conduit under railroad tracks shall be not less than 24 inches below bottom of tie.

Conduit shall be placed under existing pavement by approved jacking or drilling methods. Pavement shall not be disturbed without the approval of the Engineer and then only in the event obstructions are encountered. Upon approval of the Engineer, small test holes may be cut in the pavement to locate obstructions. Jacking or drilling pits shall be kept two feet clear of the edge of any type of pavement wherever possible. Excessive use of water such that pavement might be undermined, or subgrade softened, will not be permitted.

Where conduit is required to be installed across the surface of a pavement which is to be resurfaced, there shall be a minimum cover of one inch over the pipe or its fittings. In case the resurfacing material is not of sufficient depth to allow for the minimum coverage, the Contractor shall chip out the existing pavement to such depth as required to obtain the desired covering. Before constructing the resurface to finished grade, the Contractor shall bed the conduit in such a manner that there will be no lateral or longitudinal movement of it during the construction of the wearing course of the new pavement. This may require chipping out in the course below the wearing course in order to obtain proper embedment.

On new construction, conduit shall be placed prior to placement of base course and pavement.

Conduit terminating in standards or pedestals shall extend approximately two inches above the foundation vertically and shall be sloped towards handhole opening.

Conduit entering through the bottom of a pull box shall be located near the end walls to leave the major portion of the box clear. At all outlets, conduit shall enter from the direction of the run.

Suitable marker stakes shall be set at the ends of conduits which may be buried so that they may be easily located.

Condulets and other fittings shall be installed at locations as designated by the Engineer so as to provide a conduit channel that will permit freedom for installing the electrical control wires. When condulets are called for on the plans, or where their installation is required by the Engineer, the Contractor shall also furnish all necessary condulet covers and gaskets.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel and blown out with compressed air.

Conduit runs shown on the plans are for bidding purposes only and may be changed, with approval of the Engineer, to avoid underground obstructions.

–3.05 PULL BOXES, JUNCTION BOXES

Pull boxes or junction boxes shall conform to standard drawings No. 30 for Type 1 and No. 31 for Type 2, and shall be installed at the locations shown on the plans and at such additional points as ordered by the Engineer, when conduit runs are more than 200 feet. The Contractor may install, at his own expense, such additional boxes as may be desired to facilitate the work.

Location of underground pull boxes shall be marked by the installation of a standard guide post installed on the shoulder adjacent to the pull box, or in the island near the pull box, with the top six inches painted red.

46–4 MEASUREMENT AND PAYMENT

Payment will be made for such of the following bid items as are included and shown in any particular contract:

1. "Illuminated Terminal Nosing (Type No. —)", per each.
2. "Galvanized Conduit Pipe (Diameter)", per linear foot.

The unit contract price per each for "Illuminated Terminal Nosing (Type —)," shall be full compensation for furnishing all labor, material including lamp box and flasher, tools and equipment necessary to install each unit in accordance with the plans and specifications.

The unit contract price per linear foot, measured by the actual length of completed pipe in place for "Galvanized Conduit Pipe (diameter)," shall be full compensation for furnishing all pipe, pipe connections, elbows, bend caps, reducers, condulets, unions, pull boxes and junction boxes for placing the pipe in accordance with the above provisions, including all excavation or jacking required, backfilling of the trenches, chipping of pavement and bedding of the pipe and all other work incidental to the construction of the conduit.

Section 50—Monuments

50–1 DESCRIPTION

This work consists of the resetting of survey monuments, cast iron frames and covers which during construction will be covered over, damaged or otherwise rendered useless. The work may consist of constructing monuments, adjusting monuments to proper grade, and the furnishing and placing of materials and other related work in accordance with the standard drawings Nos. 19 to 23, inclusive.

50–2 MATERIALS

Monument cast iron frames and covers, bronze marker plugs, precast concrete monuments, poured monuments, or other types of monuments shall be of the quality, material, and the dimensions shown on the standard drawings, the plans and the special provisions.

Frame and cover castings shall conform to the requirements of ASTM A 48 Class 25 and shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability. Repair of defects by welding, or by the use of "smooth-on" or similar material will not be permitted. The manufacturer shall provide test bars as per ASTM A 48 for all orders of 200 or more units when called for in the special provisions, and upon request of the Owner the manufacturer shall certify that the product conforms to the requirements of these specifications.

When painting is called for in the special provisions, a bituminous coating equivalent to Preservative Paint Co. No. 25-22 Black Dip Paint shall be applied to all faces. The Owner shall have the right to require inspection and approval of all castings prior to painting.

Monument cast iron frames and covers shall be machine finished or ground on seating surfaces so as to assure non-rocking fit in any position, and interchangeability. At the request of the Owner, there shall be made available at the foundry standard frames and standard covers for use by inspectors in testing fit and seating.

50–3 CONSTRUCTION DETAILS

–3.01 REFERENCE POINTS

The Engineer will reference all monuments in advance of construction and will reset the points and grades at the proper time.

It shall be the responsibility of the Contractor to furnish materials and install required monuments and castings in accordance with the plans as and where directed by the Engineer. The Contractor shall carefully protect all reference points to the monuments and he shall give the Engineer reasonable notice of the schedule for monument work in order to avoid destruction of the points.

–3.02 PRECAST CONCRETE MONUMENTS

Where called for on the plans or where directed by the Engineer, the Contractor shall furnish and install precast monuments. These monuments shall be set to proper line and grade upon a sound, well compacted base, and shall be backfilled and thoroughly tamped to the satisfaction of the Engineer.

–3.03 POURED MONUMENT

Where called for on the plans, or where directed by the Engineer, the Contractor shall construct the monument by placing it in concrete mix and inserting a bronze marker plug to the required line and grade.

The Owner will furnish the bronze marker plug without charge.

–3.04 MONUMENTS ON CEMENT CONCRETE PAVING PROJECTS

Unless otherwise provided, bronze marker plugs will be furnished by the Owner and will be placed by its own forces in the pavement surface at the time of pour. The Contractor will be required, however, to block out forms where necessary to provide for placement of monument in the subsequent adjacent pour and this work shall be considered as incidental and the costs thereof shall be included in various pay items of the work. Where conditions require other types of monuments, the Contractor shall construct them in accordance with the plans and for such payment as may be shown in the proposal or otherwise provided.

–3.05 FURNISHING AND PLACING MONUMENTS CASTINGS

Where called for on the plans or where directed by the Engineer, the Contractor shall furnish and install castings to the line and grade established by the Engineer.

–3.06 ADJUSTMENT OF EXISTING MONUMENT CASTINGS TO GRADE

Where shown on the plans or where encountered on the project the existing monument castings shall be adjusted to the grade furnished by the Engineer. Procedure for these adjustments is described in Section 53 entitled, "Adjustment of New and Existing Utility Structures to Finish Grade".

50–4 MEASUREMENT AND PAYMENT

Payment will be made at the unit contract price for such of the following bid items as are included in any particular contract:

1. "Precast Monument," per each.
2. "Poured Monument," per each.
3. "Furnish and Place Monument Frame and Cover," per each.
4. "Adjust Monument Frame and Cover," per each.

The unit contract prices for the items enumerated above shall be full compensation for all labor, tools and materials and for all incidental work required in setting the monuments and castings in accordance with the plans, drawings and specifications to the satisfaction of the Engineer.

Section 51—Sidewalk Drain for Building Downspout

51–1 DESCRIPTION

Where shown on the plans or designated by the Engineer, the Contractor shall construct sidewalk drains of the required type which are designed to carry storm water from the building downspouts under the sidewalk surface to the street gutter.

With some modification, the drains may be installed to serve paved areas requiring surface drainage. If modification becomes necessary to meet a particular need and has not been described on the plans or special provisions, the modification shall be made by the Contractor under directions by the Engineer.

51–2 MATERIALS

The dimensions and quality of materials for the sidewalk drains shall be as indicated on the standard drawings for the type of drain indicated, unless otherwise modified on the plans or special provisions.

51–3 CONSTRUCTION DETAILS

–3.01 GENERAL

The two types of sidewalk drain for building downspout are Type I and Type II, as shown on standard drawings Nos. 16 and 17, respectively.

Sidewalk drains may be constructed simultaneous with new sidewalk construction or may be constructed where a sidewalk already exists.

51–4 MEASUREMENT AND PAYMENT

–4.01 MEASUREMENT

Measurement for sidewalk drain for building downspout will be per linear foot for the length of drain constructed.

51–5 PAYMENT

Payment will be made for such of the following bid items as are included in any particular contract:

1. "Sidewalk Drain for Building Downspout Type I", per linear foot.
2. "Sidewalk Drain for Building Downspout, Type II", per linear foot.

The unit contract price per linear foot for sidewalk drain of the type specified shall be full compensation for all labor, materials and tools required for the construction of the sidewalk drain, including the removal of existing sidewalk area and any necessary replacement items. Any additional work involved by reason of a modification to meet a particular need shall be considered as incidental to the construction and all costs thereof shall be included in the pay item or items of the work.

Section 52—Removal of Existing Street Improvements

52–1 DESCRIPTION

The work shall consist of the removal and disposal or various existing improvements, such as pavements, structures, pipe, curb, curb and gutter, gutter, and other items necessary for the accomplishment of the improvement. Some of the items may be included in the bid proposal or covered elsewhere in the specification or special provisions.

Removal of things not covered in the contract for payment shall be considered as incidental to the construction, and all costs thereof shall be included in the bid items of work for which payment is provided.

52–2 CONSTRUCTION DETAILS

–2.01 GENERAL

The removal of street improvements shall be conducted in such a manner as not to injure utilities and any portion of the improvement that is to remain in place. Any deviation in this matter will obligate the Contractor at his own expense, to repair, replace or otherwise make proper restoration to the satisfaction of the Engineer.

When sawing of concrete or combinations of rigid materials is called for in the plans or in the special provisions, the Contractor will be paid therefor at the unit contract price for the quantity involved. The depth of cut shall be such as will accomplish the intended purpose and will be determined in the field to the satisfaction of the Engineer.

Whenever the sawing will be performed by forces of the Owner, it will be so noted in the special provisions; otherwise, the Contractor shall perform the sawing.

–2.02 REMOVAL OF CURBS

Existing curbs shall be removed where shown on the plans or where encountered in the work and designated by the Engineer. There are several types of this work. When the integral curb is to be removed by cutting the base horizontally and thus preserve the slab or base below the curb, the removal shall be considered as Class A. When the integral curb is to be removed together with the base material by cutting vertically, it shall be considered as Class B. When pavement is being removed, the curb shall be considered as pavement removal and the measurement for payment thereof will be made to the back of the curb. Precast curbs and curbs of other materials which are to be removed will be further identified on the plans and in the proposal if payment is contemplated; otherwise, the second paragraph of Section 52-1 will apply.

–2.03 REMOVAL OF PAVEMENT

The removal of pavements such as concrete, asphalt, brick, cobblestone, or combinations of the various materials which constitute a rigid type of pavement and which is two (2) inches or more in thickness, shall be classified as described in the three paragraphs that follow.

Class A pavement removal shall consist of pavement removal other than as described below for Class B and Class C.

Class B pavement removal shall be pavement removal required for the placing of utilities at greater and varying depths, such as sewers and water mains in existing streets paved with rigid types of pavements, the thickness of which has not been accurately determined prior to the pavement removal.

Class C pavement removal shall consist of the removal required for narrow and shallow utility cuts in order to install light cables, conduits and similar items. Pavement under these circumstances shall be removed to a minimum width to accomplish the desired results. The meet lines shall be cut or sawed vertically. If sawing is required it will be so noted in the special provisions.

In the removal of pavement for the purposes described above, extreme care shall be taken to prevent damage to any pavement that is to remain in place, and to leave vertical cleavage planes in order that the paved surface will be as durable as before it was disturbed.

Pavement breakers such as a "headache ball" shall not be used where underground utilities exist, and paving breakers shall be of such types as will not damage any of the utility installations, and shall be approved by the Engineer before use.

–2.04 REMOVAL OF CEMENT CONCRETE SIDEWALKS

All concrete slabs that average four (4) inches or less in thickness and which are to be removed, shall be considered as sidewalk removal. Pavement breakers used for this purpose shall meet the requirements previously outlined for pavement removal. Where concrete sawing is required, the provisions previously described shall obtain. Sidewalk aprons and private walks on street grading and paving projects shall be removed to the extent necessary to provide for construction of pavements and curbs. After the curbs and pavement have been constructed, the Contractor will be required to remove any additional sidewalk required to provide proper connections and grades, as determined by the Engineer.

–2.05 REMOVAL OF CURB AND GUTTER

Curb and gutter to be removed may be of cement concrete, or may be a cement concrete curb with a brick gutter on a cement concrete base, or may be other combinations of rigid materials. In any event it is intended that the full section shall be removed.

Where pavement is being removed, curb and gutter removal shall be considered as pavement removal and the measurement for payment thereof will be to the back of the curb.

–2.06 REMOVAL OF ASPHALT CONCRETE PAVEMENT

Asphalt concrete pavement upon an earth or granular base shall be considered as part of the roadway excavation, except as otherwise described hereinafter or otherwise provided for in the special provisions. Where asphalt concrete pavement exists in parking strips and is ordered removed, it will be paid for as removal of asphalt concrete pavement.

Side street approaches to the project and street approaches at each end of the project which are paved with asphalt concrete pavement on an earth or granular base, and which are to be removed, will be paid for as removal of asphalt concrete pavement beyond the radius point of returns to the limits of construction, as the Engineer directs.

Immediately prior to the placing of asphalt concrete against the meet line, the existing edge shall be removed by cutting the existing pavement vertically a sufficient distance from the line of excavation to avoid damaged areas (not to exceed 3 feet), and the work will be paid for at the unit contract price per linear foot for "Chipping Existing Asphalt Surface."

Removal of asphalt concrete pavement will be paid for as such when the removal is for the purpose of making underground installations.

Where asphalt concrete pavements are removed, the meet lines shall be cut in straight and vertical lines.

–2.07 REMOVAL OF CATCH BASINS, MANHOLES, CURB INLETS, SUMPS, ETC.

Where structures or installations of concrete, brick, blocks et cetera interfere with the construction, they shall be removed and all pipe openings shall be plugged tightly. Payment therefor will be made in accordance with the bid items in the proposal. If, however, there is no bid item to cover any one or more of such removals, then in that event the work of removal shall be considered as incidental to the construction and the costs thereof shall be included in other items of the work.

Where the structures are removed, the voids shall be backfilled with such material as the Engineer may direct and be compacted to the degree required by the Engineer, and such work shall be considered as incidental to the removal without compensation. The removal of wooden structures shall be considered as incidental to the work unless otherwise provided in the special provisions.

–2.08 SALVAGE

If indicated in the plans or in the special provisions, all castings, pipe and other material of recoverable value taken from the discarded facilities shall be carefully salvaged and delivered to the Owner in good condition and in such order of salvage as the Engineer may direct. Materials and things deemed of no value by the Engineer shall be salvaged by the Contractor and become his property to be disposed of as he wishes.

–2.09 WASTE DISPOSAL

Unless otherwise provided in the plans, the Contractor shall provide the waste site for disposal of materials not required for the construction, as defined in Section 4.06.

52–3 MEASUREMENT AND PAYMENT

Measurement and payment will be made for such of the following items as may be included in the proposal of any particular contract:

1. "Remove Cement Concrete Pavement Class A," per square yard.
2. "Remove Cement Concrete Pavement Class B," per square yard.
3. "Remove Cement Concrete Pavement Class C," per linear foot.
4. "Remove Cement Concrete Sidewalk," per square yard.
5. "Remove Cement Concrete Curb Class A," per linear foot.
6. "Remove Cement Concrete Curb Class B," per linear foot.
7. "Remove Curb and Gutter," per linear foot.
8. "Remove Asphalt Concrete Pavement," per square yard.
9. "Remove Catch Basin," per each.
10. "Remove Manhole," per each.
11. "Remove Inlet," per each.
12. "Remove Curb Inlets," per each.
13. "Remove Sump," per each.
14. "Chipping Existing Asphalt Surface," per linear foot.

The unit contract prices for such of the items as are included in the proposal shall be full compensation for all labor, tools and incidentals required to perform the work as specified.

Payment for selected materials, if required, will be made in accordance with applicable bid items, but the compaction of the materials shall be considered as incidental to the construction and the costs thereof shall be included in bid items of the proposal.

Section 53—Adjustment of New and Existing Utility Structures To Finish Grade

53–1 DESCRIPTION

This work consists of constructing and/or adjusting all new and existing utility structures encountered on the project to finished grade.

53–2 DIVISION OF RESPONSIBILITY

–2.01 PRIVATELY OWNED UTILITY STRUCTURES

Privately owned utilities are generally in streets and road rights of way pursuant to franchises or to rights claimed under the laws of the United States of America, or the State of Washington and, therefore, these utility agencies will be responsible for all adjustments and relocations of their facilities. These agencies will locate and make all adjustments to their respective structures at no charge to the Contractor.

–2.02 PUBLICLY OWNED UTILITY STRUCTURES

Publicly owned structures that are to be adjusted to finished grade by the Contractor will be listed in the bid proposal. Where these are not shown in the proposal, the public utility will make necessary adjustments at no cost to the Contractor.

–2.03 CONTRACTOR TO SCHEDULE WORK

The Contractor shall schedule his work and cooperate to the fullest extent so that structure adjustments by others can be satisfactorily accomplished. The Con-

tractor shall do all pavement patching which may be necessary after adjustment of structures, and the cost thereof shall be considered as incidental to the adjustment of the various structures, except as modified hereinafter, and except that private utilities shall reimburse the Contractor for such patching.

53–3 CONSTRUCTION DETAILS

–3.01 ADJUSTMENT OF MANHOLES, CATCH BASINS AND SIMILAR STRUCTURES

–3.01A General

Manholes shall be brought to proper finished grade by utilizing the same methods of construction as required for manhole construction in Section 63.

–3.01B Unpaved Street Grading Projects

New manholes being constructed in conjunction with street grading projects which are to be surfaced with gravel or crushed stone shall be constructed to a point approximately eight (8) inches below the subgrade and covered with a temporary wood cover as shown on the standard drawing No. 45. Existing manholes encountered shall be cut off and covered in similar manner. The Contractor shall carefully reference each manhole so that they may be easily found upon completion of the street work.

After placing the gravel or crushed stone surfacing, the manhoies and manhole castings shall be constructed to the finished grade of the roadway surface. Excavation necessary for bringing manholes to grade shall center about the manhole and be held to the minimum area necessary. At the completion of the manhole adjustment, the void around the manhole shall be backfilled with materials which will result in the section required on the typical roadway section, and be thoroughly compacted.

Where bituminous surface treatment is to be placed, the manhole castings shall be installed from one-half (½) inch to one (1) inch higher than the roadway surface, as the Engineer may direct.

–3.01C Cement Concrete Paving Projects

Manholes shall be constructed or adjusted in the same manner as outlined in Section 53-3.01B except that the final adjustment shall be made and cast iron frame be set after forms have been placed and checked. In placing the concrete pavement, extreme care shall be taken not to alter the position of the casting in any way.

–3.01D Asphalt Concrete Paving Projects

On asphalt concrete paving projects, the manholes shall not be adjusted until the pavement is completed, at which time the center of each manhole shall be carefully relocated from references previously established by the Contractor. The pavement shall be cut in a restricted area and base material be removed to permit removal of the cover. The manhole shall then be brought to proper grade utilizing the same methods of construction as for the manhole itself.

The cast iron frame shall be placed on the concrete blocks and wedged up to the desired grade. The asphalt concrete pavement shall be cut and removed to a neat circle, the diameter of which shall be equal to outside diameter of the cast iron frame plus two (2) feet. The ballast and crushed stone shall be removed and Class 5(1½) concrete placed so that it extends below the frame for a minimum of six (6) inches for the entire area of the excavation and up to within but not to exceed one and one-half (1½) inches of the finished pavement surface.

On the following day the concrete, the edges of the asphalt concrete pavement, and the outer edge of the casting shall be painted with hot asphalt cement. Asphalt concrete shall then be placed and compacted with hand tampers and a patching roller. Asphalt concrete will be paid for as "Asphalt Concrete Pavement, Class B", per ton.

The completed patch shall match the existing paved surface for texture, density, and uniformity of grade. The joint between the patch and the existing pavement shall then be carefuly painted with hot asphalt cement or asphalt emulsion and shall be immediately covered with dry paving sand before the asphalt cement solidifies.

The inside throat of the manhole shall be thoroughly mortared and plastered.

–3.01E Asphalt Resurfacing Projects

Adjustment of manholes on asphalt resurfacing projects shall meet the requirement of Section 53-3.01D. Unless adjustment rings for castings are provided for in the special provisions and bid proposal, existing pavements shall be removed to the extent necessary to remove the manhole casting. The cost of removing the pavement shall be considered as incidental to the work of adjusting the manhole.

–3.01F Storm and Sanitary Sewer or Water Projects

Manholes being constructed in conjunction with sewer or water projects on graded or paved streets shall be brought to final grade as outlined previously in these specifications.

–3.01G Establishment of Grade for Top of Manhole

The Owner will establish approximate grades for tops of manholes for the various stages of construction; however, these grades will be approximate only. The Owner assumes no responsibility in this regard, except when the final grade is set.

–3.02 ADJUSTMENT OF INLETS

The final alignment and grade of cast iron frames for new and old inlets to be adjusted to grade will be established from the forms or adjacent pavement surfaces. The final adjustment of the top of the inlet will be performed in similar manner to that described for manholes. On asphalt concrete paving projects using curb and gutters, that portion of the cast iron frame not embedded in the gutter section shall be solidly embedded in concrete also. The concrete shall extend a minimum of six (6) inches beyond the edge of the casting and shall be left one and one-half (1½) inches below the top of the frame so that the wearing course of asphalt concrete pavement will butt the cast iron frame. The existing concrete pavement and edge of the casting shall be painted with hot asphalt cement.

Adjustments in the inlet structure shall be constructed in the same manner and of the same material as that required for new inlets. The inside of the inlets shall be plastered.

–3.03 ADJUSTMENT OF MONUMENTS AND CAST IRON FRAME AND COVER

Monuments and monument castings shall be adjusted to grade in the same manner as for manholes.

–3.04 ADJUSTMENT OF VALVE BOX CASTINGS

Adjustment of valve box castings shall be made in the same manner as for manholes.

53–4 MEASUREMENT AND PAYMENT

Payment will be made for such of the following applicable bid items as are included and shown in any particular contract, consistent with measurement and payment requirements contained in the specifications for each particular item.

1. "Adjust Existing Manhole or Catch Basin to Grade," per each.
2. "Adjust Existing Inlet to Grade," per each.
3. "Adjust Existing Monument Frame and Cover to Grade," per each.
4. "Adjust Existing Valve Box to Grade," per each.
5. "Type.....(or size) Manhole, Extra Depth," per vertical foot.
6. "Additional Depth Shaft for Existing Manhole," per vertical foot.
7. "Type.....Inlet," per each.
8. "Furnish Locking Manhole Frame and Cover (heavy, light)," per each.
9. "Furnish Manhole Frame (heavy, light) and Cover," per each.
10. "Furnish Metal Frame and Grate for Catch Basin or Inlet," per each.
11. "Asphalt Concrete Pavement, Class B," per ton.
12. "Bituminous Plant Mix," per ton.

–4.01 ADJUST EXISTING MANHOLE OR CATCH BASIN TO GRADE

The unit contract price for "Adjust Existing Manhole or Catch Basin to Grade," shall be full compensation for removing the cast iron frame and cover, removing necessary pavement, cutting the existing structure down where necessary, furnishing and placing temporary wood cover, rebuilding the structure, resetting the existing cast iron frame and cover to proper grade, backfilling the void around the structure, and plastering the structure throat and extension. Where manholes are to be adjusted downward and it is necessary to remove the entire cone section, the entire adjustment will be paid for by force account. Where an existing manhole is to be raised from its present grade in excess of two and one-half (2½) feet, the shaft portion above the two and one-half (2½) foot adjustment will be paid for as "Additional Depth Shaft for Existing Manhole," per vertical foot.

–4.02 ADJUST EXISTING INLET TO GRADE

The unit contract price for "Adjust Existing Inlet to Grade," shall be full compensation for removing pavements, casting, upper portion of inlet, whether it is cast iron, concrete or blocks, reconstructing the inlet to the new and proper grade, backfilling the void around the structure, and utilizing the existing cast iron frame and cover.

–4.03 ADJUST EXISTING MONUMENT FRAME AND COVER TO GRADE

The unit contract price for "Adjust Monument Frame and Cover to Grade," shall be full compensation for removing necessary pavement, for removing and resetting the existing cast iron frame and cover to proper grade, and for backfilling the void around the structure. Where existing castings are not to be used, new ones shall be installed and will be paid for in accordance with Section 53-4.08.

–4.04 ADJUST EXISTING VALVE BOX TO GRADE

The unit contract price for "Adjust Existing Valve Box to Grade," shall be full compensation for removing necessary pavement and for resetting the casting to proper grade, including backfilling the void around the structure, and all other work incidental thereto.

–4.05 TYPE, OR SIZE, MANHOLE EXTRA DEPTH

The unit contract price per vertical foot for "Type .....(or size) Manhole, Extra Depth" shall be full compensation for all costs incurred in completing the construction in accordance with the specifications of Section 63, with measurement and payment as described in sections 63-4 and 63-5.

–4.06 TYPE.....INLET IN PLACE

The unit contract price per each for "Type..... Inlet," shall be full compensation for furnishing all labor, equipment and material necessary to construct inlets as shown on the standard drawing and in accordance with Section 64, including the adjustment to finished grade.

–4.07 FURNISHING CASTINGS

Where adjustment of existing manholes, catch basins, inlets, valve boxes, etc. are required, and where the existing castings are discarded or ordered to be salvaged by the Engineer, the Contractor shall furnish new castings of the type specified. In such case, the Contractor will be paid the unit contract price for each adjustment item and also the unit contract price for each type of casting involved.

–4.08 ASPHALT CONCRETE

Asphalt concrete or bituminous plant mix used in patching around various types of structures or casting adjustments will be paid for in accordance with the unit contract price per ton for "Asphalt Concrete, Class B" or per ton for "Bituminous Plant Mix," whichever is used.

–4.09 INCIDENTAL WORK

Any work required to make adjustments to manholes, catch basins, inlets, sumps, valve boxes, monuments, etc., which is not specifically mentioned in the foregoing specifications, shall be considered as incidental to the construction, and all costs thereof shall be included by the Contractor in his unit contract prices.

Section 54—Pavement Patching

54–1 DESCRIPTION

This work shall consist of the patching of various types of pavement cuts, the performance of which shall be in accordance with the requirements outlined hereinafter and as shown on standard drawing No. 18.

54–2 MATERIALS

All materials shall conform to the requirements specified for material in other sections of these standard specifications, such as for instance, sections 27 and 39.

54–3 CONSTRUCTION DETAILS

–3.01 GENERAL

Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.

The placing and compaction of the trench backfill, and the preparation and compaction of the subgrade shall be in accordance with the requirements of the various applicable sections of these specifications.

Before the patch is constructed all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces. The use of a concrete saw will not be required unless provided for in the special provisions.

The class of concrete used in patches will depend upon the urgency of opening the street to traffic. The class of concrete shall be as specified in the special provisions and proposal. Curing compound as specified in Section 39-2.09 shall be placed on the concrete immediately after finishing.

Proper signs, barricades, lights and other warning devices, as may be approved by the Engineer, shall be maintained all 24 hours of day until the patch is completed and ready for traffic.

–3.02 CEMENT CONCRETE PAVEMENTS

After the subgrade for the pavement has been compacted and constructed to line and grade, the cement concrete pavement patch shall be placed, compacted and struck off to the grade of the adjacent pavement in accordance with the pertinent provisions of Section 39. Through and dummy joints shall be placed and edged where directed. The surface shall be finished and brushed with a fibre brush. Approved curing compound shall be placed on the finished concrete immediately after finishing.

–3.03 RIGID TYPE PAVEMENTS RESURFACED WITH ASPHALT CONCRETE

Streets which have rigid type pavements resurfaced with asphalt concrete shall be patched as shown on the standard drawing, or as otherwise specified. The surface of the cement concrete portion of the patch shall be left low enough to accommodate the asphalt portion of the patch. Brush finishing will not be required. Joints shall be placed if directed by the Engineer. Curing shall be accomplished with an SS-1 emulsion cut back with water as directed by the Engineer.

Asphalt concrete or bituminous plant mix shall not be placed until the day after the cement concrete has been placed unless otherwise permitted by the Engineer. The edges of the existing asphalt pavements and castings shall be painted with hot asphalt cement or asphalt emulsion immediately before placing the asphalt patching material. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to the adjacent paved surface. Immediately thereafter, all joints between the new and original asphalt pavement shall be painted with hot asphalt or asphalt emulsion and be covered with dry paving sand before the asphalt solidifies.

–3.04 ASPHALT CONCRETE STREETS ON GRANULAR BASE

After the subgrade has been prepared as shown on the standard drawing, or as directed by the Engineer, a minimum of two (2) inches of asphalt concrete pavement Class B or bituminous plant mix shall be placed and completed in the same manner as specified in Section 54-3.03.

tractor shall do all pavement patching which may be necessary after adjustment of structures, and the cost thereof shall be considered as incidental to the adjustment of the various structures, except as modified hereinafter, and except that private utilities shall reimburse the Contractor for such patching.

53–3 CONSTRUCTION DETAILS

–3.01 ADJUSTMENT OF MANHOLES, CATCH BASINS AND SIMILAR STRUCTURES

–3.01A General

Manholes shall be brought to proper finished grade by utilizing the same methods of construction as required for manhole construction in Section 63.

–3.01B Unpaved Street Grading Projects

New manholes being constructed in conjunction with street grading projects which are to be surfaced with gravel or crushed stone shall be constructed to a point approximately eight (8) inches below the subgrade and covered with a temporary wood cover as shown on the standard drawing No. 45. Existing manholes encountered shall be cut off and covered in similar manner. The Contractor shall carefully reference each manhole so that they may be easily found upon completion of the street work.

After placing the gravel or crushed stone surfacing, the manholes and manhole castings shall be constructed to the finished grade of the roadway surface. Excavation necessary for bringing manholes to grade shall center about the manhole and be held to the minimum area necessary. At the completion of the manhole adjustment, the void around the manhole shall be backfilled with materials which will result in the section required on the typical roadway section, and be thoroughly compacted.

Where bituminous surface treatment is to be placed, the manhole castings shall be installed from one-half (½) inch to one (1) inch higher than the roadway surface, as the Engineer may direct.

–3.01C Cement Concrete Paving Projects

Manholes shall be constructed or adjusted in the same manner as outlined in Section 53-3.01B except that the final adjustment shall be made and cast iron frame be set after forms have been placed and checked. In placing the concrete pavement, extreme care shall be taken not to alter the position of the casting in any way.

–3.01D Asphalt Concrete Paving Projects

On asphalt concrete paving projects, the manholes shall not be adjusted until the pavement is completed, at which time the center of each manhole shall be carefully relocated from references previously established by the Contractor. The pavement shall be cut in a restricted area and base material be removed to permit removal of the cover. The manhole shall then be brought to proper grade utilizing the same methods of construction as for the manhole itself.

The cast iron frame shall be placed on the concrete blocks and wedged up to the desired grade. The asphalt concrete pavement shall be cut and removed to a neat circle, the diameter of which shall be equal to outside diameter of the cast iron frame plus two (2) feet. The ballast and crushed stone shall be removed and Class 5(1½) concrete placed so that it extends below the frame for a minimum of six (6) inches for the entire area of the excavation and up to within but not to exceed one and one-half (1½) inches of the finished pavement surface.

On the following day the concrete, the edges of the asphalt concrete pavement, and the outer edge of the casting shall be painted with hot asphalt cement. Asphalt concrete shall then be placed and compacted with hand tampers and a patching roller. Asphalt concrete will be paid for as "Asphalt Concrete Pavement, Class B", per ton.

The completed patch shall match the existing paved surface for texture, density, and uniformity of grade. The joint between the patch and the existing pavement shall then be carefuly painted with hot asphalt cement or asphalt emulsion and shall be immediately covered with dry paving sand before the asphalt cement solidifies.

The inside throat of the manhole shall be thoroughly mortared and plastered.

–3.01E Asphalt Resurfacing Projects

Adjustment of manholes on asphalt resurfacing projects shall meet the requirement of Section 53-3.01D. Unless adjustment rings for castings are provided for in the special provisions and bid proposal, existing pavements shall be removed to the extent necessary to remove the manhole casting. The cost of removing the pavement shall be considered as incidental to the work of adjusting the manhole.

–3.01F Storm and Sanitary Sewer or Water Projects

Manholes being constructed in conjunction with sewer or water projects on graded or paved streets shall be brought to final grade as outlined previously in these specifications.

–3.01G Establishment of Grade for Top of Manhole

The Owner will establish approximate grades for tops of manholes for the various stages of construction; however, these grades will be approximate only. The Owner assumes no responsibility in this regard, except when the final grade is set.

–3.02 ADJUSTMENT OF INLETS

The final alignment and grade of cast iron frames for new and old inlets to be adjusted to grade will be established from the forms or adjacent pavement surfaces. The final adjustment of the top of the inlet will be performed in similar manner to that described for manholes. On asphalt concrete paving projects using curb and gutters, that portion of the cast iron frame not embedded in the gutter section shall be solidly embedded in concrete also. The concrete shall extend a minimum of six (6) inches beyond the edge of the casting and shall be left one and one-half (1½) inches below the top of the frame so that the wearing course of asphalt concrete pavement will butt the cast iron frame. The existing concrete pavement and edge of the casting shall be painted with hot asphalt cement.

Adjustments in the inlet structure shall be constructed in the same manner and of the same material as that required for new inlets. The inside of the inlets shall be plastered.

–3.03 ADJUSTMENT OF MONUMENTS AND CAST IRON FRAME AND COVER

Monuments and monument castings shall be adjusted to grade in the same manner as for manholes.

–3.04 ADJUSTMENT OF VALVE BOX CASTINGS

Adjustment of valve box castings shall be made in the same manner as for manholes.

53–4 MEASUREMENT AND PAYMENT

Payment will be made for such of the following applicable bid items as are included and shown in any particular contract, consistent with measurement and payment requirements contained in the specifications for each particular item.

1. "Adjust Existing Manhole or Catch Basin to Grade," per each.
2. "Adjust Existing Inlet to Grade," per each.
3. "Adjust Existing Monument Frame and Cover to Grade," per each.
4. "Adjust Existing Valve Box to Grade," per each.
5. "Type.....(or size) Manhole, Extra Depth," per vertical foot.
6. "Additional Depth Shaft for Existing Manhole," per vertical foot.
7. "Type.....Inlet," per each.
8. "Furnish Locking Manhole Frame and Cover (heavy, light)," per each.
9. "Furnish Manhole Frame (heavy, light) and Cover," per each.
10. "Furnish Metal Frame and Grate for Catch Basin or Inlet," per each.
11. "Asphalt Concrete Pavement, Class B," per ton.
12. "Bituminous Plant Mix," per ton.

–4.01 ADJUST EXISTING MANHOLE OR CATCH BASIN TO GRADE

The unit contract price for "Adjust Existing Manhole or Catch Basin to Grade," shall be full compensation for removing the cast iron frame and cover, removing necessary pavement, cutting the existing structure down where necessary, furnishing and placing temporary wood cover, rebuilding the structure, resetting the existing cast iron frame and cover to proper grade, backfilling the void around the structure, and plastering the structure throat and extension. Where manholes are to be adjusted downward and it is necessary to remove the entire cone section, the entire adjustment will be paid for by force account. Where an existing manhole is to be raised from its present grade in excess of two and one-half (2½) feet, the shaft portion above the two and one-half (2½) foot adjustment will be paid for as "Additional Depth Shaft for Existing Manhole," per vertical foot.

–4.02 ADJUST EXISTING INLET TO GRADE

The unit contract price for "Adjust Existing Inlet to Grade," shall be full compensation for removing pavements, casting, upper portion of inlet, whether it is cast iron, concrete or blocks, reconstructing the inlet to the new and proper grade, backfilling the void around the structure, and utilizing the existing cast iron frame and cover.

–4.03 ADJUST EXISTING MONUMENT FRAME AND COVER TO GRADE

The unit contract price for "Adjust Monument Frame and Cover to Grade," shall be full compensation for removing necessary pavement, for removing and resetting the existing cast iron frame and cover to proper grade, and for backfilling the void around the structure. Where existing castings are not to be used, new ones shall be installed and will be paid for in accordance with Section 53-4.08.

–4.04 ADJUST EXISTING VALVE BOX TO GRADE

The unit contract price for "Adjust Existing Valve Box to Grade," shall be full compensation for removing necessary pavement and for resetting the casting to proper grade, including backfilling the void around the structure, and all other work incidental thereto.

–4.05 TYPE, OR SIZE, MANHOLE EXTRA DEPTH

The unit contract price per vertical foot for "Type .....(or size) Manhole, Extra Depth" shall be full compensation for all costs incurred in completing the construction in accordance with the specifications of Section 63, with measurement and payment as described in sections 63-4 and 63-5.

–4.06 TYPE.....INLET IN PLACE

The unit contract price per each for "Type..... Inlet," shall be full compensation for furnishing all labor, equipment and material necessary to construct inlets as shown on the standard drawing and in accordance with Section 64, including the adjustment to finished grade.

–4.07 FURNISHING CASTINGS

Where adjustment of existing manholes, catch basins, inlets, valve boxes, etc. are required, and where the existing castings are discarded or ordered to be salvaged by the Engineer, the Contractor shall furnish new castings of the type specified. In such case, the Contractor will be paid the unit contract price for each adjustment item and also the unit contract price for each type of casting involved.

–4.08 ASPHALT CONCRETE

Asphalt concrete or bituminous plant mix used in patching around various types of structures or casting adjustments will be paid for in accordance with the unit contract price per ton for "Asphalt Concrete, Class B" or per ton for "Bituminous Plant Mix," whichever is used.

–4.09 INCIDENTAL WORK

Any work required to make adjustments to manholes, catch basins, inlets, sumps, valve boxes, monuments, etc., which is not specifically mentioned in the foregoing specifications, shall be considered as incidental to the construction, and all costs thereof shall be included by the Contractor in his unit contract prices.

Section 54—Pavement Patching

54–1 DESCRIPTION

This work shall consist of the patching of various types of pavement cuts, the performance of which shall be in accordance with the requirements outlined hereinafter and as shown on standard drawing No. 18.

54–2 MATERIALS

All materials shall conform to the requirements specified for material in other sections of these standard specifications, such as for instance, sections 27 and 39.

54–3 CONSTRUCTION DETAILS

–3.01 GENERAL

Pavement patching shall be scheduled to accommodate the demands of traffic and shall be performed as rapidly as possible to provide maximum safety and convenience to public travel.

The placing and compaction of the trench backfill, and the preparation and compaction of the subgrade shall be in accordance with the requirements of the various applicable sections of these specifications.

Before the patch is constructed all pavement cuts shall be trued so that the marginal lines of the patch will form a rectangle with straight edges and vertical faces. The use of a concrete saw will not be required unless provided for in the special provisions.

The class of concrete used in patches will depend upon the urgency of opening the street to traffic. The class of concrete shall be as specified in the special provisions and proposal. Curing compound as specified in Section 39-2.09 shall be placed on the concrete immediately after finishing.

Proper signs, barricades, lights and other warning devices, as may be approved by the Engineer, shall be maintained all 24 hours of day until the patch is completed and ready for traffic.

–3.02 CEMENT CONCRETE PAVEMENTS

After the subgrade for the pavement has been compacted and constructed to line and grade, the cement concrete pavement patch shall be placed, compacted and struck off to the grade of the adjacent pavement in accordance with the pertinent provisions of Section 39. Through and dummy joints shall be placed and edged where directed. The surface shall be finished and brushed with a fibre brush. Approved curing compound shall be placed on the finished concrete immediately after finishing.

–3.03 RIGID TYPE PAVEMENTS RESURFACED WITH ASPHALT CONCRETE

Streets which have rigid type pavements resurfaced with asphalt concrete shall be patched as shown on the standard drawing, or as otherwise specified. The surface of the cement concrete portion of the patch shall be left low enough to accommodate the asphalt portion of the patch. Brush finishing will not be required. Joints shall be placed if directed by the Engineer. Curing shall be accomplished with an SS-1 emulsion cut back with water as directed by the Engineer.

Asphalt concrete or bituminous plant mix shall not be placed until the day after the cement concrete has been placed unless otherwise permitted by the Engineer. The edges of the existing asphalt pavements and castings shall be painted with hot asphalt cement or asphalt emulsion immediately before placing the asphalt patching material. The asphalt concrete pavement shall then be placed, leveled, and compacted to conform to the adjacent paved surface. Immediately thereafter, all joints between the new and original asphalt pavement shall be painted with hot asphalt or asphalt emulsion and be covered with dry paving sand before the asphalt solidifies.

–3.04 ASPHALT CONCRETE STREETS ON GRANULAR BASE

After the subgrade has been prepared as shown on the standard drawing, or as directed by the Engineer, a minimum of two (2) inches of asphalt concrete pavement Class B or bituminous plant mix shall be placed and completed in the same manner as specified in Section 54-3.03.

–3.05 OIL MAT STREETS

The existing oil mat shall be uniformly trimmed to a straight line. After the subgrade has been prepared as shown on the standard drawing, or as directed by the Engineer, a minimum of two (2) inches of asphalt concrete pavement Class B shall be placed and completed in the same manner as specified in Section 54-3.03.

–3.06 INCIDENTAL WORK

All incidental work required to complete the patching of street surfaces as specified and to the satisfaction of the Engineer, including joints where required, shall be considered as incidental to the patching and the costs thereof shall be included in the items for which payment is provided.

54–4 MEASUREMENT AND PAYMENT

Payment for pavement patching above subgrade will be made in the following items:

1. "Cement Concrete Class 6.5(1½) H. E. S. for Pavement Patch," per cubic yard.
2. "Asphalt Concrete Class B for Pavement Patch," per ton.
3. "Bituminous Plant Mix for Pavement Patch," per ton.

Measurement for payment of cement concrete used in patching will be based upon computation of the neat lines of the section shown on standard drawing No. 18, and not by batch volume.

The unit contract price per cubic yard for cement concrete and per ton for asphalt concrete or bituminous plant mix as shown in the proposal shall be full compensation for all labor, tools and materials and for all incidental work required to complete the patching in accordance with the specifications and standard drawing, excepting however, that payment for selected materials will be made in accordance with applicable bid items but compaction of the materials shall be considered as incidental to the construction and no payment will be made therefor.

Section 55—Top Soil

55–1 DESCRIPTION

These specifications shall apply where the plans or special provisions require the procurement of top soil by the Contractor for the surface finishing of an area, or where the removal and replacement of existing top soil is required for the finishing of a specific construction area, generally in lawns or parking strips.

55–2 MATERIALS

–2.01 TOP SOIL, PROCURED

Top Soil that is required to be furnished by the Contractor from a source other than the area upon which it will be placed shall consist of fertile, friable soil, preferably of a loamy character, typical of the top soil common to the locality, and it shall contain a normal amount of organic matter. It shall be obtained from arable land and shall be free from subsoil, refuse and other deleterious substances. It shall be reasonably free from brush, roots, heavy clay, sticks and other litter, and shall contain no stones or gravel larger than one-half (½) inch in diameter. It shall be free of toxic amounts of either acid or alkaline elements and be capable of sustaining healthy plant life. It shall be appoved by the Engineer before placement.

55–3 CONSTRUCTION DETAILS

–3.01 PLACEMENT OF TOP SOIL

Immediately prior to placing top soil, the surface area upon which it is to be placed shall be cleaned of objectionable matter and the area be smoothed and compacted to the satisfaction of the Engineer.

Top soil shall be placed where shown on the construction plans and to depths provided for in the special provisions, or direction of the Engineer. It shall be leveled, raked, and compacted so as to provide a well-shaped and uniform appearance.

–3.02 REMOVAL AND REPLACEMENT OF TOP SOIL

Whenever it is necessary to remove top soil with the purpose of later replacing it in the same area, the Engineer will direct the limits of the area and the depth of top soil to be removed. The top soil shall be removed in a uniform depth and be stored in such manner that it will not become mixed with unsatisfactory soils. After the trench has been backfilled, the stored top soil shall be replaced at a uniform depth in its original area. The top soil shall then be shaped, leveled, and compacted to blend with the contour of adjacent ground.

In the event that additional top soil is required and is procured from a source other than the construction area, the Contractor shall furnish and place it in compliance with Section 55-3.01 and the intent of this subsection.

55–4 MEASUREMENT

–4.01 TOP SOIL, PROCURED

Measurement of procured top soil will be made by the cubic yard in net volume of truck loads at point of delivery.

–4.02 REMOVAL AND REPLACEMENT OF TOP SOIL

Top soil removed and later replaced in original area will be measured by the cubic yard calculated upon the square footage of the area by the depth of soil removed.

55–5 PAYMENT

Payment will be made for such of the following items as are included in the proposal of any particular contract:

1. "Top Soil", per cubic yard.
2. "Remove and Replace Top Soil", per cubic yard.

The unit contract price per cubic yard for "Top Soil" shall be full compensation for the furnishing, hauling and placing of the soil in accordance with the specifications, whether it be for the full depth upon any area or an additional quantity required where removal and replacement of top soil resulted in a deficiency.

The unit contract price per cubic pard for "Remove and Replace Top Soil" shall be full compensation for all work and costs of scalping the original soil from an area, transporting it to storage, and then replacing it in the area in accordance with the specifications, and to the satisfaction of the Engineer.

Section 56—Lawn Removal and Replacement

56–1 DESCRIPTION

The work shall consist of the removal and replacement of existing lawn turf by cutting the sod to be removed into convenient sized squares or strips, cutting to uniform thickness, piling and storing, and finally replacing the sod in its original position. This work will be performed only where the special provisions provide for such work.

56–2 CONSTRUCTION DETAILS

The area of sod to be removed shall be laid out in squares or strips of such size as to provide easy handling and matching. The sod shall then be carefully cut along these lines to a depth of four (4) inches, taking care to keep all cuts straight and strips of the same width. After the sod has been cut vertically, it shall be removed to a uniform depth of approximately three (3) inches with an approved type of sod cutter. This operation shall be performed in such manner as to insure uniform thickness of sod throughout the operation.

As the sod scalping proceeds, the sod strips shall be placed in neat piles at convenient locations and from

then on they shall be maintained in a damp condition continuously until the sod strips are replaced on the lawn. In no case shall the sod remain in piles longer than ten (10) days before replacement on the lawn.

Prior to replacing the strips of sod, the scalped area shall be carefully shaped to proper grade and be thoroughly compacted. Wherever the construction operations have resulted in the placement of unsuitable or poorer soils in the area to be resodded, the surface shall be left low and covered with top soil meeting all requirements of Section 55.

The finished grade, after shaping and compacting the top soil, shall be thoroughly dampened prior to and immediately before replacing the sod. The sod shall be replaced to the required grade, taking care to butt each piece tightly against the adjacent one. Upon completion, the sod shall be dampened and rolled with a lawn roller to the satisfaction of the Engineer.

All tools used shall be of the type specially designed for the work and be satisfactory to the Engineer. In no case shall sod be removed by the use of a mattock or other tool which will not meet requirements specified herein.

56–3 MEASUREMENT

Measurement for cutting, removing, storing, and replacing sod will be made by the square yard on the plane of surface scalped and resodded.

Measurement for top soil required within the scalped area will be by the cubic yard measured in trucks at point of delivery.

56–4 PAYMENT

Payment will be made for such of the following items as are included in the proposal of any particular contract:

1. "Remove and Replace Lawn", per square yard.
2. "Top Soil", per cubic yard.

The unit contract price per square yard for "Remove and Replace Lawn" shall be full compensation for the complete operation of cutting, removing, dampening, storing, and replacing the sod as specified. The unit contract price per cubic yard for "Top Soil" shall be full compensation for the furnishing, hauling, leveling and placing of the top soil as required, to the satisfaction of the Engineer.

Section 57—Finishing and Cleanup

57–1 DESCRIPTION

After all other work embraced in the contract is completed and before final acceptance of the contract, the entire roadway including the roadbed, parking, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades, and cross sections shown on the plans and as hereinafter specified.

57–2 CONSTRUCTION DETAILS

Slopes, sidewalk areas, parking areas, and roadway shall be smoothed and finished to the required cross section and grade by means of a grading machine insofar as it is possible to do so without damaging existing improvements, trees, and shrubs. Machine dressing shall be supplemented by hand work to meet requirements outlined herein, to the satisfaction of the Engineer.

Upon completion of the cleaning and dressing the project shall appear uniform in all respects. All graded areas shall be true to line and grade as shown on the typical sections and as required by the Engineer. Where the existing parking is below sidewalk and curb, the area shall be filled and dressed out to the walk regardless of limits shown on the plans. Wherever fill material is required in the parking area it shall be left enough higher to allow for final settlement but, nevertheless, the raised surface shall present a uniform appearance.

All rocks in excess of one (1) inch diameter shall be removed from the entire construction area and shall be disposed of the same as required for other waste material. In no instance shall the rock be thrown onto private property. Overhang on slopes shall be removed and slopes dressed neatly so as to present a uniform well sloped surface.

All windrows of earth at the outer lateral limits of the project shall be removed entirely. Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and not placed in areas adjacent to the project. Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Contractor shall remove and dispose of same at his own expense.

Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris which is the result of the Contractor's operations, unless the specifications of any particular section or the special provisions provide otherwise.

Where, by permission, spoil is dumped on private property, the Contractor will not be required to perform any work beyond that described in the special provisions.

The contractor shall remove and dispose of all construction stakes.

All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements such as portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities which have been sprayed by the asphalt cement shall be cleaned to the satisfaction of the Engineer. Castings for manholes, monuments, water gates, lamp poles, vaults, and other similar installations which have been sprayed with the asphalt material shall be cleaned to the satisfaction of the Engineer.

The Contractor shall flush the street at the conclusion of the work unless otherwise provided in the special provisions. Flusher shall be of a pressure type and approved by the Engineer. The Contractor shall furnish the water required and will be paid therfor at the unit contract price per M gallons for "Water." Sidewalks shall be hand broomed.

On sewer and water distribution projects where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties. All other requirements outlined previously shall be met, except that it will not be necessary to pick up rocks unless so provided in the special provisions.

57–3 MEASUREMENT AND PAYMENT

Measurement for finishing and cleanup will be based upon a lump sum contract price, or upon a per station (100-foot) unit contract price, whichever is shown in the proposal.

Payment will be made for such of the following bid items as are included in any particular contract:

1. "Finishing and Cleanup", per lump sum.
2. "Finishing and Cleanup", per station (100-foot).
3. "Water", per M gallons.

Regardless of whether payment is made by lump sum or upon measurement by stations, it shall include the finishing and cleaning of all side street approaches. Where payment is based upon the station unit, measurement will be along the center line of the project and the finishing and cleaning of side street approaches will not be included in the station quantities. Finishing and cleaning of side street approaches shall be considered as incidental to the construction and all costs thereof shall be included in the lump sum, or in the unit contract price per station as measured along center line of the project.

Water used for flushing will be measured and paid for by the unit of one thousand (M) gallons in accordance with provisions of Section 16.

In event the proposal does not include a bid item for "Finishing and Cleanup", the work thereof, including water for flushing, shall be considered as incidental to the construction of the project and all costs thereof shall be included by the Contractor in other items of work.

Section 60—Pipe Materials and Testing for Sewers, Drains and Culverts

60–1 DESCRIPTION

Pipe used in sanitary sewer construction, unless otherwise specified, shall be of cement concrete, vitrified clay, or asbestos cement. Storm drains and culvert pipe, unless otherwise specified, shall be concrete, vitrified clay, or corrugated galvanized metal. All sanitary sewer pipe shall have flexible gasketed joints unless otherwise specified. Storm drain and culvert pipe shall be jointed as specified.

60–2 GENERAL

Where reference is made to an ASTM or AASHO designation, it shall be the latest revision at time of call for bids, except as noted on the plans or in the special provisions.

Pipe eight (8) inches in diameter and larger shall be furnished in units of not less than three (3) feet, except as noted in Section 60-3.01B.

60–3 MATERIALS AND TESTING

–3.01 PIPE MATERIALS

–3.01A Concrete Pipe, Nonreinforced

Nonreinforced concrete pipe shall conform to ASTM Designation C14, Table II (extra strength), except as otherwise provided.

–3.01B Concrete Pipe, Reinforced

Reinforced concrete pipe shall conform to ASTM Designation C76, except as otherwise provided, and shall be of the class noted on the plans or in the special provisions. Unless otherwise specified, all reinforced concrete pipe ends shall be of the bell and spigot type, modified bell and spigot type, or tongue and groove, and both bells and spigots shall be reinforced in pipe thirty (30) inches in diameter and larger. For pipes 30 inches or more in diameter, the length of the unit shall be not less than eight (8) feet unless otherwise specified.

–3.01C Vitrified Clay Pipe

Vitrified clay pipe shall conform to ASTM Designation C278, unless otherwise provided.

–3.01D Asbestos-Cement Pipe

Asbestos-cement pipe shall conform to ASTM Designation C428, unless otherwise provided, and shall be of the class noted on the plans or in the special provisions.

–3.01E Galvanized Corrugated Metal Pipe

Galvanized corrugated metal pipe as specified in the plans or special provisions shall conform to the material, fabrication and inspection requirements of AASHO Designation M 36, except that gauges and types shall be as noted on the plans.

–3.01E1 Bituminous Coated Paved Invert Metal Pipe. Bituminous coated paved invert galvanized corrugated metal pipe shall conform both as to base metal analysis and fabrication to the standard specifications of AASHO M 36, and in addition shall be coated inside and out with a bituminous coating which shall meet the following requirements:

A. *Coating.* The bituminous coating shall be 99.5% soluble in Carbon Disulfide.

B. *Thickness of Coating.* The pipe shall be uniformly coated inside and out to a minimum thickness of .05 inch, measured on the crests of the corrugations. Additional bituminous material shall be added to the bottom quarter of the circumference to form a smooth pavement with a minimum thickness of ⅛ inch above the crests of the corrugations.

C. *Performance Requirements.* The asphalt cement shall adhere to the metal tenaciously, shall not chip off in handling, and shall protect the pipe from deterioration as evidenced by samples prepared from the coating material meeting the following tests:

1. *Shock Test.* Four specimens in the form of disks, each ⅜ inch thick and 1¾ inches in diameter, shall be cooled in a brine solution at a temperature of 30° F. for a period of at least one hour. The samples shall then be removed from the solution one at a time and quickly centered under the plunger of the impact test apparatus and the hammer dropped from a height of 5⅛ inches. Not more than one of the specimens shall show a crack.

2. *Flow Test.* Two specimens in the form of cylinders, each ⅜ inch in diameter and ¾ inch long shall be placed on a corrugated brass slide which is supported on a 45° slope. The apparatus shall then be placed in a constant temperature oven and left at 150° F. for a period of four (4) hours. The flow of lower edge of either specimen must not exceed ¼ inch.

–3.01E2 Asbestos Impregnated Galvanized Corrugated Metal Pipe. Asbestos impregnated galvanized corrugated metal sewer pipe shall be fabricated from asbestos bonded corrugated sheets. Both sides of the metal sheets shall be coated with a layer of asbestos fibers applied in a sheet form by pressing into a molten metallic bonding medium. Immediately after the metallic bond has solidified, the asbestos fibers shall be thoroughly saturated with a bitumininous saturant. The finished sheets shall be of first-class commercial quality, free from blisters or unsaturated spots and with the fibers adhering tightly to the metal. In addition, the pipe shall be coated inside and out with a bituminous coating which will meet the requirements as described in Section 60-3.01E.

–3.01E3 Smooth Lined Corrugated Metal Pipe. As noted on the plans, the pipe shall be fabricated from either corrugated galvanized sheets as specified in Section 60-3.01E or from corrugated asbestos impregnated galvanized sheets as specified in Section 60-3.01E2.

The outside of the pipe shall be coated uniformly with bituminous material to a minimum thickness of .05 inch measured on the crests. The inside of the pipe shall be coated with bituminous material so that a smooth surface will be formed, completely filling the corrugations and having a minimum thickness of ⅛ inch above the crests of the corrugations. Straight pipe shall have the interior coating applied by a centrifugal method. The interior coating shall be free from sags and runs.

The thickness of the interior lining shall be maintained to the ends of the pipe. The ends of the pipe shall be so trimmed and finished that a minimum gap results when straight pipe sections are properly joined. The bituminous material shall meet the solubility, shock and flow requirements of Section 60-3.01E1.

–3.02 JOINTING MATERIALS

–3.02A Flexible Gasketed Joints

Flexible joints shall be rubber gasketed when used with concrete, asbestos-cement or corrugated galvanized metal pipe; or shall be factory manufactured joints in accordance with ASTM Designation C425 when used with vitrified clay pipe.

Rubber gaskets for asbestos-cement sewer pipe shall conform to the requirements of ASTM Designation D1869, Rubber Rings for Asbestos-Cement Pipe.

Rubber gaskets for concrete sewer pipe, asbestos cement non-pressure sewer pipe, or vitrified clay sewer pipe shall meet the following physical requirements, plus such other specifications as may be claimed for the particular brand of gasket furnished:

Tensile strength, min., psi	1200
Elongation at break, min., %	350
Shore durometer hardness, Type A (*)	
Min.	40
Max.	60
Compression set, (constant deflection) max., % of original deflection	25
Accelerated aging, changes in properties after conditioning in a circulating hot air oven for 96 hours at 158° F.:	
Decrease in tensile stength, max. % of original	15
Decrease in elongation, max., % of original	20
Water absorption by wt., 48 hrs. at 70° C max., %	5

(*) Allowable variation ± 5 from hardness specified for the gasket used.

Methods of making the above tests shall be as given in ASTM Designation C443.

Gaskets made with vulcanized joints shall be capable of withstanding 100% stretch across the joint with no visible damage occurring when held for one minute.

Gasket material shall be stored in a cool, clean place, protected from sunlight and contaminants until ready for installation on the pipe. Pipes with gaskets affixed shall be installed in the sewer line within 28 days, unless adequately protected against sunlight and contaminants.

All surfaces of the joint upon or against which the gasket may bear shall be smooth, free from spalls, cracks or fractures and imperfections which would adversely affect the performance of the joint.

The joints of the pipe shall be of such design that they will withstand the forces caused by the compression of the gasket, when joined, without cracking or fracturing.

The rubber type gasket shall be the sole element depended upon to make the joint flexible and watertight.

The gasket shall be a continuous ring which fits snugly into the annular space between the overlapping surfaces of the joints of the pipe to form a flexible watertight seal. The gasket shall not be stretched more than 20% of its original circumference when seated on the spigot or tongue end of the pipe.

The annular space, including the manufacturer's tolerances, between the gasket bearing surfaces of the respective cones when the joint has been closed shall not be more than 75% of the uncompressed thickness of the applied gasket.

Gaskets used with corrugated metal pipe shall be made of three-eighths (⅜) inch thick by six (6) inch minimum width closed cell synthetic sponge rubber, per ASTM Designation D1056-58 T, grade SB 43L, fabricated in the form of a cylinder with a diameter of approximately ten (10) percent less than the nominal pipe size. The gasket shall be centered under the band and lapped an equal distance on the ends of the adjoining pipe sections.

Where gaskets are specified, the exterior rivet heads for the last twelve (12) inches of longitudinal seam at both ends of each pipe section shall be kept from projecting past the outside of the pipe. This may be accomplished by the use of countersunk rivets or by welding the last twelve (12) inches of seam. Gaskets are necessarily used with the "U-Bolt" bands, and may be specified with the "Angle-Lug" or "Rod and Lug" bands.

Flexible gasketed joints shall be subject to the following yard tests:

A. *With Pipe in Proper Alignment.* Not less than three nor more than five pipes selected from stock by the Engineer shall be assembled according to installation instructions issued by the manufacturer, and with ends bulkheaded and restrained against internal pressure shall be subjected to ten (10) psi hydrostatic pressure with no resultant leakage at the joints. When approved by the Engineer, internal hydrostatic pressure may be applied by a suitable joint tester.

B. *With Pipe in Maximum Deflected Position.* Upon completion of the test for pipe in proper alignment, the test section shall be deflected to create a position one-half (½) inch wider than the fully compressed position on one side of the outside perimeter. When thus deflected, there shall be no leakage at the joints from an applied internal hydrostatic pressure of ten (10) psi. When approved by the Engineer, internal hydrostatic pressure may be applied by a suitable joint tester.

C. *With Joints Under Differential Load (15" diameter rigid pipe and larger).* The test section shall be supported on blocks, or otherwise, so that one of the pipes is suspended freely between adjacent pipes, bearing only on the joints. The suspended pipe shall then be loaded, in addition to the weight of the pipe, an amount as given in the following table:

DIAMETER	LOAD
15 inches	7,400 lbs.
18 inches	8,800 lbs.
21 inches	10,000 lbs.
24 inches and over	11,000 lbs.

While under this load, the stressed joints shall show no leakage when subject to five (5) lbs. hydrostatic pressure. As an acceptable alternate, one-half of the load may be applied on the bell of the suspended pipe.

Pipe of less than fifteen (15) inch diameter shall be tested with joints under differential load according to the procedures contained in ASTM Designation C425.

–3.02B Coupling Bands for Corrugated Metal Pipe

As noted on the plans, coupling bands for corrugated metal pipe shall be one of the following types:

1. The type of band described as "Angle-Lug" band shall not be less than 7 inches wide for diameters of 8 inches to 30 inches, inclusive; not less than 12 inches wide for pipe with diameters 36 inches to 54 inches, inclusive, and not less than 24 inches wide for pipe with diameters 60 inches and over. Such bands shall be so constructed as to lap on an equal portion of each of the pipe sections to be connected. The ends of the band segments shall be connected by galvanized angles having minimum dimensions of 2 inches x 2 inches x 3/16 inch.

The 7-inch band shall have at least two galvanized bolts not less than ½-inch diameter, the 12-inch band shall have three ½-inch bolts, and the 24-inch band shall have five ½-inch bolts. The band may be furnished in two halves with one half shop riveted to the end of one pipe section. The band shall be made from the same type of corrugated sheets as the pipe except that coupling band sheet may be 2 gauge numbers lighter than the pipe corrugated sheets.

2. The type of band described as "Rod and Lug" band shall be made from the same type of corrugated sheets as the pipe except that the coupling band sheets may be 2 gauge numbers lighter than the pipe corrugated sheets. The bands may be made in two halves, and one half may be shop riveted to one end of one pipe section. Instead of "Angle-Lugs", the bands shall be tightened by means of threaded galvanized rods and galvanized cast lugs. For pipe 21-inch diameter and smaller, four ⅜-inch diameter rods are to be used with bands not less than 12 inches wide. For pipe 24-inch through 54-inch, four ½-inch diameter rods are to be used with bands not less than 12 inches wide. For pipe 60-inch and larger, four ⅝-inch diameter rods are to be used with bands not less than 24 inches wide.

3. The type of bands described as "U-bolt" bands shall be fabricated 16-gauge galvanized metal bands, complete with gaskets which mesh into one corrugation on the end of each pipe section. The bands and the gaskets shall be at least 6 inches wide. The gaskets shall be as described in Section 60-3.02A. The metal bands shall lap at least two inches at the joints and shall be tightened by ½-inch diameter galvanized U-bolts with malleable iron band bars. The bolt assembly shall be anchored to the band by galvanized straps fastened by three ⅜-inch diameter rivets or bolts through each strap. Two-piece bands shall be used on pipe 42 inches and larger in diameter.

–3.02C Mortar Joints

Pipe ends designed for rigid mortar joints shall conform to ASTM Designations C13, C14, or C76 as may be applicable. Mortar shall be cement mortar mixed in the proportion of one part portland cement to one and one-half (1½) parts plaster sand, mixed with the least amount of clean water necessary to provide a workable mortar.

–3.03 FITTINGS

Unless otherwise specified, tee fittings shall be provided in the sewer main for side sewer, catch basin or inlet connections. Tees shall be six (6) inches inside diameter, unless otherwise specified or noted. All fittings shall be of sufficient strength to withstand all handling and load stresses normally encountered. All fittings shall be of the same material as the pipe. Material joining the fitting to the pipe shall be free from cracks and shall adhere tightly to each joining surface.

–3.04 CAP FOR FITTINGS

All fittings shall be capped with a plug of the same material as the pipe, and gasketed with the same gasket material as the pipe joint, or be integrally cast. The plug

shall be able to withstand all test pressures involved without leakage.

60–4 MEASUREMENT AND PAYMENT

Measurement and payment for pipe and incidental accessories, and for the testing as has been specified herein, will be included in such other of the sewer and culvert sections as their use is related to. Accessories and testing shall be considered as incidental to the materials affected and the costs thereof shall be included in the unit contract prices of applicable bid items in the proposals.

Section 61—Trench Excav., Backfill, Foundation and Bedding for Sewers, Drains and Culverts

61–1 DESCRIPTION

Trench excavation and backfill shall include all excavation, backfilling, disposal of surplus material, and all other work incidental to the construction of trenches, including any additional excavation which may be required for manholes or other structures forming a part of the pipe line and not otherwise classified as "Structure Excavation".

61–2 CLASSIFICATION

Trench excavation and backfill shall be classified as Class A or Class B for earth excavation, Class C for rock excavation, and Class D for excavation in unsuitable earth below grade. The approximate limits and quantities for Classes A, B, and C will be shown on the construction plans except for those projects where it is contemplated that all trench excavation and backfill will be Class A in which case no classification will appear on the construction plan.

Classes A, B, and C excavation and backfill, where ordered by the Engineer, shall extend to a depth not more than one foot below the invert elevation. Beyond this depth, Class D excavation will be paid for.

The Engineer shall have the authority to change classifications and the limits thereof as he may deem necessary, consistent with requirements outlined under definitions of the classifications.

–2.01 TRENCH EXCAVATION AND BACKFILL, CLASS A

Class A shall be trench excavation where the excavated material is piled beside the trench as it is removed and backfilled from this position, or wasted immediately adjacent to the excavation. The disposal of excess material resulting from pipe volume shall be considered as incidental to Class A, unless otherwise provided for in the special provisions.

–2.02 TRENCH EXCAVATION AND BACKFILL, CLASS B

Class B shall cover all cases of trench excavation where the excavated material, instead of being piled beside the trench, is transported to another site for wasting, or is transported to another point on the trench for backfill, or to another site for storage, as a result of confined operational conditions where no space is available for storage beside the trench.

Where the excavated material is transported to another site for storage all the cost including that of returning the material to the trench site for backfill shall be considered as incidental to this item and no additional payment will be made therefor.

The Contractor shall secure and maintain all necessary waste and storage sites unless otherwise designated on the plans or in the special provisions.

Where the Engineer directs that a blanket of select material be placed over the upper portions of the trench, the excavated material which is displaced by the select material shall be disposed of elsewhere, and shall be considered as Class B.

–2.03 TRENCH EXCAVATION AND BACKFILL CLASS C

Class C shall cover the removal and disposal of solid rock, i. e. ledge rock that requires systematic drilling and blasting for its removal, and also boulders exceeding one-half cubic yard in volume. All ledge rock, boulders, or stones shall be removed to provide a minimum clearance of six inches under the pipe.

Hard clay or hardpan will not be classified as solid rock excavation.

All materials removed shall be replaced with satisfactory waste materials from adjacent trenches or from imported bedding or backfill, as determined by the Engineer. All costs for backfilling not requiring haul shall be considered as incidental to this item. Payment for imported materials, where required, shall be in accordance with applicable bid items in the proposal.

–2.04 TRENCH EXCAVATION AND BACKFILL, CLASS D

Class D shall apply to the excavation of unsuitable material which lies in excess of one foot below the invert elevation, the removal of which may be ordered by the Engineer. Excavated materials shall be disposed of at an approved waste site and all costs involved in the excavating and wasting of this material shall be considered as incidental to this item. The imported material for foundations required for backfill will be paid for in accordance with the applicable bid items in the proposal.

61–3 CONSTRUCTION DETAILS

–3.01 EXCAVATION

The length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall it exceed one hundred and fifty (150) feet unless specifically authorized by the Engineer.

The maximum permissible trench width from the bottom of the trench to the crown of the pipe shall be as follows:

15-inch diameter and smaller....40 inches

18-inch diameter and larger.....1½ x inside diameter + 18 inches

In all cases, trenches must be of sufficient width to permit proper jointing of the pipe and backfilling of material along the sides of the pipe. Trench width at the surface of the ground shall be kept to the minimum amount necessary to install the pipe in a safe manner, ordinarily accomplished by sloping the trench sides to the angle of repose of the material encountered. Trenches wider than the maximum specified may result in a greater load of overburden than the pipe is designed for and, consequently, if the maximum trench width is exceeded by the Contractor without the written authorization of the Engineer, the Contractor will be required at his own expense to provide pipe of higher strength classification, or to provide a higher class of bedding, as may be deemed necessary by the Engineer.

Excavation for manholes and other structures shall be sufficient to provide a minimum of twelve (12) inches between their surfaces and the sides of the excavation.

All material excavated from trenches and piled adjacent to the trench or in a roadway or public thoroughfare shall be piled and maintained so that the toe of the slope of the material is at least two (2) feet from the edge of the trench. It shall be piled in such manner as will cause a minimum of inconvenience to public travel, and provision shall be made for merging traffic where such is necessary. Free access shall be provided to all fire hydrants, water valves and meters, and clearance shall be left to enable free flow of storm water in all gutters, other conduits, and natural watercourses.

–3.02 DEWATERING

Pipe trenches shall be kept free from water during pipe laying and jointing by such method as the Contractor may elect, provided the method is acceptable to the Engineer. The Contractor shall be responsible for damages of any nature resulting from the dewatering operations, notwithstanding tacit approval of the method by the Engineer.

Dewatering of the trench shall be considered as incidental to the construction and all costs thereof shall be included in various unit contract prices in the proposal, unless otherwise provided in the special provisions.

–3.03 FOUNDATIONS AND BEDDING

–3.03A Foundation Preparation

Proper preparation of foundation, placement of foundation material where required, and placement of bedding material shall precede the installation of all sewer and culvert pipe. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade so that the entire length of pipe will rest firmly on a well compacted material, so the backfill material around the pipe will be placed in a manner to meet requirements specified hereinafter.

–3.03B Classification of Bedding

Bedding procedures shall be classified as Class A, Class B, Class C, and Class D. The approximate limits for the various classes of bedding will be indicated on the construction plans where it is feasible to do so.

Where no special reference is made to the classification of bedding on the plans or in the specifications, it shall be construed that all bedding procedures shall be as described for Class D.

The Engineer shall have the authority to change bedding classifications and the limits thereof as he may deem necessary during the progress of the construction, consistent with the requirements outlined under the definitions and requirements of the various classifications contained herein. Classification of bedding will not constitute a pay item in itself, with the exception of Class A bedding, but the materials used will be paid for in accordance with applicable bid items in the proposal.

Where unauthorized excavation has been made below the established grade, the Contractor shall provide, place and compact suitable bedding material to the proper grade elevation at his own expense.

–3.03B1 Class A Bedding. Class A bedding shall consist of a pipe cradle constructed of Class 4(1½) portland cement concrete as specified in Section 39–3.01. The bottom of the trench shall be fully compacted before placement of pipe or cradle. Cradle construction shall conform to the details on standard drawing No. 62.

The unit contract price per linear foot for Class A bedding shall be full compensation for furnishing all labor, equipment, and materials necessary to construct the concrete cradle. Any trench excavation, furnishing and placing of select bedding material and compaction of same will be paid for in accordance with applicable bid items in the proposal.

–3.03B2 Class B Bedding. Class B bedding shall consist of the leveling of the bottom of the trench or the top of the foundation material at such elevations as the Engineer may direct, and the furnishing and placing of bedding materials under the pipe and long the sides to the springline of the pipe. Minimum thickness of the layer of bedding material required under any portion of the pipe shall be four inches for all pipe sizes of 27 inches diameter and smaller, and six inches for all pipe sizes of 30 inches diameter and larger.

Bedding material used in classes B and C bedding shall consist of clean, granular, well graded sand and gravel material of which 100 percent will pass the U. S. Standard ¾-inch opening, and not more than 3 percent will pass the U. S. No. 200 (wet sieve), with a minimum sand equivalent of 50. (Section 6)

Where bedding material of classes B or C is required, all costs for its procurement, hauling and placement shall be included in the unit contract price per cubic yard for "Bedding Material."

Compaction shall be as directed by the Engineer and payment will be made in accordance with applicable bid items in the contract.

–3.03B3 Class C Bedding. Class C bedding shall meet the requirements outlined for Class B bedding except that bedding material need be placed only to approximately the lower quadrant of the pipe.

Material for Class C bedding shall conform to the specification for Class B bedding, and payment will be made at the unit contract price per cubic yard for "Bedding Material."

Compaction shall be as directed by the Engineer and payment will be made in accordance with applicable bid items in the contract.

–3.03B4 Class D Bedding. Class D bedding shall consist of carefully excavating the trench to proper grade and placing select native material around the pipe and backfilling in accordance with Section 61–3.05. Class D bedding, as described, shall be considered as incidental to the construction and all costs thereof shall be included in other unit contract items of the proposal.

–3.03C Pipe Bedding in Solid Rock Excavation

In solid rock excavation, all ledge rock, boulders, or stones shall be removed to provide a minimum clearance of six (6) inches under the pipe. All materials thus removed shall be replaced with the classification of bedding noted on the plans, or directed by the Engineer.

–3.03D Foundation Material

Where unsuitable excavation has been removed, necessary foundation material shall be placed and compacted to form a suitable base for the replacement of the required thickness of bedding material. Where unsuitable native foundation materials have been removed from excavations, an approved replacement foundation material shall be placed to the required thickness. Such foundation material shall conform to one of the following gradations as called for on the plans, the special provisions, or as determined by the Engineer.

MATERIAL PASSING	CLASS A Min.	CLASS A Max.	CLASS B Min.	CLASS B Max.
2-½" square opening	98	100	95	100
2" square opening	92	100	75	100
1-½" square opening	72	87	30	60
1-¼" square opening	58	75	0	15
¾" square opening	27	47	0	1
⅜" square opening	3	14	–	–
U. S. No. 4 sieve	0	1	–	–

Coarse aggregate shall contain no piece larger than five (5) inches, measured along the line of greatest dimension.

Where foundation material is required, all costs for its procurement and placement shall be included in the unit contract price per cubic yard for "Foundation Material, Class .....,"

–3.04 CRIBBING AND SHEETING

Unless otherwise provided in the special provisions, the Contractor shall provide all cribbing and sheeting needed to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. Such cribbing and sheeting shall be according to the Contractor's design which shall comply with applicable local and state safety codes.

Removal of any cribbing and sheeting from the trench shall be accomplished in such a manner as to fullfill the above requirements.

Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the Contractor. Cribbing will not be a pay item and the cost thereof shall be included in the unit contract price for "Trench Excavation" of the particular class of trench excavation required, unless otherwise provided in the special provisions.

–3.05 BACKFILLING

As the pipe is installed, it shall be backfilled by hand with selected native material up to an elevation six (6) inches above crown, taking care that the backfill is in contact with the entire periphery of the pipe. The backfill shall be so carefully placed that subsequent backfilling operations will not disturb the pipe in any way. If the Engineer deems it necessary to compact the hand placed backfill, it will be paid for in accordance with the applicable unit contract price. If there is no such bid item, the compaction will be paid for under a mutually agreed price.

Temporary cribbing, sheeting, or other timbering shall be removed unless specific permission is given by the Engineer to leave it in place.

In backfilling the trench, the Contractor shall take all necessary precautions to protect the pipe from any damage or shifting of the pipe. In general, backfilling shall be performed by pushing the material from the end of the trench into, along and directly over the pipe so that the material will be applied in the form of a rolling slope rather than by side filling which will damage the pipe. Backfilling from the sides of the trench will be permitted after sufficient material has first been carefully placed over the pipe to such a depth as the Engineer may approve.

Pipe placed below the water table shall be kept from floating by placing backfill material upon it, or by maintaining the water level at the bottom of the trench.

During all phases of the backfilling operations and testing as outlined herein, the Contractor shall protect the sewer installation, provide for the maintenance of traffic as may be necessary, and provide for the safety of property and persons.

Where it is required that a blanket of select material or bank run gravel be placed on top of the native backfill, the backfill shall be placed to such elevation as shown on the plans, or as the Engineer may direct, and shall be leveled to provide for a uniform thickness of the borrow material. Where compaction is required, it shall be performed prior to placing the borrow material.

The cost of backfilling shall be included in the unit contract price per linear foot for the particular class of trench excavation and backfill, and in addition thereto, payment will be made for tamping, water settling, and furnishing and placing of bank run gravel when any of these are included in the plans and proposal, or ordered by the Engineer.

–3.06 COMPACTION OF TRENCH BACKFILL

Where compaction of trench backfill material is required, one of the following methods or combination thereof as set forth in the special provisions shall be used and payment will be made in accordance therewith. The Engineer shall have the right to change methods and limits to better accommodate field conditions. The density of backfilled material shall meet requirements outlined in the special provisions.

–3.06A Water Settling

Water settling shall be performed and payment will be made therefor as specified in Section 16, entitled "Water."

–3.06A1 Water for Uses Other Than Trench Backfill. Water required for dust control and uses other than described in this section shall be used and paid for in accordance with the requirements of Section 16, "Water."

–3.06B Mechanical Tamper

The mechanical tamper shall meet the specifications described for it in Section 15-3.01A.

–3.06C Vibratory Compactor

The vibratory compactor shall be a single hand operated unit, a group hand operated unit, or a vibratory roller. Where vibratory units will be required on the job, it will be so specified in the special provisions. and the method of payment therefor will be included in the proposal.

If vibratory compactors are required on a project for which the plans and proposal make no provisions for the use and payment therefor, the Contractor shall furnish and operate such compactors as the Engineer may require for proper compaction. In the absence of any unit contract prices for the equipment, the Contractor shall be paid therefor upon an hourly basis for each compactor or combination thereof in accordance with the latest semi-annual issue of "Rental Rates for Equipment Used on Force Account," by the Department of Highways, Olympia, Washington.

–3.07 BANK RUN GRAVEL FOR TRENCH BACKFILL

Wherever a trench is excavated in paved roadway, sidewalk or other area where minor settlement would be detrimental and where the native excavated material is not suitable for compaction as backfill, the trench shall be backfilled to such depth as the Engineer may direct with Bank Run Gravel, Class A or Class B as specified in Section 26-2, excepting that 100 percent of the material shall pass the 2-½ inch square opening.

–3.08 TOP SOIL REMOVAL AND REPLACEMENT

Removal of top soil and replacement of it shall be performed in accordance with the provisions of Section 55 and payment will be made at the unit contract price per cubic yard as specified therein.

–3.09 LAWN REMOVAL AND REPLACEMENT

Removal of lawn and the replacement of it shall be performed in accordance with the provisions of Section 56 and payment will be made at the unit contract price per square yard as specified therein.

61–4 MEASUREMENT AND PAYMENT

–4.01 TRENCH EXCAVATION AND BACKFILL

Measurement for trench excavation and backfill will be by the linear foot whenever a single classification of trench excavation and backfill is involved for a continuous distance, and when it is so provided in the special provisions or bid proposal. In cases where mixed classifications are involved, trench excavation and backfill will be measured by the cubic yard within certain limitations as to allowable width and depth as described hereinafter.

–4.01A Measurement by the Linear Foot

When measurement and payment is called for by a unit contract price per linear foot, the trench shall be measured continuously along center line from the beginning point to the terminus and including the distances through structures, excepting however, that if excavation for structures is a bid item in connection with the structures the allowable distance along center line through the structure excavation shall be deducted from the total length of trench.

The unit contract price per linear foot for "Trench Excavation and Backfill, Class ....," shall be full compensation for all labor, materials, tools and equipment required to excavate and backfill the trench in accordance with the plans and specifications; the unit contract price does not, however, include the work and expense of bank run gravel, foundation material, bedding material, water settling and compaction equipment such as tampers which, if required, will become separate items in the proposal.

–4.01B Measurement by the Cubic Yard

When measurement and payment is called for by a unit contract price per cubic yard, the volume shall be computed upon the following basis for length, width and depth of trench:

Length. The entire horizontal distance in feet along the center line of the trench, including measurement through manhole or structure locations, excepting, however, that the measurement through such structures will be deducted if the proposal carries a separate item of structure excavation that is applicable to the structures.

Width. For 24-inch pipe and smaller, the width upon which excavation will be calculated will be the inside diameter of the pipe plus 24 inches. For pipes with inside diameter greater than 24 inches, the calculated width will be the inside diameter plus 36 inches.

Depth. The vertical measurement shall be whichever is the lesser dimension arrived at from the following possible cases: (a) the vertical measurement from invert of pipe to original ground or paved surface, (b) the vertical measurement from invert of pipe to the scalped surface after removal of top soil or lawn, and (c) the measurement from invert of pipe to roadway excavation subgrade in cases where it is intended that sewer and street construction are to be performed in conjunction with each other. In cases where a blanket of bank run gravel is placed upon a lower layer of compacted native backfill, the vertical measurement of the "Bank Run Gravel, Class B" will be from the top of the compacted native backfill to the completed surface of the bank run gravel.

Measurement will be made at intervals of not more than 50 feet along the center line of the trench, and closer if the terrain justifies.

The unit contract price per cubic yard for "Trench Excavation and Backfill, Class ....," shall be full compensation for all labor, material, tools and equipment required to excavate and backfill the trench in accordance with the plans and specifications; the unit contract price does not, however, include the work and expense of bank run gravel, foundation material, bedding material, water settling and compaction equipment such as tampers which, if required, will become separate items in the proposal.

–4.02 BANK RUN GRAVEL FOR TRENCH BACKFILL

Bank run gravel of class specified will be measured by the cubic yard in the trucks at the point of delivery.

–4.03 PIPE BEDDING CLASS A

Measurement will be for the actual number of linear feet of concrete cradle constructed for each pipe size.

–4.04 FOUNDATION MATERIAL

Foundation material of class specified will be measured by the cubic yard in trucks at the point of delivery.

–4.05 BEDDING MATERIAL

Bedding material will be measured by the cubic yard in the trucks at the point of delivery.

–4.06 MECHANICAL TAMPERS AND VIBRATORY COMPACTORS

Measurement will be to the nearest one-half (½) hour of actual time consumed in compacting for each of the types of equipment used. No allowance will be made for time consumed in making repairs to the equipment, nor for moving equipment to or from areas on the work for which compaction is required.

61–5 PAYMENT

Payment will be made for such of the following bid items as are included and shown on any particular contract:

1. "Trench Excavation and Backfill Class A", per linear foot.
2. "Trench Excavation and Backfill Class B", per linear foot.
3. "Trench Excavation and Backfill Class C", per linear foot.
4. "Trench Excavation and Backfill Class D", per linear foot.
5. "Trench Excavation and Backfill Class A", per cubic yard.
6. "Trench Excavation and Backfill Class B", per cubic yard.
7. "Trench Excavation and Backfill Class C", per cubic yard.
8. "Trench Excavation and Backfill Class D", per cubic yard.
9. "Bank Run Gravel Class A", per cubic yard.
10. "Bank Run Gravel Class B", per cubic yard.
11. "Pipe Bedding Class 4(1½) for (size) Pipe", per linear foot.
12. "Bedding Material", per cubic yard.
13. "Foundation Material Class ....", per cubic yard.
14. "Mechanical Tamper", per hour.
15. "Vibratory Compactor", per hour.
16. "Hydrant Settling Water", per M gallons.
17. "Haul Settling Water", per M gallons.
18. "Water", per M gallons.
19. "Top Soil Removal and Replacement", per cubic yard.
20. "Lawn Removal and Replacement", per square yard.

Section 62—Pipe Laying, Jointing and Testing

62–1 DESCRIPTION

This section covers the pipe laying, jointing and testing of sanitary sewers, storm drains and culverts. The construction of these lines shall meet the requirements herein and as shown on the plans, special provisions and standard drawings.

Any pipe or appurtenance which inadvertently or otherwise has been laid or jointed in non-accordance with the specifications and special provisions shall, upon direction of the Engineer at any time before final acceptance of the contract or before expiration of the guaranty period, be repaired or be removed and replaced at the expense of the Contractor, and to the satisfaction of the Engineer.

62–2 MATERIALS

The materials shall conform to requirements outlined in the various applicable sections of the specifications.

62–3 CONSTRUCTION DETAILS

–3.01 SURVEY LINE AND GRADE

Survey line and grade control hubs will be provided by the Engineer in a manner consistent with accepted practices.

The Contractor shall constantly check line and grade and in the event they do not meet specified limits described hereinafter, the work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the work.

–3.02 SEWER PIPE LAYING

Laying of sewer pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the foundation and/or bedding has been prepared in accordance with Section 61. Mud, silt, gravel and other foreign material shall be kept out of the pipe and off the jointing surfaces.

All pipe laid shall be retained in position by mechanical means or otherwise, as approved by the Engineer, so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the plans, within the limits that follow.

Variance from established line and grade shall not be greater than one thirty-second (1/32) of an inch per inch of pipe diameter and not to exceed one-half (½) inch, provided that such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty-fourth (1/64) per inch of pipe diameter, or one-half (½) inch maximum.

The sewer pipe, unless otherwise approved by the Engineer, shall be laid up grade from point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end forward or upgrade, unless approved otherwise. When pipe laying is not in progress the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

–3.03 CULVERT PIPE

Laying of culvert pipe shall conform to the requirements of Section 62-3.02 except that variation from established line and grade, measured at each joint, shall not exceed one thirty-second (1/32) inch per inch of pipe diameter, and provided that resulting level or back-sloping length of pipe does not occur.

–3.04 DEWATERING

Dewatering, sufficient to maintain the ground water level at or below the surface of trench bottom or base of the bedding course, shall be accomplished prior to pipe laying and jointing, if not prior to excavation and placing of the bedding as called for in other sections of the specifications or special provisions. The dewatering operation,

however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench. The normal water table shall be restored to its natural level in such a manner as to not disturb the pipe and its foundation.

–3.05 BEDDING

The pipe bedding shall be placed so that the entire length of the pipe will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete. Bell holes shall be dug as required to assure uniform support along the pipe barrel.

–3.06 PLUGS AND CONNECTIONS

Plugs for pipe branches, stubs or other open ends which are not to be immediately connected shall be made of an approved material and shall be secured in place with a joint comparable to the main line joint, or stoppers may be of an integrally cast breakout design.

–3.07 PIPE MARKINGS

The markings on reinforced concrete pipe indicating the minor axis of the elliptical reinforcement shall be placed in a vertical plane (top or bottom) when the pipe is laid.

–3.08 PIPE JOINTING

Type of joints to be used on a particular project will be specified in the plans or in the special provisions.

All pipe and jointing shall be subject to the tests specified in Section 62-3.10.

–3.08A Hand Mortared Joints

When hand mortared joints are specified they shall be made with cement mortar mixed in the proportions of one (1) part cement to one and one-half (1-½) parts commercial plaster sand, mixed with the least amount of clean water necessary to provide a workable mix. Before jointing, the interior of the bell shall be wiped clean, dampened, and the lower one-third shall be well covered with cement mortar before the insertion of the spigot end of the adjoining pipe. Special care shall be taken to avoid shoving mortar ahead of the spigot end of the pipe when inserting it into the bell.

The spigot end shall be firmly seated against the shoulder of the bell. After the two adjoining pipe sections have been centered and the inverts aligned, the annular space shall be partially filled with mortar to hold the two pipe sections in place. Then, beginning at the bottom, the mortar shall be thoroughly pressed into the annular space and a neat forty-five (45) degree fillet built up on the outside.

Pipe twenty-four (24) inches and over in diameter, and all pipe laid on curves shall have the joints pointed on the inside. In all cases, after jointing is completed the inside of the pipe shall be wiped clean and shall have a smooth surface free from protrusions of any kind. All joints shall be protected from water and the drying effects of wind and sun. Wet burlap sacks or other approved means of protection shall be provided if required by the Engineer.

The work of jointing shall follow at such a distance behind pipe laying as may be necesary to insure that joints once mortared will not be disturbed by pipe laying operations. There shall be no walking or backfilling upon the pipe until the joints have set hard.

–3.08B Gasket Type Joints

All extensions, additions and revisions of the sewer system, unless otherwise indicated in the special provisions, shall be made with sewer pipe jointed by means of a flexible gasket which shall be fabricated and installed in accordance with the specifications that follow. The material specifications of all approved flexible gasketing shall be in accordance with Section 60 or the special provisions.

Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced, cleaned and relubricated if required, before the jointing is attempted.

Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint as specified in Section 62-3.02 shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted. At the end of the work day, the last pipe laid shall be blocked in an effective way to prevent creep during "down time."

Pipe required to be laid on curved alignment shall be joined in straight alignment and then be deflected, joint by joint. Special care shall be taken in blocking the pipe just previously laid, by tamped fill or otherwise to resist the misaligning forces generated during compression of the joints being made.

–3.08C Jointing of Dissimilar Pipes

For dissimilar pipes where suitable adaptor couplings are not available, the jointing shall be accomplished with a special fabricated coupling or concrete encasement expansion block, as approved by the Engineer.

–3.09 SEWER LINE CONNECTIONS

Sewer line connections to trunks, mains, laterals or side sewers shall be left uncovered until after an acceptance inspection has been made. After approval of the connection, the trench shall be backfilled as specified in Section 61-3.05, after first covering the bare pipe with select material compacted to a depth of six (6) inches above crown of pipe.

–3.09A Side Sewer Connections

Where a side sewer is larger than the trunk, main, or lateral to which it is to be connected, the connection shall be made only at a standard manhole unless otherwise provided in the plans or special provisions, or unless otherwise authorized by the Engineer.

–3.09B Manhole Connections

Connection to a manhole shall be made in accordance with the provisions of Section 63-3.12.

–3.10 TESTING FOR ACCEPTANCE

All sanitary sewer pipe and appurtenances shall be cleaned, and shall be tested after backfill by exfiltration method, unless otherwise provided in the special provisions; excepting however, that if the conditions where the ground water table are such as to preclude a proper exfiltration test, the Engineer may require infiltration tests. Storm sewer pipe and appurtenances shall be cleaned and be tested after backfill by the infiltration method, unless otherwise provided in the special provisions.

All work involved in cleaning and testing sewer lines between manholes and/or rodding inlets as required herein shall be completed within 15 working days after backfilling of sewer lines and structures. Any further delay will require the written consent of the Engineer. The Contractor shall furnish all labor, materials, tools and equipment necessary to make the test, clean the lines and to perform all work incidental thereto. Precautions shall be taken to prevent joints from drawing during tests, and any damage resulting from tests shall be repaired by the Contractor at his own expense. The manner and time of testing shall be subject to approval of the Engineer, provided that the Engineer may limit pipe footage to be laid without testing.

All wyes, tees and stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable, and for their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

In the event that the Contractor elects to test large diameter pipe one joint at a time, leakage allowances shall be converted from GPM per 100 feet to GPM per joint by dividing by the number of joints occurring in 100 feet. If leakage exceeds the allowable amount, corrective measures shall be taken and the line be then retested to the satisfaction of the Engineer.

–3.10A Exfiltration Test

Allowable leakage, unless otherwise provided in the special provisions, shall comply with the provisions that follow.

Leakage after backfill shall be no more than five tenths (0.5) gallon per hour per inch of diameter per 100 feet of sewer pipe, with a minimum test pressure of six feet of water column above the crown at the upper end of the pipe. The length of pipe tested shall be limited so that the pressure on the invert of the lower end of the section tested shall not exceed sixteen feet of water column. For each increase in pressure of two feet above a basic six feet measured above the crown at the lower end of the test section, the allowable leakage shall be increased by 10%.

Side sewers shall also be tested for their entire length from the public sewer in the street to the connection with the building plumbing. Testing of side sewers shall be as required by the local sanitary agency but in no case shall it be less thorough than that of filling the pipe with water before backfill and visually inspecting the exterior for leakage. See Section 66-3.06B. The decision of the Engineer as to acceptance of the side sewer shall be final.

The Contractor may fill the pipe any time up to 24 hours prior to the time of exfiltration testing to permit normal absorption into the pipe walls.

–3.10B Infiltration Test

Infiltration testing shall take place during jetting or sluicing of backfill, except when the natural ground water table is above the crown of the higher end of the test section. The maximum allowable limit for infiltration shall be four tenths (0.4) gallon per hour per inch of internal diameter per 100 feet of length, with no allowance for external hydrostatic head.

–3.10C Other Test Allowances

All lateral or side sewer branches included in the test section shall be taken into account in computing allowable leakage. An allowance of two tenths (0.2) GPH per foot of head above invert shall be made for each manhole included in a test section.

–3.10D Payment for Tests

The work of cleaning and testing and the furnishing of caps and plugs for the tests shall be considered as incidental to the construction and all costs incurred therefor shall be included in the unit contract price of pay items in the proposal.

62–4 MEASUREMENT

Measurement for payment shall be by the linear foot of pipe laid and tested and shall be along the pipe through the tees and fittings. Measurements shall be from center to center of standard types of manholes or to inside face of structures, and shall be taken to the nearest one tenth (0.1) foot.

Measurement for tees and fittings shall be per each for each size, class and type of tees or fittings as constructed.

62–5 PAYMENT

Payment for all pipe shall be the unit contract price "per linear foot" for each class, size and type of pipe laid and satisfactorily tested in accordance with the specifications. No additional compensation will be allowed for testing.

Payment for tees and fittings shall be the unit contract price "per each" for each size, class and type, including caps or plugs laid and tested. No additional compensation will be allowed for testing or providing the cap or plug.

Section 63—Manholes for Storm and Sanitary Sewers

63–1 DESCRIPTION

Standard manholes may be constructed of precast units, concrete masonry units or concrete or clay brick, cast-in-place concrete, or shop-fabricated corrugated metal when used with corrugated metal pipe, all in accordance with the standard plans and these specifications; excepting, however, that the contractor's choice of alternates may be limited in the special provisions. These various types of manholes are identified herein as follows:

Type I	PRECAST UNIT CONSTRUCTION	1. 48″ dia.
Type I–A	With precast base	2. 48″ reduced to 36″
Type I–B	With cast-in-place base	3. 72″ reduced to 36″ 4. 72″ reduced to 48″
	Standard Drawing Nos. 35, 36, 37, 38	5. 48″ shallow 6. 72″ shallow
Type II	CONCRETE BLOCK OR BRICK MASONRY CONSTRUCTION	1. 48″ dia. 2. 48″ reduced to 36″ 3. 72″ reduced to 36″ 4. 72″ reduced to 48″
	Standard Drawing No. 39	5. 48″ shallow 6. 72″ shallow
Type III	MONOLITHIC CONCRETE CONSTRUCTION	1. 48″ dia. 2. 48″ reduced to 36″ 3. 72″ reduced to 36″ 4. 72″ reduced to 48″
	Standard Drawing No. 39	5. 48″ shallow 6. 72″ shallow
Type IV	MONOLITHIC BASE SECTION CONSTRUCTION	1. Precast unit shaft
Type IV–A	Pipe sizes 24″ through 36″	2. Concrete block or brick masonry shaft
Type IV–B	Pipe sizes 42″ through 120″	3. Monolithic concrete shaft
	Standard Drawings Nos. 40 & 41	
Type V	SHOP FABRICATED CORRUGATED METAL PIPE CONSTRUCTION	1. 48″ dia. 2. 48″ reduced to 36″ 3. 72″ reduced to 36″ 4. 72″ reduced to 48″
	Engineer to furnish drawing	5. 48″ shallow 6. 72″ shallow

63–2 MATERIALS

–2.01 REINFORCED CONCRETE

Reinforced concrete shall consist of portland cement, mineral aggregates and water, in which steel has been embedded in such manner that the steel and concrete act together.

–2.01A Cement

Portland cement shall conform to the requirements of the Specifications for Portland Cement ASTM C 150, any type, unless otherwise limited in the special provisions; or it may be air-entraining portland cement conforming to ASTM C 175.

–2.01B Wire Fabric Reinforcement

Reinforcement shall consist of wire conforming to ASTM A 185.

–2.01C Bar Reinforcement

Bar reinforcement shall conform to ASTM A 15, intermediate grade.

–2.01D Aggregates

Aggregates shall conform to ASTM C 33, except that the requirement for gradation shall not apply to precast items.

–2.01E Mixture

The aggregates shall be so sized, and graded, and proportioned and thoroughly mixed in proportions of cement and water as will produce a homogeneous concrete mixture of such quality that the manhole components will conform to the strength and watertightness requirements of these specifications. Admixtures or blends may be used with the written permission of the Engineer.

–2.01F Curing

Upon completion of casting, the precast manhole components shall be placed in a location free from outside drafts, covered and cured in a moist atmosphere maintained by an injection of steam for such time and under such temperature as may be needed to enable the manhole components to meet the strength requirements. Or, precast components may be water-cured by covering the manhole components with a water saturated material, or by a system of perforated pipes, mechanical sprinklers, porous hose, or by any other approved method that will keep the manhole components continuously moist during the curing period. Cast-in-place manhole components shall be moist-cured for a period not less than seven days, except that when high-early-strength cement is used the curing shall be not less than three days. Pigmented membrane curing compound or other approved method may be applied in lieu of moist curing.

–2.01G Strength

All concrete placed under these specifications shall have a minimum compressive strength of 3000 psi at 28 days. Strength determination shall be in accordance with ASTM C 39, unless otherwise approved by the Engineer. Precast components shall not be moved from the manufacturer's yard until a compressive strength of at least 1500 psi has been reached.

–2.02 STEPS

Manhole steps may be either of the following, at option of the contractor or option of the manufacturer of the manhole:

–2.02A Aluminum Steps

Aluminum steps shall be forged of 615-T6 alloy having a minimum tensile strength of 38,000 psi. The cross section shall be not less than ¾″ wide by ⅞″ deep with two non-skid grooves not to exceed ⅛″ deep and ⅛″ wide. Pattern and dimensions shall conform to the standard drawings.

–2.02B Galvanized Deformed Bar Steps

Galvanized deformed bar steps shall be 1″ diameter deformed bar conforming to ASTM A 15, intermediate or standard grade, hot bent and galvanized after bending. For bending, the temperature shall be at least 1600° F. Galvanizing shall conform to ASTM A 123. Step dimensions and pattern shall conform to the standard drawings.

–2.03 LADDERS

Except as otherwise provided in the special provisions, base sections of precast manholes more than three feet in height shall be provided with a ladder as detailed on the standard plans, made of aluminum or steel galvanized after fabrication, conforming to the requirements for steps given in sections 63-2.02A and 63-2.02B. Base sections three feet or less in height require no steps or ladder.

–2.04 MORTAR

–2.04A Mortar for Jointing

Mortar for jointing precast manhole sections or masonry manhole units shall be one part portland cement to not less than one part nor more than two parts plaster sand, mixed with the least amount of clean water necessary to provide a workable mortar.

–2.04B Mortar for Plaster-coating

Mortar for plaster-coating masonry unit manholes shall be proportioned according to either of the two alternates tabulated below:

	Parts by volume portland cement	Parts by volume masonry cement	Parts by volume hydrated lime or lime putty	Plaster sand measured in damp loose condition
Alt. 1	1	1 (Type II)	0	Not less than 2¼ and not more than 3 times the sum of volumes of cement and lime.
Alt. 2	1	0	¼	

–2.05 CONCRETE MASONRY UNITS

Concrete manhole block shall conform to the Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes ASTM Designation C 139, except that nominal horizontal thickness shall be 6″ measured radially, and blocks shall have semicircular mortar grooves approximately 1″ radius at the ends.

–2.06 CONCRETE BRICK

Concrete brick shall conform to the Specification for Concrete Building Brick ASTM C 55 Grade A.

–2.07 CLAY BRICK

Clay brick shall conform to ASTM C 32, Grade NA unless otherwise provided in the special provisions.

–2.08 CAST IRON FRAMES AND COVERS

Cast iron frames and covers shall conform to the standard details for 24″ opening Manhole Frame and Cover, heavy pattern (9″ depth) unless otherwise provided in the special provisions. Covers shall have the word SEWER in 2″ raised letters when used in connection with sanitary sewer installations, or DRAIN in 2″ raised letters when used in connection with storm drain installations, unless otherwise provided in the special provisions. Cover shall be non-locking unless otherwise provided in the special provisions. Castings shall not be coated unless called for in the special provisions.

Castings shall conform to the requirements of ASTM A 48 Class 25 and shall be free of porosity, shrink cavities, cold shuts or cracks, or any surface defects which would impair serviceability. Repair of defects by welding, or by the use of "smooth-on" or similar material will not be permitted. The manufacturer shall provide test bars as per ASTM A 48 for all orders of 200 or more units when called for in the special provisions; and upon request of the Owner, shall certify that the product conforms to the requirements of these specifications.

When painting is called for in the special provisions, a bituminous coating equivalent to Preservative Paint Co. No. 25-22 Black Dip Paint shall be applied to all faces. The Owner shall have the right to require inspection and approval of all castings prior to painting.

Manhole rings and covers shall be machine finished or ground on seating surfaces so as to assure non-rocking fit in any position, and interchangeability. At the request of the Owner, there shall be made available at the foundry standard rings and standard covers for use by inspectors in testing fit and seating.

Where lock-type castings are called for, the locking device shall be such that the cover may be readily released from the ring, and all movable parts shall be made of non-corrosive metals and otherwise arranged to avoid possible binding. At the request of the Owner there shall be made available at the foundry a testing device suitable for proving the capacity of the assembly to resist an uplift pressure on the lid equal to 20-ft. head.

–2.09 PRECAST MANHOLE COMPONENTS

–2.09A Base Sections

Base sections for Type I construction shall conform to the requirements for precast manhole sections in Section 63-2.09B herein, except that the reinforced base slab shall be made an integral part of the unit, and openings for pipe shall be provided to meet job requirements as indicated on the plans. The base slab shall be not less than 6″ in thickness and shall be cast monolithically with the wall section, or otherwise constructed in such manner as to achieve a completely watertight structure.

Reinforcement of the base slab shall consist of No. 4 (½″) steel bars on eight-inch centers, both directions (90°). The steel shall be placed not less than 2″ nor more than 4″ from the top, and shall extend into the wall of the manhole section and be tied to the longitudinal steel.

Openings to receive pipe shall be circular, tapered in toward the inside of the section, and shall be held to the minimum size possible to accommodate the pipe to be inserted and to effectively seal the joint. Openings for pipe up to 21″ diameter may be provided in 48″ base sections. Openings for pipe up to 42″ diameter may be provided in 72″ base sections. Where pipe of larger diameters are to be accommodated, a monolithic base

structure as described in Section 63-3.04 shall be provided.

–2.09B Precast Manhole Sections

Standard precast sections shall consist of circular sections, in standard nominal inside diameters, 36″, 48″, and 72″. Heights of sections shall be multiples of 12″ at option of the manufacturer, excepting however, that each manufacturer shall produce at least three standard heights in each standard diameter. The nominal thickness of the 36″ and 48″ sections shall be 4″, and the nominal thickness of the 72″ sections shall be 6″.

Reinforcement for standard sections shall consist of a single cage of steel, placed at the approximate center of the wall of the section. The 36″ and 48″ standard sections shall have not less than 0.12 square inches, and the 72″ standard sections not less than 0.17 square inches of circumferential steel per linear foot. The cage shall be welded at every circumferential wire, or lapped 40 diameters and tied. The welded splice shall develop a tensile strength of 50,000 psi of wire diameter.

Joints between sections shall be tongue and groove, and shall provide ½″ nominal annular space and a minimum of 1¼″ lap.

No more than two lift holes shall be cast into each section. Holes shall be so located as to not damage reinforcing or expose it to corrosion. At the manufacturer's option, steel loops may be provided for handling, in lieu of lift holes.

Unless otherwise provided in the special provisions, steps shall be installed in each section so that sections placed together in any combination will provide a continuous vertical ladder with rungs equally spaced at 12″. Steps shall project uniformly from the inside wall of the manhole as per the standard drawings, and shall be cast or firmly grouted in place so as to ensure complete watertightness. Where it is intended that manholes be installed without fixed steps, the special provisions shall so specify.

–2.09C Precast Cones

Standard precast cones shall provide concentric reduction from 48″ to 36″, from 48″ to 24″; and from 36″ to 24″, inside diameters. Cones 48″ to 36″ shall be not less than 24″ in height; others not less than 17″ in height. Tongue and groove jointing shall be provided for fitting to adjoining sections, excepting, however, that the top surface of cones 48″ to 24″ and 36″ to 24″ shall be flat and at least 6″ wide, radially, to receive adjustment block or brick.

Wall thickness shall be 4″ nominal, and reinforcing shall conform to the requirements specified for standard sections of the larger diameter. Steps shall be provided as specified for standard precast sections, and an additional step shall be provided in the 48″ to 24″ and the 36″ to 24″ cones opposite the ladder steps and about midway in elevation, as shown on the standard drawings. No more than two lift holes shall be cast into each cone, and they shall be located so they will not damage reinforcing or expose it to corrosion. At the manufacturer's option, steel loops may be provided for handling, in lieu of lift holes.

–2.09D Flat Slab Covers

Standard flat slab covers shall be a minimum of 8″ thick and shall conform to the outer dimension of the 72″ or 48″ standard sections upon which they are to be placed. The 24″ diameter opening shall be eccentrically located as shown on the standard plans so as to provide at least 6″ minimum radial distance from edge of the 24″ opening to outer edge of slab, but not more than 2½″ offset distance from edge of the 24″ opening to the inside face of the standard section below. Reinforcing shall be as shown on the standard plans.

–2.09E Flat Slab Reducing Sections

Reduction from 72″ standard section to 48″ or 36″ shall be made by means of a flat slab reducing section as shown on the standard plans. The section shall be a minimum of 8″ thick and shall conform to the outer dimension of the 72″ section upon which it is to be placed. The 48″ or 36″ opening shall be located as shown on the plans or noted in the special provisions. Reinforcing shall be as shown on the standard plans.

–2.09F Permissible Variation in Precast Section Dimensions

(1) Variations in the inside diameters of standard sections, or in the diameters of openings in cones and slabs, shall not exceed 1½% of the nominal dimensions. Wall thicknesses of sections and cones shall be not less than 94% of the nominal dimensions specified in sections 63-2.09B and 63-2.09C. Outside dimensions of flat slab covers and reducing sections shall not be less than the nominal outside diameters of the standard sections to which they are to be joined. Thickness of precast slabs shall be not less than the nominal dimensions called for. Thickness variation in any slab shall be no more than ½″ Permissible eccentricity of standard sections and cones shall be such that when sections are placed together with steps in alignment, the maximum offset between sections will not exceed ¾″. The planes of the ends of cones and sections shall be perpendicular to their longitudinal axis within ¾″ measured across any diameter. Variation in the step spacing shall not exceed 1½″.

(2) Reinforcement in standard sections and cones shall be placed within 1″ of the center of the walls. Bar reinforcement in slabs shall conform to the standard drawings and shall not vary more than the dimensional tolerances shown on the drawings.

–2.09G Workmanship and Finish of Precast Sections

Cones and sections shall be substantially free from fractures, large or deep cracks and surface roughness. Slabs shall be sound and free from gravel pockets. All manhole elements shall be capable of producing a watertight structure when properly assembled and jointed.

–2.10 SHOP FABRICATED CORRUGATED METAL MANHOLES

Where corrugated metal manholes, Type V, are used with corrugated pipe, detailed plans shall be submitted by the manufacturer to the Engineer for approval prior to shipment.

–2.11 MONOLITHIC CONCRETE MANHOLES

Monolithic concrete manholes, Type III, shall conform to detailed plans submitted to the Engineer for approval prior to beginning work and shall conform to the dimensional requirements specified in Section 63-3.05. Walls and base shall be 6″ minimum thickness, and spacing of steps shall be 12″.

63–3 CONSTRUCTION DETAILS

–3.01 FOUNDATION PREPARATION

–3.01A Dewatering

Dewatering of the site shall conform to the requirements for sewer trench dewatering in Section 62-3.04.

–3.01B Sub-base Preparation

Adequate foundation for all manhole structures shall be obtained by removal and replacement of unsuitable material with well graded granular material; or by tightening with coarse ballast rock, or by such other means as provided for foundation preparation of the connected sewers, or as required in the special provisions. Where water is encountered at the site, all cast-in-place bases or monolithic structures shall be placed on a one-piece waterproof membrane, so placed as to prevent any movement of water into the fresh concrete.

–3.02 BEDDING

Precast base sections shall be placed on a well graded granular bedding course conforming to the requirements for sewer bedding in Section 61-3.03, but not less than 4″ in thickness and extending either to the limits of the excavation or to a minimum of 12″ outside the outside limits of the base section. In the latter case, the balance of the excavated area shall be filled with select material well tamped to the level of the top of the bedding to positively prevent any lateral movement of the bedding when the weight of the manhole is placed upon it. The bedding course shall be firmly tamped and made smooth and level to assure uniform contact and support of the precast elements.

–3.03 CAST-IN-PLACE BASES

Cast-in-place bases shall be at least 6″ in thickness and shall extend at least 6″ radially outside of the outside dimension of the manhole section.

–3.04 MONOLITHIC BASE STRUCTURES

Where any pipe 24″ in diameter or larger connects to a 48″ precast manhole Type I-A, or where any pipe 48″ or larger connects to any type manhole except Type V, or when indicated on the plans, the base structure up to at least 3″ above the top of the highest pipe shall be monolithically cast-in-place, in accordance with the standard plans or special details shown on the plans.

–3.05 MANHOLE DIMENSIONS

The inside diameter of all manholes at the base shall be 48″ unless otherwise shown on the plans, and manholes less than 12 feet in total depth to pipe invert shall not be reduced in diameter except for the top reduction to 24″ to accommodate the casting ring. Where manholes are more than 12 feet in depth, the contractor may, unless otherwise provided in the special provisions, reduce to 36″ diameter, with the base of the reducing cone to be not less than 5 feet above the shelf of the manhole. Flat slab reducers on 72″ manholes shall be located as detailed on the plans.

Manholes less than 7 feet in total depth to invert shall have flat slab covers unless otherwise provided in the special provisions.

–3.06 BLOCK OR BRICK MANHOLES, TYPE II

Masonry units or brick shall be laid up in full unfurrowed mortar joints to provide complete filling of all horizontal and vertical joints. The inside of the manhole shall be made to conform to the shape and dimensions specified in Section 63-3.05 with reasonably even surfaces and with joints scraped or wiped flush. Ladder rungs shall be as specified for precast manholes except that uniform spacing shall not exceed 16″.

The inside and outside of all masonry manholes shall be plaster coated with mortar not less than ½″ thick for the purpose of waterproofing, unless otherwise provided in the special provisions.

–3.07 PRECAST MANHOLES

–3.07A Type I-A

The base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment, and making sure that all entering pipes can be inserted on proper grade.

All lift holes and all joints between precast elements shall be thoroughly wetted aand then be completely filled with mortar, smoothed and pointed both inside and out, to ensure watertightness.

Precast sections shall be placed and aligned to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimensions, and be watertight.

–3.07B Type I-B and Types IV-A-1 and IV-B-1

The first precast section shall be placed on the monolithic base structure (Section 63-3.04) before the base has taken initial set, and shall be carefully adjusted to true grade and alignment with all inlet pipes properly installed so as to form an integral, watertight unit; or the section shall be mortared into a suitable groove provided in the top of the monolithic base. The first section shall be uniformly supported by the base concrete, and shall not bear directly on any of the pipes.

All lift holes and all joints between precast elements, and all connections between precast elements and cast-in-place bases or structures shall be thoroughly wetted and completely filled with mortar, smoothed and pointed both inside and out to ensure watertightness.

Precast sections shall be placed and aligned so as to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimension, and be watertight.

–3.08 MONOLITHIC CONCRETE MANHOLES

Monolithic concrete manholes, Type III, shall be constructed in accordance with the provisions of this Section 63 and applicable provisions of Section 39, where not in conflict.

–3.09 SHOP FABRICATED CORRUGATED METAL MANHOLES

Shop fabricated corrugated metal manholes, Type V, shall be constructed in strict accordance with the detailed plans approved by the Engineer, and shall conform to all applicable provisions of these specifications.

–3.10 GRADE ADJUSTMENT

Unless otherwise shown on the plans or in the special provisions, grade adjustment shall be as per Section 63-3.10A. Final elevation for each manhole will be determined by the Engineer, and tilt shall conform to the existing street surface unless otherwise specified or directed by the Engineer.

–3.10A Streets at Grade

Where work is in paved streets or areas which have been brought to grade, not less than 8″ or more than 20″ shall be provided between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to street grade.

–3.10B Streets with no Established Grade

Where work is in streets or other areas which have not been brought to grade, the top of cone or slab shall be constructed so as to provide clearance not less than 24″ or more than 36″ below the surface to be restored, unless otherwise directed by the Engineer.

–3.11 CHANNELS

Channels shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well rounded junctions, satisfactory to the Engineer. Channel sides shall be carried up vertically to the crown elevation of the various pipes, and the concrete shelf between channels shall be smoothly finished and warped evenly with slopes to drain.

–3.12 PIPE CONNECTIONS

All unreinforced pipes entering or leaving the manhole shall be provided with flexible joints within 12″ of the manhole structure and shall be placed on firmly compacted bedding, particularly within the area of the manhole excavation which normally is deeper than that of the sewer trench. Special care shall be taken to see that the openings through which pipes enter the structure are completely and firmly rammed full of mortar to ensure watertightness.

–3.13 BACKFILL

Backfill around the manhole and extending at least one pipe length into each trench shall be hand placed and tamped with selected native material up to an elevation of six (6) inches above the crown of all entering pipes. Work shall conform to the applicable provisions of sections 61-3.05 and 61-3.06.

–3.14 DROP MANHOLES

Drop manholes, wherever shown on the plans, shall conform in all respects to the requirements for standard manholes of the type or types used on the project except for the additional drop detail as shown on the standard drawing No. 44.

63–4 MEASUREMENT

Each manhole will be measured to the nearest one-tenth (0.10) of a foot, from invert of the outlet pipe vertically to the top of the casting, for the purpose of determining the amount to be paid per foot in addition to the base price per each for manholes five feet or less in overall depth.

63–5 PAYMENT

Payment for each manhole shall consist of a basic price per each, plus a unit price per foot for all depth in excess of five feet, plus a unit price per each for drop connections where they occur.

Where more than one type or size designation is shown on the drawings or called for in the special provisions, each shall be covered by a separate bid item of the following form:

1. "Type ..... (or size) Manhole, Basic Price," per each.
2. "Type ..... (or size) Manhole, Extra Depth," per vertical foot.
3. "Drop Connection," per each.

Where an existing manhole is encountered in the work and it is required that it must be adjusted to new grade, the work and payment therefor shall be as provided in Section 53, Adjustment of New and Existing Utility Structures to Finish Grade.

Where a new manhole that has been set at a grade specified by the Engineer is later required to be adjusted to a revised grade, the work shall be covered by a bid item as follows:

4. "Adjust New Manhole to Grade," per each.

The unit contract prices shall be full compensation for furnishing and constructing manholes complete and connected to the sewers, excepting however, that excavation, backfill, gravel bedding or foundation material, or additional connections not shown on the plans will be paid for in accordance with the applicable bid items of other sections.

Section 64—Catch Basins and Inlets

64–1 DESCRIPTION

Standard catch basins and inlets may be constructed of precast units, concrete masonry units, or of concrete or clay brick, or cast-in-place concrete, all in accordance with the standard drawings and specifications; excepting however, that the Contractor's choice of alternates may be limited in the special provisions.

The various types and methods of construction are identified below.

–1.01 CATCH BASIN INLET, RECTANGULAR CROSS SECTION

Type I–A Concrete masonry, or concrete or clay brick.
Type I–B Cast-in-place concrete.
Type I–C Precast concrete.
Standard drawings 47, 48, 49, respectively.

–1.02 CATCH BASIN INLET, ROUND BARREL CROSS SECTION

Type II–A Concrete masonry, or concrete or clay brick.
Type II–B Cast-in-place concrete.
Type II–C Precast concrete.
Standard drawings 50, 51, 52, respectively.

–1.03 COMBINATION CURB AND GUTTER CATCH BASIN INLET

Type III–A Concrete masonry, or concrete or clay brick.
Type III–B Cast-in-place concrete.
Type III–C Precast concrete.
Standard drawings 54, 55, 56, respectively.

–1.04 CURB INLET

Type IV–A Concrete masonry, or concrete or clay brick.
Type IV–B Cast-in-place concrete.
Type IV–C Precast concrete.
Standard drawings 57, 58, 59, respectively.

64–2 MATERIALS

Materials for catch basins and inlets shall conform to the applicable provisions of Section 63-2 except as specified in subsections that follow.

–2.01 FRAME AND GRATE

The frame and grate shall conform to the standard drawing No. 46 for catch basin and inlet frame and grate. The frame may be made of cast iron, ASTM A-48 Class 25, cast steel, ASTM A-27, Grade 70-36, or nodular cast iron, ASTM A-339, Grade 60-45-10, at the manufacturer's option. The grate may be cast steel or nodular cast iron only, at the manufacturer's option. Other applicable provisions of Section 63-2.08 shall apply.

–2.02 TRAPS

Where traps are specified, they shall be constructed in accordance with the standard drawing No. 60 and be of 22 gauge galvanized sheet metal, unless otherwise specified in the special provisions. All joints shall be seamed and soldered, and all longitudinal joints shall be riveted.

–2.03 MORTAR

Mortar for jointing catch basins and inlets shall be one part portland cement and not less than one part nor more than two parts plaster sand, mixed with the least amount of water necessary to provide a workable mortar. Mortar for plaster coating shall conform to Section 63-2.04B.

64–3 CONSTRUCTION DETAILS

Construction details for catch basins and inlets shall follow all applicable provisions of Section 63-3, Construction Details for Manholes. Sections 63-3.10, Grade Adjustment, and 63-3.12, Pipe Connections, will not be applicable, but shall be replaced by the subsections which follow.

–3.01 GRADE ADJUSTMENT

The inlet frame may be either cast into a concrete collar or set flange down on concrete adjustment blocks and mortared, as directed by the Engineer. It shall not, in any case, be grouted to final grade until the final elevation of the pavement, gutter, ditch or sidewalk in which it is to be placed has been established and permission has been given by the Engineer to grout the casting in place.

–3.02 PIPE CONNECTIONS

Catch basin bases shall be set so that the invert of the outlet pipe will be not less than 18″ above the floor of Type I or Type III Catch Basin Inlet, or not less than 24″ above the floor of Type II Catch Basin Inlet, and so that a minimum cover of 30″ is provided where grades permit. The crown elevation of inlet pipes shall be fixed at or above the crown of the outlet pipe. All pipes shall be grouted in place to effect a watertight closure.

–3.03 SUBGRADE DRAINAGE OPENINGS

Bankrun gravel or crushed rock shall be packed around the openings in the catch basin inlets to provide uninterrupted drainage from the adjacent roadway subgrade into the catch basin. Where directed by the Engineer, subgrade drainage openings may be omitted or, if existing in precast elements may be grouted full in lieu of placing filter material.

–3.04 SEEPAGE STRUCTURE

Catch basin inlets may be specified with perforated side walls, as detailed in the special provisions or supplementary drawings, in lieu of outlet pipes. Where called for, the excavation shall be carefully made so that clean filter material, as described in the special provisions, can be packed around the structure to a thickness of not less than 12″ at any point and more if specified, and extending up from the base of the structure to not less than 6″ above the highest perforation. Plugged outlet pipes may be stubbed out for future connection to sewers, where specified.

–3.05 TRAPS

Traps shall be installed where shown on the construction plans. Traps shall meet the requirements outlined in Section 64-2.02 and be in accordance with the standard drawing No. 60.

64–4 MEASUREMENT

–4.01 CATCH BASIN AND INLET

Measurement for payment of all catch basins or inlets of 5-foot depth or less shall be per each. Measurement for payment of all catch basins or inlets more than five feet deep shall be taken to the nearest one-tenth (0.10) foot, from top of grating to inside bottom of catch basin.

64–5 PAYMENT

Payment will be made for such of the following bid items as are included in the proposal:

1. "Type I, 5-foot Catch Basin Inlet," per each.
2. "Type II, 5-foot Catch Basin Inlet," per each.
3. "Type III 5-foot Combination Curb and Curb and Gutter Catch Basin Inlet," per each.
4. "Type IV Curb Inlet," per each.
5. "Additional Depth to 5-foot Type ..... Catch Basin Inlet," per vertical foot.
6. "Additional Depth to 5-foot Type ..... Combination Curb and Curb and Gutter Catch Basin Inlet," per vertical foot.
7. "Catch Basin Trap (size)," per each.
8. "Furnish Metal Frame and Grate for Catch Basin or Inlet," per each.

–5.01 CATCH BASIN AND INLET

Catch basins and inlets of each type required will be paid for at the unit contract price bid per each in place, plus the unit contract price per vertical foot for all depth in excess of five feet as defined in Section 64-4.01.

–5.02 TRAP

Traps, where required, will be paid for at the unit contract price bid per each in place, for each size required.

–5.03 CATCH BASIN INLET FRAME AND GRATE

Catch basin frame and grate casting shall be considered as incidental to the unit contract price for the particular type of catch basin inlet designated in the proposal. Where existing catch basin inlets are encountered and where new castings are to be placed thereon, the cost of furnishing and placing new castings will be paid for at the unit contract price per each for "Furnish Metal Frame and Grate for Catch Basin or Inlet."

The unit contract price per each shall included the furnishing of the frame and grate on the job site, and shall be full compensation for materials and all costs incurred in placing the casting.

–5.04 ADJUSTMENT OF EXISTING CATCH BASIN AND INLET

Payment for adjustment of existing catch basin and inlet will be made in accordance with Section 53-4.02 when and if the proposal carries an item of "Adjust Existing Catch Basin (or Inlet) to Grade," per each.

Section 65—Subsurface Drains

65–1 DESCRIPTION

This section is intended to cover only the collection and control of subsurface water and does not apply beyond the point at which the water is discharged into the storm sewer or other outlet.

65–2 MATERIALS AND TESTING

–2.01 CORRUGATED METAL PIPE

Corrugated metal pipe for underdrains shall meet the requirements of AASHO M 136 as hereinafter supplemented.

–2.01A Bituminous Coated Corrugated Metal Pipe

When so specified, corrugated metal pipe shall be bituminous coated. The bituminous material used for coating shall meet the requirements of AASHO M 190.

–2.02 CLAY PIPE

Clay pipe shall meet the requirements of ASTM Designation C278 for extra strength pipe and shall be perforated in accordance with ASTM Designation C211.

–2.03 PERFORATED CONCRETE PIPE

Perforated concrete pipe and fittings shall meet the requirements of ASTM Designation C444.

The class of pipe furnished shall be as specified or as shown on the plans.

Perforated concrete pipe may be either bell and spigot or tongue and groove pattern unless otherwise specified.

–2.04 PERFORATED ASBESTOS-CEMENT PIPE

Perforated asbestos-cement pipe and fittings shall meet the requirements of AASHO M 189.

–2.05 INSPECTION

–2.05A Inspection at Factory

If requested in writing by the Engineer, all pipe shall be inspected by the Engineer or his representative at the manufacturer's plant before shipment.

–2.05B Disposition of Defective Material

All material found to be defective at time of delivery or at any time during the progress of the work will be rejected by the Engineer. Rejected material shall be promptly removed from the site of the work by the Contractor.

–2.05C Material Furnished by Contractor

The Contractor shall be responsible for all material furnished by him and shall replace at his own expense any pipe or other material which is found defective.

–2.05D Material Furnished by Owner

The Contractor shall inspect all pipe or other materials furnished by the Owner at time of delivery to him, and shall at that time reject any material found defective. Once accepted by the Contractor, any damaged or otherwise defective material found prior to final acceptance of the work shall be replaced at the expense of the Contractor and the cost of all labor, equipment and incidental expense necessary for its replacement and incorporation in the work to the satisfaction of the Engineer shall be borne by the Contractor.

65–3 CONSTRUCTION DETAILS

–3.01 EXCAVATION

–3.01A General

The trench shall be dug to the required alignment and grade only so far in advance of pipe laying as the Engineer will approve. The clear width of unsheeted or sheeted trench measured at the horizontal diameter of the pipe in place shall be 18 inches or one (1) foot greater than the outside diameter of the pipe, whichever is the greater. Any part of the trench excavated below grade or to a greater width than specified shall be backfilled at the expense of the Contractor with filter material hereinafter described.

Extreme care shall be exercised by the Contractor at all times during the performance of the work to maintain the trench and excavated material in such condition that there will be no mixing of excavated material with the filter material to be used for backfilling. All excess excavated material shall be loaded, hauled and deposited at a place designated on the plans or in the specifications.

–3.01B Protection of Existing Utilities

The Engineer will furnish such information as is available to determine the location of existing utilities that may be affected by the construction. Final responsibility for the definite location of any such existing utilities shall be the sole responsibililty of the Contractor and he shall, at his own expense, perform all the necessary work to protect and maintain the services of any utilities affected by his operations. Any damage to an existing utility as a result of the construction operations shall be immediately repaired at the expense of the Contractor, and to the satisfaction of the Engineer.

–3.01C Braced and Sheeted Trench

Wherever necessary, sheeting, bracing, or cribbing shall be provided in accordance with the provisions of Section 61-3.04.

–3.02 PIPE LAYING

–3.02A General

Pipe laying shall conform to the requirements of Section 62, "Pipe Laying, Jointing and Testing", except as hereinafter supplemented.

–3.02B Bedding

Prior to laying any pipe, a 6-inch layer of filter material, as hereinafter described, shall be placed uniformly in the bottom of the trench. This material shall be placed immediately prior to laying the pipe and shall be uniformly spread to true grade and be properly compacted. Should any of this filter material become contaminated by slough of the trench, by storm water or from other cause, it shall be immediately removed and be replaced with acceptable filter material at the expense of the Contractor.

–3.02C Inspection

All pipe shall be inspected prior to lowering into the trench and, if necessary, cleaned of any material tending to plug the perforations of the pipe.

–3.02D Lowering Pipe and Fittings into Trench

The Contractor shall have available the proper tools, men and equipment for efficient execution of the work. All pipe and fittings shall be carefully lowered into the trench to avoid any contamination of the filter bedding material. Pipe or fittings shall not be dumped into the trench. Pipe shall be laid with perforations down, unless otherwise specified or directed by the Engineer.

–3.03 PIPE JOINTING

–3.03A Corrugated Pipe

Corrugated metal pipe and fittings, if so specified, shall be connected with an approved galvanized band or plastic band provided by the manufacturer.

–3.03B Asbestos-Cement Pipe

Asbestos-cement pipe shall be supplied with plain ends or with ends machined for tapered couplings. Couplings furnished shall be of asbestos cement or polyethylene plastic and shall be compatible with the end machining of the pipe furnished. Couplings shall also comply with the requirements of AASHO M 189 Section 5.

–3.03C Clay Pipe

Clay pipe joints shall be sealed with a sewer joint compound conforming to the requirements of Federal Specifications No. SS-S-169 for either Type II (coal tar base) or Type III (plastic base), Class 1 material. There shall be no open joints. Clay pipe joints, if specified, may be cement mortar, hot-pour compounds or bituminous or coal tar base as approved by the Clay Pipe Institute, or factory applied resilient joints per ASTM Designation C425, depending on the service intended.

–3.03D Concrete Pipe

Concrete pipe shall be butted up tight and centered so as to provide a continuous and uniform line of pipe with a smooth and regular interior surface. Pipe shall be laid without joint closure unless otherwise provided in the special provisions. Where joint closure is specified, jointing shall conform to the requirements of Section 62-3.08A or Section 62-3.08B, and materials shall conform to the requirements of Section 60-3.02A or Section 60-3.02C except that the dimensional requirements for rubber gaskets and annular spaces shall not apply.

–3.04 BACKFILLING WITH FILTER MATERIAL

–3.04A Filter Material

Filter material used as backfill shall comply with the following requirements:

GRADING (% by weight)

% Passing ¾" square sieve	100
% Passing ¼" square sieve	30–60
% Passing No. 8 sieve	20–50
% Passing No. 30 sieve	8–30
% Passing No. 50 sieve	3–12
% Passing No. 200 sieve (wet sieve)	0–1

Filter material shall be crushed or natural granular material and shall contain not more than 1% by weight of clay lumps.

–3.04B Placing Filter Material

The filter material shall be damp when placed in the trench and shall be deposited uniformly on both sides of the pipe for the full width of the trench and to the horizontal diameter of the full length of the pipe. The material shall be tamped in 4-inch layers to provide thorough compaction under and on each side of the pipe. Succeeding layers of filter material shall be deposited in 8-inch layers and be thoroughly compacted to the depth shown on the plans, or as specified.

–3.05 RESTORATION, FINISHING AND CLEANUP

The Contractor shall restore and/or replace all paved surfaces, curbing, sidewalks, or other disturbed surfaces to their original condition in such manner as to meet the requirements of applicable sections. All surplus material and temporary structures, as well as all excess excavation, shall be removed and the entire site of Contractor operations shall be left in a neat and clean condition, as specified in Section 57.

65–4 MEASUREMENT AND PAYMENT

–4.01 GENERAL

Except as otherwise specified herein, no direct payment will be made for the various miscellaneous and incidental items of work to be performed, nor for accessories to be furnished and installed. All costs in connection therewith shall be considered as incidental to the constructon and shall be included in the unit contract prices of items in the proposal affected thereby.

–4.02 PIPE

Pipe of each kind and size shall be measured by the linear foot for the pipe in place and accepted. The unit contract price per linear foot shall be full compensation for the kind and size specified in place, including connecting accessories, all fittings such as elbows, tees, wyes, etc., and the price shall be full compensation for the furnishing of all material, labor and equipment necessary to complete the pipe laying and jointing as specified, and to the satisfaction of the Engineer.

–4.03 EXCAVATION AND BACKFILL

Excavation and backfill shall be measured and compensation be made as provided in Section 61.

–4.04 FILTER MATERIAL

Filter material in place will be measured in the trucks at point of delivery, and will be paid for at the unit contract price per cubic yard which shall be full compensation for furnishing the material and placing it in accordance with the specifications, excepting however, that the unit contract price will not include mechanical tamping.

–4.05 MECHANICAL TAMPER

The mechanical tamper shall meet the specifications described for it in Section 15-3.01A. Measurement and payment will be to the nearest one-half (½) hour of actual time consumed in compacting. No allowance will be made for time making repairs to the equipment, nor for moving to or from areas on the work for which compaction is required.

Section 66—Side Sewers

66–1 DESCRIPTION

A side sewer is considered to be that portion of a sewer line that will be constructed between a main sewer line and a residence or other building in which the disposal originates. It does not include any of the internal piping or connecting appurtenances, the installation of which is controlled by a municipal code, ordinance or regulation.

The general requirements for construction of sewers in other sections of these specifications shall apply for side sewers unless they be inconsistent with any of the provisions of this particular section, and the specifications shall apply alike to all side sewers on public rights of way and private property.

66–2 MATERIALS

–2.01 PIPE

Approved pipe materials shall be cast iron, concrete, vitrified clay, or asbestos-cement. Pipe materials other than these shall not be used, unless otherwise specified in the special provisions or unless authorized by the Engineer.

Clay, concrete and asbestos-cement pipe shall conform to the requirement of ASTM designations C278, C14 (extra strength), and C428, respectively. Cast iron pipe shall conform to Federal Specifications WW-P-421A. Class of asbestos-cement pipe shall be as shown on the drawings or designated in the special provisions.

–2.02 JOINTS

Approved jointing materials shall be flexible gasketing or lead.

Flexible gasketing shall be construed to include rubber, synthetic rubberlike and plastic materials specially manufactured for the joint, pipe size, and use intended and shall be furnished by the manufacturer of the pipe to be used. Physical properties of the flexible gasketing shall conform to that defined in Section 60.

–2.03 FITTINGS

Tees, wyes, bends, couplers, adapters, hubs and transition sections shall conform to the requirements of sections 66-2.01 and 66-2.02.

66–3 CONSTRUCTION DETAILS

–3.01 GENERAL

Side sewer construction shall conform to all applicable ordinances or regulations with respect to equipment, methods to be used, protective measures, size of pipe, depth of cover, number of users per pipe, permissible connections, inspection, and testing.

The necessary permits shall be obtained by the Contractor prior to beginning the work of constructing side sewers.

–3.02 EXCAVATION AND BACKFILL

Excavation and backfilling for side sewers shall conform to the requirements of Section 61, excepting that no backfill in excess of that required to hold the pipe in true alignment shall be placed prior to the inspection and leakage testing.

No backfill shall be placed for side sewers in excess of that required to hold the pipe in true alignment, prior to inspection and testing.

–3.03 PIPE LAYING AND JOINTING

Pipe laying and jointing, except as hereinafter provided, shall in general conform to the requirements of Section 62. During the pipe laying and pointing, the side sewer shall be kept free of any water, dirt or objectionable matter.

–3.03A Line and Grade

Pipe shall be laid with a minimum grade of one-fourth inch (¼") per linear foot wherever possible. Where this is not possible, the Engineer may authorize the laying of pipe to as little minimum grade as one-eighth inch (⅛") per linear foot, provided extreme care is used in the selection, bedding and jointing of pipe sections and fittings.

The Contractor shall establish such alignment and grade control as is necessary to properly install the side sewer.

–3.03B Pipe Laying

Belled pipe shall be laid with the bell end up grade and, in general, all pipe laying shall start and proceed up grade from the point of connection at the public sewer or other starting point.

Pipe shall be laid in a straight line at a uniform grade between fittings, or on a uniform horizontal or vertical curvature achieved by deflecting pipe joints within the limits recommended by the manufacturer of the pipe used.

–3.03C Jointing

Jointing for cast iron side sewers shall be by means of approved flexible gaskets or caulked lead. For other kinds of pipe the jointing, including jointing for adapters, shall be by means of approved flexible gaskets.

–3.04 FITTINGS

All fittings shall be factory-produced and shall be designed for installation on the pipe to be used. Fittings shall be of the same quality and material as the pipe used except that tees, wyes, and bends for use with asbestos-cement pipe may be cast iron.

The maximum deflection permissible at any one fitting shall not exceed 45 degrees (45°) (one-eighth (⅛) bend). The maximum deflection of any combination of two adjacent fittings shall not exceed 45 degrees (45°) (one-eighth (⅛) bend) unless straight pipe of not less than two and one-half (2½) feet in length be installed between such adjacent fittings, or unless one of such fittings be a wye branch with a cleanout provided on the straight leg.

Side sewers shall be connected to the tee, wye, or riser provided in the public sewer where such is available, utilizing approved fittings or adapters. Where no tee, wye, or riser is provided or available, connection shall be made by machine-made tap and suitable saddle, or otherwise as approved by the Engineer.

–3.05 CLEANOUTS

Not less than one cleanout shall be provided for each side sewer and/or each total change of 90 degrees (90°) of grade or alignment, except that no cleanout will be required at the connection of the side sewer to a riser on the public sewer. A suitably located cleanout in the house piping or plumbing may be considered as a cleanout for the side sewer.

Cleanouts shall be placed at intervals of not more than 100 feet in straight runs. Cleanouts in the line shall utilize a wye branch at the side sewer.

The extension of house sewer cleanouts to grade will be optional with the home owner. When installed to grade, cleanouts shall be full side sewer diameter and shall be extended to a point not less than six (6) inches nor more than twelve (12) inches below the finished ground surface and shall be plugged with a removable stopper which will prevent passage of dirt or water. When specified, the Contractor shall install an approved casting to provide ready access to the cleanout stopper. A one-eighth (⅛) bend shall be used to deflect the side sewer upward as a cleanout where the terminal end of the side sewer lies upstream from the last point of connection.

–3.06 INSPECTION AND TESTING

–3.06A Inspection

Side sewers shall meet the inspection and leakage requirements specified in Section 62, except as noted for backfill in Section 66-3.02.

Unless otherwise specified, all side sewers shall be tested for leakage in the presence of the inspector, and all arrangements and materials for testing shall be ready prior to the Contractor's request for inspection. For exfiltration testing the inspector may require the removal of any backfill or bedding material which obscures his view of the pipe and for this purpose adequate blocking shall be available to place at deflection fittings.

–3.06B Testing

For test purposes, a tee fitting in which a suitable stopper may be placed, may be located as close as practicable to the public sewer and an additional tee fitting shall be located near the property line. The Contractor shall place a suitable stopper in the line immediately before leakage tests are started.

After acceptable testing of the side sewer, the leakage test stopper shall be removed and the tee opening closed with a fastened-in-place approved stopper which will not project into the side sewer.

–3.07 MISCELLANEOUS REQUIREMENTS

–3.07A Requirements

1. *Pipe and Connections.* Side sewer shall be not less than four inches (4") in diameter. No roof drain, area drain, or subsurface drain shall be connected to a sanitary side sewer.

2. *Minimum Cover.* The minimum cover above the pipe for side sewers located in public right of way or driveways shall be four and one-half (4½) feet. On private property in areas not subject to vehicular use, the minimum cover may be reduced to two (2) feet.

3. *Proximity to Water Supply Lines.* Any side sewer which at any point will lie within ten (10) feet of a water supply line shall be constructed so that it will be at least six (6) inches in elevation below the water supply line. If this requirement will prohibit a connection of the side sewer, the Contractor shall proceed under such method and with such materials as the municipal water agency may require and as the Engineer, acting for the water agency, shall direct.

4. *Plugs.* Any unused openings to the side sewer shall be closed with a watertight stopper fastened in place.

5. *Septic Tanks and Cesspools.* No side sewer shall be constructed through or adjacent to an existing cesspool or septic tank. If the conditions prohibit any other location, the Contractor shall abate the cesspool or septic tank by such means as the Engineer may direct, and by such payment as may be specified or agreed upon.

–3.08 RESTORATION, FINISHING AND CLEANUP

The Contractor shall restore and/or place all paved surfaces, curbing, sidewalks, or other disturbed surfaces to their original condition in such manner as to meet the requirements of applicable sections. All surplus material and temporary structures, as well as all excess excavation shall be removed and the entire site of contractor operations shall be left in a neat and clean condition, as specified in Section 57.

66–4 MEASUREMENT

Measurement shall be along the pipe from the outside surface of the main sewer to the extreme end of the last pipe or fitting placed, through tees, wyes, and other fittings; and from the center of the side sewer along the center line of any branch to the extreme end of the last pipe or fitting placed, through tees, wyes or other fittings. Plugged wyes or tees shall not be considered branches. Measurement shall be to the nearest one-tenth (0.1) foot.

66–5 PAYMENT

Payment for side sewers shall be at the unit contract price per linear foot for each size, class, or type of pipe specified.

Payment for wyes, tees, and eighth bends shall be at the unit contract price per each. Couplings or adaptors to house plumbing or to wye or tee stubs on the main or elsewhere, and plugs shall be considered as incidental to the construction and all costs thereof shall be included in other pay items of the proposal.

Payment for cut-in connections to main sewers where no wye or tee stub exists shall be per each, and the unit contract price shall include all labor and materials required.

Payment for cleanout surface box castings shall be per each, and shall include all material and labor required.

Excavation, backfill, bedding gravel, testing, cleanup, and restoration shall be considered as incidentals to the construction of the side sewer and the costs thereof shall be included in the unit contract prices of various pay items in the proposal.

Section 67—Pipe Covering and Embankment for Sewer Construction

67–1 DESCRIPTION

This section of the specification applies to the construction of pipe covering and embankment. Pipe covering shall be constructed where the invert of the pipe is so shallow that placing of earth over the pipe becomes necessary to provide a minimum depth of cover. Pipe cover and embankment shall be constructed where the invert of the pipe is above existing ground and it becomes necessary to construct an embankment upon which the pipe and pipe covering is to be placed. The embankment and cover shall be constructed to lines shown on the standard drawing No. 61.

67–2 CONSTRUCTION DETAILS

–2.01 PIPE BED

The area upon which the embankment for the pipe bed is to be placed shall be stripped to the extent the Engineer directs, and the cost thereof will be paid for by force account as defined in Section 9.04.

The embankment upon which the pipe is to be installed shall be constructed in accordance with requirements outlined in Section 13-3.10E3 Method B, up to a point equal to the spring line of the pipe. The material used in constructing the embankment shall be such that it will readily compact to required density. The Contractor may use any type of compacting equipment he wishes provided the required end result is obtained, and provided no damage occurs to surface or subsurface improvements.

–2.02 PIPE COVER

The pipe cover material above the compacted embankment shall be placed without compaction, and shall be shaped to the required section.

–2.03 SOURCE OF MATERIAL

The source of material shall be that which is specified in the special provisions.

67–3 MEASUREMENT

Measurement will be by the cubic yard as calculated from cross sections based on elevations of the ground surface and the neat lines of the section conforming to standard drawing No. 61, from which will be deducted the volume in cubic yards displaced by the pipe.

67–4 PAYMENT

Payment will be made at the unit contract price per cubic yard for "Pipe Covering and Embankment," which price shall be full compensation for furnishing all labor, equipment, and materials necessary to construct and compact the embankment and cover as specified to the satisfaction of the Engineer.

Section 68—Finishing and Cleanup for Underground Conduits

68–1 CLEANUP

Before acceptance of sewer line construction, all pipes, manholes, catch basins, and other appurtenances shall be cleaned of all debris and foreign material.

After all backfill has been completed, the ground surface shall be shaped to conform to the contour of adjacent surfaces. General cleanup of the entire construction area shall otherwise conform to applicable requirements specified in Section 57.

DIVISION IV—WATER DISTRIBUTION

Section 72—Pipe for Water Mains

72–1 GENERAL

These specifications cover the pipe and fittings normally used for water distribution systems. Special considerations will be covered in the plans and special provisions.

Specification references made herein for manfactured materials such as pipe, hydrants, valves and fittings refer to designations for American Water Works Association (AWWA), or to American Standards Association (ASA), as they are effective on the date of call for bids.

72–2 PIPE

–2.01 CAST IRON PIPE

Cast iron pipe shall conform to the latest AWWA Standard C106 or C108. If cement lining is specified, it shall be in accordance with AWWA C104, with the exception of thickness. The interior coating thickness shall be as follows: 4″ to 12″ pipe, 1/16 inch; 14″ to 24″ pipe, 3/32 inch. Type of joint, class, thickness designation, castings, lining, marking, testing, etc., shall be as specified in the special provisions in accordance with applicable ASA or AWWA designations.

–2.02 ASBESTOS-CEMENT PIPE

Asbestos-cement pipe shall conform to the latest AWWA Standard C400. Class, marking, testing. etc., shall be as specified in the special provisions.

–2.03 CONCRETE CYLINDER PIPE

Reinforced concrete water pipe, steel cylinder type prestressed, shall conform to the latest AWWA Standard C301. Size, class, marking, specials, lengths, etc., shall be as specified in the special provisions.

–2.04 STEEL PIPE

Steel pipe up to 3½″ in diameter shall conform to ASTM Designation A120 and unless black pipe is called for, shall (including fittings) be hot dip galvanized inside and out. The pipe shall be coupled by using malleable iron screw coupling in accordance with ASA Specification B16.3.

Steel pipe 4″ to 30″ in diameter shall conform to the latest issue of AWWA Standard C202. Special provisions shall include outside diameter, wall thickness, class and details lengths, tests (including hydrostatic), protective treatment, etc.

–2.04A Coatings for Steel Pipe

Types of protective treatment shall be as follows:

1. Coal tar coating per AWWA Standard C204.
2. Asphalt dipped and wrapped coating.

After pipe has been tested, it shall be thoroughly cleaned and maintained free of oil, grease, dirt, rust, loose mill scale or other objectionable matter. The pipe shall be dipped in a bath of best grade air-blown asphalt pipe dip maintained at a temperature between 385° and 415° F., or as recommended by coating manufacturer. Pipe shall remain in dip until it reaches the same temperature as asphalt. It then shall be removed and allowed to cool, then immersed again. After the pipe has been double dipped and cooled, it shall be spirally wrapped with mica-surfaced asphalt impregnated asbestos fibre felt, weighing not less than 23½ pounds per 100 square feet. The wrapping shall be cemented to the pipe with hot asphalt.

3. Other special coatings as may be described in special provisions.

–2.04B Couplings for Steel Pipe

All steel pipe 4″ and larger shall be coupled by the following:

1. Dresser coupling style 38, or equal.
2. Bell and spigot with O-ring rubber gasket which provides unrestricted flow in either direction.
3. Flanges shall conform to AWWA Standard C207.
4. Other types as specified in special provisions

Couplings shall be coated same as the pipe.

–2.05 Galvanized Steel Pipe

Galvanized steel pipe shall conform to latest revision of ASTM Designation A 120.

–2.06 GALVANIZED WROUGHT IRON PIPE

Galvanized wrought iron pipe shall conform to latest revision of ASTM Designation A 72 for wrought iron pipe. Specify standard in special provisions.

–2.07 PIPE FITTINGS

–2.07A Cast Iron

All cast iron fittings shall conform to the latest ASA Specifications A21.10 for short body, cast iron fittings 12″ and less, and AWWA C100 for fittings 14″ and larger. Lining, type of joints or other special items shall be specified in special provisions.

–2.07B Steel

Steel fittings for pipe 4″ and larger shall conform to AWWA C208 - class to be at least the same as pipe. Fittings shall be coated the same as pipe.

For pipe 3½″ and smaller, malleable iron screwed fittings in accordance with ASA Specification B16.3. They shall be galvanized unless black is specified.

–2.08 SPECIAL FITTINGS

Special fittings shall be in accordance with special plans and provisions.

72–3 MEASUREMENT AND PAYMENT

Payment for pipe, valves and fittings is described in Section 74-3.

Section 73—Trench Excavation and Backfill for Water Mains

73–1 GENERAL

The specifications in this section, and those of sections 72 through 78, shall apply to the construction of water distribution mains and appurtenances in sizes up to and including twenty-four inches (24″) in diameter for both temporary and permanent installation under ordinary conditions.

Special conditions will be covered in the special provisions for each contract and will become a part of the specifications thereof.

Specification references for manufactured materials such as pipe, hydrants, valves and fittings will refer to the designations for American Water Works Association (AWWA), or to American Standards Association (ASA), as effective on the date of call for bids. Copies of these publications may be obtained at nominal cost from the American Water Works Association, 2 Park Avenue, New York 16, New York, and from the American Standards Association, 10 East 40th Street, New York 16, New York.

Water mains will be constructed on locations as shown on the plans.

Where grading is required, such grading as excavation and embankment shall conform to the requirements of Section 13, and rough grading shall be completed before excavation of the water main trench.

Guaranty: Unless otherwise provided by the special provisions, the unit contract prices shall include a guaranty by the Contractor that the design, materials, workmanship and performance of the pipe, valves, hydrants, valve chambers, boxes, fittings and accessories furnished by him will be as specified, and that they and the installation of them will be satisfactory to the Owner for the purpose intended for a period of one year after final acceptance of the contract.

–1.01 UNGRADED STREETS

On ungraded streets, when grading is not provided in the contract schedule, the depth of trench excavation shall be as shown on the plan and profile and as staked by the Engineer.

Where the plans show the pipe is to be laid above the existing ground surface, an embankment fill shall be made and compacted to conform with the section shown on the plans and the water main trench shall be excavated therein. That portion of the embankment below the bottom of the pipe shall be compacted with rollers or mechanical compactors under controlled moisture conditions as required under Method B of Section 13-3.10E3.

Where no bid items are provided in the contract schedule for earthwork, filling, or embankment fill, such work shall be considered as incidental to the construction and all costs thereof shall be included in the unit contract price per linear foot for "Trench Excavation and Backfill."

Where, in the opinion of the Engineer, the extent of the work of earthwork, filling, or embankment fill justifies bid items, such items and payment will be as provided in Section 13, under the specifications of which the work shall be done, unless otherwise provided in the special provisions.

–1.02 CLEARING AND GRUBBING IN UNGRADED STREETS

Where not provided under schedules for "Grading" the area to be excavated or filled shall be cleared and grubbed by the Contractor. This work shall consist of the removal and disposal of all logs, stumps, roots, brush and other refuse. All such material shall be burned, or removed and disposed of as directed by the Engineer. Burning shall be done in a manner that will avoid all hazards such as damage to existing structures, construction in progress, or to trees and vegetation. All burning operations shall be in accordance with federal, state and local regulations, and shall be conducted in such a manner as not to create undue or unnecessary nuisance.

Payment for clearing and grubbing will be made in accordance with provisions in Section 12.

–1.03 REMOVAL OF PAVEMENT FROM DRIVEWAYS AND SIDEWALKS

Removal of existing street improvements shall be performed as specified in Section 52 except that payment therefor shall be considered as incidental to the construction and the costs thereof shall be included by the Contractor in the unit contract price per linear foot for "Trench Excavation and Backfill."

The removal of material from pavement, driveway and sidewalk and the disposal thereof shall be considered as incidental to the construction, and the costs thereof shall be included by the Contractor in the unit contract price per linear foot for "Trench Excavation and Backfill."

–1.04 GRADE AND ALIGNMENT

Grade and alignment on ungraded streets will be given from hubs set parallel to the line of the pipe, and on graded streets the grade and alignment shall be taken from established points on the existing curbs or sidewalks, when directed by the Engineer. Trenches for the pipe shall be opened in accordance with the lines and grades given or to the standard depth of cover provided in the special provisions. The Contractor shall transfer lines and grades to the pipe from hubs set by the Engineer or from existing concrete curbs or sidewalks as an incidental part of his work.

Sequence of operations, traffic requirements, or restrictions on the amount of open trench, if any, will be provided in the special provisions.

–1.05 LOCATING AND MARKING UNDERGROUND UTILITIES

Surface and underground utilities, excepting service connections, which may affect the construction will be shown on the plans insofar as they are known. The Contractor shall thoroughly acquaint himself with the nature of the utilities and any structure or thing that may interfere with the construction. Underground utilities are shown for the Contractor's convenience only, and the Owner assumes no responsibility for improper location or for failure to show utility locations on the construction plans.

73–2 TRENCH EXCAVATION

The Contractor shall perform all excavation of every description and of whatsoever substances encountered to the depth indicated on the drawings or specified herein. All excavations shall be made by open cut unless otherwise provided in the special provisions. The banks of the trenches shall be kept as nearly vertical as soil conditions will permit, and where required to control trench width or to protect adjacent structures the trench shall be properly sheeted and braced. Work shall comply with the Washington State Safety Code for construction work as required by the State Safety Inspector. Where, in the opinion of the Engineer, damage is liable to result from withdrawing sheeting, the Engineer may require the sheeting to be left in place and payment therefor will be made in accordance with Section 73-3.07.

All grading and other excavations nearby shall be controlled to prevent surface water from flowing into the excavations. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance away from the edges of trenches to avoid overloading and to prevent slides or cave-ins. Unsuitable material, or that in excess to the needs for embankments or backfill, shall be wasted and disposed of in areas indicated on the drawings; or if drawings do not indicate spoil areas, then in areas selected by the Contractor and approved by the Engineer. Other requirements for waste sites are as provided in Section 4.06.

The Contractor shall exercise sound engineering and and construction practices in excavating the trench and maintaining it so that no damage will occur to any foundation, structure, pole line, pipe line, or other facility because of slough of slopes, or from any other cause. If, as a result of the excavation, there is disturbance of the ground such as to endanger other property, the Contractor shall immediately take remedial action at his own expense. No act, representation or instruction of the Engineer or his representatives shall in any way relieve the Contractor from liability for damages or costs that result from trench excavation.

Care shall be taken not to excavate below the depth indicated, and excavation below that depth shall be backfilled with selected backfill material and compacted to the satisfaction of the Engineer at the Contractor's expense.

The bottom of trenches shall be accurately graded to provide uniform bearing and support for each length of pipe on undisturbed or compacted soil at every point along its entire length, except at the joints. Bell holes shall be excavated to an extent sufficient to permit accurate work in making and inspecting the joints.

–2.01 CUTTING EXISTING SERVICES

When excavation is made by machine, the Owner will cut the utility services ahead of the machine and reconnect them after it has passed on. The Contractor shall carefully do all necessary excavation to fully expose such services. If the Contractor elects to excavate the trench without first exposing the services, he shall be responsible for any and all damages incurred to the services by reason of his operations and shall immediately arrange for replacement of all damaged services. All additional costs incident to such work under either method by the Contractor shall be considered as incidental to the construction and shall be included in the unit contract price per linear foot for "Trench Excavation."

–2.02 SOLID ROCK EXCAVATION

Solid rock shall include solid rock formations requiring systematic drilling and blasting with explosives and any boulders or broken rock larger than one-half cubic yard in volume. Hardpan or cemented gravel, even though it may be advantageous to use exlosives in its removal, shall not be classified as solid rock excavation. Solid rock shall be excavated to a width equal to the outside barrel diameter of the pipe plus 24 inches, and to a grade line not less than six inches below bottom of pipe. Bottom of the trench shall be brought up to grade by backfilling with selected backfill material and be compacted to the satisfaction of the Engineer.

The Contractor shall notify the Engineer at least 24 hours prior to any blasting. All blasting shall be done in accordance with local, county and state regulations governing this class of work. Any damage to persons or property resulting from blasting operations shall be the sole responsibility of the Contractor and his surety.

Payment for solid rock will be made in accordance with Section 73-3.02.

-2.03 EXTRA EXCAVATION

Changes in grades of the water main from those shown on the plans, or as provided in the special provisions, may be necessary because of unplotted utilities, or for other reasons. If, in the opinion of the Engineer, it is necessary to adjust, correct, relocate or in any way change the line and grade, such changes shall be made by the Contractor under the terms of these specifications.

When a change in horizontal alignment is ordered by the Engineer, payment will be made for any trench which has been excavated upon the original location at the unit contract price per linear foot for "Trench Excavation and Backfill."

Changes in grade which will involve additional depth of trench by not more than four feet will be paid for at the unit contract price per cubic pard for "Extra Excavation," computed on the basis of the specified minimum trench width and additional depth.

Additional depth of trench involving more than four feet will be paid for either on a negotiated price basis or as force account work, as the Engineer may determine.

In cases where sheeting becomes necessary on account of the additional depth, payment therefor will be made the Contractor on a negotiated price basis or as force account work, as the Engineer may determine.

-2.04 UNFORESEEN BURIED OBJECTS ENCOUNTERED IN TRENCH EXCAVATION ON GRADED STREETS

Where streets have been graded, it is presumed that stumps, railroad ties, buried pavements, etc., will have been removed in the original grading work. Where such unexpected objects are encountered in trench excavation for water mains, they shall be removed and disposed of by the Contractor. In cases where they can be removed by the same equipment or method at hand for excavating, and where it is unnecessary to employ special equipment, install shoring or bracing, or to increase the trench width or depth more than two feet for any one object, then in that event the removal of such obstructions shall be considered as an incidental part of the Contractor's work and no additional payment will be made therefor.

Where objects, railroad ties, buried pavements, etc. are continuous and require extra work beyond the scope of the work outlined above, or extra equipment for their removal, additional payment will be made upon a negotiated price basis, or as force account work as the Engineer may determine.

-2.05 REMOVAL OF UNSUITABLE MATERIALS

Wherever in excavating the trench for water mains the bottom of the trench exposes peat, soft clay, quicksand or other material which is unsuitable in the opinion of the Engineer, such material shall be removed and disposed of by the Contractor. The material thus removed shall be replaced by suitable surplus material obtained from trench excavation within the limits of the project which shall be deposited and compacted in eight-inch layers by mechanical compaction. If surplus material is not available within the limits of the project, the Contractor shall furnish suitable material, as provided in Section 73-2.08, Bank Run Gravel for Trench Backfill.

Measurement and payment for removal and replacement of unsuitable material will be made in accordance with Section 73-3.04.

-2.06 BACKFILLING TRENCHES

Backfilling of trenches shall be made with the same materials excavated from the trenches unless these materials are found to be unsuitable by the Engineer.

Prior to backfilling, all form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling unless it is ordered by the Engineer to be left in place.

Bedding for water mains will not ordinarily be required. When required, it shall consist of clean granular sand and gravel of which 100% will pass the U. S. standard ¾-inch opening and not more than 3% will pass the U. S. No. 200 (wet sieve), with a minimum sand equivalent of 50. Payment for furnishing and placing bedding material will be made upon measurement in trucks at point of delivery at the unit contract price per cubic yard for "Bedding Material."

Backfill up to six inches over the top and both sides of the pipe shall be evenly and carefully placed, but not until all large rocks capable of damaging the pipe or its coating have been removed from the backfill material. The balance of the material may be placed by dumping into the trench by any method at the option of the Contractor and shall be compacted as specified hereinafter.

-2.07 COMPACTION OF BACKFILL

On graded streets without pavement or on roadway shoulders and unimproved areas, compaction of backfill shall be by water settling or wheel rolling.

-2.07A Water Settling of Trenches

Where water settling of trenches is required, the jetting or puddling method shall be used. Jets shall be inserted at not more than four-foot intervals throughout the length of the backfilled area and shall be slowly forced down to the bottom of the trench and held until the trench backfill is completely saturated with water. The jetting operations shall be completed as close behind the pipe laying and backfilling.

After the water-settled trench has set for several days, any depression in the trench shall be filled and mounded up over the trench, and then further compacted by the use of heavy rubber-wheeled equipment.

-2.07B Equipment for Water Settling Trenches

The Contractor shall furnish all hose and equipment necessary for jetting operations. The minimum size of hose and equipment shall be such as to provide not less than thirty-five (35) pounds per square inch pressure at the discharge. The jet shall be a rigid iron pipe with a minimum diameter of one (1) inch.

-2.07C Source of Water for Water Settling

Source of water will depend upon local conditions and shall be as provided in the special provisions. Where no provision for water is made in the special provisions, the Contractor shall make his own arrangements for it.

-2.07D Compaction of Backfill under Special Conditions

At locations where paved streets, driveways or sidewalks will be constructed or reconstructed over the trench, or where provided for in the special provisions or directed by the Engineer, the backfill shall be spread in layers and be compacted by mechanical tampers. In such cases the backfill material shall be placed in successive layers, not exceeding eight (8) inches in thickness and each layer shall be compacted with mechanical tampers to the density directed by the Engineer. Mechanical tampers shall be of the impact type as specified in Section 15-2.01A.

-2.08 BANK RUN GRAVEL FOR TRENCH BACKFILL

Selected backfill material shall consist of bank run gravel Class A or Class B, as specified in Section 26 excepting, however, that 100% of the material shall pass the 2½-inch square opening.

Payment for bank run gravel Class A or Class B will be made in accordance with Section 73-3.06.

-2.09 SHEETING LEFT IN PLACE

When, in the opinion of the Engineer, the withdrawal of sheeting from the trench will result in damage to adjacent utilities or other property, the Engineer may order all or a portion of the sheeting to be left in place, in which case it shall be cut off 24 inches below grade. Payment will be made in accordance with Section 73-3.07.

-2.10 TEMPORARY PEDESTRIAN CROSSINGS

The Contractor shall provide all necessary temporary pedestrian crossings for the proper handling of pedestrian traffic over the trench and shall provide access to private property where required by the Engineer. Temporary pedestrian crossings shall have the minimum requirements shown on standard plan No. 63.

73-3 MEASUREMENT AND PAYMENT

-3.01 CLEARING AND GRUBBING

When an item for "Clearing and Grubbing" is provided in the bid proposal, payment will be made on basis of a "Lump Sum" contract price which shall be in full for the removal and disposal of all material as specified, or in accordance with provisions of Section 12.

When no item is provided in the bid proposal, all clearing and grubbing shall be considered as incidental to the work of constructing the water main and all costs thereof shall be included in the unit contract price per linear foot for "Trench Excavation and Backfill."

-3.02 TRENCH EXCAVATION AND BACKFILL

Measurement for "Trench Excavation and Backfill" shall be by the linear foot measured along the center line of the pipe from end to end, including also fittings, valves, etc. When two trenches intersect, the measurement of each shall be to the intersection of the center lines of the cross or tee.

Payment for "Trench Excavation and Backfill" will be made at the unit contract price per linear foot of trench, which price shall be full compensation for all costs of materials, labor and equipment required to excavate the trench to the depth and in the manner required by the plans and specifications including: (a) excavation for bell holes, valves, fittings, and other appurtenances except chambers, (b) the removal and disposal of pavements, sidewalks and driveways, (c) the furnishing, placing and removal of sheeting, (d) the clearing and grubbing if there be no separate item for such in the proposal, and (e) the backfilling of the trench and compaction of backfill in accordance with the specifications. Exception is made, however, that excavation of solid rock and of unforeseen buried objects will be paid for additionally in the manner hereinbefore described.

-3.03 SOLID ROCK EXCAVATION

Payment for "Solid Rock Excavation" will be made at the unit contract price per cubic yard, which price shall be in addition to the price per linear foot for "Trench Excavation and Backfill." The volume of solid rock excavation will be based upon a trench width equal to the outside barrel of the pipe plus 24 inches, and to a grade six inches below the bottom of the pipe and the profile of the top of the rock as established by field measurements.

Selected backfill used in adjusting the bottom of the trench to grade will be measured and paid for as described in Section 73-2.06.

-3.04 REMOVAL AND REPLACEMENT OF UNSUITABLE MATERIAL

Payment will be made at the unit contract price per cubic yard for "Removal and Replacement of Unsuitable Material," which price shall be full compensation for excavating and disposing of the unsuitable material as defined in Section 73-2.05 herein, and the loading, hauling and placing of suitable excess material in the trench as specified.

If suitable excess material is not available, the Contractor will be paid for furnishing suitable material from other approved source as provided in Section 73-2.08, "Bank Run Gravel for Trench Backfill."

Compaction of suitable replacement material shall be by mechanical tampers as specified in Section 73-2.07D, as directed by the Engineer, and will be paid for at the unit contract price per hour for "Mechanical Tamping."

-3.05 MECHANICAL TAMPING

Where mechanical tamping is required, payment will be made at the unit contract price per hour for "Mechanical Tamping," which price shall be full compensation for any additional costs of spreading backfill in layers and for all materials, labor, equipment, tools and incidentals required to complete the mechanical tamping in accordance with the specifications. Payment will be made for the actual time that mechanical tamping is performed, and as and when required by the Engineer.

Mechanical tamping is work not required within the payment scope of "Trench Excavation and Backfill."

-3.06 BANK RUN GRAVEL FOR TRENCH BACKFILL

Measurement of "Bank Run Gravel for Trench Backfill," will be by the cubic yard measured in trucks at point of delivery.

Payment for "Bank Run Gravel" will be made at the unit contract price per cubic yard, which price shall be full compensation for the furnishing and hauling of the material to the trench. Handling of the material at the trench shall be included in the unit contract price per cubic yard for "Trench Excavation and Backfill."

-3.07 SHEETING LEFT IN PLACE

Sheeting left in place at the discretion of the Engineer will be paid for at the unit contract price per thousand feet board measure (MBM) for the actual amount of lumber left in the trench. Such payment shall be full compensation for the material, and for the labor and equipment required to cut off that portion of the sheeting not intended to be left in place and to make satisfactory disposal of it.

-3.08 TEMPORARY PEDESTRIAN CROSSINGS

Payment for temporary pedestrian crossings will be made at the unit contract price per each for "Temporary Pedestrian Crossing," which price shall be full compensation for furnishing, placing and removal of the crossing. Each crossing will be paid for as a separate unit whether it is new construction or has been moved from a prior location.

Section 74—Pipe Installation for Water Mains

74-1 GENERAL

Pipe shall be installed in accordance with the manufacturer's specifications and instructions for installing the type of pipe used unless modified or changed in the special provisions. The Contractor shall provide all tools and equipment including any special tools designed for installing each particular type of pipe used.

74-2 CONSTRUCTION

-2.01 DEWATERING OF TRENCH

Where water is encountered in the trench, it shall be removed during pipe-laying operations and so maintained until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

-2.02 HANDLING OF PIPE

All types of pipe shall be handled in such manner as will prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of the Engineer or be removed from the job and methods of handling shall be corrected to prevent further damage when called to the attention of the Contractor.

Threaded pipe ends shall be protected by couplings or other means until laid.

The pipe and fittings shall be inspected for defects and cast iron pipe, while suspended above grade, shall be rung with a light hammer to detect cracks.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be

removed, cleaned and relaid. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Engineer to ensure absolute cleanliness inside the pipe.

–2.03 LAYING OF PIPE ON CURVES

Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints. If the pipe is shown curved on the plans and no special fittings are shown, the Contractor can assume that the curves can be made by deflection of the joints with standard lengths of pipe. If shorter lengths are required, the plan will indicate maximum lengths that can be used.

Where field conditions require deflection or curves not anticipated by the plans, the Engineer will determine the methods to be used. No additional payment will be made for laying pipe on curves as shown on the plans, nor for field changes involving standard lengths of pipe deflected at the joints. When special fittings not shown on the plans are required to meet field conditions, additional payment will be made for special fittings as provided in Section 74-3.02.

Maximum deflections at pipe joints and laying radius for various pipe lengths are as found in the following standards:

Cast Iron Pipe Bell and Spigot Joints	AWWA C 600-54T Sec. 7.8
Cast Iron Pipe Mechanical Joints	AWWA C 600-54T Sec. 9b.5
Cast Iron Pipe Tyton Joints	See manufacturer's recommendations
Asbestos-cement Pipe	AWWA C 400-53T
Concrete Cylinder Pipe	See manufacturer's recommendations
Steel Pipe O-Ring Joints	See manufacturer's recommendations
Steel Pipe Welded Joints	AWWA C 202-49

When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.

–2.04 LAYING CAST IRON PIPE

–2.04A Joints for Cast Iron Pipe

Joints for cast iron pipe shall consist of one of the three following types unless otherwise provided in the special provisions:

1. Bell and spigot pipe with lead joints.
2. Mechanical joints.
3. Rubber gasket joints (Tyton type).

–2.04B Bell and Spigot Pipe with Lead Joints

This type joint shall be made by use of a packing material followed by melted lead calked in place.

–2.04C Packing Material

Packing material shall be molded rubber rings. Dry braided sterile packing of a type approved by the Engineer and State Department of Health may be used only when the space between the bell and the spigot will not permit use of a rubber ring. When removed from the container, special care shall be used to prevent contamination to the rings or the braided packing.

–2.04D Preparation of Joint

The bell and spigot ends of the pipe shall be thoroughly brushed and cleaned of all oil, grit, tar and other foreign matter. The molded rubber packing ring shall be placed on the spigot end and the pipe entered to the full depth of the socket. The rubber ring shall be driven home and the joint filled with molten lead.

When yarning material is used, it shall be placed around the spigot of the pipe and shall be of proper dimensions to center the spigot in the bell. When the spigot is shoved home, the yarning material shall be driven tightly against the inside base or hub of the bell with suitable yarning tools.

When a single strand of yarning material is used, it shall have an overlap at the top of not more than two inches. When more than a single strand is required for a joint, each strand shall be cut to sufficient length so that the ends will meet without causing overlap. Ends of successive yarning rings shall be staggered and shall be driven home separately.

–2.04E Depth of Jointing Material

The depth of the lead joints shall be not less than 2¼" for pipe having a nominal diameter of 20" or less, and 2½" in 24-inch pipe.

–2.04F Lead

Lead for calking purposes shall contain not less than 99.73 percent pure lead. Impurities shall not exceed the following limits:

	PERCENT
Arsenic, antimony and tin together	0.015
Copper	0.08
Zinc	0.002
Iron	0.002
Bismuth	0.25
Silver	0.02

The producer's name or the mark of Lead Industries shall be clearly cast or stamped upon each piece of lead.

–2.04G Heating and Pouring of Lead

Lead shall be heated in a melting pot, kept in easy reach of the joint to be poured so that the molten metal will not be chilled in being carried from the melting pot to the joint, and shall be brought to a proper temperature so that when stirred it will show a rapid change of color. Before pouring, all scum shall be removed. Each joint shall be made with one continuous pour filling the entire joint space with solid lead. Spongy or imperfectly filled joints shall be burned out and be repoured.

–2.04H Position of Joint Runner

The joint runner shall fit snugly against the face of the bell and the outside of the pipe and shall be dammed with clay to form a pouring lip to provide for filling the joint flush with the face and to the top of the bell.

–2.04I Calking Lead Joints

After the lead has cooled to the temperature of the pipe, lead joints shall be calked with pneumatic or hand tools operated by competent workmen until such joints are thoroughly compacted and watertight, without overstraining the bell of the pipe. The finished joint shall show a hard and even hammered surface overall.

–2.05 JOINTING MECHANICAL JOINT PIPE

The outside diameter of the spigot end of bell-and-spigot pipe varies with the type, size and class of pipe. There is only one joint size for each diameter of mechanical joint pipe. Thus, difficulty may be met when attempts are made to connect existing bell-and-spigot pipe to mechanical joint pipe. When such a connection must be made, an adapter having a fitting bell and a mechanical joint socket is manufactured and shall be used.

–2.05A Cleaning and Assembling Joint

The last 8 inches outside of the spigot and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint, and then painted with a soap solution made by dissolving one-half cup of granulated soap in one gallon of water. The cast iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

–2.05B Bolting of Joint

The entire section of the pipe shall be pushed forward to seat the spigot end of the bell. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The cast iron gland shall be moved along the pipe into

position for bolting, all of the nuts inserted, and the nuts screwed up tightly with the fingers. All nuts shall be tightened with a torgue-limiting wrench. The torgue for various sizes of bolts shall be as follows:

Size Inch	*Range of Torgue Ft. - Lbs.*
⅝	40 - 60
¾	60 - 90
1	70 - 100
1¼	90 - 120

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland.

–2.06 JOINTING RUBBER GASKET JOINT PIPE (TYTON TYPE)

–2.06A Cleaning and Assembling Joint

The inside of the bell shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint. The circular rubber gasket shall be flexed inward and inserted in the gasket seat provided in the socket and released with the gasket fitting over the bead in the gasket seat.

A thin film of gasket lubricant shall be applied to the inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer and approved by the Engineer.

The spigot end of the pipe shall be cleaned and entered into the rubber gasket in the socket, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the bottom of the socket, using a forked tool or jack-type tool or other device approved by the Engineer. Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.

Field-cut pipe lengths shall be filed or ground to resemble the spigot end of manufactured pipe.

–2.07 LAYING ASBESTOS-CEMENT PIPE

–2.07A Couplings for Asbestos-cement pipe

Asbestos-cement pipe shall be furnished with one of the following types of couplings: Super Simplex Automatic, Fluid-tite and Ring-tite. Each coupling shall be grooved to fit the type of rubber ring used. Rings shall be molded rubber, of manufacturer's design and as furnished by manufacturer to fit the type of pipe and coupling used.

–2.07B Cleaning and Assembling Joint

All parts of the pipe ends and couplings shall be thoroughly cleaned to remove oil, grit or other foreign matter from the joint.

Insert the two molded rubber joint rings in the grooves provided in the coupling.

Lubricate the outside surface of the pipe ends back to the stop shoulder with a solution of vegetable soap and water or other prepared solution supplied by the manufacturer and approved by the Engineer.

Align the pipe and coupling and jack the pipe home until rings are properly seated with recommended tolerance between pipe lengths.

–2.07C Short Lengths and Field Cut Joints

Short lengths of pipe supplied by the manufacturer shall be used whenever possible to provide the proper spacing of valves, tees or special fittings.

Whenever it becomes necessary to cut a length of pipe, the cut shall be made by abrasive saw or by a special pipe cutter, using a cutting blade rotated around the pipe at right angles to the axis of pipe.

Cut ends shall be machined with special machining equipment to the exact dimensions of the pipe supplied by the manufacturer.

–2.08 LAYING STEEL PIPE

–2.08A Threaded Steel Pipe in Sizes Up to and Including 3½ Inch

All steel pipe in sizes up to and including 3½ inch shall be connected with malleable iron screwed couplings in accordance with ASA Specification B16.3. Couplings shall be galvanized or black depending on the coating specified for pipe. Unions or flanges shall be used at all equipment and valves.

Exposed threads, after jointing, shall be brush-coated with an asphalt coating approved by the Engineer.

–2.08B Coupled Pipe 4-inch and Larger

All steel pipe 4-inch and larger for use in underground services shall be coupled by either one of the following methods:

Dresser Couplings, Style 38 or approved equal.

O-Ring rubber gasket joint of a design approved by the Engineer and having the following basic design:

One end expanded to form a bell.

The other, or spigot end, shall have a rolled groove to accommodate a round rubber gasket of proper diameter and cross section.

All parts shall be thoroughly cleaned before assembly and a vegetable soap solution shall be brushed on the inside of the bell just prior to assembly.

All component parts of couplings, rings, bells, etc., shall receive a protective coating in the same manner as specified for steel pipe. Bolts and nuts, exposed edges, flanges, etc. shall, after installation, be covered with a heavy hot pour of asphalt if asphalt coated pipe is used, or with coal tar enamel if coal tar coated pipe is used.

All steel pipe 4-inch and larger for above ground service shall be coupled with flanges, dresser type or victaulic type couplings. All flanges for steel pipe shall conform to AWWA Standard C-207, Class B for working pressures up to 86 psi, Class D for working pressures up to 150 psi, and Class E for working pressures up to 275 psi.

Pipe for outdoor service above ground shall be protected with one coat primer and one coat bitumastic paint approved by the Engineer.

Pipe for indoor service shall be protected with one coat of red lead and two coats of approved enamel paint of a color specified or selected by the Engineer.

–2.09 LAYING CONCRETE PIPE

Concrete cylinder pipe with steel joint rings, or concrete non-cylinder pipe when called for on the plans or special provisions, shall be laid to conform with requirements that follow.

–2.09A Cleaning and Assembling Joint

All parts of the joint, both bell and spigot ends, shall be thoroughly brushed and cleaned to remove oil grit and other foreign matter. The circular rubber gasket provided with the pipe shall be stretched and snapped into the groove provided on the spigot end. It shall be lifted and released at several points on the circumference to equalize tension and remove twist in the gasket.

The bell end of the pipe shall be lubricated with a solution of vegetable soap and water or other prepared solution supplied by the pipe manufacturer and approved by the Engineer. The pipe shall then be jacked home until it stops.

The outside annular space at the joint shall be filled with cement mortar.

The grouting of the outside joints shall be made by wrapping the joint with two bands of strong waterproof sisalkraft paper. The bands of paper shall then be tightly strapped to the pipe with ⅜-inch box strapping, using tools recommended by the manufacturer of the strapping. Hand-tamped backfill shall be built up around the band to the horizontal diameter of the pipe. The joint shall then be filled with mortar from one side only until the mortar appears on the other side of the pipe. Mortar shall be mixed with the least amount of water that will permit placing by the method described. Flexible wires shall be worked around the joint to assist grouting and ensure proper filling of the joint. The top of the pipe shall then be grouted and the paper band laid over the entire joint to protect it while curing.

The inside annular space shall also be filled with cement mortar and troweled flush. Mortar shall consist of one part portland cement and two parts of plaster

sand. Mortar for inside joints shall be mixed with only enough water for "dry packing."

No grouting of joints will be allowed within three joints of laying operations. A representative of the Engineer shall be present when outside joints are being poured.

–2.10 CONNECTIONS TO EXISTING MAINS

All connections to water mains in use shall be made by the utility unless otherwise provided in the special provisions. All crosses or other specials required to be inserted in any main already in use shall be furnished by the Contractor and be set by the utility. The Contractor shall furnish the special, as shown on the plans, and all other material required. He shall make all necessary excavations and backfilling. The labor of cutting and inserting the special shall be performed by the utility.

Where the connection of new work to old requires interruption of service and notification of customers affected, the superintendent of the utility, the Engineer and the Contractor shall mutually agree upon a date for connections which will allow ample time to assemble labor and materials, and to notify all customers affected.

–2.11 WATER SERVICE CONNECTIONS

The utility will at its own cost make all taps for service connections and install the service pipe, unless otherwise provided on the plans and in the special provisions.

The Contractor shall leave the main trench open at all points where service connections are to be made until such services are installed and tested to the curb cock.

When requested by the Engineer, the Contractor shall open side trenches to such depths as may be necessary to carry services from the main to the curb. Excavation and backfill of side trenches for water service connections shall be as specified for water main trenches in Section 73. Unless otherwise provided, payment for side trenches will be made at the unit contract price per linear foot for "Trench Excavation and Backfill for Water Service Connections."

Where existing services are to be transferred from old to new mains, the Contractor shall plan and coordinate his work with that of the utility so that service will be resumed with the least possible inconvenience to consumers.

Whenever the Contractor is required by the plans and special provisions to remove an existing water main, the special provisions will state whether or not the salvage of pipe, valves, hydrants and fittings will be required, and the method of payment therefor.

The Contractor shall not in any case remove old pipe until all service connections have been transferred to the new main. Adequate provisions shall be made by the Contractor during construction for the care and protection of mains or services in use.

Where salvage of pipe, valves, hydrants and fittings is required under the contract, salvage methods shall be used which will save all materials intact and undamaged. Salvaged material shall be stored at the trench side for removal by the utility, unless otherwise provided.

If salvage is not specified, the materials therefrom shall become the property of the Contractor and shall be promptly removed from the site for disposal as he sees fit.

–2.12 FIELD TESTS

All pipe shall be subjected to a hydrostatic test after it is laid. Each section of pipe between gate valves shall be tested as soon as possible after laying, or when directed by the Engineer.

Field tests shall be made before backfilling over any joints or fittings. At points where pressure reaction and movement may occur, such as at bends, tees and plugs the pipe shall be properly blocked or braced. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing.

The Contractor shall furnish all labor and equipment necessary to make the tests except for pressure gauges which will be furnished by the utility.

Where the utility has water available for testing, it will be furnished without charge. All costs of tapping and piping shall be borne by the Contractor unless otherwise specified in the special provisions. Where water is not available from the utility, the Contractor shall provide water from an approved source for testing and the cost thereof shall be included in other unit contract prices of the work.

Test pressures for field testing shall be 150 psi above the static pressure to which the particular section tested will be subjected when placed in service and be based upon the pressure at the low end of the section under test. In no case shall the test pressure exceed 200 percent of the safe working pressure of the class of pipe tested.

While under test pressure, the entire installation shall be carefully examined for defective material and joint leaks. If test pressure is maintained for five minutes without pumping, it will be considered an acceptable leakage test. Visible leaks at joints shall be repaired to the satisfaction of the Engineer.

Defective material furnished by the Contractor or furnished in good condition by the utility and damaged after acceptance by the Contractor shall be replaced by him at his own expense.

Material furnished by the utility found to be defective before final acceptance will be replaced with sound material by the utility. In such event, the Contractor shall remove the defective material and install the new material at his own expense.

–2.13 DISINFECTION OF WATER MAINS

–2.13A Flushing

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap should be provided large enough to develop a velocity of at least 2.5 fps. in the main. One 2½-inch hydrant opening will, under normal pressures, provide this velocity in pipe sizes up to and including 12-inch.

Taps required by the Contractor for chlorination or flushing purposes shall be provided by him as a part of the construction of water mains, unless otherwise provided in the special provisions. Service taps, or taps that are necessary for temporary or permanent release of air will generally be provided by the utility; if not performed by the utility, the Engineer may direct the Contractor to make the taps for which work he will receive extra compensation.

Where dry calcium hypochlorite is used for disinfection of the pipe, flushing shall be done after disinfection.

–2.13B Requirement of Chlorine

Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that a chlorine residual of not less than 10 ppm remains in the water after standing 24 hours in the pipe.

–2.13C Form of Applied Chlorine

Chlorine shall be applied by one of the methods which follow, to give a dosage of not less than 50 ppm of available chlorine.

–2.13D Dry Calcium Hypochlorite

As each length of pipe is laid, sufficient high test calcium hypochlorite (65-70% chlorine) shall be placed in the pipe to yield a dosage of not less than 50 ppm available chlorine, calculated on the volume of the water which the pipe and appurtenances will contain.

The number of ounces of 65% test calcium hypochlorite required for a 20-foot length of pipe equals $.008431d^2$, in which "d" is the diameter in inches.

–2.13E Liquid Chlorine

A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.

–2.13F Chlorine-bearing Compounds in Water

A mixture of water and high-test calcium hypochlorite (65-70%Cl) may be substituted for the chlorine gas-water mixture. The dry powder shall first be mixed as a paste and then thinned to a 1 percent chlorine solution by adding water to give a total quantity of 7.5 gallons of water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinfected while filling the main with water in the amounts as shown in the table which follows.

Chlorine Requirements for 100-Ft. Lengths of Various Sizes of Pipe

Pipe Size Inches	Volume of 100-ft. Length Gals.	Amount Required to Give 50 ppm Cl. 100% Chlorine Lb.	1% Chlorine-Water Solution in Gals.
4	65.3	0.027	⅓
6	146.5	0.061	¾
8	261.0	0.108	1⅓
10	408.0	0.170	2
12	588.7	0.240	3

–2.13G Point of Application

The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valved section of it, and through a corporation stop inserted by the utility in the horizontal axis of the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made by the utility on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of application may be used when approved or directed by the Engineer.

–2.13H Rate of Application

Water from the existing distribution system, or other source of supply, shall be controlled to flow very slowly into the newly laid pipe line during application of the chlorine. The rate of chlorine gas-water mixture or dry gas feed shall be in such proportion to the rate of water entering the newly laid pipe that the dosage applied to the water will be at least 50 parts per million.

–2.13I Preventing Reverse Flow

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired.

–2.13J Retention Period

Treated water shall be retained in the pipe at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least ten (10) parts per million.

–2.13K Chlorinating Valves and Hydrants

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

–2.13L Final Flushing and Testing

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows, upon test, the absence of chlorine. In the event chlorine is normally used in the source of supply, then the tests shall show a residual not in excess of that carried in the system.

After flushing initial bacterial test, the Engineer will arrange for taking samples by the utility or by health authorities. A second set of bacterial test samples will be taken after a 24-hour retention period of the water remaining in the pipe.

–2.13M Repetition of Flushing and Testing

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory test shall be considered as failure of the Contractor to keep the pipe clean during construction, or to properly chlorinate the main, and no additional payment will be made for reflushing and rechlorinating until a satisfactory test is made.

–2.14 CONCRETE BLOCKING

Concrete thrust blocking, as detailed on the plans or on the standard drawings, shall be placed at bends, tees, and crosses as directed by the Engineer. Blocking shall be Class 5(1½) concrete mix poured in place, unless precast blocks are authorized by the Engineer.

Concrete blocking, when placed as indicated on the standard drawing No. 74, shall be bearing against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to obstruct access to the joints of the pipe or fittings.

Concrete used for blocking shall be Class 5(1½) mix poured in place.

Precast concrete blocks shall not be used for concrete blocking unless authorized by the Engineer.

74–3 MEASUREMENT AND PAYMENT

–3.01 MEASUREMENT OF WATER MAINS

Measurement shall be based on the slope distance from point to point. The point of beginning or ending of measurement in any particular run of pipe shall be the vertical intersection of the center line of the pipe measured with the center line of the intersecting pipe, or with the beginning or ending of any new pipe laid. No deductions will be made for the linear length of fittings, valves, couplings, etc. contained within the measured length. At changes in pipe size connected by a reducer, the point of measurement shall be taken as the midpoint of the reducer.

–3.02 PAYMENT FOR WATER MAINS AND WATER SERVICE CONNECTIONS

The unit contract price per linear foot for each size and kind of pipe shall be full compensation for furnishing the pipe and all fittings required for complete installation along the run of each pipe size and kind. The unit contract price per linear foot shall also include all costs of every nature for the laying and jointing of the pipe and fittings along each run, and also all costs for the testing, flushing and disinfecting of the pipe line.

In case any fittings are omitted in the construction by direction of the Engineer, or if any additional ones not shown on the plans are required, then in that event an adjustment, down or up, will be made the Contractor upon basis of the unit contract price per pound for "Special Fittings." If there is no such item in the proposal the adjustment will be made upon a negotiated basis.

Excavation and backfilling of trenches, pipe line accessories such as hydrants, hydrant connections, gate valves, etc., will be paid for separately as provided in sections 73, 77 and 75, respectively.

–3.03 PARTIAL PAYMENT FOR MATERIALS DELIVERED

Pipe delivered to the trench side but not installed will be included in the estimate of monthly payments to the Contractor. The basis for such payments shall be 85 percent of the price which the Contractor has been billed by his supplier, as evidenced by certified statements by the supplier. Partial payments will not apply to materials such as pipe fittings, valves, etc., but will apply only to pipe.

–3.04 CONCRETE BLOCKING

The unit contract price per cubic yard for "Concrete Blocking in Place" shall be full compensation for all labor, material, equipment and tools necessary to place concrete blocking of the proportions required. It shall include also, all excavation, concrete form work, finishing, removal and disposal of excavation not required for backfill, and any other work that may be necessary for constructing the blocking in place as specified.

–3.05 TRENCH EXCAVATION AND BACKFILL FOR WATER SERVICE CONNECTIONS

Trench excavation and backfill for water service

connections shall be measured and paid for in accordance with Section 73-3.02.

74–4 UNIT PRICE METHOD OF PAYMENT FOR WATER DISTRIBUTION MAIN CONSTRUCTION (An alternate method)

–4.01 MEASUREMENT OF WATER MAINS FOR UNIT PRICE PAYMENT

Measurement for all piping shall be based upon the center line slope distance (laying length) of the pipe installed in any particular run, excluding the lengths so determined for all valves, fittings and specials. This method of measurement shall apply also to pipe installed for "Hydrant Connections."

–4.02 PAYMENT FOR WATER MAIN CONSTRUCTION UNDER UNIT PRICE METHOD

Payment will be made for various kinds and sizes of pipe, fittings and specials at the unit contract price per linear foot, in place. Such payment shall be compensation in full for all labor, equipment, tools and materials required to lay, joint, disinfect and test the pipe line.

The unit contract price shall be used for price adjustment for either an increase or a decrease in quantities from that shown on the plans or listed in the proposal.

Excavation and backfilling of trenches including water settlement, pipe line accessories such as hydrants, gate valves, bank-run sand and gravel, disposal of spoil, concrete thrust anchors, etc., will be paid for separately at unit contract prices upon items and units contained in the proposal.

Section 75—Gate Valves for Water Mains

75–1 DESCRIPTION

The valves shall be suitable for ordinary waterworks service, intended to be installed in a normal position on buried pipe lines for water distribution systems.

The minimum requirements for all gate valves shall, in design, material and workmanship, conform to the standards of the AWWA C500-59T approved January 28, 1959, or latest revisions thereof. All materials used in the manufacture of waterworks gate valves shall conform to the AWWA standards designed for each material listed.

75–2 MATERIALS

–2.01 MANUFACTURE AND MARKING

The gate valves shall be standard pattern of a manufacturer whose products are approved by the Owner and shall have the name or mark of the manufacturer, year valve casting was made, size and working pressure plainly cast in raised letters on the valve body.

–2.02 TYPE AND MOUNTING

The valve bodies shall be cast iron, mounted with approved noncorrosive metals. All wearing surfaces shall be bronze or other approved noncorrosive material and there shall be no moving bearing or contact surfaces of iron in contact with iron. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.

All gate valves shall be two-faced, double disc, with parallel seats and bronze or other approved wedging devices placed between them. The stem shall be of high tensile strength bronze or other approved noncorrosive metal. All nonferrous bushings shall be of substantial thickness, tightly fitted and pressed into machined seats.

–2.03 END CONNECTIONS

The dimensions of hub or bell end connections shall conform to the dimensions of the AWWA Standard No. C100-55. The dimensions for the mechanical joint connections shall conform to the A. S. A. Specifications No. A21.11.

The end flanges of flanged gate valves shall conform in dimensions and drilling to the standard A. S. A. B16.1 for cast iron flanges and flanged fittings, Class 125, unless specifically provided otherwise. The bolt holes shall straddle the vertical center line.

–2.04 GATE VALVES 16-INCH AND LARGER

Gate valves 16-inch and larger shall be double square bottom arranged for operation in the horizontal position and shall be equipped with bronze tracks fastened into a groove or slot within the valve body casting, together with bronze rollers, shafts, bushings and scrapers. They shall be nonrising stem type and shall be equipped with approved rugged gate position indicators. The valves shall be provided with handwheels or operating nuts as designated in the proposal. Where handwheels are called for, a design of ample proportion is required. Where operating nuts are called for, a standard 2" operating nut shall be furnished.

All gears on gate valves shall be cut tooth steel gears, housed in heavy cast iron grease cases of approved design. When by-pass gates are called for, the valves shall be equipped with by-passes and gates of the sizes adopted as standard in the specifications of AWWA. All by-pass gates shall be equipped with standard 2" operating nuts, except as otherwise specified.

All gate valves 16-inch and larger shall be enclosed in a masonry chamber and shall be geared with gearing designed for handwheel operating in a horizontal plane, or for an operating nut mounted on a vertical pinion shaft, as shown on the standard drawings.

–2.05 GATE VALVE STEM SEALS

Unless otherwise designated in the proposal, all gate valves up to and including 12-inch in size shall be furnished with O-Ring Stem Seals. Number, size and design shall conform to the AWWA Standards for gate valve O-Ring Stem Seals.

–2.06 TAPPING VALVES

Tapping valves shall be furnished with flanged inlet end connections having a machined projection on the flanges to mate with a machined recess on the outlet flanges of the tapping sleeves and crosses. The outlet ends shall conform in dimensions to the AWWA Standards for hub or mechanical joint connections, except that the outside of the hub shall have a large flange for attaching a drilling machine. The seat opening of the valves shall be larger than normal size to permit full diameter cuts.

–2.07 HYDROSTATIC TEST PRESSURE AT FACTORY

Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests: each 3-inch to 12-inch valve, inclusive, shall be subjected to hydrostatic test under pressures of both 300 psi and 175 psi, and each 16-inch to 48-inch valve, inclusive, shall be subjected to test pressures of 300 psi and 150 psi. These tests shall be conducted in accordance with provisions of AWWA C500-59T or latest revision thereof. Tests for special valves shall be made as provided in the special provisions.

–2.08 PAINTING AT FACTORY

After the factory test and inspection, all ferrous parts of the valves except finished or bearing surfaces shall be painted inside and out with two coats of asphalt varnish, Federal Specifications TT-V-51A or approved equal.

75–3 INSTALLATION OF GATE VALVES

All gate valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished.

Valves 12-inch and under shall be installed in a vertical position and be provided with a standard valve chamber or cast iron gate box so arranged that no shock will be transmitted to the valve. The box shall be centered over the operating nut, and the cast iron box cover shall be set flush with the road bed or finished paved surface.

After installation, all valves shall be subjected to the field test for piping as outlined in Section 74-2.12 of these specifications. Should any defects in design, materials or workmanship appear during these tests, the Contractor shall correct such defects with the least possible delay and to the satisfaction of the Engineer. Should the Contractor fail to do this within a reasonable period of time in the judgment of the Engineer, he may cause such defects to be corrected and deduct the cost thereof from any moneys or payments due or to become due the Contractor.

75–4 MEASUREMENT AND PAYMENT

–4.01 PAYMENT FOR GATE VALVES

Payment for "Gate Valve (size)" will be made at the unit contract price per each, which price shall be full compensation for all labor, material, equipment and tools necessary to furnish and install tthe valve complete in place in the water main, including trenching, jointing, painting, disinfecting and hydrostatic testing.

Section 76—Valve Chambers and Boxes for Water Mains

76–1 DESCRIPTION

This section shall apply to the construction of standard valve chambers, special valve chambers and cast iron valve boxes, all in accordance with the standard drawings Nos. 69, 70, 71 and 72.

Where shown on the plans or where directed by the Engineer, gate valves shall be enclosed in valve chambers, or shall be provided with cast iron valve boxes set over the operating stem.

76–2 MATERIALS

–2.01 RING AND COVER AND VALVE BOX CASTINGS

Castings for cast iron ring and cover and for cast iron parts of valve boxes shall conform to the requirements of Standard Specifications for Gray Iron Castings, ASTM Designation A-48-56.

–2.02 PORTLAND CEMENT CONCRETE BLOCKS

Portland cement concrete blocks shall be solid and conform to the requirements of ASTM Designation C 139-39. Over-all thickness of block shall be six (6) inches with optional lengths and widths. Curved manhole blocks shall be used for round valve chambers.

–2.03 PORTLAND CEMENT CONCRETE

Concrete for cast in place valve boxes shall be Class 5(1½) mix.

–2.04 MORTAR

Portland cement mortar shall be one (1) part portland cement to not less than one and one-half (1½) parts nor more than three (3) parts of plaster sand, mixed with the least amount of water necessary to provide a workable mix. Dehydrated lime in an amount not exceeding 50 percent of the portland cement, by weight, may be added to the mix at the option of the Contractor.

76–3 CONSTRUCTION DETAILS

Valve chambers may be either precast, cast in place, or be made of solid concrete blocks according to the details shown on the standard drawings.

–3.01 PRECAST VALVE CHAMBERS

Precast valve chambers for nominal depth of cover from 2'-6" to 3'-6" are cast in one piece with slotted holes for placing over the main.

Precast valve chambers for nominal depth of cover from 4'-6" to 6'-6" are made in two sections.

The concrete base shall be poured in place or precast. Poured-in-place base shall be allowed to attain sufficient strength to support the chamber (usually 2 or 3 days), as directed by the Engineer. Precast chambers shall be set on the base in cement mortar with the slotted holes straddling the water main.

The water main shall first be wrapped with one (1) inch thick expansion joint material under the chamber walls and after setting the chamber the remaining space shall be filled with cement mortar or mortared bricks. In no case shall the chamber walls rest on the pipe.

–3.02 CAST-IN-PLACE CHAMBERS

Cast-in-place chambers may be constructed by using forms and poured concrete. Finishing of walls is not required other than the patching of porous spots (rock pockets) and bolt holes. Forms shall be removed for inspection of concrete.

–3.03 CHAMBERS MADE WITH PRECAST CONCRETE BLOCKS

Circular or rectangular chambers may be made with solid precast concrete blocks. The base shall first be poured in place and after reaching sufficient strength (usually 2 or 3 days), the walls may be constructed of concrete blocks with cement mortar joints.

Circular chambers shall be constructed with curved manhole blocks. The chamber top shall be tapered in to the dimensions shown on the standard drawings.

Rectangular chambers shall have a cast-in-place or precast concrete cover.

–3.04 SETTING CAST IRON FRAME AND COVER

The cast iron frame and cover shall be set to grades furnished by the Engineer. Provisions for future adjustment of frame to changes in grade shall be made by constructing two courses of brick with mortar joints between the top of the chamber and the bottom of the casting. Brick for this purpose shall be standard clay or cement-lime brick 2¼ inches thick.

–3.05 VALVE CHAMBER DRAIN

Unless otherwise specified, each valve chamber shall be provided with a drain consisting of a short length of four-inch (4") sewer pipe leading to a gravel drain.

The gravel drain shall consist of one-half (½) cubic yard of clean paving gravel (3" to ⅜") placed outside of and below the bottom of the chamber. In naturally porous soils the gravel may be omitted at the direction of the Engineer.

–3.06 CAST IRON VALVE BOXES

Cast iron valve boxes, as shown on the standard drawing No. 68, are placed for enclosing gate valves of small size in lieu of gate valve chambers.

Cast iron valve boxes in general are set to position during backfilling operations so they will be in a vertical alignment to the gate valve operating stem. The lower casting of the unit is installed first in such a manner as to be cushioned and to not rest directly upon the body of the gate valve or upon the water main. The upper casting of the unit is then placed in proper alignment and to such an elevation that its top will be at final grade. Backfilling around both units shall be placed and compacted to the satisfaction of the Engineer.

76–4 MEASUREMENT AND PAYMENT

–4.01 PAYMENT FOR VALVE CHAMBERS

For purposes of payment, valve chambers will have three classifications as follows: "Valve Chambers, Standard" for valve chambers for valves up to and including 12-inch set vertically; "Valve Chambers, Large" for rectangular valve chambers for valves 16-inch to 30-inch, inclusive, laid horizontally, and "Valve Chambers, Special" with inside dimensions given to nearest foot according to detail plans (i. e. "Valve Chamber Special 5' 8").

In each case payment will be made at the unit contract price per each, which price shall be in full for all materials, labor and equipment, including cast iron ring and cover, cast iron valve box, concrete, bricks, grout, expansion material (for large or special), one length of sewer pipe drain, gravel pocket, excavation and backfilling, and disposal of surplus excavation not needed for backfilling.

–4.02 PAYMENT FOR CAST IRON VALVE BOXES

The unit contract price per each for "Cast Iron Valve Box," shall be full compensation for all labor, material, equipment and tools necessary to furnish and install a cast iron valve box in proper position during the backfilling operations, as specified.

Section 77—Fire Hydrants

77–1 DESCRIPTION

These specifications are to be used in conjunction with the AWWA Standard C502-54 approved as Standard May 27, 1954, or the latest revision thereof for fire hydrants for ordinary water works service.

77–2 MATERIALS

–2.01 MATERIALS FOR HYDRANTS AND APPURTENANCES

All materials used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502-54.

–2.02 MANUFACTURER AND MARKING

The hydrant shall be of standard manufacture and of a pattern approved by the Owner-municipality. The name or mark of the manufacturer, size of the valve opening and year made shall be plainly cast in raised letters and so placed on the hydrant barrel as to be visible after the hydrant has been installed.

–2.03 TYPE AND MOUNTING

As a minimum requirement, all hydrants shall be designed for a working pressure of 150 lbs. per square inch and in workmanship, design and material, shall conform to the AWWA Standard C502-54, or latest revision thereof. The hydrant bodies shall be cast iron, fully mounted with approved noncorrodible metals. All wearing surfaces shall be either bronze or some other approved noncorrodible material, and there shall be no moving bearing or contact surfaces of iron in contact with iron or steel. All contact surfaces shall be finished or machined in the best workmanlike manner and all wearing surfaces shall be easily renewable.

The design of the hydrant shall be such that all working parts may be removed through the top of the hydrant and shall have the required AWWA specified number of turns of the stem to open the gate an area equal to the area of the valve opening. Any change in area of the water passage through the valve must have an easy curve, and all outlets must have round corners of good radius.

–2.04 END CONNECTIONS

The dimensions of hub or bell end connections shall conform to the dimensions of the AWWA Standard No. 100-55. The dimensions for the mechanical joint connections shall conform to the A. S. A. Specification No. A21.11.

The flanged lateral connection shall be faced and drilled to conform to the American Standard for 125-lb. W. P. flanged fittings. Flanges shall be machine finished to a true surface. Bolt holes shall straddle the vertical center line.

–2.05 HYDRANT DIMENSIONS

The dimensions and details of hydrant and nozzles, unless otherwise noted, shall be as follows:

	Hydrant 4-inch Connection	*Hydrant 6-inch Connection*
Hydrant connection pipe size inside dia.	4 inches	6 inches
Standpipe, minimum inside dia.	6 inches	7 inches
Length of hyd. from bottom of hyd. conn. to sidewalk ring	As required by Owner	
Valve opening, minimum dia.	4 inches	5 inches
Size of auxiliary gate valve	4 inches	6 inches
Hose nozzles, number and size	2—2½ inches	2—2½ inches
Thread (Nat. Board of Fire Underwriters)	7½ per inch	7½ per inch
Outside dia. finished	3-1/16 ins.	3-1/16 ins.
Dia. at root of thread	2.8715 inches	2.8715 inches
Pattern of thread	60° V-thread	60° V-thread
Total length of threaded male nipple	1 inch	1 inch
Streamer nozzles, number and size	} to match Owner's existing pattern	
Thread, outside dia. finished		
Dia. at root of thread		
Spreads		
Pattern of thread		
Total length of threaded male nipple		

All nozzles shall be fitted with cast iron threaded caps with operating nut of the same design and proportions as the hydrant stem nut. Caps shall be threaded to fit the corresponding nozzles and shall be fitted with suitable gaskets for positive water tightness under test pressures.

–2.06 OPERATING NUTS

The operating nuts on hydrant stem and nozzle caps shall be the same for both sizes of hydrants. Dimensions shall be as follows:

Pattern of Nut	Tapered Pentagonal
Height	1-1/16 inch
Size of Pentagon	1.35-inch at bottom of nut
	1.23-inch at top of nut (measured from point to flat)

The hydrant valve shall open by turning to the left (counterclockwise).

–2.07 SHACKLING LUGS

Lugs, if required for harnessing the hydrant to the connecting pipe from the main in the street, shall be provided on the bell of the elbow or on the hydrant bottom casting. A drawing of the lug construction shall be submitted for approval, on request of the Engineer.

–2.08 SIDEWALK FLANGE CONSTRUCTION

Hydrants shall be provided with a sidewalk flange. Breaking devices, if required, shall be at the sidewalk flange which will allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided at this point a safety stem coupling on the operating stem that will shear at the time of impact. Unless otherwise specified, all hydrants shall be equipped with O-Ring stem seals.

–2.09 FACTORY HYDROSTATIC TEST

Before the hydrant is painted at the factory, it shall be subjected to an internal hydrostatic test of 300 pounds per square inch with the hydrant valve in a closed position and again with the hydrant valve in an open position.

–2.10 PAINTING

All iron parts of the hydrant both inside and outside shall be thoroughly cleaned and painted. All inside surfaces and the outside surfaces below the ground line shall be coated with asphalt varnish, Federal Specification TT-V-51a or J. A. N. P-450, unless otherwise specified. They shall be covered with two coats, the first having dried thoroughly before the second is applied.

The outside of the hydrant above the finished ground line shall be thoroughly cleaned and thereafter painted with one coat of paint of a durable composition conforming to Federal Specification TT-P-86a, Type IV, and one additional coat of a color specified by the Owner.

77–3 CONSTRUCTION DETAILS

–3.01 SETTING HYDRANTS

Where shown on the plans or where designated by the Engineer, hydrants shall be installed in accordance with the detail shown on the standard drawings Nos. 65, 66 and 67.

All hydrants shall be inspected in the field upon arrival to ensure proper working order. After installation, they shall be subjected to a hydrostatic test not to exceed the factory test pressure.

–3.02 HYDRANT CONNECTIONS

Hydrant laterals shall consist of a section of 4-inch or 6-inch pipe from the main to the hydrant and shall include an auxiliary gate valve set vertically and placed in the line as indicated in the standard drawing for hydrant settings.

–3.02A Shackle Rods

Hydrants shall be harnessed to the auxiliary gate valve and the valve to the tee at the main with steel rods of size, shape and arrangements, as indicated in the detail drawing for hydrant settings.

–3.02B Auxiliary Gate Valve

All auxiliary gate valves shall conform to Section 75 in all respects, except that the end connections shall be provided with lugs for rodding or the bells shall have sufficient clearance between the body of the valve and the hub to permit the installation of shackles.

–3.02C Cast Iron Valve Boxes

See Section 76-3.06.

–3.03 RESETTING EXISTING HYDRANTS

Where existing hydrants are shown on the plans for adjustments to conform to new street alignment and/or grade, the hydrant shall be relocated without disturbing the location of the hydrant lateral tee at the main.

The method of harnessing the hydrant shall be determined by the conditions found in the field and shall be reshackled or reblocked as directed by the Engineer.

This work shall conform in all respects to the specifications for setting hydrants mentioned elsewhere in these specifications.

–3.04 MOVING EXISTING HYDRANTS

When shown on the plans or when directed by the Engineer, existing hydrants shall be moved. When the existing tee is moved to a new hydrant location, a new tee shall be inserted and the open part of the abandoned tee shall be securely sealed and shackled. When the existing hydrants are blocked to the main line, the same method shall be used to anchor the hydrants at their new locations unless, in the judgment of the Engineer, it is found necessary to shackle them in which case the harnessing of the hydrants shall be as indicated in the standard detailed drawings for Hydrant Setting Type A and Type B. The work shall conform in all respects to hydrant settings as described elsewhere in these specifications.

–3.05 RECONNECTING EXISTING HYDRANTS

When reconnecting existing hydrants is specified, the hydrants remain unchanged in their original position, but the existing hydrant connection is changed to connect with a new hydrant tee provided in a new main.

Hydrant reconnections shall meet all the requirements for new work.

Where existing hydrants were not shackled to the old main, the new connection shall be shackled with steel rods as shown on the standard drawings, or by such other shackling method as may be directed by the Engineer.

All hydrants shall be set on concrete pier blocks as shown on the standard drawing.

The hydrant drain shall waste into a pit of crushed stone or gravel situated at the base of the hydrant as shown on the standard drawing.

–3.06 HYDRANT EXTENSIONS

The minimum requirements for all flanged hydrant barrel extensions and flanged adaptors for hydrant lateral connections shall, in design, material and workmanship conform to the AWWA Standards for such castings. The drilling of the flanges on the extensions shall match the drilling of the flanges on the hydrant. The drilling of the adaptor flanges shall match those of the hydrant foot flange and the auxiliary gate valve flange.

77–4 MEASUREMENT AND PAYMENT

–4.01 PAYMENT FOR FIRE HYDRANTS

Payment will be made at the unit contract price per each for "Hydrant, 4-inch Connection" and "Hydrant, 6-inch Connection" which shall be full compensation for the hydrant in place. As incidental thereto, the Contractor shall include in his unit contract prices of the hydrants all costs of every kind for shackles, tie rods, pier blocks, coarse gravel, painting, and other things that will be required for the complete installation of the hydrant as specified, excepting however, that the 4-inch and 6-inch pipe connecting the hydrant to the main will be paid for at the unit contract price per linear foot for "Water Mains." Auxiliary gate valves will be paid for at the unit contract price per each for "Gate Valves."

–4.02 RESETTING EXISTING HYDRANTS

Payment for "Resetting Existing Hydrant" will be made at the unit contract price per each and shall include the costs for shackling, painting and all other labor, material and equipment necessary to place and connect the hydrant in its new location, but the unit contract price shall not include payment for new pipe used for hydrant connections. New pipe will be paid for at the unit contract price per linear foot for "Water Mains" of the size used.

–4.03 MOVING EXISTING HYDRANTS

Payment will be made for "Moving Existing Hydrants" at the unit contract price per each and shall include all costs for shackling, painting and all other labor, material and equipment necessary to move and reconnect the hydrant in its new position, excepting however, that the new pipe and fittings for hydrant connections will be paid for at the unit contract price per linear foot for "Water Mains."

–4.04 RECONNECTING EXISTING HYDRANTS

Payment for "Reconnecting Existing Hydrants" will be made at the unit price per each, and it shall be full compensation for adjustment of hydrant connections, shackling, painting and all other labor, material and equipment necessary to connect the hydrant to the new main, excepting however, that any new pipe used for the connection will be paid for at the unit contract price per linear foot for "Water Mains."

–4.05 HYDRANT EXTENSIONS

Payment for vertical or horizontal hydrant extensions shall be made at the unit contract price bid for "Hydrant Extensions" per pound in place. The weight so paid for shall include the weight of castings together with the weight of additional length of hydrant rods, bolts, nuts, washers and gaskets.

The price paid per pound shall cover the cost of all machine work and all labor required to lengthen the rods and there will not be any additional compensation either per pound additional or otherwise for such work. Lengthening of hydrants to specified length with vertical hydrant extensions will not be allowed except by permission of the Engineer, and in such cases no extra payment will be allowed for vertical extensions, and such costs shall be included in the unit price bid for "Hydrants."

Section 78—Restoration and Cleanup of Water Main Construction

78–1 GENERAL

Surface improvements such as pavement, curb, curb and gutter and other like surface facilities that have been removed or damaged during the construction of water mains, shall be restored by the Contractor if there is one or more bid items in the proposal to cover the work.

If there is no bid item in the proposal for restoration, it will be assumed that the Owner will do the work with its own forces. The Contractor shall, however, backfill the trench to the surface and perform such work as may be required under the specifications and special provisions.

78–2 CONSTRUCTION DETAILS

–2.01 REMOVAL OF EXISTING STREET IMPROVEMENTS

Removal and disposal of existing street improvements shall be done in accordance with applicable sections of the specifications, and Section 73-1.03 which provides that removal and disposal shall be considered as incidental to the construction and the costs thereof shall be included in the unit contract price per linear foot for "Trench Excavation and Backfill."

-2.02 RESTORATION OF EXISTING STREET IMPROVEMENTS

Restoring of existing street improvements shall be as specified in the applicable sections of these specifications pertaining to their construction and the measurement and payment will be as described in Sections 78-3.01 and 78-3.02.

-2.03 MAINTAINING POSTAL SERVICE

Maintenance of postal service including removal and replacement of mail boxes, and new supports for boxes whenever such is necessary for proper replacement, shall be in accordance with Section 7.19, shall be performed satisfactory to the Engineer. All such work shall be considered as incidental to the construction and the costs thereoof shall be included by the Contractor in other bid items of the contract, unless otherwise provided in the special provisions and proposal.

-2.04 FINISHING AND CLEANUP

Finishing and cleanup shall be as specified in Section 57.

78-3 MEASUREMENT AND PAYMENT

-3.01 EXISTING STREET IMPROVEMENTS

Cement concrete pavement, driveway, sidewalk, asphalt concrete pavement, or bituminous plant mix pavement will be measured and payment made therefor at the unit contract prices specified in the applicable sections pertaining to their construction, excepting however, that measurement and payment will be limited to a trench width equal to the outside diameter of the barrel of the pipe plus forty-eight (48) inches. Any surfaces requiring restoration outside of this limit which is removed or damaged by the Contractor, shall be restored by him at his own expense.

-3.02 CEMENT CONCRETE CURB, CURB AND GUTTER

Payment for cement concrete curb and curb and gutter will be made at the unit contract prices set up for same in applicable sections pertaining to their construction. Measurement for payment will be restricted as follows:

1. Where the water main crosses the curb or curb and gutter at right angles, measurement for payment will be the length of the curb removed but not more than the outside diameter of the pipe plus forty-eight (48) inches.
2. Where the water main crosses the curb or curb and gutter in a diagonal course, the measurement will be no more than the diagonal distance along the face of the curb between two lines, each projected parallel to the outside of the barrel of the pipe and each twenty-four (24) inches distant therefrom.
3. Where it is necessary to remove curb or curb and gutter within the pay width of trench excavation (outside pipe diameter plus 24 inches each side), and where the curb or curb and gutter parallels the center line of the water main, or approximately so, measurement and payment will be at the unit contract price per linear foot for the actual length of curb, or curb and gutter, that is required to be constructed.

-3.03 FINISHING AND CLEANUP

Whenever the proposal includes an item per lump sum or per station for "Finishing and Cleanup", the measurement and payment will be made in accordance with Section 57, Finishing and Cleanup.

If the proposal does not include an item for "Finishing and Cleanup", the work required shall be performed as specified in Section 57, but shall be considered as incidental to the construction and the costs thereof shall be included by the Contractor in other bid items of the contract.

DIVISION V—STRUCTURAL

Division V is being reserved for structural sections to be included in revised reprints of this edition or supplements thereto if there appears to be sufficient need for inclusion of this highly specialized subject. Meantime, for structural specifications the engineer is referred to the 1962 revised edition of Standard Specifications for Road and Bridge Construction, published by the Department of Highways, Olympia, Washington.

DIVISION VI — STANDARD FORMS

DIVISION VI—STANDARD FORMS

(STANDARD FORM NO. 1)

PROPOSAL

....., Washington, ..., 19.....

To the City Clerk (or other)
Anywhere, Washington

Project No. .....
L.I.D. No. .....
W.O. No. .....

The undersigned hereby certif..... that ..... ha..... personally examined the location and construction details of work as outlined on the plans and specifications for Project No....., ...
(Job description and location)

.....

.....

and ha..... read and thoroughly understand..... the plans and specifications and contract governing the work embraced in this improvement and the method by which payment will be made for said work and hereby propose..... to undertake and complete the work embraced in this improvement in accordance with said plans, specifications, and contract and at the following schedule of rates and prices:

(NOTE: Unit prices for all items, all extensions and total amount of bid must be shown. Show unit prices in both words and figures and where conflict occurs the written or typed words shall prevail.)

ITEM NO.	APPROX. QUANTITY	ITEM WITH UNIT PRICED BID (Unit prices to be written in words)	UNIT PRICE Dollars	UNIT PRICE Cts.	AMOUNT Dollars	AMOUNT Cts.
1.	1011 Cu. Yds.	Unclassified Excavation including haul, at SEVENTY-FIVE CENTS Per Cu. Yd.		75	758	25
2.	1053 Cu. Yds.	Bankrun Gravel for streets, at ONE DOLLAR Per Cu. Yd.	1	00	1053	00
3.	297 Cu. Yds.	Crushed Stone Top Course, at THREE DOLLARS Per Cu. Yd.	3	00	891	00
4.	3860 Cu. Yds.	Trench Excavation and Backfill Class A (Sanitary) ONE DOLLAR Per Cu. Yd.	1	00	3860	00
5.	200 Lin. Ft.	10-Inch Diameter Class C. Sewer Pipe (Sanitary), at FOUR DOLLARS Per Lin. Ft.	4	00	800	00

*Owner's tentative statement of items subject to 4% retail sales tax to be paid by Owner—Items 4 and 5 (subject to final determination) See Sec. 7.09, of standard specifications.

Total Bid $7362.25
*Sales Tax 186.40
Grand Total $7548.65

FORM FURNISHED BY POLITICAL SUBDIVISION.

(STANDARD FORM NO. 2)

PROPOSAL SIGNATURE SHEET

.....
(Job Description and Location)

Project No. .....

L.I.D. No. .....

W.O. No. .....

....., 19.....
(Date)

.....
(Bidder)

by .....
(Authorized Official)

.....
(Address)

NOTE: (1) If the bidder is a co-partnership, so state, giving firm name under which business is transacted.

(2) If the bidder is a corporation, this proposal must be executed by its duly authorized officials.

(3) If no bid is submitted, kindly mark "NO BID" and return to .....
(City clerk, or other)

.....
(Address)

FORM FURNISHED BY POLITICAL SUBDIVISION.

(STANDARD FORM NO. 3)

BID BOND FORM

Herewith find deposit in the form of a certified check, cashiers check, cash, or bid bond in the amount of $..... which amount is not less than five percent of the total bid.

SIGN HERE .....

BID BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, ..., as Principal,

and ....., as Surety,

are held and firmly bound unto the (Political Subdivision) , as Obligee, in the penal sum of

..... Dollars, for the

payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

The condition of this obligation is such that if the Obligee shall make any award to the Principal for

according to the terms of the proposal or bid made by the Principal therefor, and the Principal shall duly make and enter into a contract with the Obligee in accordance with the terms of said proposal or bid and award and shall give bond for the faithful performance thereof, with Surety or Sureties approved by the Obligee; or if the Principal shall, in case of failure so to do, pay and forfeit to the Obligee the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect and the Surety shall forthwith pay and forfeit to the Obligee, as penalty and liquidated damages, the amount of this bond.

SIGNED, SEALED AND DATED THIS .....DAY OF ....., 19.....

.....
Principal

.....
Surety

....., 19.....

Received return of deposit in the sum of $.....

FURNISHED BY POLITICAL SUBDIVISION. .....

(STANDARD FORM NO. 4)

BIDDER'S CHECK LIST

The bidder's attention is especially called to the following forms which must be executed in full as required:

(a) Proposal.

The unit prices bid must be shown in the space provided. Show unit prices in both words and figures.

(b) Proposal Signature Sheet.

To be filled in and signed by the bidder. Non-collusion Affidavit must be subscribed to and sworn beforc a notary public.

(c) Bond accompanying bid.

This form is to be executed by the bidder and the surety company unless bid is accompanied by a certified check. The amount of this bond shall be not less than 5% of the total amount bid and may be shown in dollars or on a percentage basis.

The following forms are to be executed after the contract is awarded:

(a) Contract.

This agreement to be executed by the successful bidder.

(b) Performance Bond

To be executed by the successful bidder and his surety company.

FORM FURNISHED BY POLITICAL SUBDIVISION.

(STANDARD FORM NO. 5)

CONTRACT

THIS AGREEMENT, made and entered into in triplicate, this ..... day of ....., 19..... by and between (Political Subdivision) , hereinafter called the Owner, and .....

.....

hereinafter called the Contractor,

WITNESSETH:

That in consideration of the terms and conditions contained herein and attached and made a part of this agreement, the parties hereto covenant and agree as follows:

I. The Contractor shall do all work and furnish all tools, materials, and equipment for

.....

.....

.....

.....

in accordance with and as described in the attached plans and specifications and the Standard Specifications for Municipal Public Works Construction, which are by this reference incorporated herein and made a part hereof, and shall perform any alterations in or additions to the work provided under this contract and every part thereof.

Work shall start within ..... days after execution of contract and be completed in ..... (calendar, working) days.

If said work is not completed within the time specified, the Contractor agrees to pay to the Owner the sum of ..... dollars for each and every day said work remains uncompleted after expiration of the specified time, as liquidated damages.

The Contractor shall provide and bear the expense of all equipment, work and labor of any sort whatsoever that may be required for the transfer of materials and for constructing and completing the work provided for in this contract and every part thereof, except such as are mentioned in the specifications to be furnished by the .....(Owner).

II. The ..... (Owner) hereby promises and agrees with the Contractor to employ, and does employ the Contractor to provide the materials and to do and cause to be done the above described work and to complete and finish the same according to the attached plans and specifications and the terms and conditions herein contained and hereby contracts to pay for the same according to the attached specifications and the schedule of unit or itemized prices hereto attached, at the time and in the manner and upon the conditions provided for in this contract.

III. The Contractor for himself, and for his heirs, executors, administrators, successors, and assigns, does hereby agree to the full performance of all the covenants herein contained upon the part of the Contractor.

IV. It is further provided that no liability shall attach to the ..... (Owner)..... by reason of entering into this contract, except as expressly provided herein.

IN WITNESS WHEREOF the parties hereto have caused this agreement to be executed the day and year first hereinabove written.

Countersigned:

.....
(Owner)

this ..... day of ..... 19.....

..... By .....
(Authorized Official)

Approved as to legality:

....
(Legal Officer) (Contractor)

By .....

FURNISHED BY POLITICAL SUBDIVISION.

(STANDARD FORM NO. 6)

PERFORMANCE BOND

BOND TO (Political Subdivision)

KNOW ALL MEN BY THESE PRESENTS:

That we, the undersigned, ...

.....

.....

as principal, and ....., a corporation organized and existing under the laws of the State of ....., as a surety corporation, and qualified under the laws of the State of Washington to become surety upon bonds of contractors with municipal corporations, as surety, are jointly and severally held and firmly bound to the (Political Subdivision) in the penal sum of $..... for the payment of which sum on demand we bind ourselves and our successors, heirs, administrators or personal representatives, as the case may be.

This obligation is entered into in pursuance of the statutes of the State of Washington, the Ordinances of the (Political Subdivision)

Dated at ....., Washington, this ..... day of ....., 19.....

Nevertheless, the conditions of the above obligation are such that:

WHEREAS, under and pursuant to Ordinance (or Resolution) No. ..... of the (Political Subdivision) , passed ....., 19....., the (Authorized Official) of said (Political Subdivision) has let or is about to let to the said .....
the above bounden Principal, a certain contract, the said contract being numbered .....,
and providing for .....

.....

.....

(which contract is referred to herein and is made a part hereof as though attached hereto), and

WHEREAS, the said Principal has accepted, or is about to accept, the said contract, and undertake to perform the work therein provided for in the manner and within the time set forth;

NOW, THEREFORE, if the said .....
shall faithfully perform all of the provisions of said contract in the manner and within the time therein set forth, or within such extensions of time as may be granted under said contract, and shall pay all laborers, mechanics, sub-contractors and material men, and all persons who shall supply said principal or sub-contractors with provisions and supplies for the carrying on of said work, and shall hold said (Political Subdivision) harmless from any loss or damage occasioned to any person or property by reason of any carelessness or negligence on the part of said principal, or any sub-contractor in the performance of said work, and shall indemnify and hold the (Political Subdivision) harmless from any damage or expense by reason of failure of performance as specified in said contract or from defects appearing or developing in the material or workmanship provided or performed under said contract within a period of one year after its acceptance thereof by the (Political Subdivision) , then and in that event this obligation shall be void; but otherwise it shall be and remain in full force and effect.

Approved as to legality: .....

.....

Approved: .....

.....

.....

FURNISHED BY POLITICAL SUBDIVISION.

This form may be used with an attached list, or may be printed on back of payroll.

(STANDARD FORM NO. 7)

MINIMUM WAGE AFFIDAVIT FORM

(POLITICAL SUBDIVISION) .....
} ss.
COUNTY OF .....

I, the undersigned, having been duly sworn, depose, say and certify that in connection with the performance of the work, payment for which this voucher is submitted, I have paid the following rate per hour for each classification of laborers, workmen, or mechanics, as indicated upon the attached list, now referred to and by such reference incorporated in and made an integral part hereof, for all such employed in the performance of such work; and no laborer, workman or mechanic so employed upon such work has been paid less than the prevailing rate of wage or less than the minimum rate of wages as specified in the principal contract; that I have read the above and foregoing statement and certificate, know the contents thereof and the substance as set forth therein is true to my knowledge and belief.

.....
CONTRACTOR

Subscribed and sworn to before me on this .....day of

....., 19.....

.....
Notary Public in and for the State of Washington
residing at

.....

FURNISHED BY POLITICAL SUBDIVISION.

This form to be used, if required, for requesting permission to employ a subcontractor.

(STANDARD FORM NO. 8)

LETTER FOR EMPLOYMENT OF SUBCONTRACTOR

(Date) , 19.....

Mr. ..... ← NOTE: To be addressed to authorized official.

Dear Sir: Re: Contract No. .....

We, the undersigned, request permission of the (Political Subdivision) to employ a subcontractor in order to fully perform the work covered by the terms of that written contract made and executed by and between the (Political Subdivision) and ourselves on the ..... day of ....., 19....., designated as Contract No. .....

We intend to employ the firm of

a.

b.

c.

for the purposes of performing the following described work, ...

.....

and represent and warrant that the work will be performed by said subcontractors in a good and workmanlike manner and under our direct supervision. We further represent and warrant that the work to be performed by them constitutes approximately ..... percent of the total dollar value of said contract.

Very truly yours,

....

(Signature of Surety) (CONTRACTOR)

TO BE FURNISHED BY CONTRACTOR.

(STANDARD FORM NO. 9)

(POLITICAL SUBDIVISION)

CONTRACT CHANGE ORDER AGREEMENT

Contract.....

Contractor.....

Summary of Proposed Change:.....

.....

.....

.....

Plan Revisions: Dwg. # Rev. #

Specification Revisions: Page # Paragraph #

New Plans or Specs:

Price Change:

Lump Sum Increase $..... or Decrease $.....

or

Item	Quantity	Unit Price	Price	Increase	or	Decrease
.....	.....		.....	.....		.....
.....	.....		.....	.....		.....
.....	.....		.....	.....		.....

Total $..... or $.....

Signatures: Contractor ..... Date .....

Engineer ..... Date .....

Approved By ..... 19..... .....
(Municipal Authority) (Date) (Authorized Official)

FURNISHED BY POLITICAL SUBDIVISION.

(STANDARD FORM NO. 10)

Sample form letter to be used for Submission of Force Account statements for Public Road construction work.

GENERAL CONTRACTORS, INC.
1946 South Alaska St.
Tacoma, Washington

January 2, 1962

NOTE: To be Addressed to Authorized Official

Dear Sir:

Re: Job No. 99999—Force Account Performed—Removing and replacing 8″ wood culvert pipe with standard culvert pipe across roadway on "B" St. at station 12 + 39 on Dec. 28, 1961.

This extra work was required because the existing wood pipe was deteriorated and had to be replaced before asphalt could be placed, and was ordered by Mr. ....., ... (Name) (Title) of ..... (Political Subdivision)

Labor (Health and Welfare Included)				
Foreman	2 hrs. at $3.86	$7.72		
Pipe Layer	4 hrs. at 3.22	12.88		
Laborer	8 hrs. at 3.00	24.00	$44.60	
Materials				
40 Lin. Ft. 8″ Culvert	$0.90	36.00	36.00	
Equipment				
Pickup Truck 4 hrs.	at $1.50	6.00	6.00	$ 86.60
Profit and Overhead				
18% of Labor, Equipment, and Materials				15.59
Payroll Taxes				
Industrial Insurance				
14 hrs. at $0.35	$0.49			
½ Medical Aid				
14 hrs. at $0.0085	$0.12			0.61
				$102.80
*4% State Sales Tax on Materials ($36.00)				1.44
TOTAL FORCE ACCOUNT				$104.24

*Percentage to be in accordance with current rates prescribed by law.

Yours very truly,

GENERAL CONTRACTORS, INC.

TO BE FURNISHED BY CONTRACTOR.

Sample form letter to be used for submission of Force Account statements on all projects other than Public Road construction work.

(STANDARD FORM NO. 11)

GENERAL CONTRACTORS, INC.
1946 South Alaska St.
Tacoma, Washington

February 18, 1959

Mr. ..... ← NOTE: To be addressed to authorized official.

Re: Force Account. L.I.D. No. 4444—Lowering Existing Sanitary Sewer at 3714 So. Cushman Ave. (Sta. 46 + 10, on the left). January 5, 1959.

Dear Sir:

This work was necessary because the sanitary line was in the subgrade of the roadway. This extra work was ordered by Mr. ....., ... (Title), (Political Subdivision)

Labor (Health and Welfare Incl.)				
Foreman	1 hr. at $ 3.86	$ 3.86		
Pipe Layer	1 hr. at 3.22	3.22		
Laborer	8 hrs. at 2.91	23.28		
Flagman	4 hrs. at 2.80	11.20	$41.56	
Materials				
40 Lin. Ft. 6-inch Sewer Pipe	$0.342	$13.68		
1 Only, 6-inch ⅛ Bend	0.765	0.77		
Mortar		0.40	14.85	
Equipment				
Pickup Truck	1 hr. at $1.50		1.50	$ 57.91
Profit and Overhead				
18% of Labor, Equipment and Material				8.69
Payroll Taxes				
Industrial Insurance				
14 hrs. at $0.035	$ 0.49			
½ Medical Aid				
14 hrs. at $0.0085	0.12			0.61
				2.69
*4% State Sales Tax on $67.21				$69.90

*Percentage to be in accordance with current rates prescribed by law.

Very truly yours,

GENERAL CONTRACTORS, INC.

TO BE FURNISHED BY THE CONTRACTOR.

(STANDARD FORM NO. 12)

(POLITICAL SUBDIVISION)

WEEKLY STATEMENT OF WORKING DAYS

Contract No. .....

.....

Date .....

Statement No. .....

TO: ....., (Contractor)

The following statement shows the number of working days charged to your contract for the week ending ....., 19.....

Date	Day	Weather Condition	Working Day	Unworkable Day Caused By Weather Conditions
	Monday			
	Tuesday			
	Wednesday			
	Thursday			
	Friday			

Working days this week .....

Working days previously reported .....

Total working days to date .....

Starting date specified in special provisions .....

Working days specified in contract .....

Computed date for completion (if all days are workable) .....

Total unworkable days to date .....

Revised date for completion .....

Working days remaining to complete contract .....

Project completed on .....

REMARKS:

.....

(Authorized Official)

NOTE: The contractor will be allowed 10 days from date of this report in which to protest in writing the correctness of this statement, otherwise it shall be deemed to have been acccepted as correct.

FURNISHED BY POLITICAL SUBDIVISION.

(STANDARD FORM NO. 13)

NON-COLLUSION AFFIDAVIT

STATE OF WASHINGTON }
COUNTY OF ..... } ss.

NON-COLLUSION AFFIDAVIT

....., being first duly sworn, on his oath says ..... that the bid above submitted is a genuine and not a sham or collusive bid, or made in the interest or on behalf of any person not therein named; and he further says that the said bidder has not directly or indirectly induced or solicited any bidder on the above work or supplies to put in a sham bid, or any other person or corporation to refrain from bidding; and that said bidder has not in any manner sought by collusion to secure to ..... self an advantage over any other bidder or bidders.

.....

(Contractor)

Subscribed and sworn to before me this ..... day of ....., 19.....

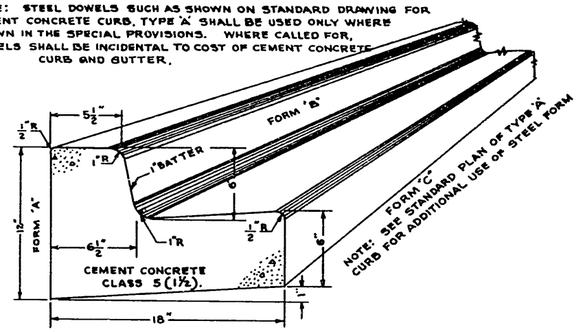
.....

Notary Public in and for the State of Washington, residing at .....

FURNISHED BY THE POLITICAL SUBDIVISION WHENEVER A NON-COLLUSION AFFIDAVIT IS REQUIRED.

DIVISION VII—STANDARD PLANS (DRAWINGS)

NOTE: STEEL DOWELS SUCH AS SHOWN ON STANDARD DRAWING FOR CEMENT CONCRETE CURB, TYPE 'A' SHALL BE USED ONLY WHERE SHOWN IN THE SPECIAL PROVISIONS. WHERE CALLED FOR, DOWELS SHALL BE INCIDENTAL TO COST OF CEMENT CONCRETE CURB AND GUTTER.



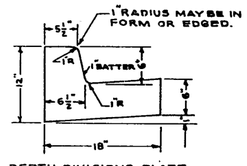
NOTES:
WHERE DROP CURB IS USED FOR DRIVEWAYS AND ALLEYS CONSTRUCTION SHALL BE SIMILAR TO THAT SHOWN ON STANDARD PLANS NOS 9 & 10.

THIS STANDARD SECTION MAY BE USED WITH WOOD RIBBONS IF DESIRED. IF THIS IS DONE HOWEVER, THE END RESULT SHALL BE EXACTLY AS SHOWN. WOOD RIBBONS SHALL BE OF SIZE AND TYPE DESIGNATED BY THE ENGINEER.

FORMS SHALL BE TRUE TO LINE & GRADE AND SECURELY STAKED.

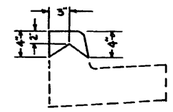
THE 1"RADIUS ON UPPER FACE OF CURB MAY BE FORMED BY EDGER OR BUILT INTO FACE FORM. 1"RADIUS ON LOWER FACE OF CURB WILL BE FORMED BY THE FACE FORM.

TYPICAL SECTION FOR CURB & GUTTER



FULL DEPTH DIVISIONS PLATE
TO BE USED ONLY WHERE THRU JOINTS ARE TO BE PLACED, OR AS DIRECTED BY THE ENGINEER. SEE NOTE BELOW FOR THRU JOINTS.

NOTE: STEEL FORMS SHALL MEET DIMENSIONS SHOWN AND SHALL BE OF STANDARD DESIGN COMMONLY USED.

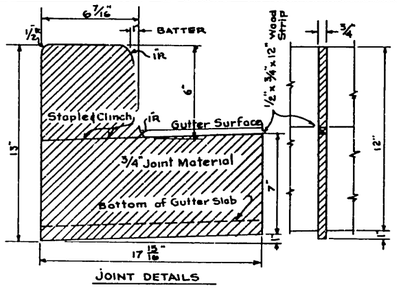


SKELETON DIVISION PLATE OR OVERHEAD CLAMPS
TO BE USED BETWEEN PARTIAL DIVISION PLATES AND BETWEEN PARTIAL DIVISION PLATE AND FULL DIVISION PLATE. VOID LEFT IN CURB BY PLATE SHALL BE FILLED WITH GROUT AND/OR EDGED; AS SOON AS FACE FORMS ARE REMOVED, OR AS ENGINEER MAY OTHERWISE DIRECT.
OVERHEAD CLAMPS SHALL BE USED IN LIEU OF SKELETON DIVISION PLATES WHERE SO DIRECTED BY THE ENGINEER.

DIMENSIONS OTHER THAN THOSE SHOWN SHALL BE INDENTICAL TO FULL DEPTH DIVISION PLATE.

PARTIAL DIVISION PLATES
TO BE USED AT 10' MINIMUM 15' MAXIMUM SPACING AND USED WITH DUMMY JOINTS, IF SO DIRECTED BY ENGINEER. SEE NOTE BELOW FOR DUMMY JOINTS.

GENERAL DATA - STEEL FORMS



JOINT DETAILS

DUMMY JOINTS OF NOT LESS THAN ⅜ THICKNESS SHALL BE OF THE SAME DIMENSIONS AS THRU JOINTS, EXCEPT THAT IT SHALL EXTEND ONLY 2¼" INTO GUTTER SECTION.

DUMMY JOINTS

GENERAL NOTES

JOINTS: DUMMY JOINTS SHALL BE PLACED NOT TO EXCEED 15' C/C NOR LESS THAN 10' C/C. THRU JOINTS SHALL BE PLACED ONLY AT POINTS OF TANGENCY ON STREETS, ALLEY AND DRIVEWAY RETURNS. THRU JOINTS SHALL BE CAPPED WITH A ½" x ¾" x 12" WOOD STRIPS ON TOP OF JOINT MATERIAL AS SHOWN. ALL JOINTS SHALL BE CLEAN AND IN THE GUTTER SECTION THEY SHALL BE EDGED. THRU JOINTS SHALL BE POURED WITH AN APPROVED TYPE OF JOINT SEALANTS AND ALL COSTS SHALL BE INCIDENTAL TO COST OF THE CONTRACT.

FORMS SHALL BE STEEL.

MATERIAL SHALL MEET REQUIREMENTS OF THESE SPECIFICATIONS.

CONCRETE. SHALL BE CEMENT CONCRETE CLASS 5(1½)

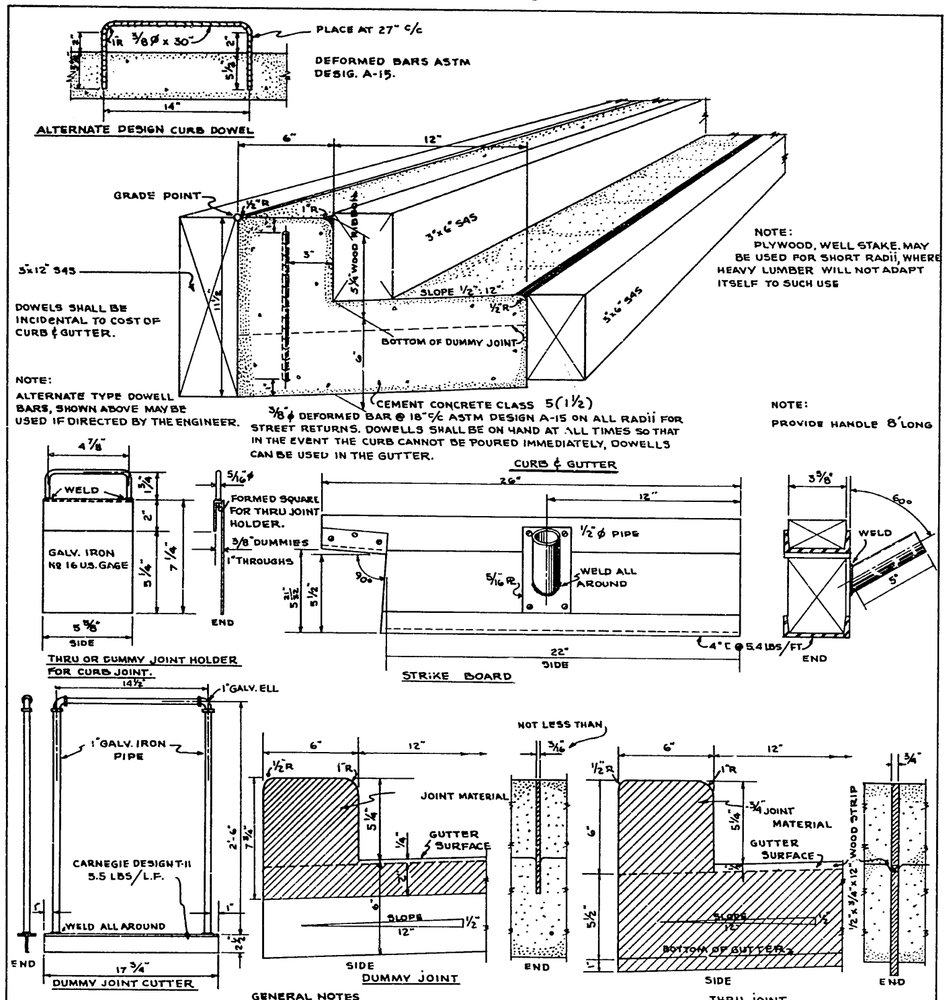
PROCEDURES: FOR FURTHER REQUIREMENTS FOR FORMS, FORM SETTING, PLACING, FINISHING AND CURING SHALL BE AS OUTLINED IN THESE SPECIFICATIONS.

*CEMENT CONCRETE CURB & GUTTER, TYPE "A," PER LINEAR FOOT. PAYMENT

Do Not Scale

Cement Concrete Curb & Gutter Type "A"

Standard Plan No. 1



3/8" ø DEFORMED BAR @ 18" C/C ASTM DESIGN A-15 ON ALL RADII FOR STREET RETURNS. DOWELLS SHALL BE ON HAND AT ALL TIMES SO THAT IN THE EVENT THE CURB CANNOT BE POURED IMMEDIATELY, DOWELLS CAN BE USED IN THE GUTTER.

GENERAL NOTES

DUMMY JOINTS SHALL BE PLACED NOT TO EXCEED 15' C/C
THRU JOINTS SHALL BE PLACED ONLY AT POINTS OF TANGENCY ON STREETS, ALLEYS & DRIVEWAYS RETURNS. THEY SHALL BE CAPPED WITH A ½" x 3/4" x 12" WOOD STRIP ON TOP OF JOINT MATERIAL AS SHOWN. ALL JOINTS SHALL BE CLEAN & IN THE GUTTER SECTION THEY SHALL BE EDGED.
THRU JOINTS SHALL BE POURED WITH AN APPROVED TYPE OF JOINT SEALANTS, AND ALL COSTS SHALL BE INCIDENTAL TO COST OF THE CONTRACT.
FORMS SHALL BE WOOD AS SHOWN
MATERIAL SHALL MEET REQUIREMENTS OF THESE SPECIFICATIONS.
CONCRETE SHALL BE CEMENT CONCRETE CLASS 5(1½).
PROCEDURES: FOR FURTHER REQUIREMENTS FOR FORMS, FORM SETTING, PLACING, FINISHING AND CURING SHALL BE AS OUTLINED IN THESE SPECIFICATION.

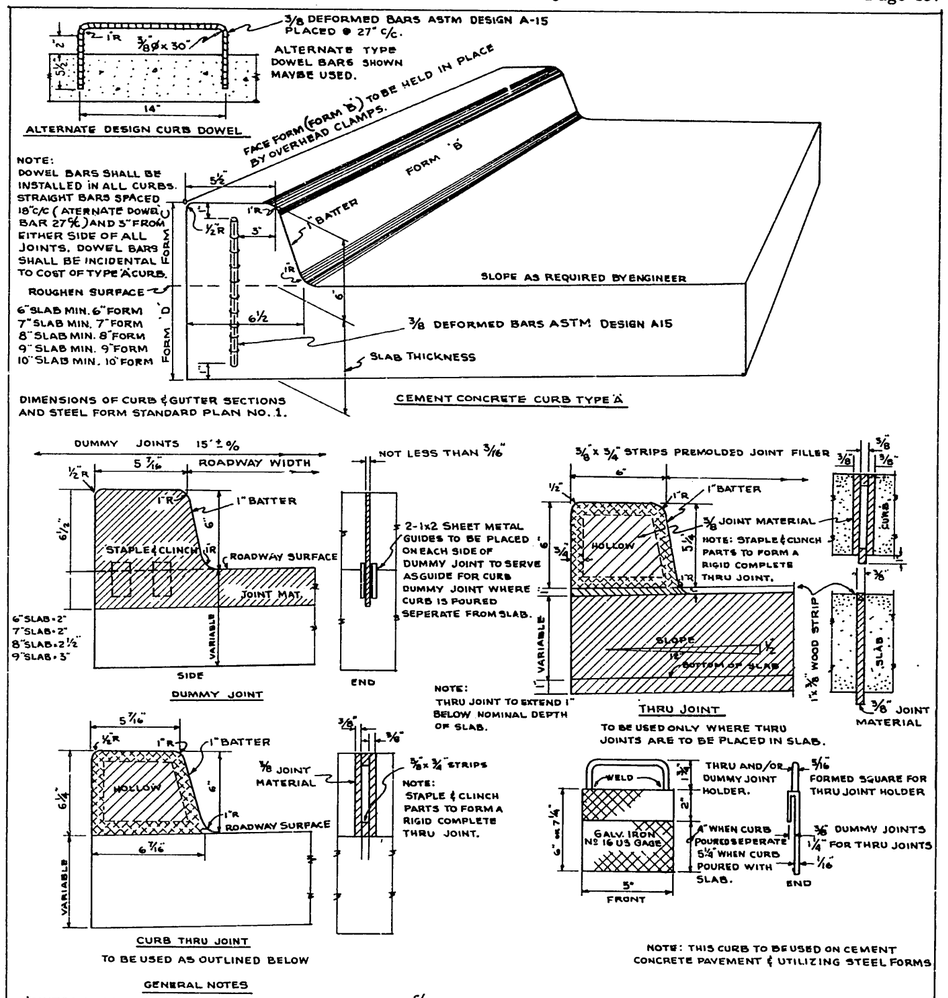
PAYMENT

"CEMENT CONCRETE CURB & GUTTER TYPE 'B'," PER LINEAR FOOT

DO NOT SCALE

Cement Concrete Curb & Gutter Type "B"

Standard Plan No. 2



GENERAL NOTES

JOINTS: DUMMY JOINTS SHALL BE PLACED NOT TO EXCEED 15' C/C.
THRU JOINTS SHALL BE PLACED ONLY AT POINTS OF TANGENCY ON STREET, ALLEY AND DRIVEWAY RETURNS, WHERE THRU JOINTS OCCUR IN THE PAVEMENT SLAB.
CURBS THRU JOINTS SHALL BE PLACED ONLY WHERE THRU JOINTS DO NOT OCCUR IN THE PAVEMENT SLAB.
MATERIAL SHALL MEET REQUIREMENTS OF THESE SPECIFICATIONS.
FORMS SHALL BE STEEL.
CONCRETE SHALL BE CEMENT CONCRETE CLASS 5(1½).
PROCEDURES: FOR FURTHER REQUIREMENTS FOR FORMS, FORMS SETTING, PLACING, FINISHING, & CURING SEE THESE SPECIFICATIONS.

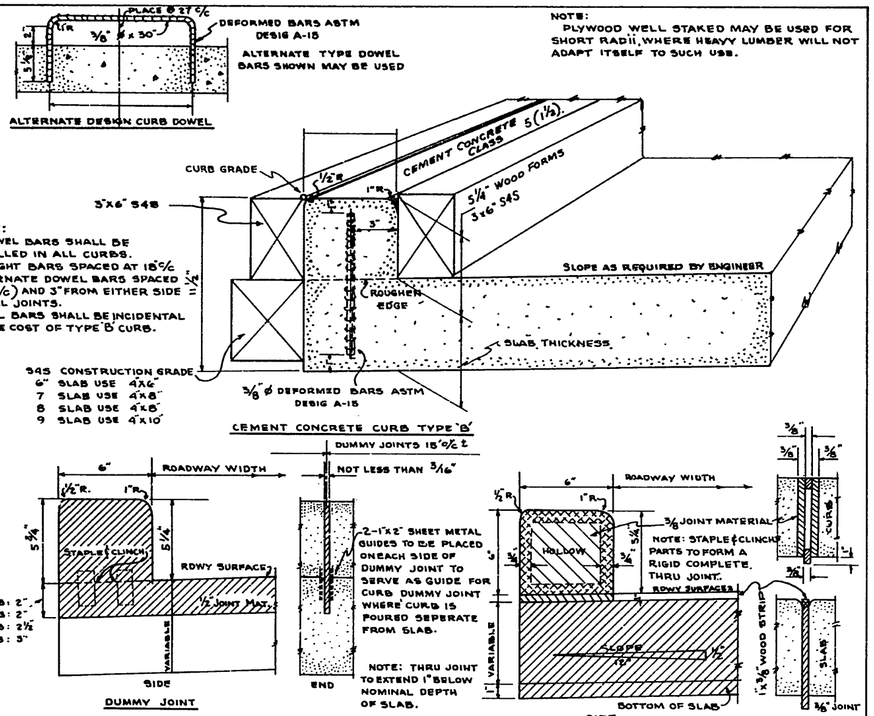
PAYMENT

"CEMENT CONCRETE CURB, TYPE 'A'," PER LINEAR FOOT.

DO NOT SCALE

Cement Concrete Curb Type "A"

Standard Plan No. 3



NOTE:
PLYWOOD WELL STAKED MAY BE USED FOR SHORT RADII, WHERE HEAVY LUMBER WILL NOT ADAPT ITSELF TO SUCH USE.

NOTE:
DOWEL BARS SHALL BE INSTALLED IN ALL CURBS. STRAIGHT BARS SPACED AT 18"c/c (ALTERNATE DOWEL BARS SPACED @ 27"c/c) AND 3" FROM EITHER SIDE OF ALL JOINTS. DOWEL BARS SHALL BE INCIDENTAL TO THE COST OF TYPE 'B' CURB.

NOTE: THIS CURB TO BE USED ON CEMENT CONCRETE PAVEMENT AND UTILIZING WOOD FORM.

Do Not Scale

GENERAL NOTES

JOINTS: DUMMY JOINTS SHALL BE PLACED NOT TO EXCEED 15'c/c. THRU JOINTS IN CURB SHALL BE PLACED ONLY AT POINTS OF TANGENCY ON STREET ALLEY & DRIVEWAYS RETURNS, AND WHERE THRU JOINTS OCCUR IN THE PAVEMENT SLAB.

THRU JOINTS IN PAVEMENTS SHALL BE POURED WITH AN APPROVED TYPE OF JOINT SEALANTS & ALL COSTS SHALL BE INCIDENTAL TO THE COST OF THE CONTRACT.

FORMS SHALL BE WOOD.

MATERIAL SHALL MEET REQUIREMENTS OF THESE SPECIFICATIONS.

CONCRETE SHALL BE CEMENT CONCRETE CLASS 5(1½).

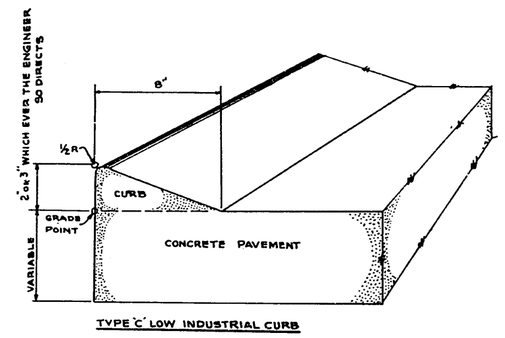
PROCEDURES: FOR FURTHER REQUIREMENTS FOR FORMS, FORM SETTING, PLACING, FINISHING & CURING SEE THESE SPECIFICATIONS.

PAYMENT

"CEMENT CONCRETE CURB, TYPE 'B'," PER LINEAR FOOT.

Cement Concrete Curb Type 'B'

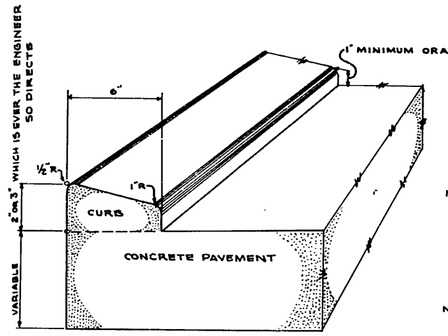
Standard Plan No.4



TYPE 'C' LOW INDUSTRIAL CURB

NOTE:
TYPE 'C' LOW CURB IS PRIMARILY USED IN INDUSTRIAL AREAS AND ALLEY CONSTRUCTION.

NOTE:
LOW CURBS SHALL BE POURED INTEGAL WITH ROADWAY SLAB.

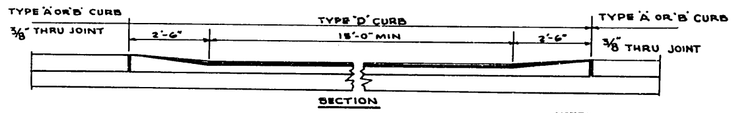


TYPE 'D' LOW CURB

NOTE:
TYPE 'D' LOW CURB IS PRIMARILY USED IN INDUSTRIAL AREAS AND IN SOME CASES USED IN DRIVEWAYS.

NOTE: WHERE TYPE 'D' LOW CURB IS PLACED ON A CURB AND GUTTER PROJECTS, IT SHALL BE AS SHOWN ON STANDARD PLAN NO. 10 AND SHALL BE PAID FOR AS "CEMENT CONCRETE CURB, TYPE 'D', PER LINEAR FOOT.

NOTE:
DOWELS SHALL NOT BE USED UNLESS OTHERWISE SPECIFIED IN THE SPECIAL PROVISIONS.



SECTION

NOTE:
CONCRETE PAVEMENT UNDER LOW CURB SHALL BE PAYED FOR AS PER SQ. YARD OF PAVEMENT TO BACK OF CURB.

GENERAL NOTE

JOINTS:
DUMMY JOINT SHALL BE PLACED NOT TO EXCEED 15'c/c.
THRU JOINT SHALL BE PLACED AT POINT OF TANGENCY ON STREET, ALLEY AND DRIVEWAY RETURNS

MATERIAL SHALL MEET REQUIREMENTS OF THESE SPECIFICATIONS.

CONCRETE SHALL BE CEMENT CONCRETE CLASS 5(1½).

PROCEDURES: FOR FURTHER REQUIREMENTS FOR FORMS, FORM SETTING, PLACING, FINISHING, AND CURING SEE THESE SPECIFICATIONS.

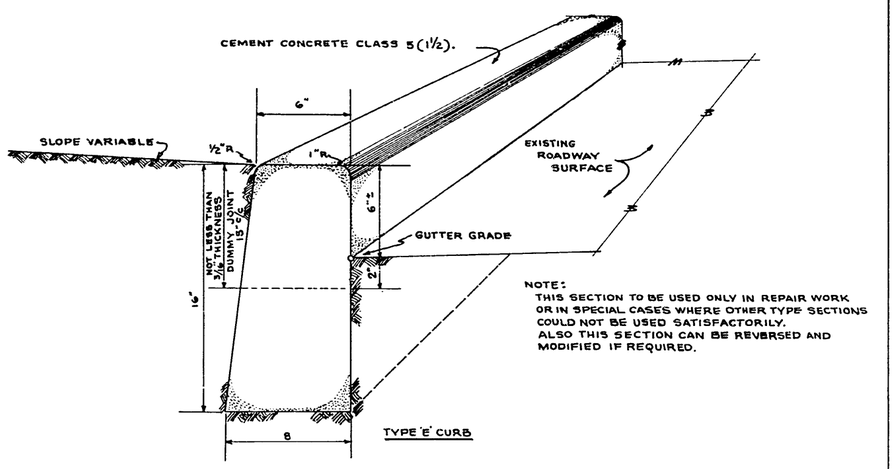
PAYMENT

"CEMENT CONCRETE CURB, TYPE 'C'," PER LINEAR FOOT.
"CEMENT CONCRETE CURB, TYPE 'D'," PER LINEAR FOOT.

Do Not Scale

Cement Concrete Curb Type 'C' & Type 'D'

Standard Plan No.5



NOTE:
THIS SECTION TO BE USED ONLY IN REPAIR WORK OR IN SPECIAL CASES WHERE OTHER TYPE SECTIONS COULD NOT BE USED SATISFACTORILY. ALSO THIS SECTION CAN BE REVERSED AND MODIFIED IF REQUIRED.

GENERAL NOTES

DUMMY JOINTS SHALL BE PLACED NOT TO EXCEED 15' c/c.

THRU JOINTS ¾" THRU JOINTS SHALL BE PLACED AT ALL COLD JOINTS OR AS DIRECTED BY THE ENGINEER, AND SHALL EXTEND 1" BELOW BOTTOM OF CONCRETE.

MATERIALS SHALL MEET REQUIREMENTS OF THESE SPECIFICATIONS.

CONCRETE SHALL BE CEMENT CONCRETE CLASS 5(1½).

PROCEDURES: FOR FURTHER REQUIREMENTS FORMS, FORM SETTING, PLACING, FINISHING, AND CURING SEE THESE SPECIFICATIONS

PAYMENT

*CEMENT CONCRETE CURB, TYPE 'E'," PER LINEAR FOOT.

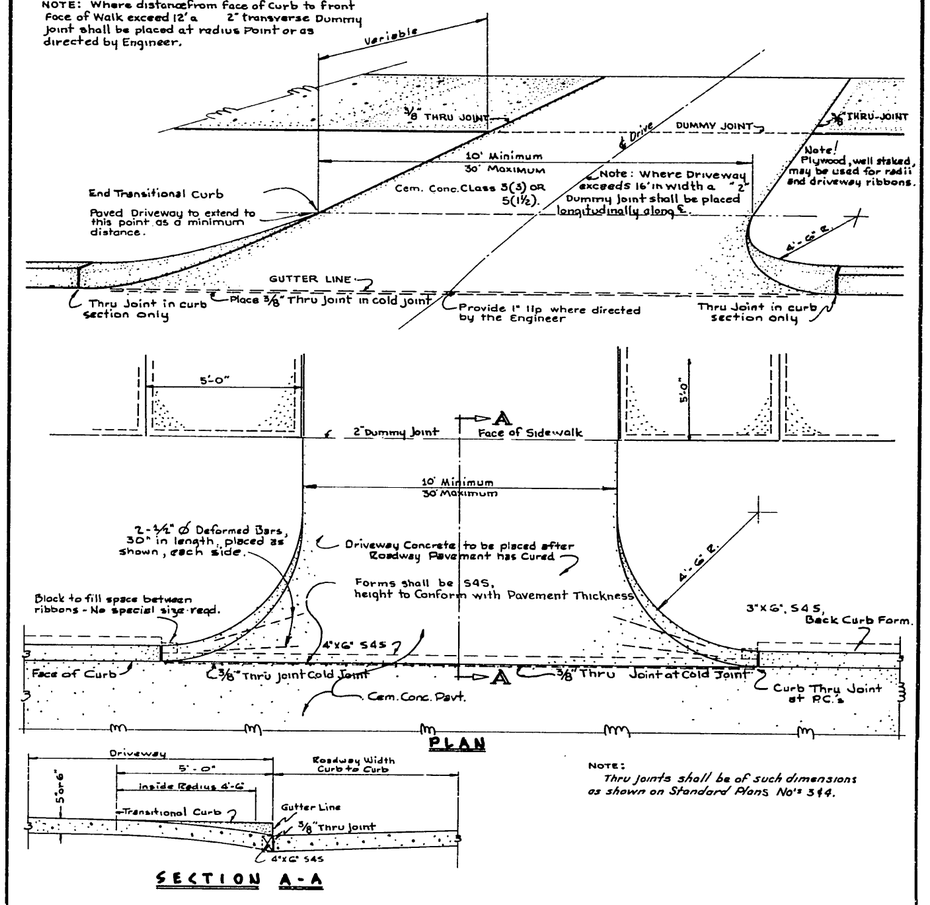
EXCAVATION REQUIRED SHALL BE INCIDENTAL TO THE COST OF CURB.

DO NOT SCALE

Cement Concrete Curb Type "E"

Standard Plan No.6

NOTE: Where distance from face of Curb to front face of Walk exceed 12'-0 2" transverse Dummy Joint shall be placed at radius Point or as directed by Engineer.



NOTE:
Thru Joints shall be of such dimensions as shown on Standard Plans No's 344.

GENERAL NOTES

Joints in paving slab shall not be extended into driveways. All joints shall be clean edged. Transverse driveway joints shall be as shown or as directed by the Engineer.

Material shall meet requirements of these Specifications.

Concrete shall be Cement Concrete Class 5(3) or 5(1½).

Procedures: For further requirements for forms, form setting, placing, finishing stripping & curing see these Specifications.

Reinforcing steel shall be incidental to cost of Cement Concrete Pavement.

PAYMENT

"Cement Concrete Pavement (thickness and class)," per square yard.

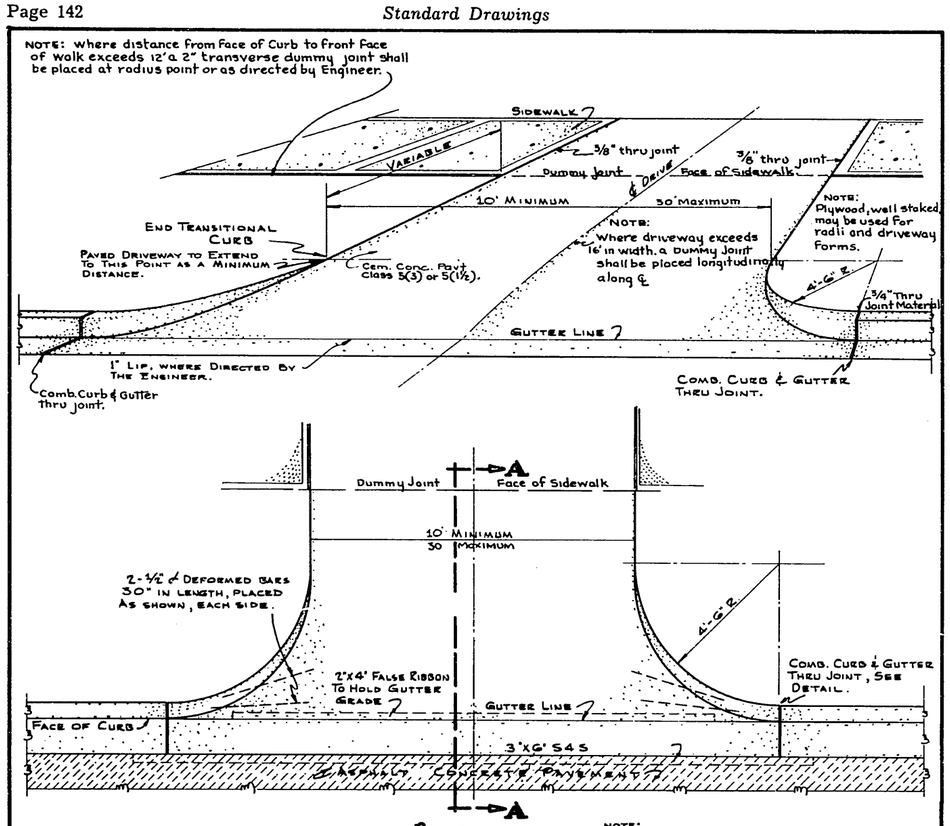
"Cement Concrete Transitional Curb," per linear foot.

NOTE:
This driveway to be used with Cement Concrete pavement.

DO NOT SCALE

Cement Concrete Driveway Type "A"

Standard Plan No. 7



NOTE:
Thru joints shall be of such dimensions as shown on Standard Plans No's 1 & 2.

Driveways to be placed before Asphalt Concrete Pavement or Bituminous Plant Mix Pavement.

NOTE:
This driveway to be used with Asphalt Concrete Pavement, or Bituminous Plant Mix Pavement.

DO NOT SCALE

GENERAL NOTES

JOINTS: thru joints shall be capped with a 1'x3/4"x12" wood strip on top of joint material. All joints shall be cleaned & edged. Transverse driveway joints shall be as shown or as directed by Engineer.

MATERIAL shall meet requirements of these Specifications.

CONCRETE shall be Cement Concrete Class 5(3) or 5(1½).

PROCEDURES: For futher requirements for forms, form setting, placing, finishing, and curing shall be as outlined in these Specifications.

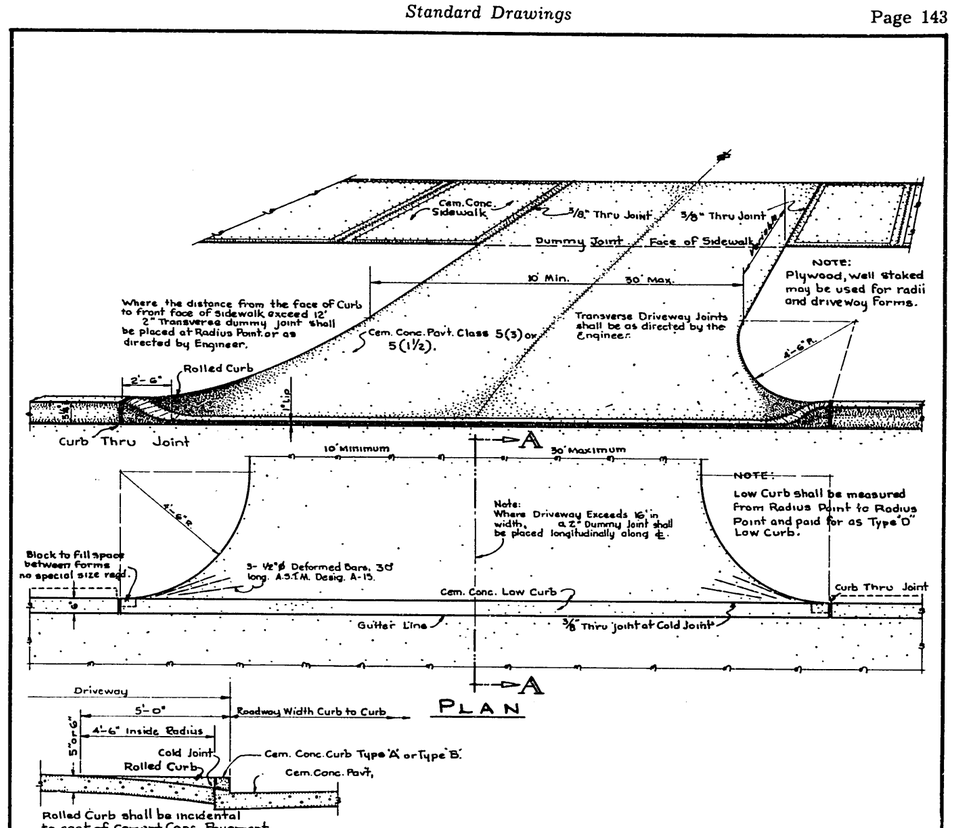
REINFORCING steel shall be incidental to cost of Cement Concrete Pavement.

PAYMENT

"Cement Concrete Pavement (thickness and class)," per square yard.
"Cement Concrete Transitional Curb," per linear foot.

Cement Concrete Driveway Type "B"

Standard Plan No. 8



NOTE: Thru Joints shall be of such Dimensions as shown on Standard Plan No's 3 & 4.

NOTE: This plan shows low Curb being constructed thru driveway section, however, it maybe desired to block out the driveway and place curb section monolithic with driveway.

GENERAL NOTES:

JOINTS in paving slab shall not be extended into driveway. All joints shall be clean and edged. Transverse driveway joints shall be as shown or as directed by the Engineer.

MATERIAL shall meet requirements of these Specifications.

CONCRETE shall be Cement Concrete Class 5(3) or 5(1½).

PROCEDURES: for further requirements for forms, form setting, placing, finishing, stripping, and curing shall be as outlined in these Specifications.

REINFORCING steel shall be incidental to cost of Cement Concrete Pavement.

PAYMENT

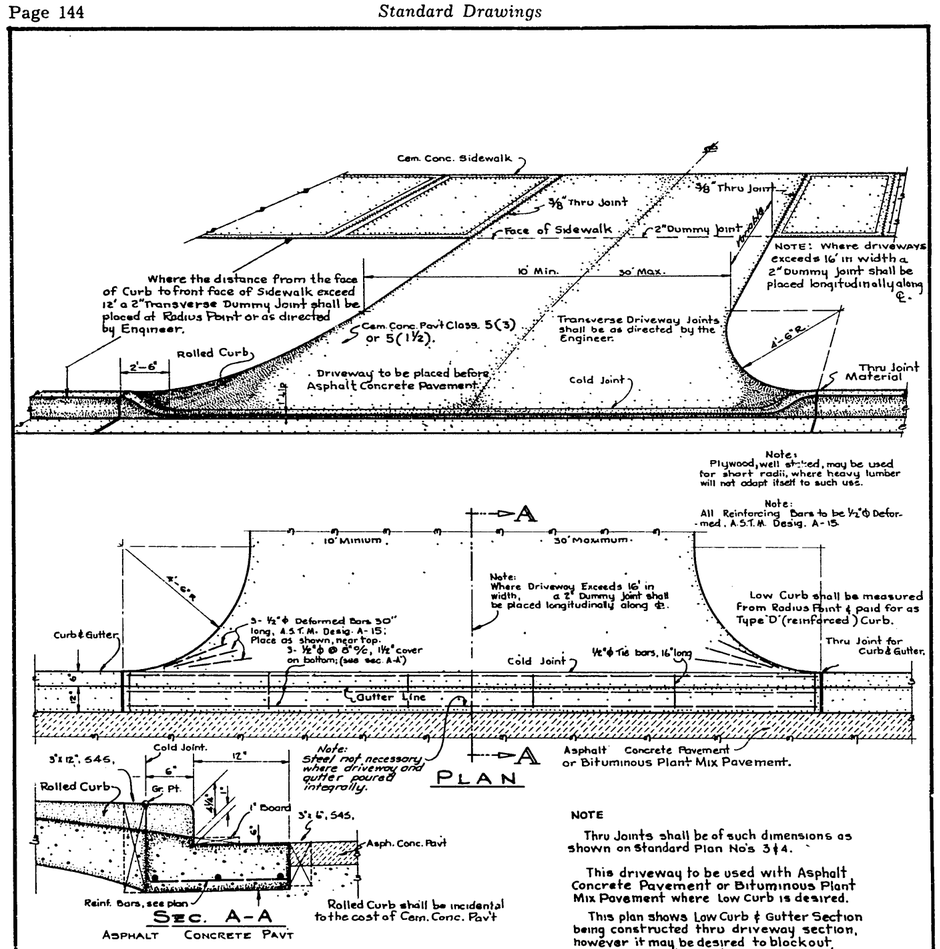
"Cement Concrete Pavement (thickness and class)," per square yard.
"Cement Concrete, Type 'D'," per linear foot.

NOTE: This driveway to be used with Cement Concrete Pavement, where Low Curb is desired.

DO NOT SCALE

Cement Concrete Driveway Type "C"

Standard Plan No. 9



NOTE

Thru Joints shall be of such dimensions as shown on Standard Plan No's 3 & 4.

This driveway to be used with Asphalt Concrete Pavement or Bituminous Plant Mix Pavement where Low Curb is desired.

This plan shows Low Curb & Gutter Section being constructed thru driveway section, however it may be desired to block out driveway in curb & gutter pour and in this case the reinforcing steel in gutter section could be eliminated.

GENERAL NOTES

Joints: thru joints shall be capped with a ½"x 3¼"x 12" wood strip on top of Joint Material. All joints shall be cleaned and edged. Transverse driveway joints shall be as shown, or as directed by Engineer.

Material shall meet requirements of these Specifications.

Concrete shall be Cement Concrete Class 5(3) or 5(1½).

Procedures: for further requirements for forms, form setting, placing, finishing, and curing shall be as outlined in these Specifications.

Reinforcing steel shall be incidental to cost of Cement Concrete Pavement.

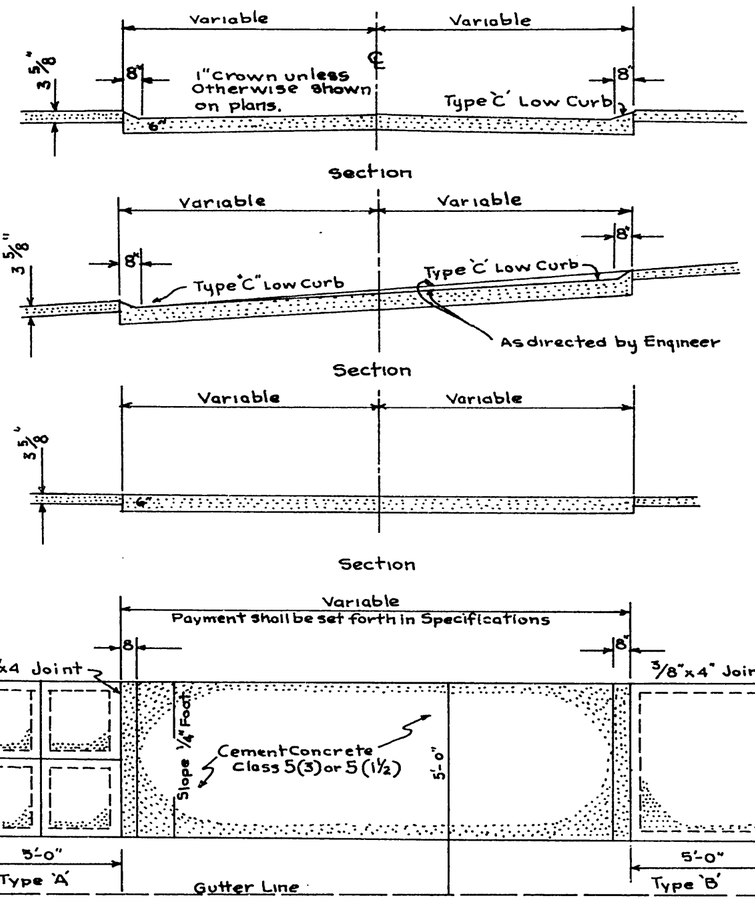
PAYMENT

"Cement Concrete Pavement (thickness and class)," per square yard.
"Cement Concrete, Type 'D'," per linear foot.

Do Not Scale

Cement Concrete Driveway Type "D"

Standard Plan No. 10



General Notes Plan

Joints shall be clean and edged with ¼" radius edger

Material shall meet requirements of these specifications.

Concrete shall be cement concrete Class 5(3) or 5(1½).

Procedures: for further requirements for forms, form setting, placing, finishing, stripping and curing. See these specifications.

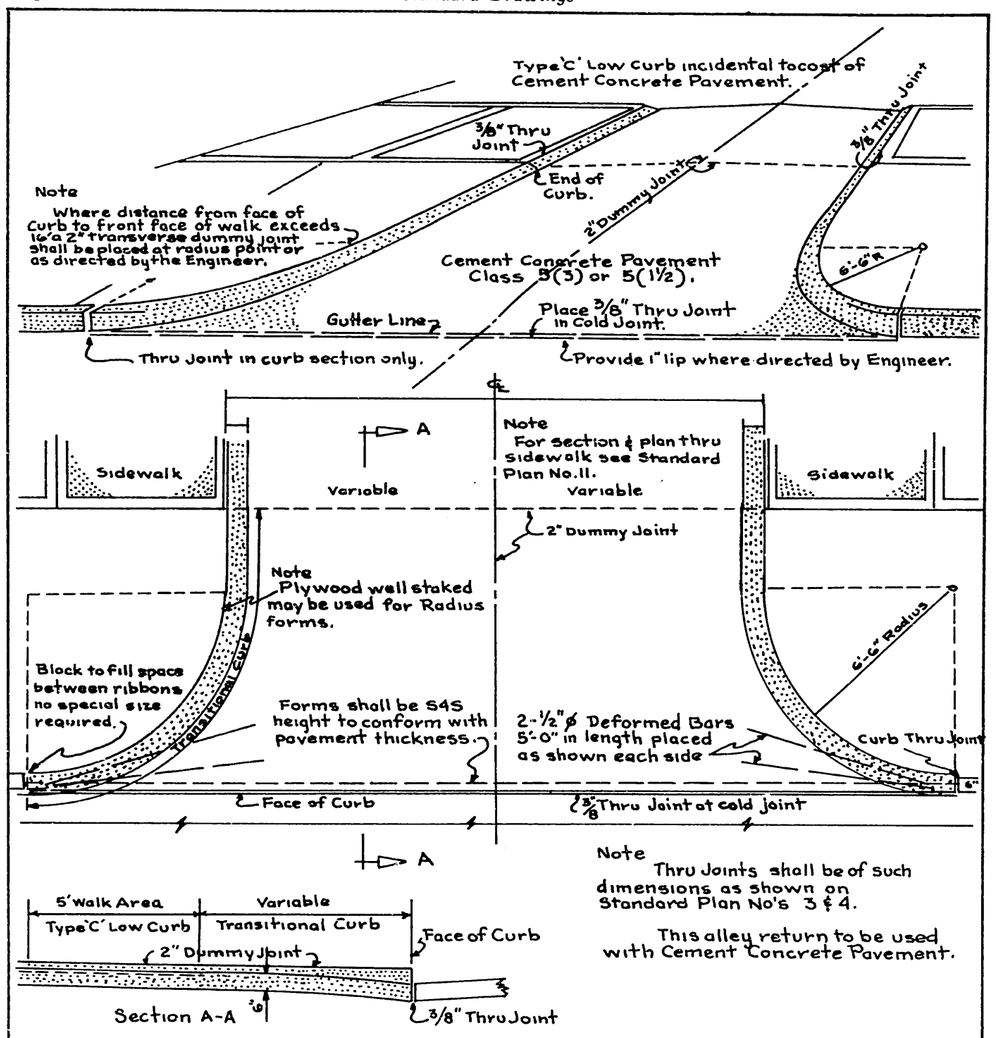
Payment

"Cement Concrete Pavement (class, thickness)," per square yard.

Do Not Scale

Alley Crossing For Sidewalk

Standard Plan No. 11



General Notes

Joints shall be cleaned & edged with a ¼" radius edger.
Longitudinal Joints shall be as directed by the Engineer.
Concrete shall be Cement Concrete Class 5(3) or 5(1½).
Material shall meet requirements of these specifications.
Procedures: for futher requirements for forms, form setting, placing, finishing & curing shall be as outlined in these specifications.

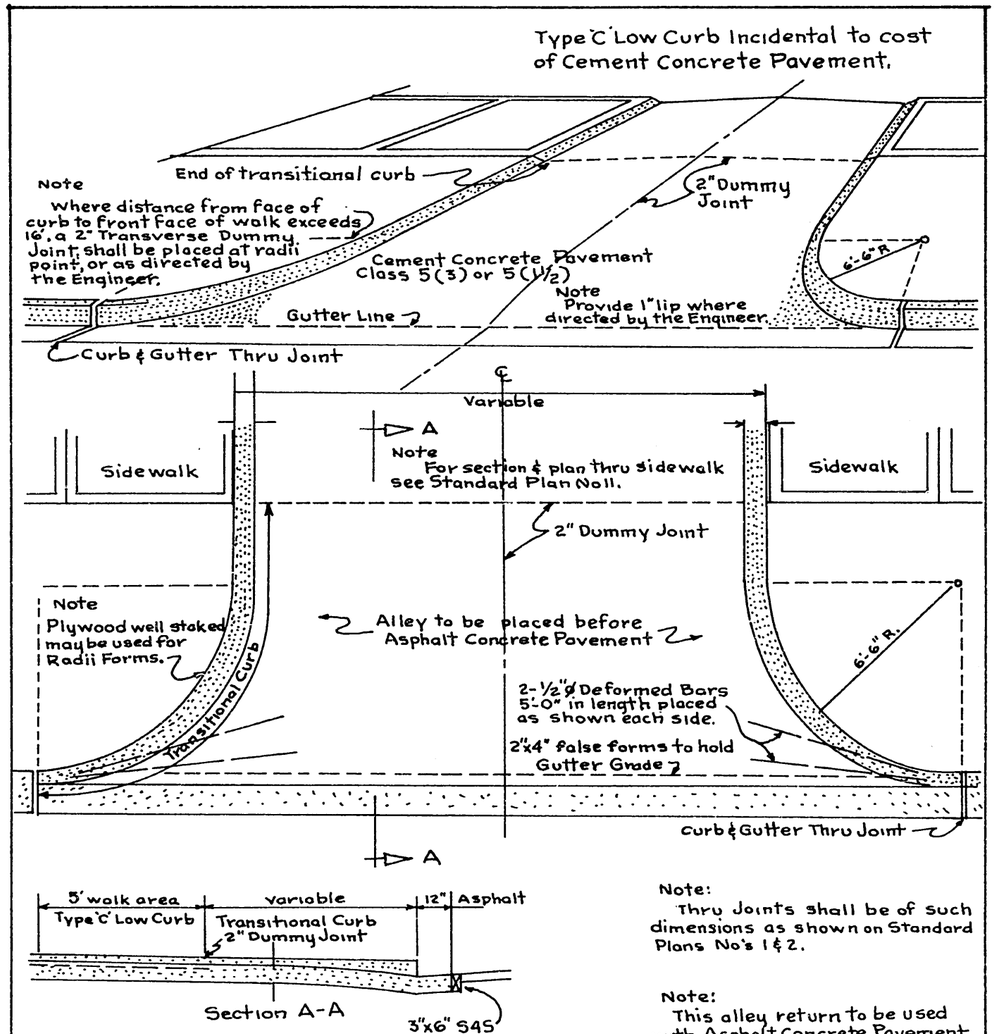
Payment

"Cement Concrete Pavement (Thickness Class)," per square yard.
"Cement Concrete Transitional Curb," per linear foot.

Do Not Scale

Cement Concrete Alley Return Type 'A'

Standard Plan No. 12



General Notes

Joints shall be cleaned & edge with a ¼" radius edger.
Longitudal Joints shall be as directed by the Engineer.
Material shall meet requirements of these Specifications
Concrete shall be Cement Concrete Class 5(3) or 5(1½).
Procedures: for further requirements for forms, form setting, placing, finishing, stripping & curing shall be as outlined in these Specifications.

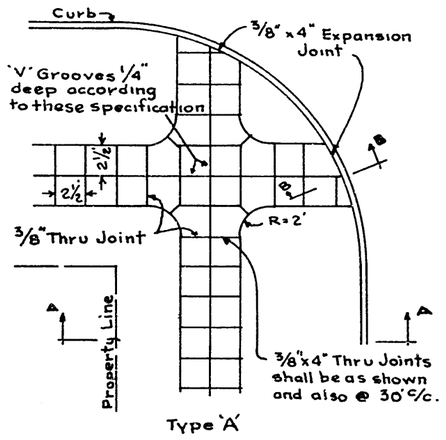
PAYMENT

"Cement Concrete Pavement (Thickness class)" per square yard.
"Cement Concrete Transitional Curb," per linear foot.

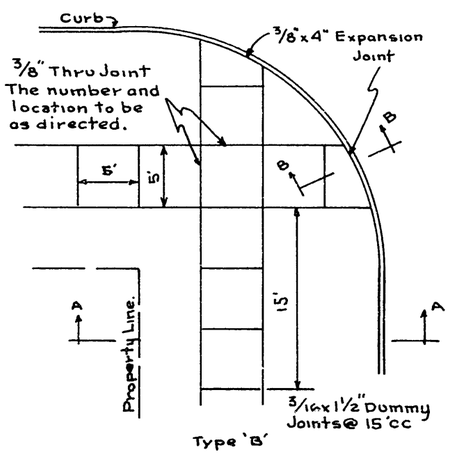
Do Not Scale

Cement Concrete Alley Return Type 'B'

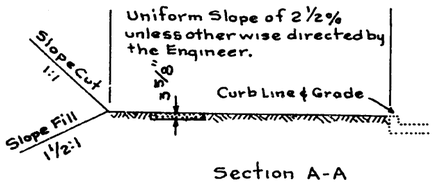
Standard Plan No. 13



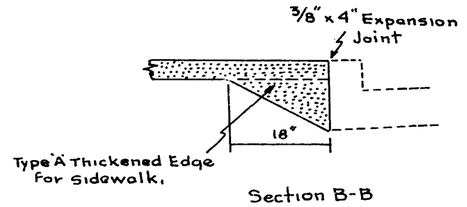
Type 'A'



Type 'B'



Section A-A



Section B-B

General Notes

Joints thru & dummy joints shall be as shown above. Thru Joints shall also be placed in the sidewalk section at driveway & alley returns as shown on Standard Plans Nos 7 to 13. All joints shall be clean & edged with an edger having a ¼" Radius. Joints shall be flush with the finished surface.

Forms shall be either wood or steel and shall meet all requirements of these Specifications.

Concrete shall be class 5(1½).

Procedures: for further requirements for forms, form setting, placing, finishing & curing shall be as outlined in these Specifications.

Note all utility poles, meter boxes, etc. in sidewalk area shall have 3/16" joint material (full depth) placed around them before placing concrete.

Payment

"Type 'A', Cement Concrete Sidewalk," per square yard.

"Type 'B', Cement Concrete Sidewalk," per square yard.

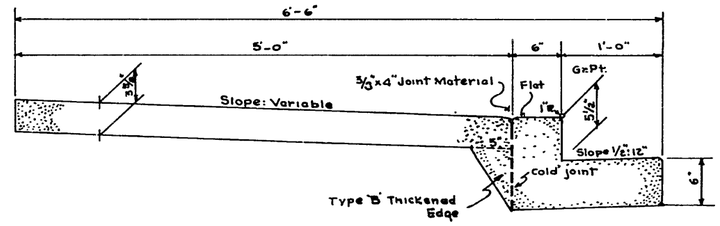
"Type 'A', Thickened Edge for sidewalk," per linear foot.

Do Not Scale

Cement Concrete Sidewalk Type 'A' & Type 'B'

Standard Plan No. 14

NOTE:
Thru and Dummy Joints details are the same as shown on Standard Plan Nos 1 & 2.



NOTE:
This section may be either Curb & Gutter Type 'A' or Type 'B'.

GENERAL NOTES

Dummy Joints shall be placed not to exceed 15'c/c nor less than 10'c/c.
Thru Joints shall be placed as directed by the Engineer.
Material shall meet the requirements of these Specifications.
Concrete shall be cement concrete class 5(1½).
Procedures: for further requirements for forms, form setting, placing, finishing, and curing shall be as outlined in these Specifications.

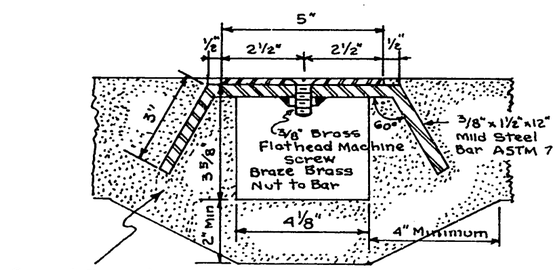
PAYMENT

"Cement Concrete Curb & Gutter, Type 'A'," per linear foot.
"Cement Concrete Curb & Gutter, Type 'B'," per linear foot.
"Type 'B' Thicken Edge for Sidewalk," per linear foot.
"Cement Concrete Sidewalks, Type__," per linear foot.

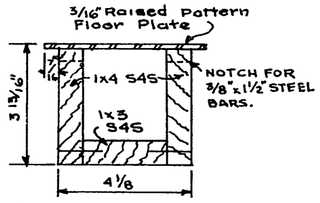
Do Not Scale

Cement Concrete Combined Walk, Curb & Gutter

Standard Plan No. 15

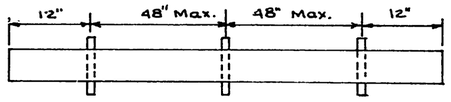


SECTION A-A



Note: Forms to be removed.

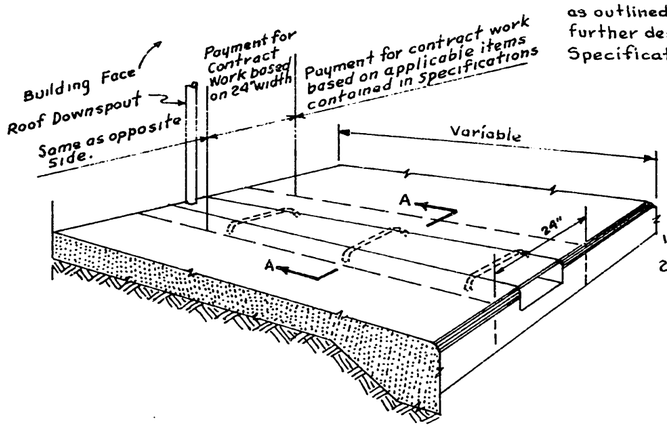
FORMING DETAIL



NOTE
For walks 6' and less use only 2 bars,
for walks 6' to 10' use 3 bars,
for walks over 10' use 4 bars.

BAR SPACING

Material: Shall meet requirements as outlined on this plan and as further described in these Specifications.



Note:
1. Steel plate to end 1/2" from face of curb.
2. Provide space between bldg. & plate for downspout.

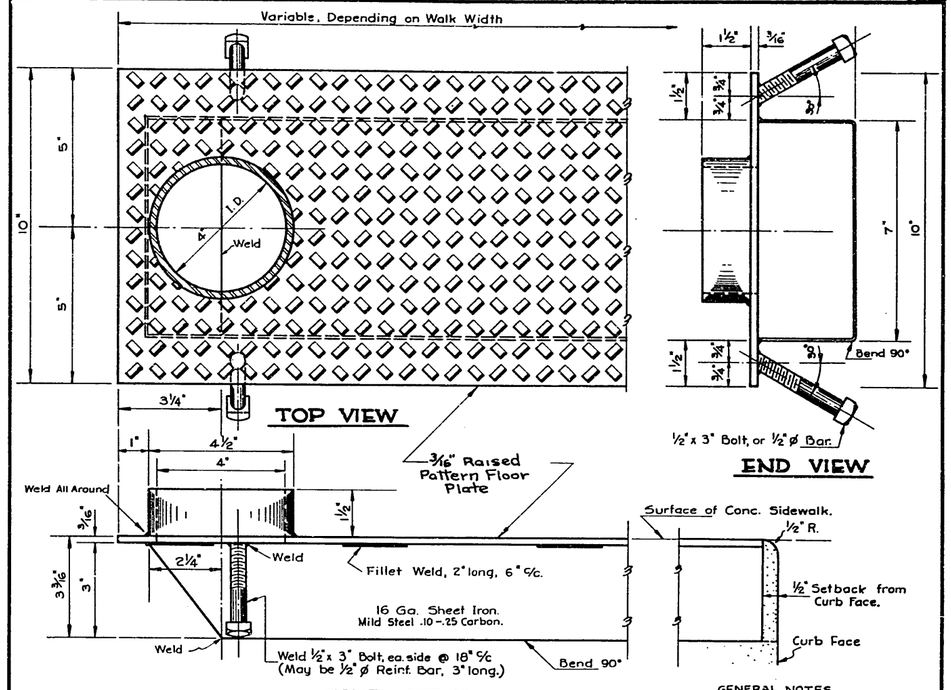
Payment

"Sidewalk Drain for Bldg. Downspout, Type I," per linear foot.

Do Not Scale

Sidewalk Drain For Building Downspout Type "I"

Standard Plan No. 16



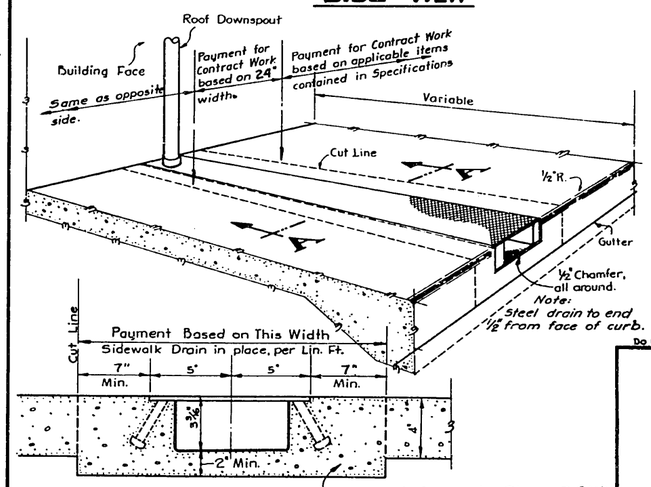
SIDE VIEW

GENERAL NOTES

Material
Materials shall meet requirements as outlined on this plan, and as further described in these Specifications.

PAYMENTS

"Sidewalk Drain for Building Downspouts, Type II," per linear foot



SECTION A-A

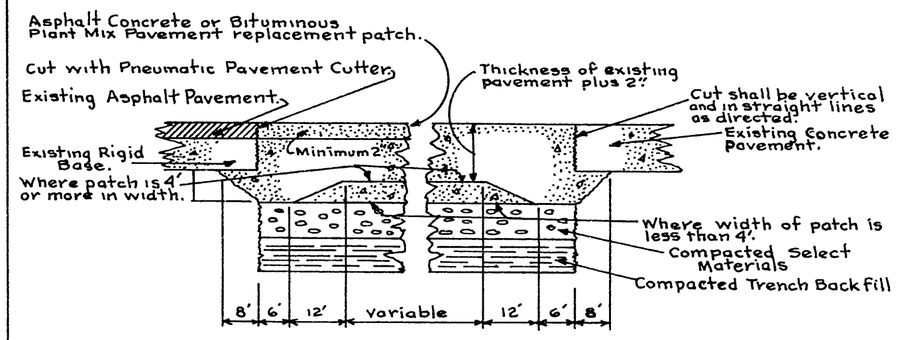
Do Not Scale

Sidewalk Drain For Building Downspout Type II

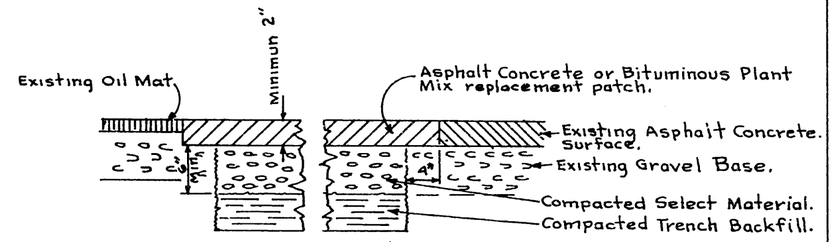
Standard Plan No 17

HALF SECTION
Rigid Pavement with Asphalt Concrete Surface

HALF SECTION
Cement Concrete Pavement



TYPICAL PATCH FOR RIGID PAVEMENT



TYPICAL PATCH FOR FLEXIBLE PAVEMENT

GENERAL NOTE

Class of Cement Concrete: Concrete mix shall be Class 6.5 (1½) H.E.S. or Class 5(1½) whichever is specified.

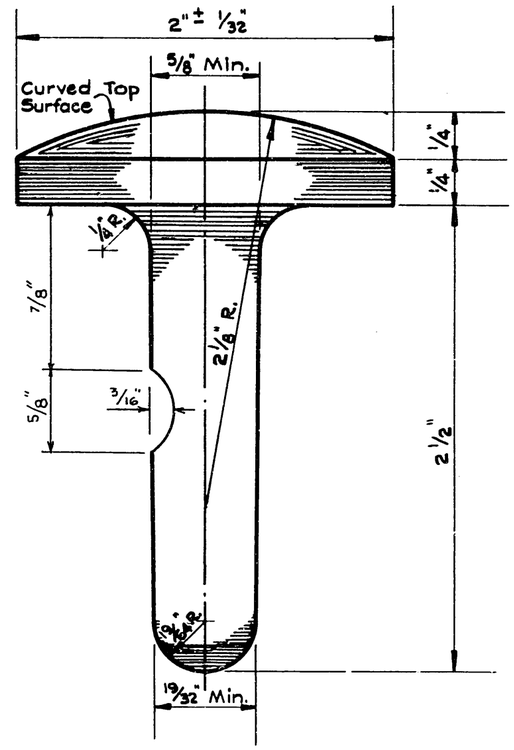
PAYMENT

."Cement Concrete Class for Pavement Patch," per Cubic Yard.
."Asphalt Concrete Class 'B' for Pavement Patch," per Ton.
."Bituminous Plant Mix for Pavement Patch," per Ton.

Do Not Scale

Pavement Patching

Standard Plan No. 18



General Notes:

Bronze shall meet S.A.E. 40 requirements

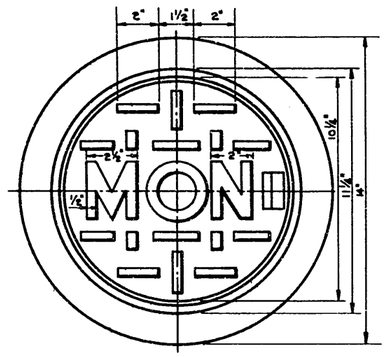
Curved Top Surface shall be buffed to a rough satin finish.

Dimensions & tolerance shown shall be strictly adhered to.

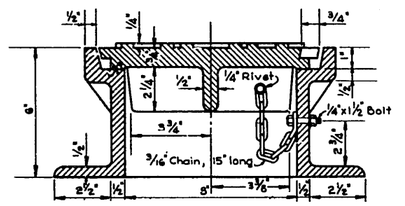
Do Not Scale

Bronze Plug Marker For Monuments

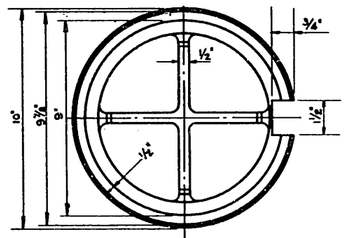
Standard Plan No. 19



TOP VIEW - FRAME & COVER



SECTION - FRAME & COVER



BOTTOM VIEW OF COVER

Note:
Machine Bearing Faces of Cover & Case to Insure Positive Fit.

Castings shall be gray iron, A.S.T.M. Designation A-48, Class 30, and shall conform further to applicable Section of these Specifications.

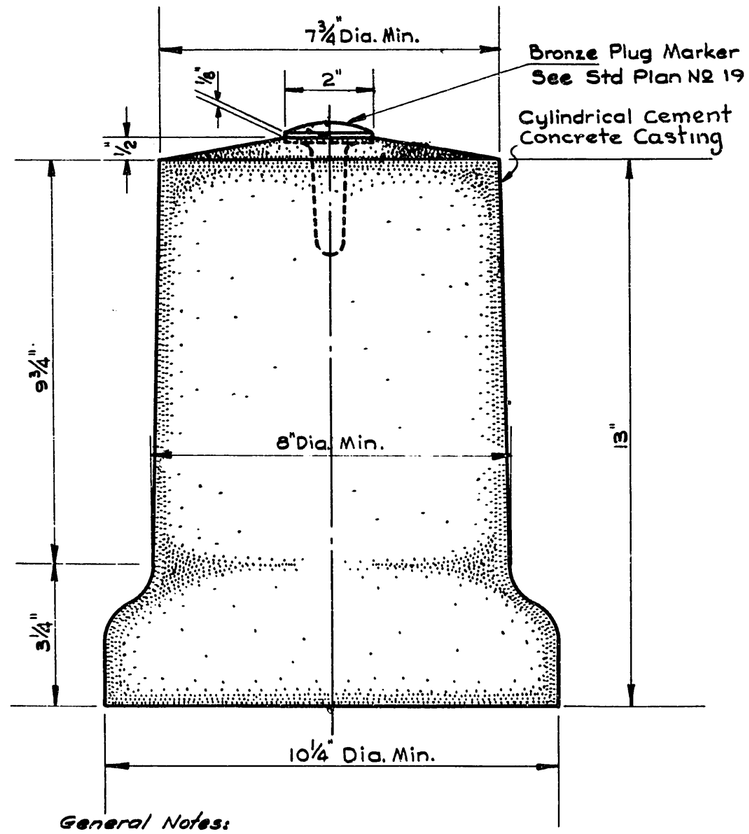
Payment

"Furnishing and Placing Monument Frame and Cover", per each

Do Not Scale

Monument Frame And Cover

Standard Plan No. 20



General Notes:

Minimum ultimate compressive strength of concrete casting at 28 days = 3000 #
Maximum aggregate size to be 1"
Monument to be furnished by Contractor

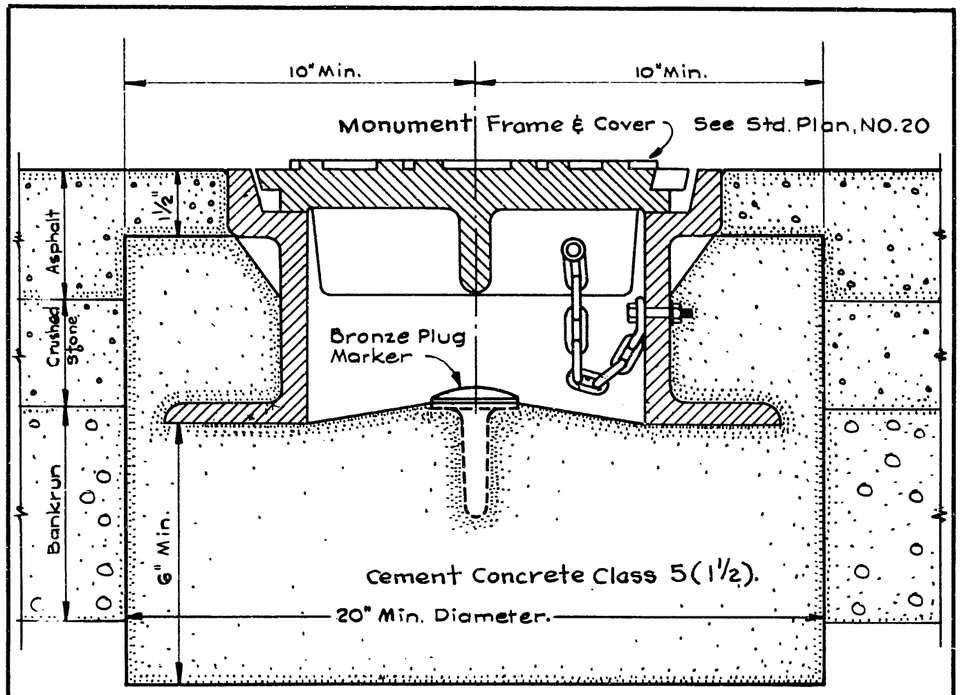
Payment

"Precast Monument," per each.

Do Not Scale

Precast Concrete Monument

Standard Plan No. 21



Note:

This section to be used primarily on Bituminous or Asphalt Concrete Pavement.

General Notes:

Concrete base dimensions shown are minimum.
Concrete base need not be formed.
City will furnish Bronze Plug Marker free of charge.

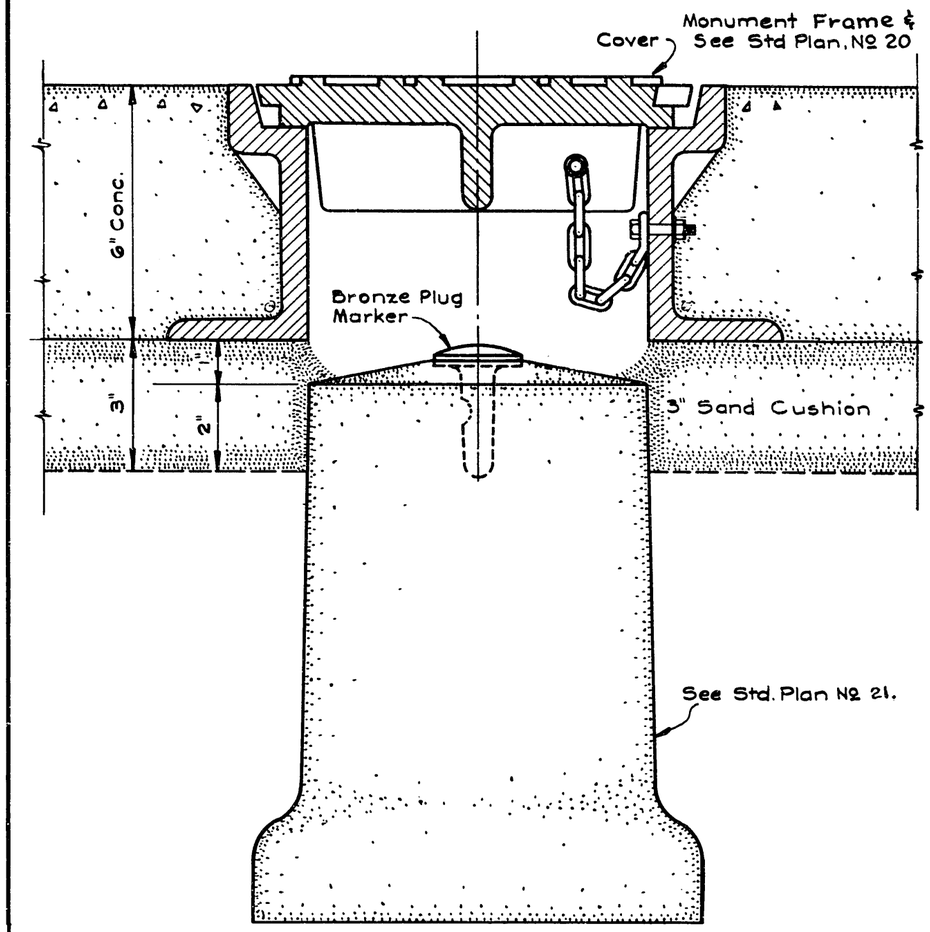
DO NOT SCALE

Payment

"Poured Monument," per each.
"Furnish and place Monument Frame and Cover," per each.

Poured Monument In Place

Standard Plan No. 22



General Notes:

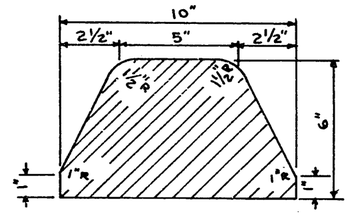
This section to be used primarily on Cement Concrete Pavement.

Payment

"Precast Monument," per each.
"Furnish and Place Monument Frame and Cover," per each.

Special Installation of Monument For Concrete Pavement

Standard Plan No. 23



EXTRUDED ASPHALT CONCRETE CURB

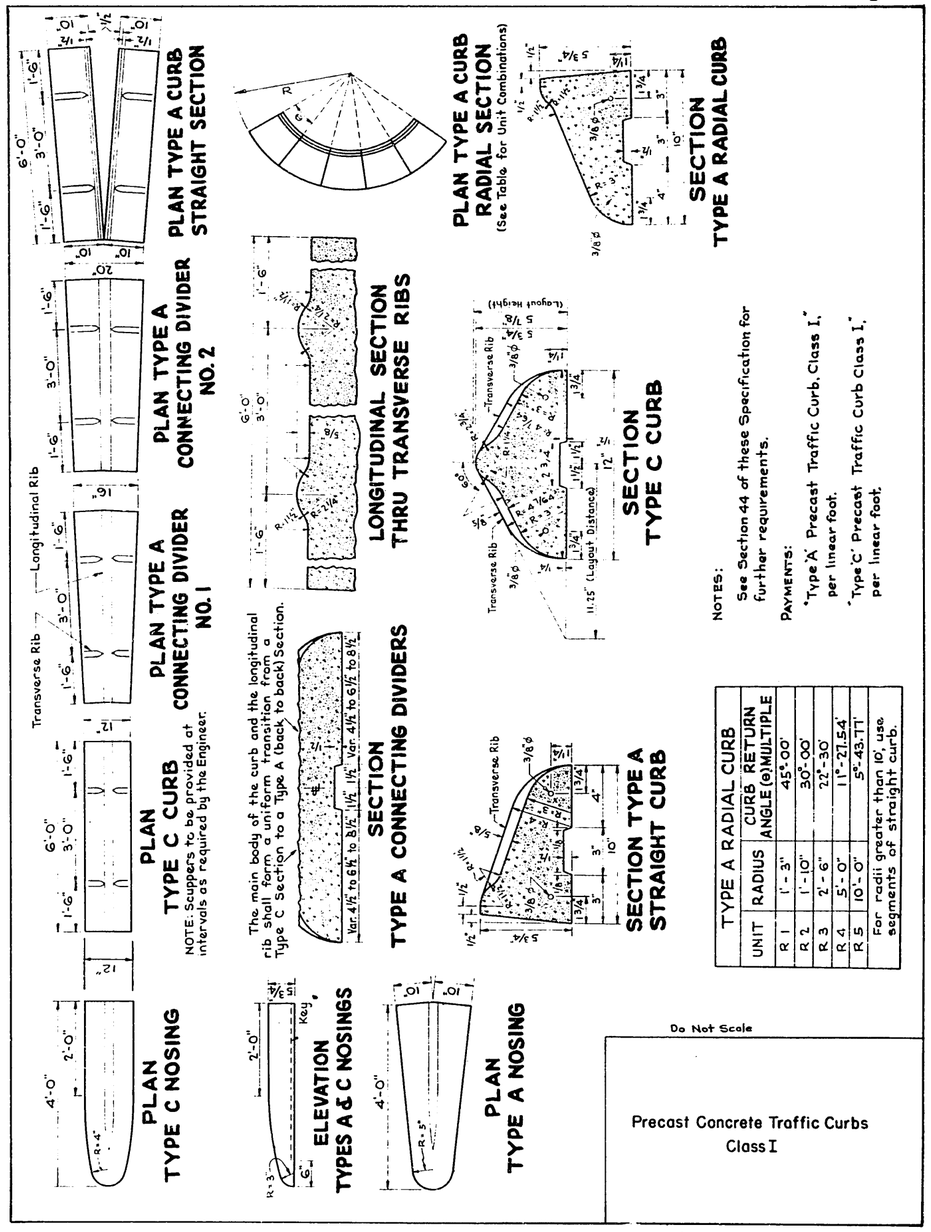
NOTE:
See section 35 of these Specification.

PAYMENT
"Extruded Asphalt Concrete Curb" per linear foot.

Do Not Scale

Extruded Asphalt Concrete Curb .

Standard Plan No.24



NOTES:
See Section 44 of these Specification for further requirements.

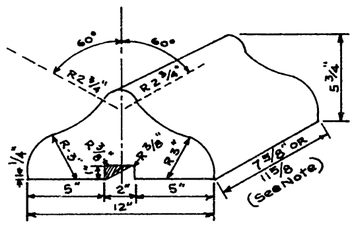
PAYMENTS:
"Type 'A' Precast Traffic Curb, Class I," per linear foot.
"Type 'C' Precast Traffic Curb Class I," per linear foot.

TYPE A RADIAL CURB		
UNIT	RADIUS	CURB RETURN ANGLE (θ) MULTIPLE
R 1	1'-3"	45°.00'
R 2	1'-10"	30°.00'
R 3	2'-6"	22°.30'
R 4	5'-0"	11°-21.54'
R 5	10'-0"	5°.43.77'
For radii greater than 10', use segments of straight curb.		

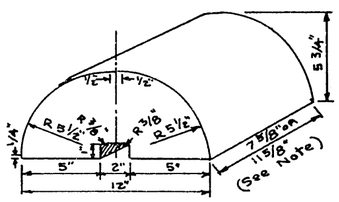
Do Not Scale

Precast Concrete Traffic Curbs
Class I

Standard Plan No. 25

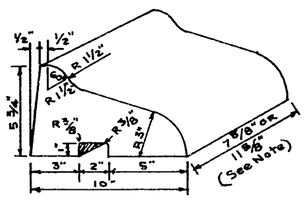


TYPE 'C' BLOCK

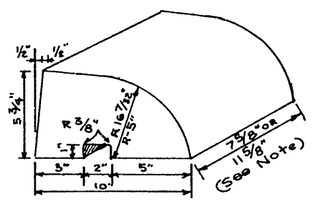


TYPE 'C' REFLECTOR BLOCK

BLOCK TYPE 'C' PRECAST TRAFFIC CURB



TYPE 'A' BLOCK



TYPE 'A' REFLECTOR BLOCK

BLOCK TYPE 'A' PRECAST TRAFFIC CURB

PAYMENT

"Block Precast Traffic Curb, Class II, Type 'A'," per linear foot.
"Block Precast Traffic Curb, Class II, Type 'C'," per linear foot.

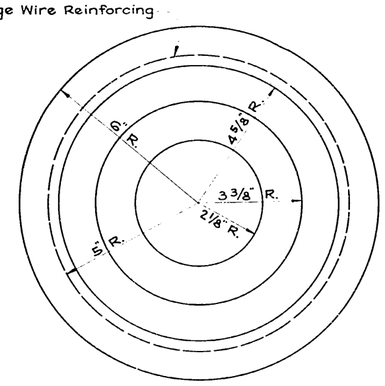
NOTE

With 7 5/8" blocks every sixth block shall be a reflector block.
With 11 5/8" blocks every fourth block shall be a reflector block.
See Section 46 of these Specification for further requirements.

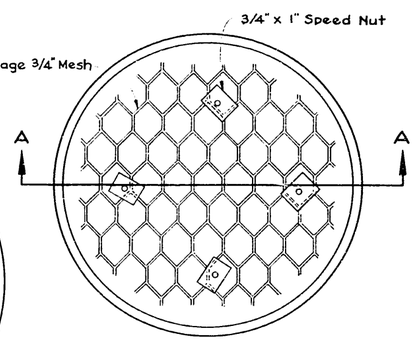
Do Not Scale

Block Precast Traffic Curbs Class II

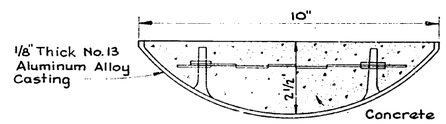
Standard Plan No.26



PLAN

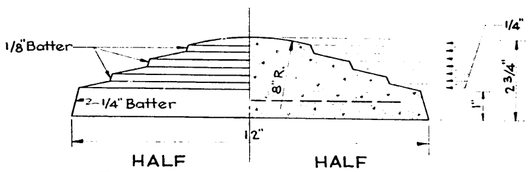


BOTTOM VIEW



SECTION A-A

ALUMINUM-COVERED TRAFFIC BUTTON



HALF ELEVATION HALF SECTION

PRECAST CONCRETE TRAFFIC BUTTON

NOTE

See Section 44 of these Specification for further requirements.

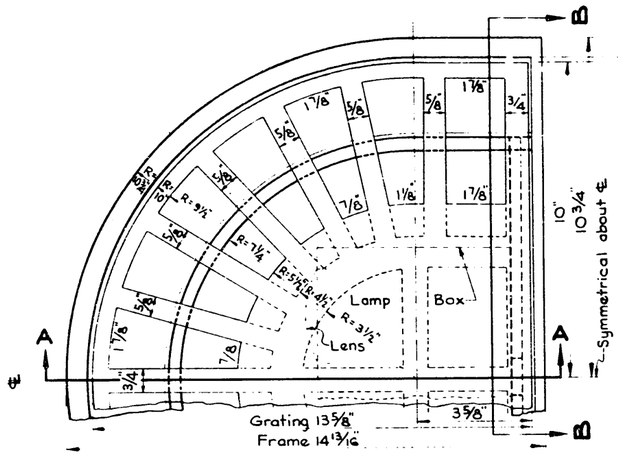
PAYMENT

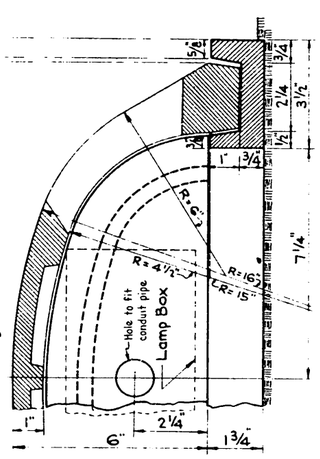
"Precast Concrete Traffic Button," per each.
"Aluminum-Covered Traffic Buttons," per each.

Do Not Scale

Traffic Buttons

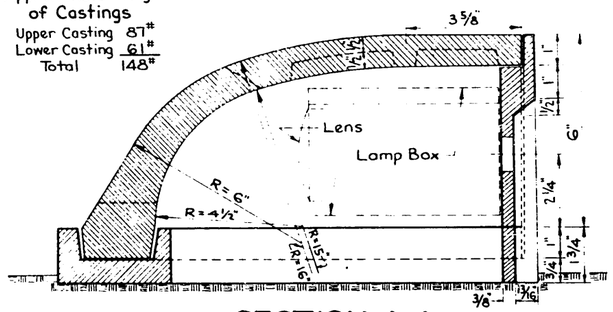
Standard Plan No.27

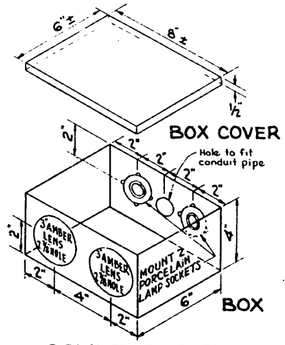


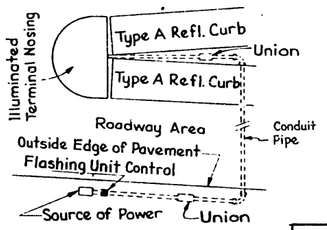


Approximate Weight of Castings

Upper Casting	87#
Lower Casting	61#
Total	148#







NOTES:

The castings shall be Malleable Iron Castings, ASTM Designation No. A47 or Steel Castings, ASTM Designation No. A27, Grade 60-30.

The lamp box and cover shall be No. 16 gauge Galvanized Sheet Metal or Aluminum Sheeting of equivalent thickness.

The terminal nose casting together with the lamp box and fittings will be furnished to the Contractor at no cost to him.

See Section 46 of these Specifications for further construction details.

PAYMENT

"Illuminated Terminal Nosing Type No. 1," per each.

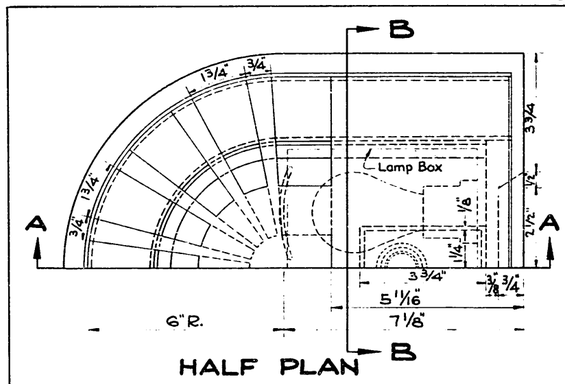
"Galv. Conduit Pipe (of the diameter specified)," per lin. ft.

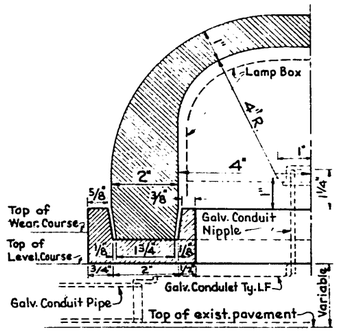
Do Not Scale

Illuminated Terminal Nosing

Type I

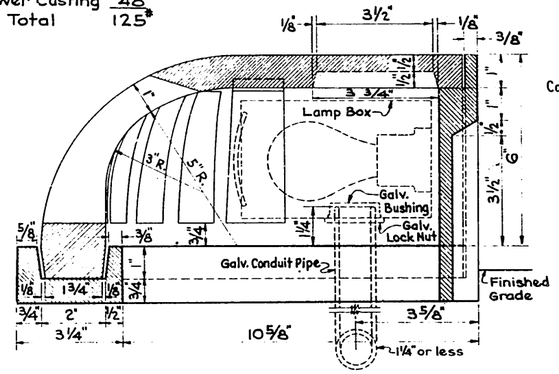
Standard Plan No. 28

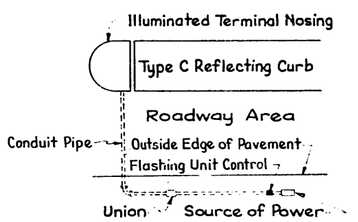


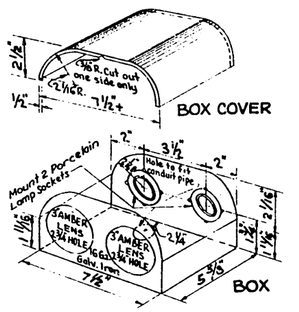


Approximate Weight of Castings

Upper Casting	77#
Lower Casting	48#
Total	125#







NOTES:

The castings shall be Malleable Iron Castings, ASTM Designation No. A 47 or Steel Castings, ASTM Designation No. A27, Grade 60-30.

The lamp box and cover shall be No. 16 gauge Galvanized Sheet Metal or Aluminum Sheeting of equivalent thickness.

See Section 46 of these Specifications for further construction details.

PAYMENT:

"Illuminated Terminal Nosing, Type No. 2," per each.

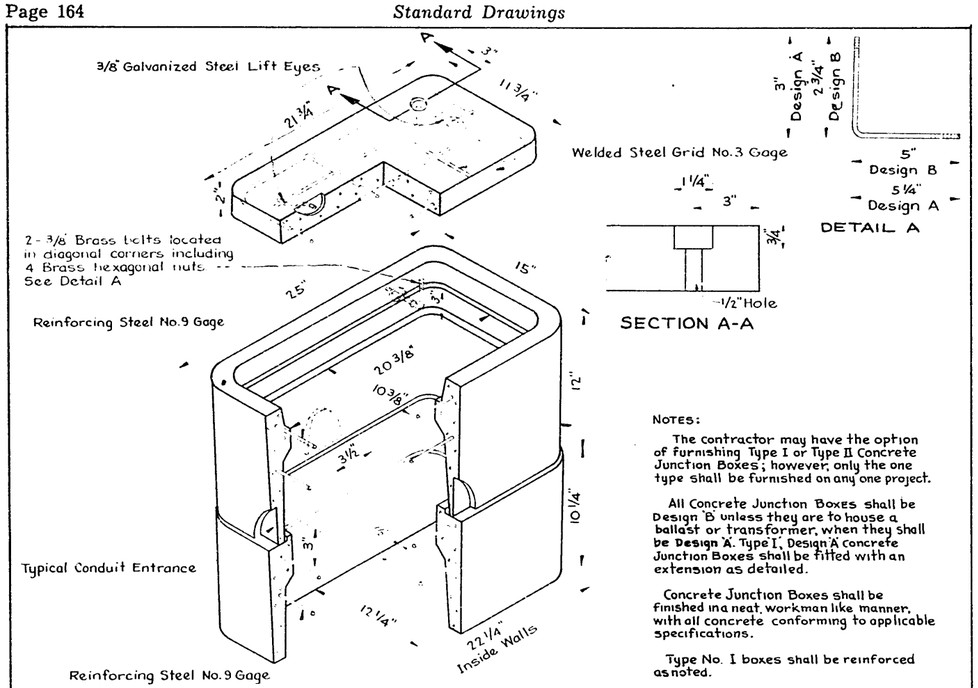
"Galvanized Conduit Pipe (of the diameter specified)," per linear foot.

Do Not Scale

Illuminated Terminal Nosing

Type II

Standard Plan No. 29



DESIGN A

SECTION A-A

DETAIL A

NOTES:

The contractor may have the option of furnishing Type I or Type II Concrete Junction Boxes; however, only the one type shall be furnished on any one project.

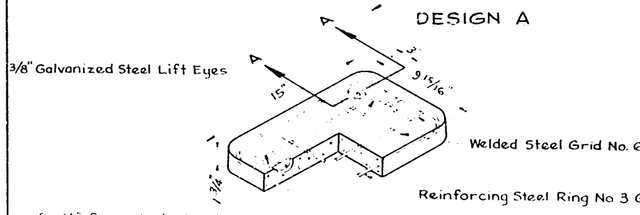
All Concrete Junction Boxes shall be Design 'B' unless they are to house a ballast or transformer, when they shall be Design 'A'. Type I, Design 'A' concrete Junction Boxes shall be fitted with an extension as detailed.

Concrete Junction Boxes shall be finished in a neat, workman like manner, with all concrete conforming to applicable specifications.

Type No. I boxes shall be reinforced as noted.

The covers of all boxes shall be inscibed, "STREET LIGHTING" unless otherwise required. The letters shall be approximately 1 inch in height and 1/8 inch in depth and shall be neatly formed.

See section 46 of these specifications for further requirements.



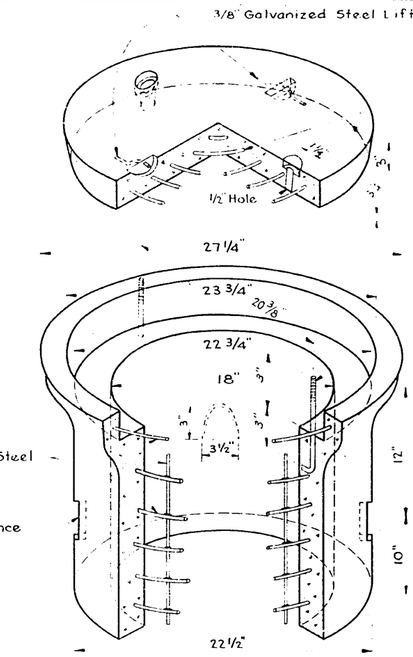
DESIGN B

TYPE NO. I

DO NOT SCALE

Concrete Junction Box
Type .I

Standard Plan No. 30



DESIGN A

2 - 3/8" Brass anchor bolts located on a diameter line including 2 brass hexagonal nuts.

NOTES:

The contractor may have the option of furnishing Type I or Type II Concrete Junction Boxes; however, only the one type shall be furnished on any one project.

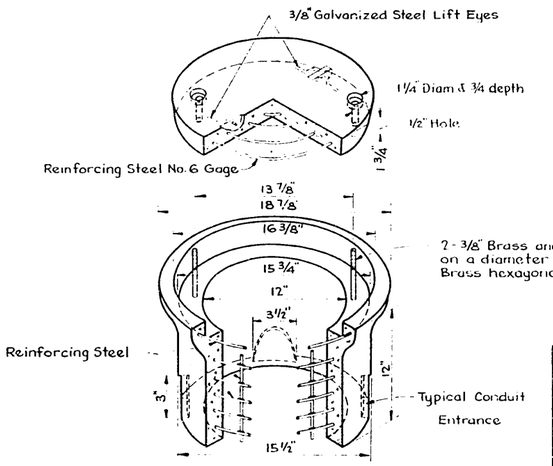
All Concrete Junction Boxes shall be Design 'B' unless they are to house a ballast or transformer, when they shall be Design 'A'. Type I, Design 'A' Concrete Junction Boxes shall be fitted with an extension as detailed.

Concrete Junction Boxes shall be finished in a neat, workman like manner, with all concrete conforming to applicable specifications.

Type No. II boxes shall meet the requirements for Standard Reinforced Concrete Culvert Pipe.

The covers of all boxes shall be inscibed, "STREET LIGHTING" unless otherwise required. The letters shall be approximately 1 inch in height and 1/8 inch in depth and shall be neatly formed.

See section 46 of these Specifications for further requirements.



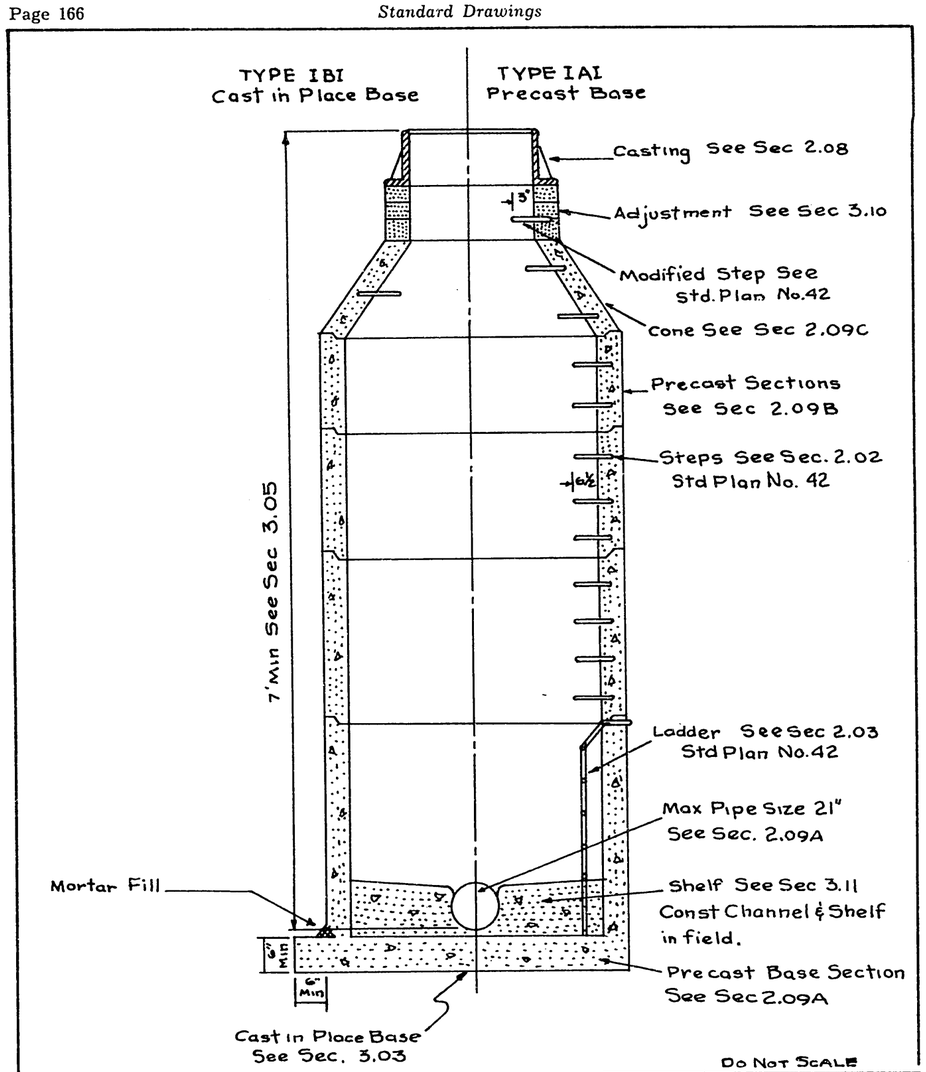
DESIGN B

TYPE NO. II

DO NOT SCALE

Concrete Junction Box
Type II

Standard Plan No. 31



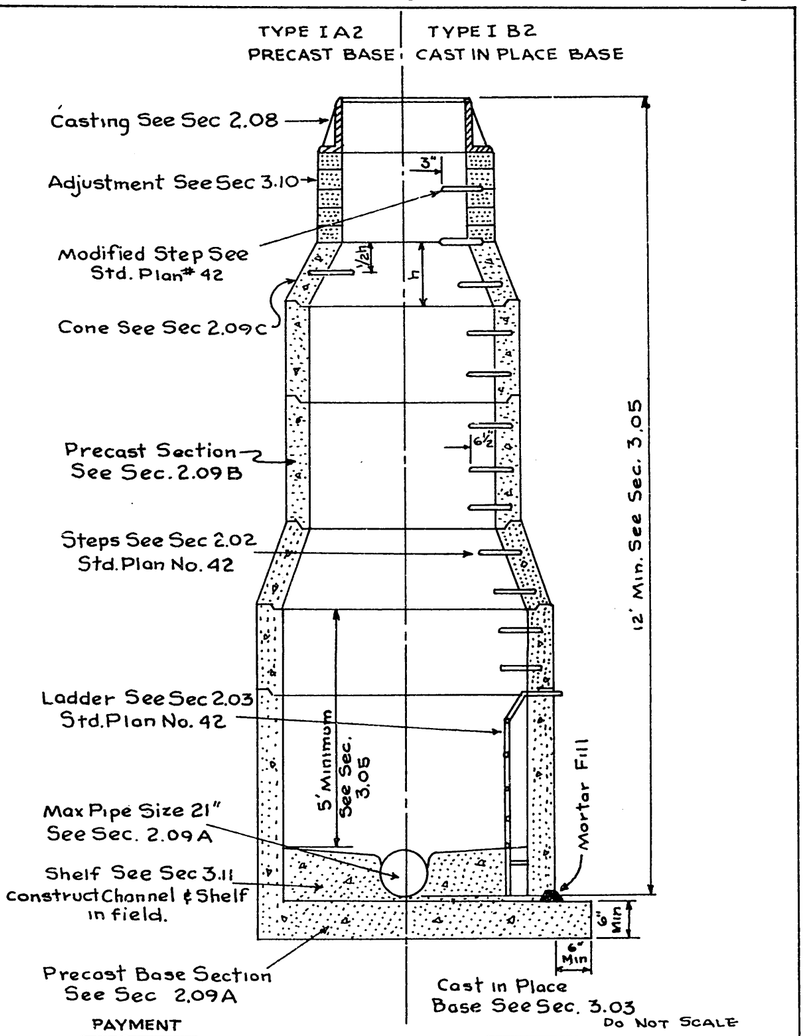
DO NOT SCALE

PAYMENT

*Type__(or Size) Manhole, Basic Price," per each.
*Type__(or Size) Manhole, Extra Depth," per foot.

Manhole
Type I Precast Units
Type IA Precast Base
Type IB Cast in Place Base
Type IA1, IB1 - 48" Diameter

Standard Plan No.35



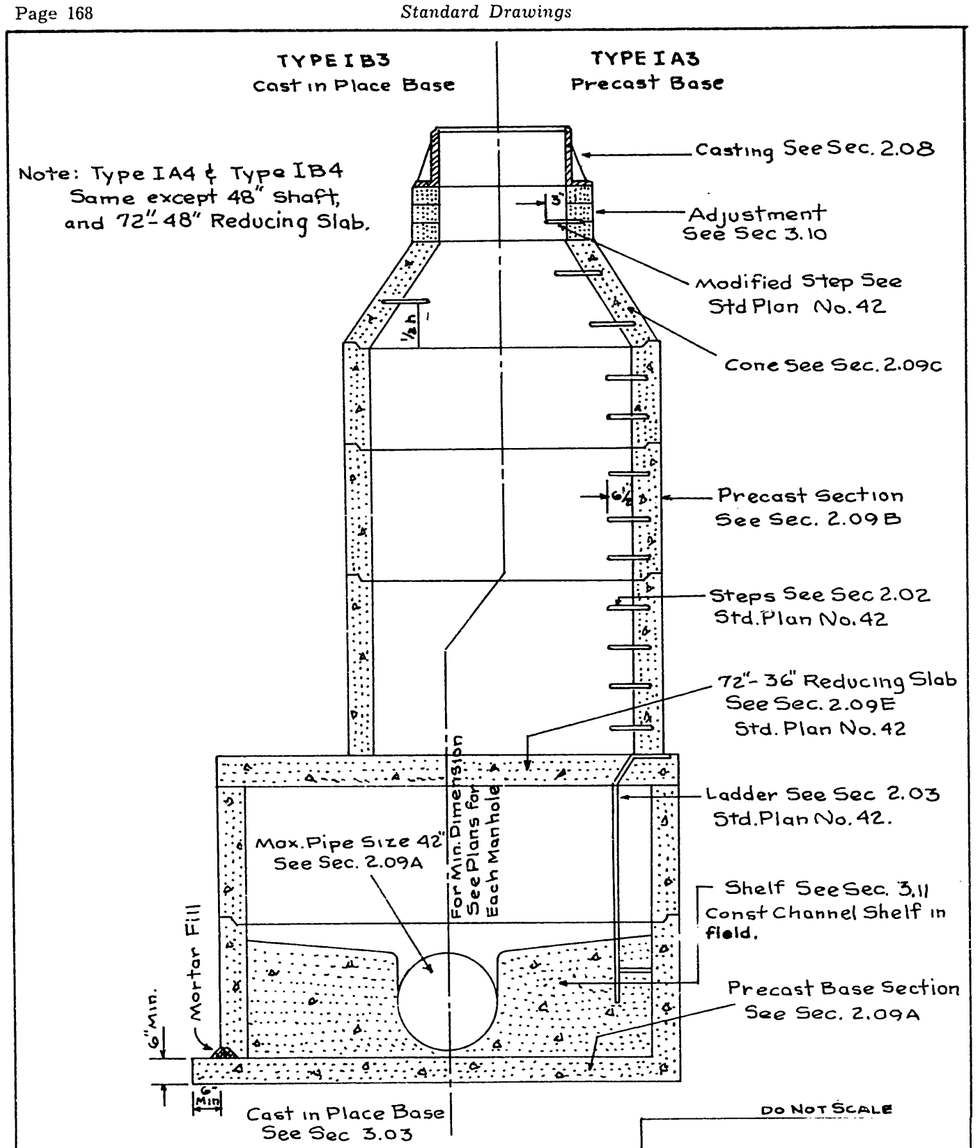
DO NOT SCALE

PAYMENT

*Type__(or Size) Manhole, Basic Price," per each.
*Type__(or Size) Manhole, Extra Depth," per foot.

Manhole
Type I Precast Units
Type IA Precast Base
Type IB Cast in Place Base
IA2, IB2 48" Dia. Reduced To 36".

Standard Plan No.36



Note: Type IA4 & Type IB4 not shown are similar except reduced to 48" diameter.

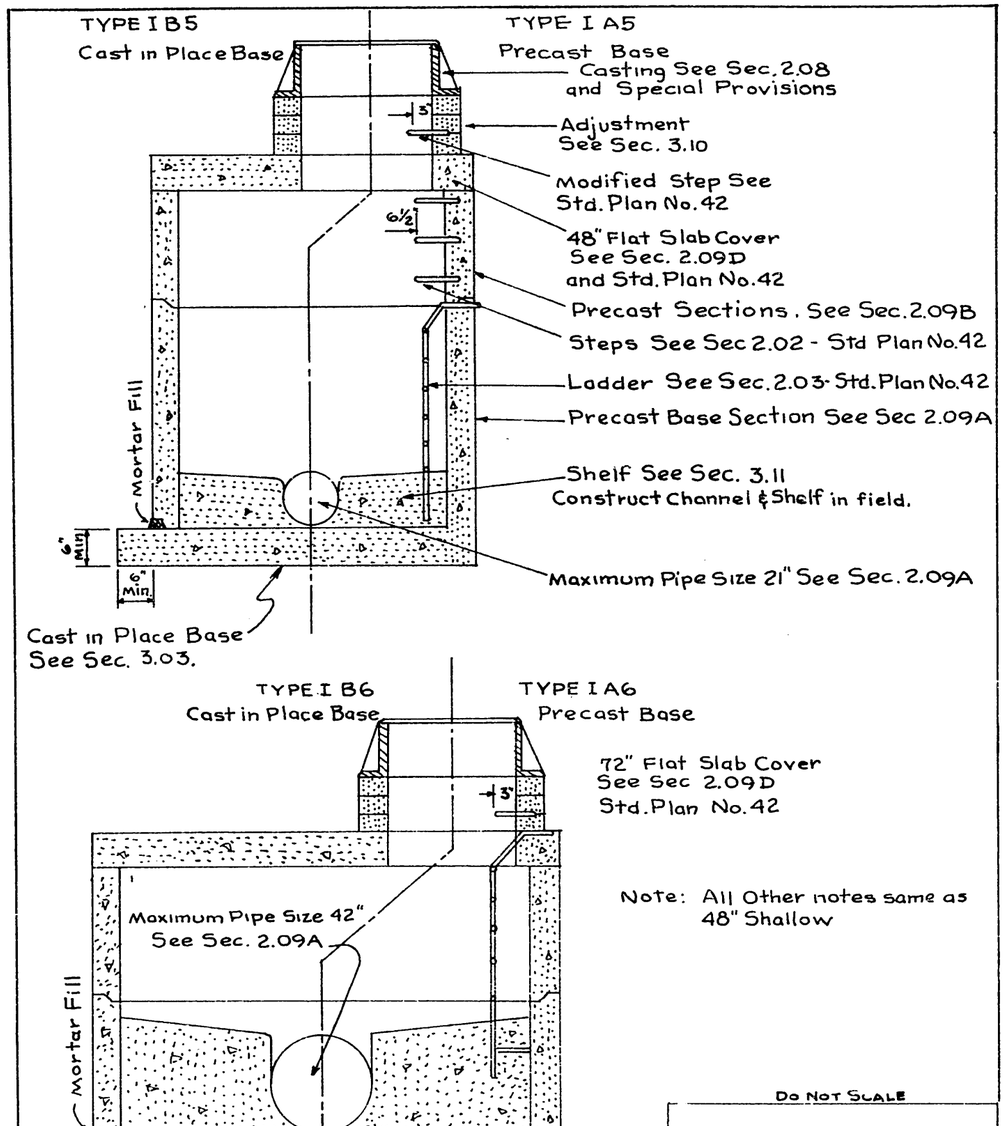
PAYMENT

*Type__(or size) Manhole, Basic Price," per each.
*Type__(or Size) Manhole, Extra Depth," per foot.

DO NOT SCALE

Manhole
Type I Precast Units
Type IA Precast Base
Type IB Cast in Place Base
IA3, IB3, 72" Dia. Reduced to 36"
IA4, IB4, 72" Dia. Reduced to 48"

Standard Plan No. 37



Note: All Other notes same as 48" Shallow

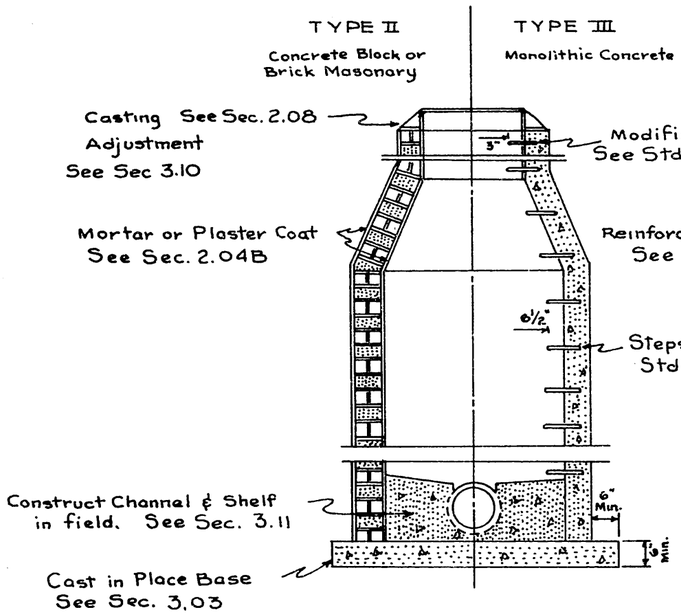
PAYMENT

*Type__(or size) Manhole, Basic Price," per each.
*Type__(or size) Manhole, Extra Depth," per foot.

DO NOT SCALE

Manhole
Type I Precast Units
Type IA Precast Base
Type IB Cast in Place
IA5, IB5, 48" Shallow
IA6, IB6, 72" Shallow

Standard Plan No. 38



Note: 1. For dimensions not given See Sec. 3.05 & 3.06

2. Type II & III

1. 48" Diameter
2. 48" Reduced to 36"
3. 72" Reduced to 36"
4. 72" Reduced to 48"
5. 48" Shallow
6. 72. Shallow

3. Type II 3,4,5,6 use precast slab, See Standard Plan No's 37, 38 Optional with Type III 3,4,5 & 6.

PAYMENT

*Type__(or size) Manhole, Basic Price," per each.

*Type__(or size) Manhole, Extra Depth," per foot.

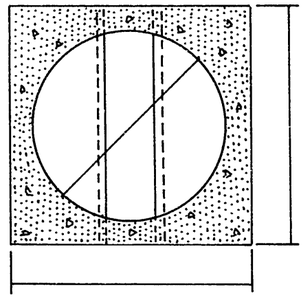
DO NOT SCALE

Manhole
Type II Concrete Block
or
Brick Masonary
Type III Monolithic Concrete
For Sub-Types See Note 2

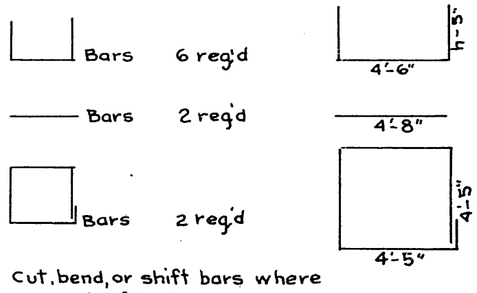
Standard Plan No. 39

TYPE IV A

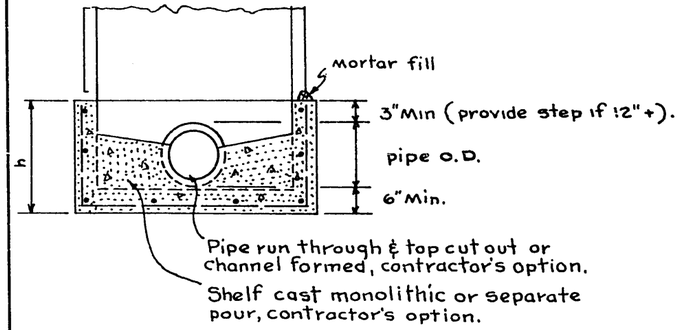
Monolithic Base Section - Pipe Sizes 36" and Smaller.



Reinforcing Schedule (all bars)



Cut, bend, or shift bars where pipe interferes.



PAYMENT

*Type__(or size) Manhole, Basic Price," per each.

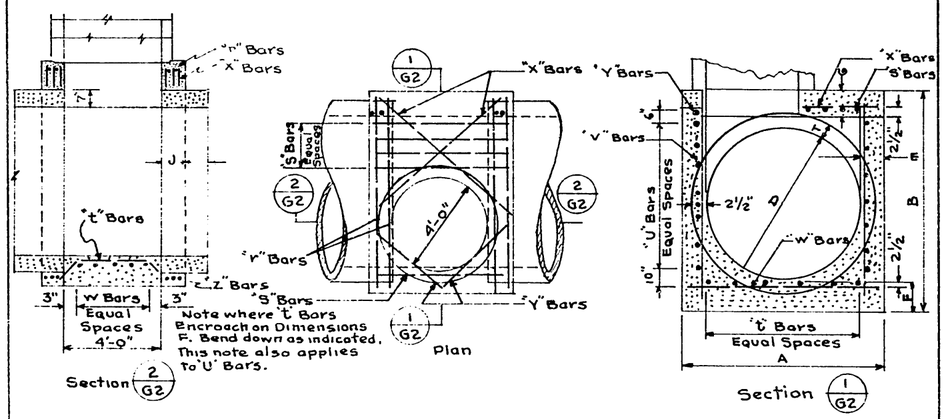
*Type__(or size) Manhole, Extra Depth," per foot.

DO NOT SCALE

Manhole
Type IV Monolithic Base
Type IVA Pipe Dia. 36" & Smaller
Type IVA1 Precast Unit Shaft
Type IVA2 Masonary Shaft
Type IVA3 Monolithic Conc. Shaft

Standard Plan No. 40

Pipe Dia (I.D.)	Depth to Invert	Concrete Dimension A	B	E	F	G	J	Reinforcing Bars: Bottom Slab t No.#	t length	W No.#	W length	Side Walls J No.#	J length	V No.#	V length	Top Slab S No.#	S length	r No.#	r length	X No.#	X length	Y No.#	Y length	Z No.#	Z length
42	10'-30"	5'-6"	6'-4"	12"	14"	12"	8"	8-S	4'-11"	6-9	5'-1"	14-S	4'-11"	10-4	5'-11	2-S	4'-11	4-S	5'-1"	2 S	2'-4"	2 S	3'-3"	4-S	13'-8"
	31'-50"	5'-6"	6'-7"	12"	14"	15"	8"	9-6	4'-11"	6-9	5'-1"	16-S	4'-11"	10-4	6'-2"	2-S	4'-11"		5'-1"		2'-4"		3'-3"		14'-2"
48	10'-30"	6'-0"	6'-10"	12"	14"	12"	8"	8-S	4'-11"	6-9	5'-7"	16-S	4'-11"	10-4	6'-5"	2-S	4'-11"		5'-7"		3'-3"		3'-3"		15'-0"
	31'-50"	6'-0"	7'-1"	12"	14"	15"	8"	9-6	4'-11"	6-9	5'-7"	18-S	4'-11"	10-4	6'-8"	2-S	4'-11"		5'-7"		3'-3"		3'-3"		15'-6"
54	10'-30"	6'-6"	7'-4"	12"	14"	12"	8"	8-S	4'-11"	6-9	6'-1"	18-S	4'-11"	10-4	6'-11"	3-S	4'-11"		6'-1"		5'-3"		3'-3"		16'-4"
	31'-50"	6'-6"	7'-7"	12"	14"	15"	8"	9-6	4'-11"	6-9	6'-1"	22-S	4'-11"	10-4	7'-2"	3-S	4'-11"		6'-1"		5'-3"		3'-3"		16'-10"
60	10'-30"	7'-0"	7'-10"	12"	14"	12"	8"	9-S	4'-11"	6-9	6'-7"	20-S	4'-11"	10-4	7'-8"	4-S	4'-11"		6'-7"		5'-7"		3'-3"		17'-8"
	31'-50"	7'-0"	8'-1"	12"	14"	15"	8"	10-S	4'-11"	6-9	6'-7"	24-S	4'-11"	10-4	7'-8"	4-S	4'-11"		6'-7"		5'-7"		3'-3"		18'-2"
66	10'-30"	7'-6"	8'-4"	12"	14"	12"	8"	10-S	4'-11"	6-9	7'-1"	22-S	4'-11"	10-4	7'-11"	5-S	4'-11"		7'-1"		6'-0"		3'-3"		18'-11"
	31'-50"	7'-6"	8'-7"	12"	14"	16"	8"	11-6	4'-11"	6-9	7'-1"	26-S	4'-11"	10-4	8'-2"	5-S	4'-11"		7'-1"		6'-0"		3'-3"		19'-6"
72	10'-30"	8'-0"	8'-10"	12"	14"	12"	8"	10-S	4'-11"	6-9	7'-7"	24-S	4'-11"	10-4	8'-5"	6-S	4'-11		7'-7"		4'-5		3'-3"		20'-5
	31'-50"	8'-0"	9'-1"	12"	14"	15"	8"	12-6	4'-11	6-9	7'-7"	28-S	4'-11"	10-4	8'-8	6-S	4'-11		7'-7"		6'-5		3'-3"		20'-9"
84	10'-30"	9'-2"	10'-1"	13"	15"	14"	12"	10-S	5'-7"	7-4	8'-9"	32-S	5'-7"	12-4	9'-8"	7-S	5'-7"		8'-9"		8'-3"		3'-6"	6-S	25'-9"
	31'-50"	9'-2"	10'-2"	13"	15"	15"	12"	12-6	5'-7"	7-4	8'-9"	32-S	5'-7"	12-4	9'-9"	7-S	5'-7"		8'-9"		8'-3"		3'-6"		25'-11"
96	10'-30"	10'-4"	11'-3"	14"	16"	14"	12"	11-S	5'-7"	7-4	9'-11"	28-S	5'-7"	12-4	10'-10"	8-S	5'-7"		9'-11"		9'-1"		3'-6"		26'-9"
	31'-50"	10'-4"	11'-4"	14"	16"	15"	12"	15-6	5'-7"	7-4	9'-11"	28-S	5'-7"	12-4	10'-11"	7-S	5'-7"		9'-11"		9'-1"		3'-6"		26'-11"
108	10'-30"	11'-6"	12'-4"	15"	17"	14"	12"	12-S	5'-7"	5-S	11'-1"	36-S	5'-7"	14-4	11'-11"	11-4	5'-7"		11'-1"		10'-3"		3'-6"		29'-7"
	31'-50"	11'-6"	12'-5"	15"	17"	15"	12"	14-6	5'-7"	5-S	11'-1"	36-S	5'-7"	14-4	12'-0"	9-S	5'-7"		11'-1"		10'-3"		3'-6"		29'-9"
120	10'-30"	12'-8"	13'-6"	16"	18"	15"	12"	13-S	5'-7"	5-S	12'-3"	42-S	5'-7"	14-4	13'-1"	12-4	5'-7"		12'-3"		11'-3"		3'-8"		32'-7"
	31'-50"	12'-8"	13'-7"	16"	18"	15"	12"	15-6	5'-7"	5-S	12'-3"	42-S	5'-7"	14-4	13'-2"	11-6	5'-7"		12'-3"		11'-3"		3'-8"		32'-9"



Type IV B Pipe sizes 42"-120"

IV B1 Precast Sectional shaft

IV B2 Concrete Block or Brick Masonary Shaft.

IV B3 Monolithic Concrete Shaft.

Do Not Scale

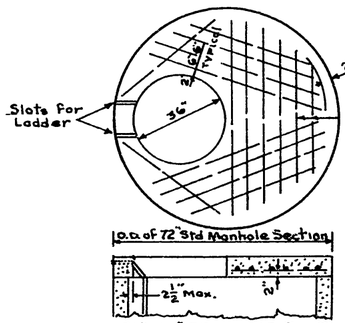
PAYMENT

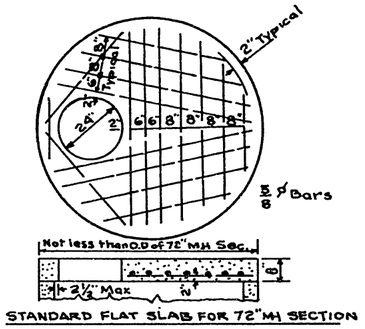
"Type__(or size) Manhole, Basic Price," per each.

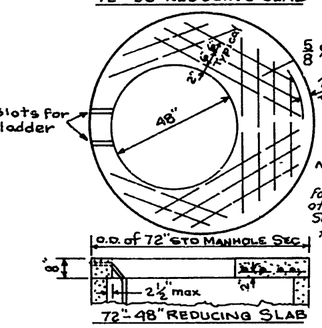
"Type__(or size) Manhole Extra Depth," per foot.

Manhole
Type IV Monolithic Base
Type IV B Pipe Dia. 42" To 120"
Type IV B1 Precast Unit Shaft
Type IV B2 Masonary Shaft
Type IV B3 Monolithic Conc. Shaft

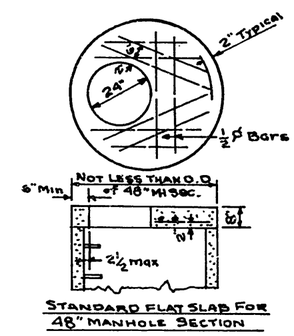
Standard Plan No. 41

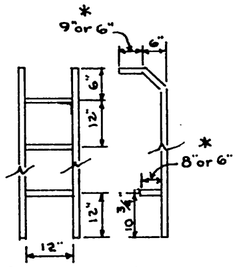






NOTE: Where plans call for openings located other than as shown See special details for reinf arrangement.





STANDARD ALUMINUM OR GALVANIZED STEEL BASE SECTION LADDER

Rungs to be deformed or non-skid as specified for steps. All parts to be 1" dia. min or equivalent section.

STANDARD ALUMINUM OR GALVANIZED PEFORMED STEEL MANHOLE STEPS

Legs may be parallel or approximately radial of option of manufacture except that all steps in any manhole shall be similar.

MODIFIED STEP FOR ADJUSTMENT RING.

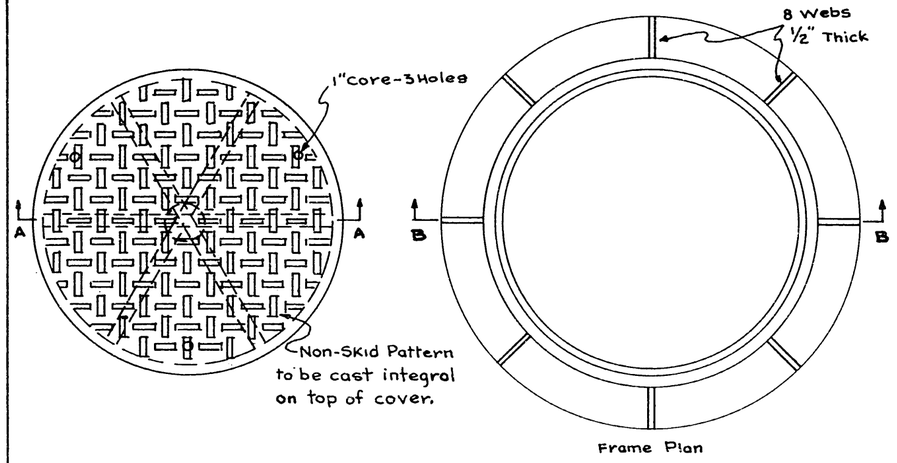
* Larger Dimension when Ladder used with reducing slab.

Do Not Scale

Manhole
Slab, Step & Ladder Detail

Standard Plan No. 42

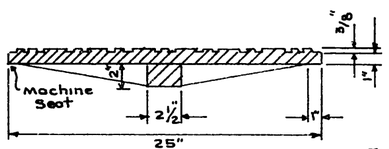
Covers shall have the word "SEWERS" in 2" raised letters when used in connection with sanitary sewer installations, or "DRAIN" when in connection with storm sewers installation, or "WATER" when in connection with water distribution installation.



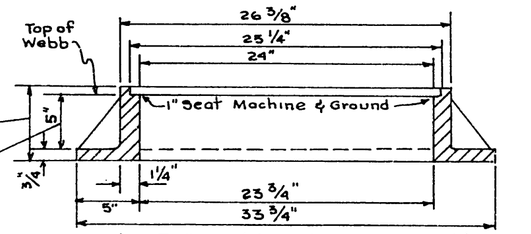
Frame Plan

Heavy Frame (9"depth) use where portland cement concrete pavement is being placed to thickness greater than 6".

Light Frame (6"depth) use where pavement thickness is 6" or less.



Section A-A
Cast Iron-Non Locking Cover
Minimum weight 150 lbs.



Section B-B Cast Iron Frame-Min. Weight 210 lbs.

DO NOT SCALE

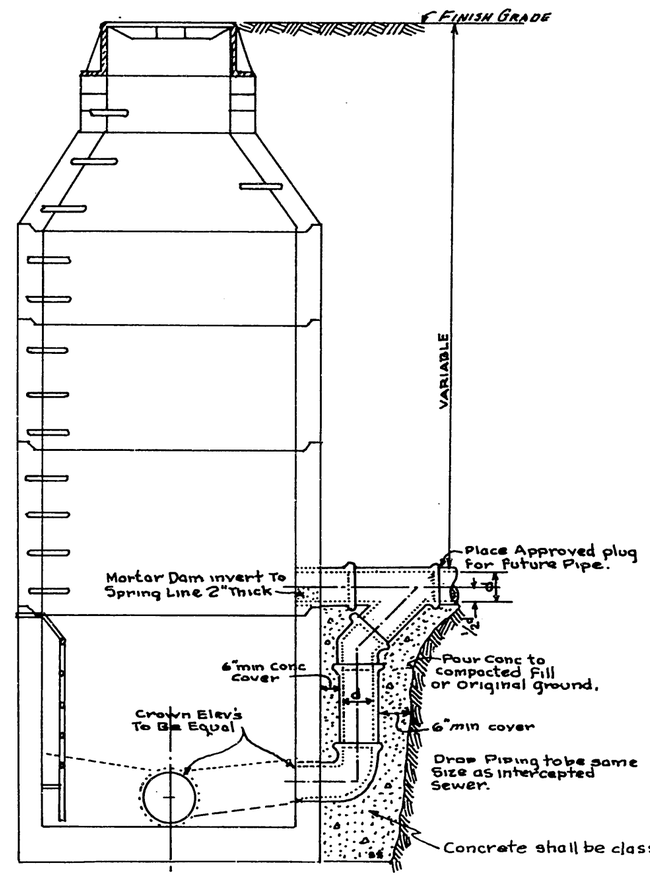
Note see section 63-2.08 for additional details.

Payment

See section 63 of these Specification.

24" Manhole
Frame With Cover

Standard Plan No.43



Drop Connection
Section

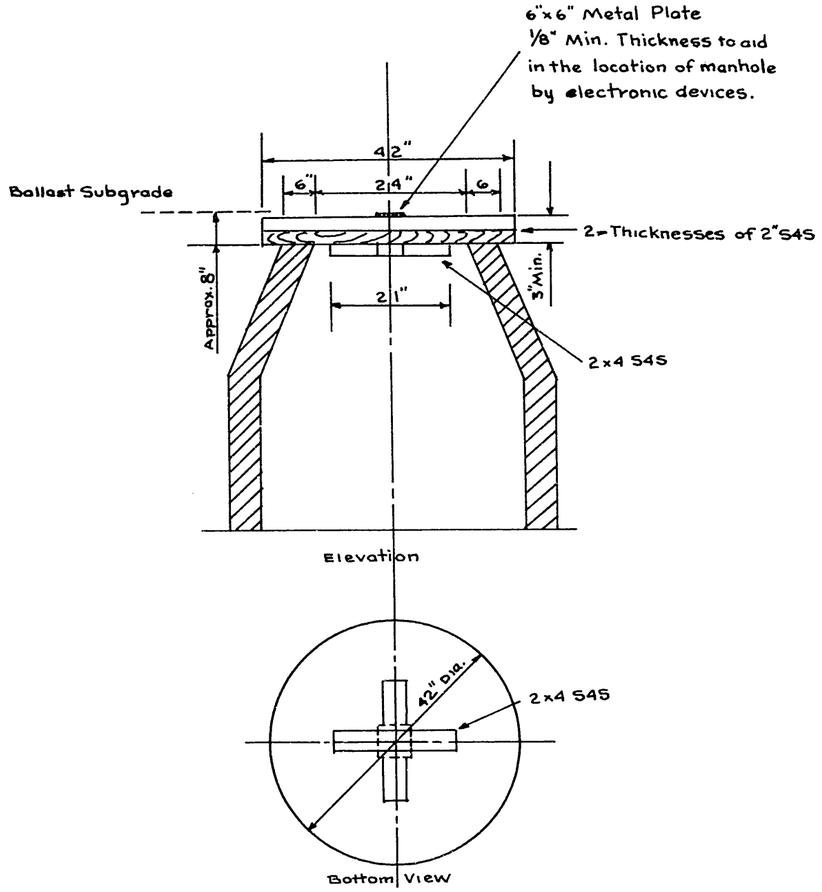
DO NOT SCALE

PAYMENT

"Drop Connection," per each.

Drop Connection

Standard Plan No. 44



General Notes

Wood Cover to be used on street construction to prevent dirt from falling into manhole.

Where subgrade elevations requires the manhole to be removed down into the cone or shaft, and a larger size cover is required, the cover measurements maybe increased. However the cost of such cover shall be incidental to the contract items.

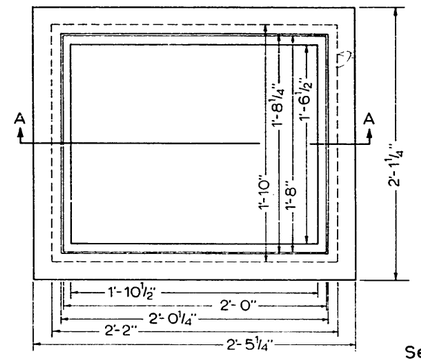
Payments.

Cost of furnishing and placing all temporary manhole covers shall be incidental to other contract items.

Do Not Scale

Temporary Wood Cover For Manhole

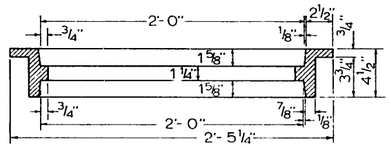
Standard Plan No. 45



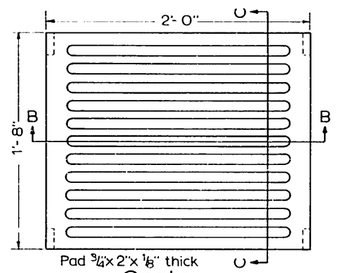
Frame

Payment

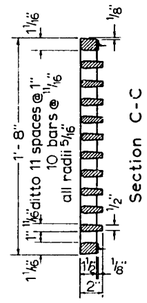
See Section 64 of these specifications.

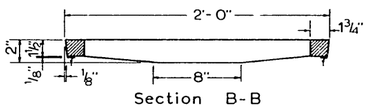


Section A-A



Grate





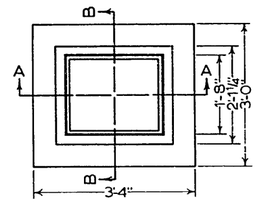
Section B-B

Note:
Sections through Grate. (Corner pads to be machined or ground for solid, non-rocking bearing in any of four possible positions in frame.)

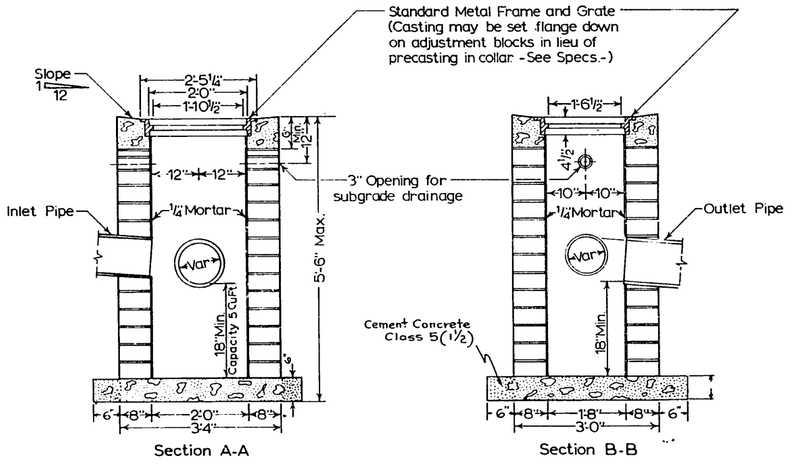
Do Not Scale

Metal Frame & Grate For Catch Basins & Inlets

Standard Plan No. 46



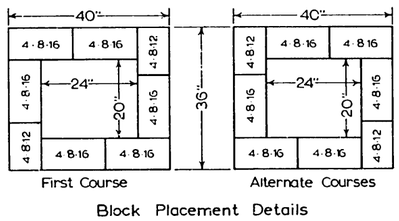
Plan



Section A-A Section B-B

Payment

"Type I, 5 foot Catch Basin Inlet," per each.
"Additional depth 5 foot, Type I Catch Basin Inlet," per each.

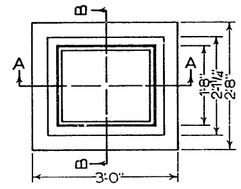


Block Placement Details

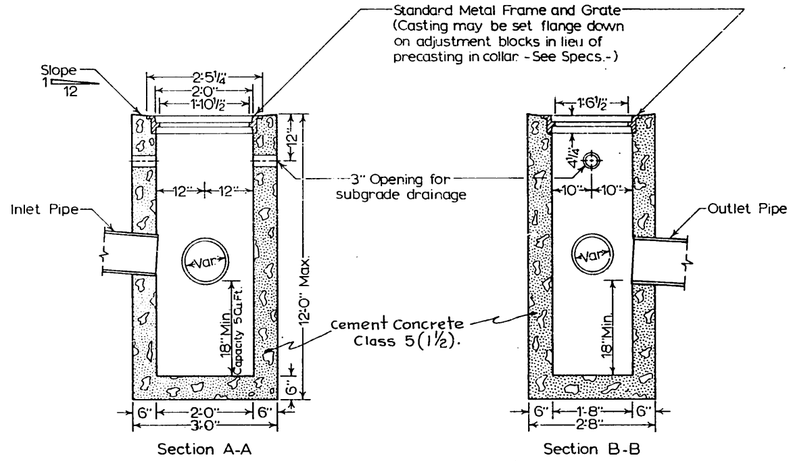
Do Not Scale

Type I-A Catch Basin Inlet
Masonry Construction

Standard Plan No. 47



Plan



Section A-A Section B-B

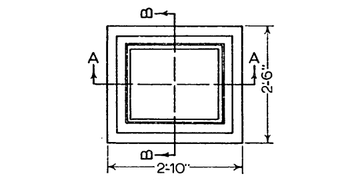
Payment

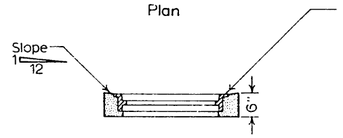
"Type I, 5 foot Catch Basin Inlet," per each.
"Additional depth 5 foot, Type I Catch Basin Inlet," per each.

Do Not Scale

Type I-B Catch Basin Inlet
Cast in Place

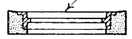
Standard Plan No. 48



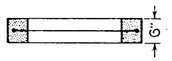


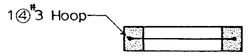
- Max. overall height of complete unit = 7'-6".
- "U" shaped openings to be cast in base section as required, for pipe sizes to 15," to provide 18" min. depth below invert of outlet pipe.
- Place one 12" "S" section immediately below top ring and lower subgrade if necessary to insure that openings intercept base course gravel.

Metal Frame and Grate
(Casting may be set flange down on adjustment blocks in lieu of precasting in collar - See Specs.-)

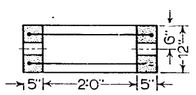


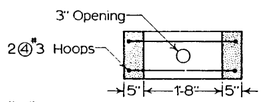
Top Unit



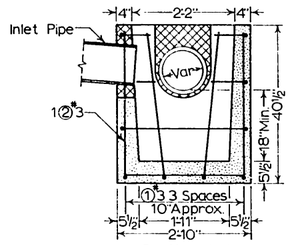


6" Unit "S"

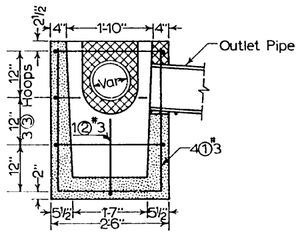




12" Unit "S"



Section A-A

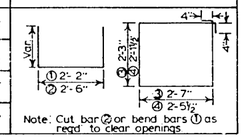


Section B-B

Base Section

Bar List
All dimensions are out to out

Mark	Location	No	Size	Length	Bending Diagram
1	Bottom Slab and Side Walls	4	3	36½"	
2	Bottom Slab and Side Walls	1	3	36½"	
3	Side Walls	3	3	10'-4"	
4	Unit "S"	2	3	9'-10"	



Note: Cut bar ② or bend bars ① as read to clear openings

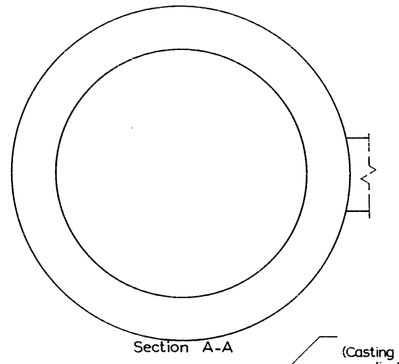
Payment

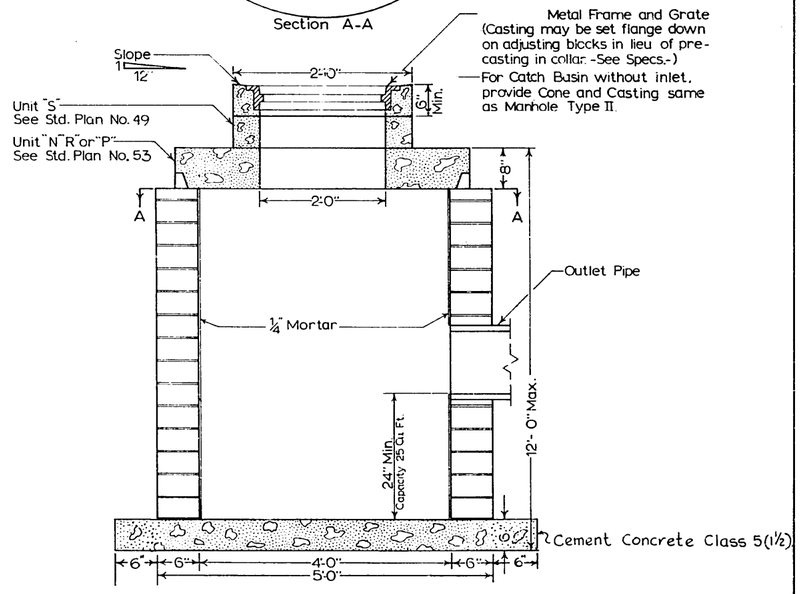
"Type I, 5 foot Catch Basin Inlet," per each.
"Additional depth 5 foot, Type I Catch Basin Inlet," per each.

Do Not Scale

Type IC Catch Basin Inlet
Precast

Standard Plan No. 49





Metal Frame and Grate
(Casting may be set flange down on adjusting blocks in lieu of precasting in collar - See Specs.-)

For Catch Basin without inlet, provide Cone and Casting same as Manhole Type II.

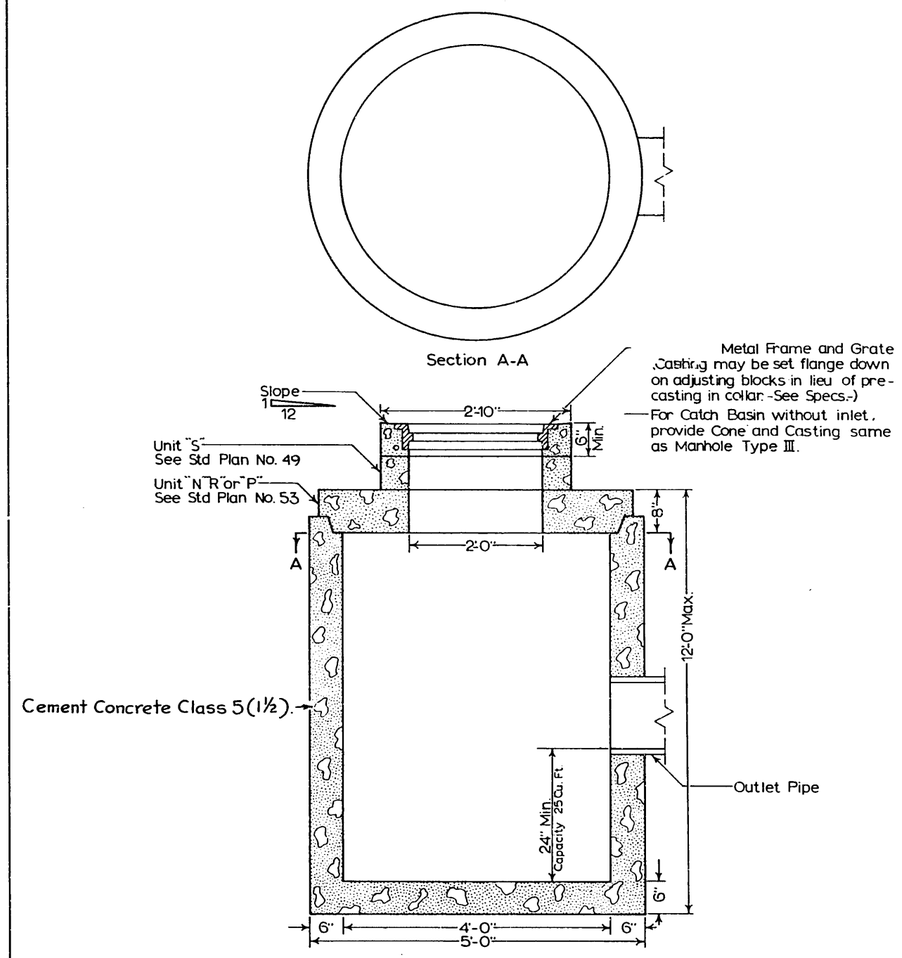
Payment

"Type II, 5 foot Catch Basin Inlet," per each.
"Additional depth 5 foot, Type II, Catch Basin Inlet," per each.

Do Not Scale

Type II-A Catch Basin Inlet
Masonry Construction

Standard Plan No. 50



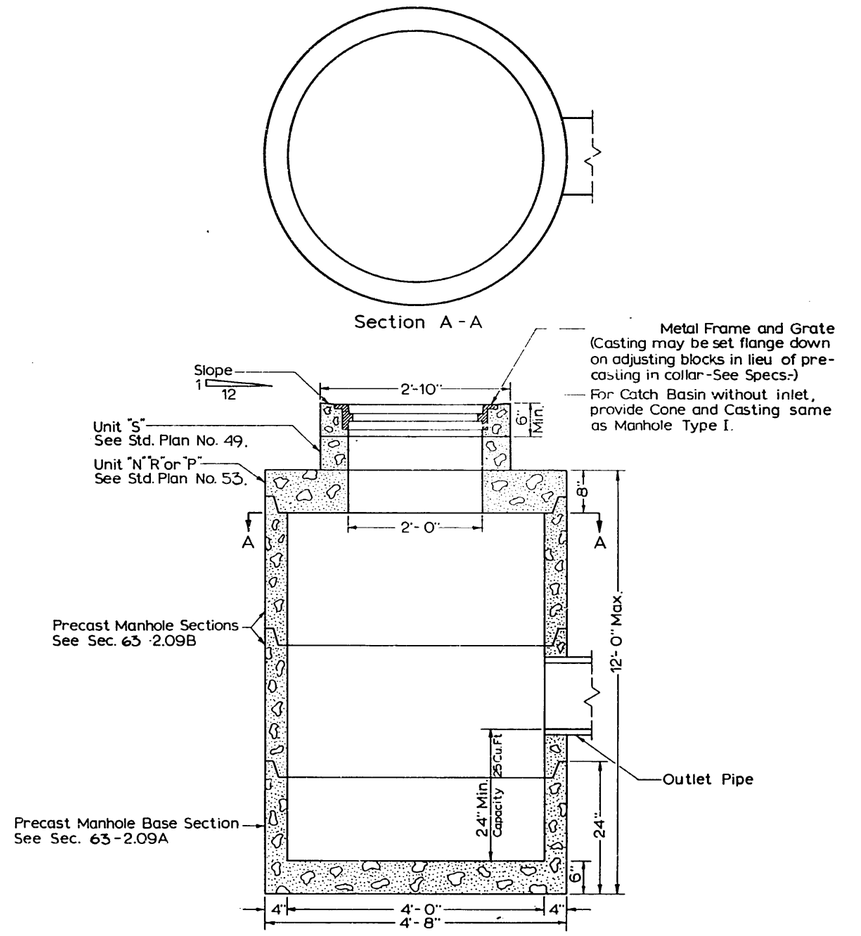
Payment

Type II, 5 foot Catch Basin Inlet", per each.
"Additional depth 5 foot, Type II, Catch Basin Inlet", per each.

DO NOT SCALE

Type II-B Catch Basin Inlet
Cast in Place

Standard Plan No. 51



Payment

"Type II, 5 foot Catch Basin Inlet", per each.
"Additional depth 5 foot, Type II, Catch Basin Inlet", per each.

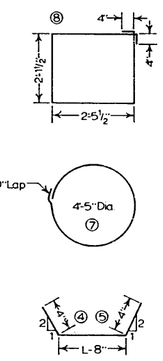
DO NOT SCALE

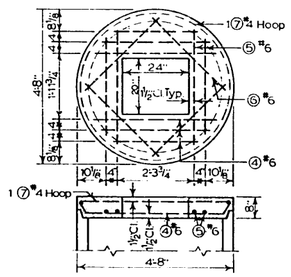
Type II-C Catch Basin Inlet
Precast

Standard Plan No. 52

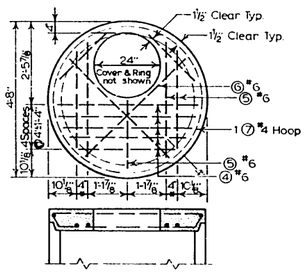
Bar List
All dimensions are out to out

Mark	Location	No	Size	Length	Bending Diagram
4	Cover Slab Unit N Bottom-Long.	6	6	Var.	L=2ea@ 4'-5"; 4'-1" & 3'-6"
5	Cover Slab Unit N Bottom-Transv.	4	6	Var.	L=2ea@ 4'-2" & 3'-8"
6	Cover Slab Unit N Bottom-Diag.	4	6	3'-2"	Str.
7	Cover Slab Unit N Top	1	4	14'-11"	
4	Cover Slab Unit P Bottom-Long.	6	6	Var.	L=2@ 4'-9"; 1ea.@ 4'-7"; 4'-3"; 3'-9"; & 3'-0"
5	Cover Slab Unit P Bottom-Transv.	5	6	Var.	L=2ea@ 4'-2"; & 3'-8"; 1@ 2'-9"
6	Cover Slab Unit P Bottom-Diag.	4	6	Var.	Str. 2ea@ 3'-9"; & 3'-2"
7	Cover Slab Unit P Top	1	4	14'-11"	
4	Cover Slab Unit R Bottom-Long.	5	6	Var.	L=1ea @ 4'-9"; 4'-8"; 4'-6"; 4'-1" & 3'-7"
5	Cover Slab Unit R Bottom-Transv.	5	6	Var.	L=2ea @ 4'-2"; 3'-8"; 1@ 2'-5"
6	Cover Slab Unit R Bottom-Diag.	4	6	Var.	Str. 2ea @ 4'-4"; & 2'-5"
7	Cover Slab Unit R Top	1	4	14'-11"	
8	Unit S	2	3	9'-10"	

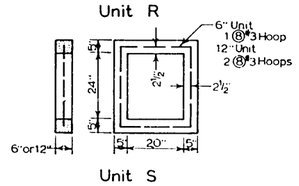




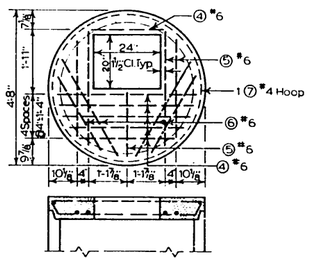
Unit N



Unit R



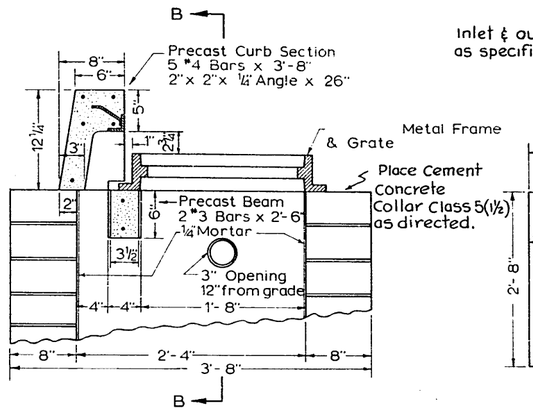
Unit S



Unit P

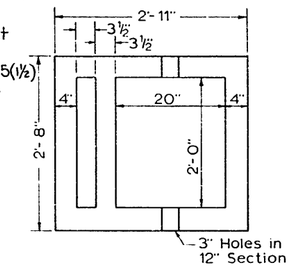
Do Not Scale

Catch Basin Inlet-Precast Cover and Extension Units

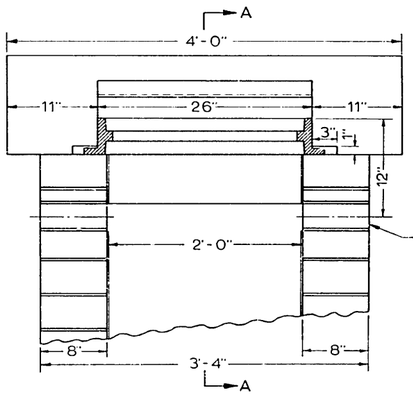


Section A-A

Inlet & outlet pipe locations shall be as specified in Section 64-3.02



Extension Sections
6" and 12" High
#3 Hoops not shown
1 Hoop in 6" Unit
2 Hoops in 12" Unit



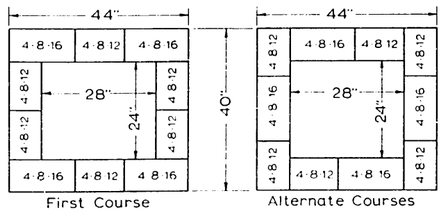
Section B-B

Note Base construction shall meet requirements shown on Standard Plan No. 47.

Payment

*Type III, 5 foot Combination Curb and Gutter Catch Basin Inlet; per each.

*Additional depth 5 foot Type III Combination Curb and Gutter Catch Basin Inlet; per vertical foot.



First Course Alternate Courses

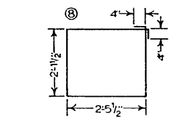
Block Placement Details

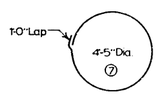
Do Not Scale

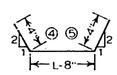
Type III-A Comb. Curb & Gutter Catch Basin Inl. Masonry Const.

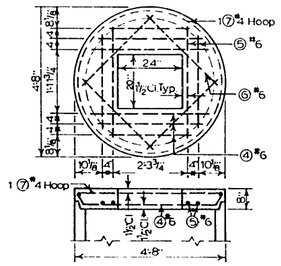
Bar List
All dimensions are out to out

Mark	Location	No.	Size	Length	Bending Diagram
4	Cover Slab Unit N Bottom-Long.	6	6	Var.	L=2ea @ 4'-5"; 4'-1" & 3'-6"
5	Cover Slab Unit N Bottom-Transv.	4	6	Var.	L=2ea @ 4'-2" & 3'-8"
6	Cover Slab Unit N Bottom-Diag.	4	6	3'-2"	Str.
7	Cover Slab Unit N Top	1	4	14'-11"	
4	Cover Slab Unit P Bottom-Long.	6	6	Var.	L=2 @ 4'-9"; 1ea @ 4'-7"; 4'-3"; 3'-9"; & 3'-0"
5	Cover Slab Unit P Bottom-Transv.	5	6	Var.	L=2ea @ 4'-2"; & 3'-8"; 1@ 2'-9"
6	Cover Slab Unit P Bottom-Diag.	4	6	Var.	Str. 2ea @ 3'-9"; & 3'-2"
7	Cover Slab Unit P Top	1	4	14'-11"	
4	Cover Slab Unit R Bottom-Long.	5	6	Var.	L=1ea @ 4'-9"; 4'-8"; 4'-6"; 4'-1" & 3'-7"
5	Cover Slab Unit R Bottom-Transv.	5	6	Var.	L=2ea @ 4'-2"; 3'-8"; 1@ 2'-5"
6	Cover Slab Unit R Bottom-Diag.	4	6	Var.	Str. 2ea @ 4'-4"; 1 2'-5"
7	Cover Slab Unit R Top	1	4	14'-11"	
8	Unit S	2	3	9'-10"	

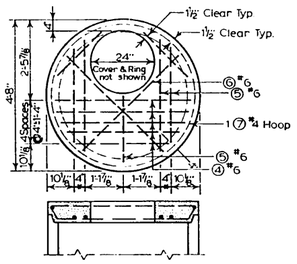




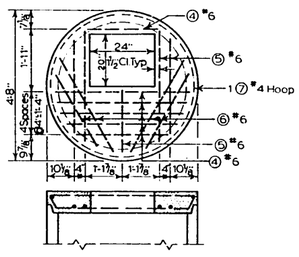




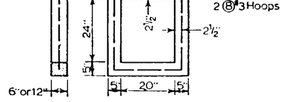
Unit N



Unit R



Unit P

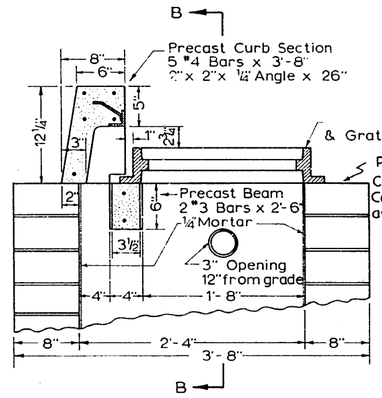


Unit S

Do Not Scale

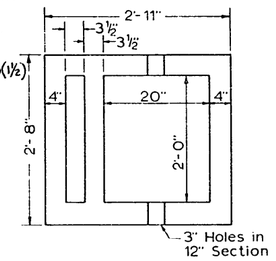
Catch Basin Inlet-Precast Cover and Extension Units

Standard Plan No. 53

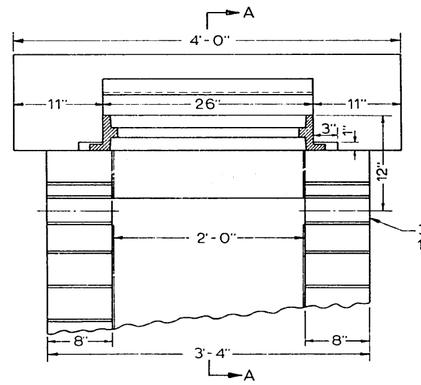


Section A-A

Inlet & outlet pipe locations shall be as specified in Section 64-3.02



Extension Sections
6" and 12" High
#3 Hoops not shown
1 Hoop in 6" Unit
2 Hoops in 12" Unit

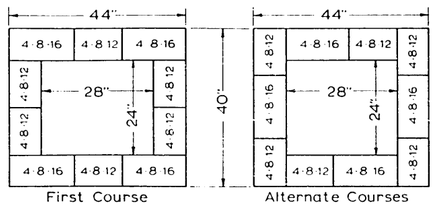


Section B-B

Note Base construction shall meet requirements shown on Standard Plan No. 47.

Payment

*Type III, 5 foot Combination Curb and Gutter Catch Basin Inlet; per each.
*Additional depth 5 foot Type III Combination Curb and Gutter Catch Basin Inlet; per vertical foot.

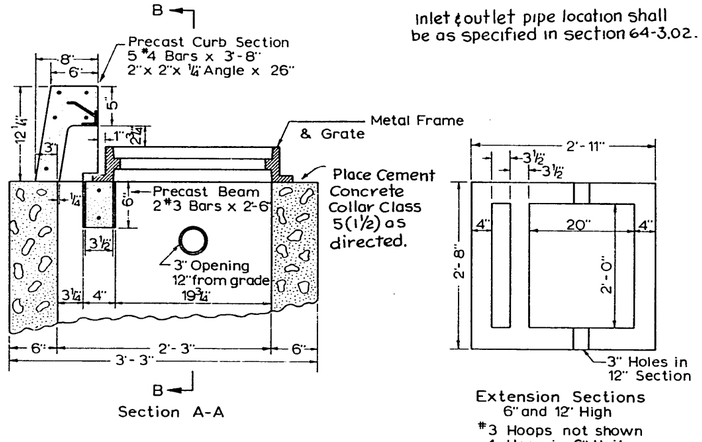


Block Placement Details

Do Not Scale

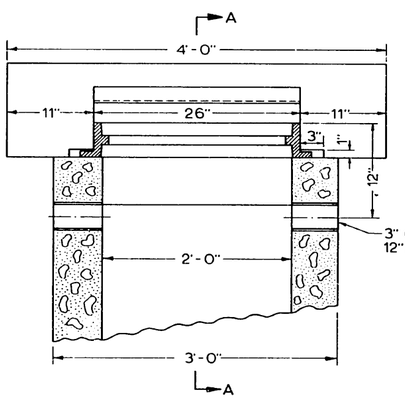
Type III-A Comb. Curb & Gutter Catch Basin Inl. Masonry Const.

Standard Plan No. 54



Inlet & outlet pipe location shall be as specified in section 64-3.02.

Extension Sections
6" and 12" High
#3 Hoops not shown
1 Hoop in 6" Unit
2 Hoops in 12" Unit



Note Base construction shall meet requirements shown on Standard Plan No. 48.

3" Opening for subgrade drainage. 12" from grade.

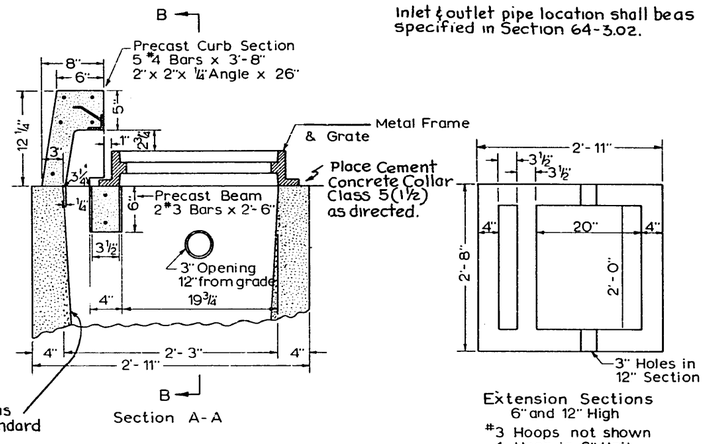
Payment

Type III, 5 foot Combination Curb and Gutter Catch Basin Inlet, per each.
Additional depth 5 foot Type III Combination Curb and Gutter Catch Basin Inlet, per vertical foot.

Do Not Scale

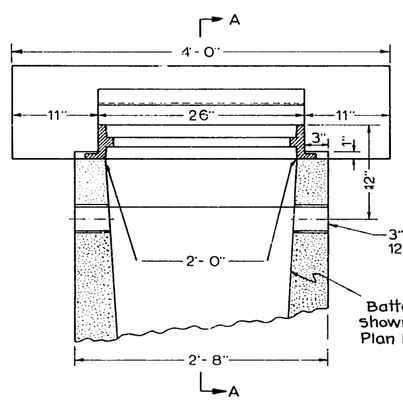
Type III-B Comb. Curb & Gutter Catch Basin Inl. Cast in Place

Standard Plan No. 55



Inlet & outlet pipe location shall be as specified in Section 64-3.02.

Extension Sections
6" and 12" High
#3 Hoops not shown
1 Hoop in 6" Unit
2 Hoops in 12" Unit



3" Opening for subgrade drainage. 12" from grade.

Batter same as shown on Standard Plan No. 49.

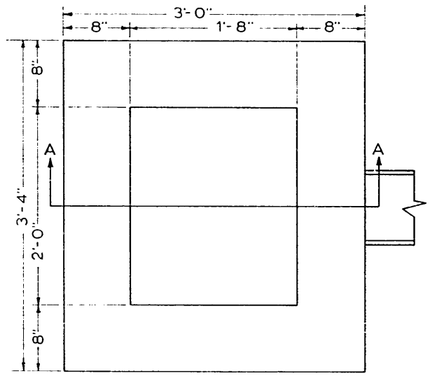
Payment

Type III, 5 foot Combination Curb and Gutter Catch Basin Inlet, per each.
Additional depth 5 foot Type III Combination Curb and Gutter Catch Basin Inlet, per vertical foot.

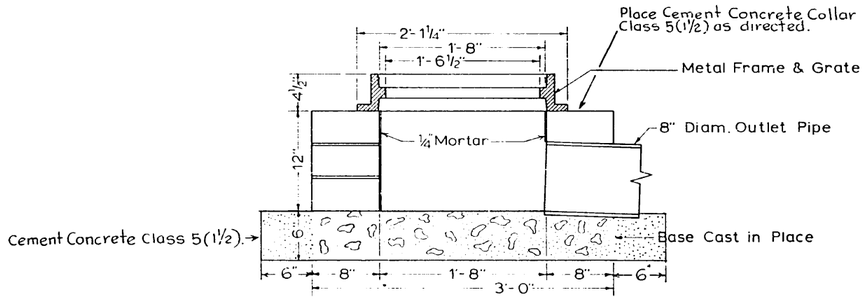
Do Not Scale

Type III-C Comb. Curb & Gutter Catch Basin Inlet Precast

Standard Plan No. 56



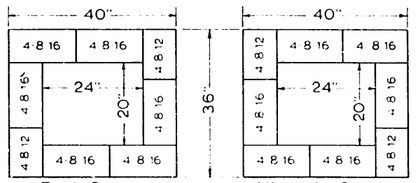
Plan



Section A-A

Payment

"Type IV Curb Inlet," per each.

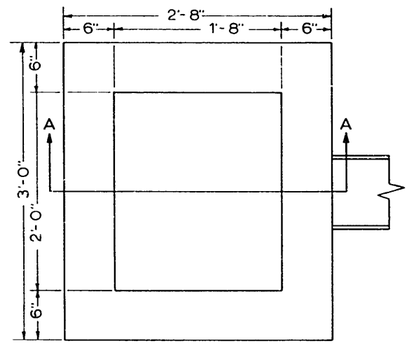


Block Placement Details

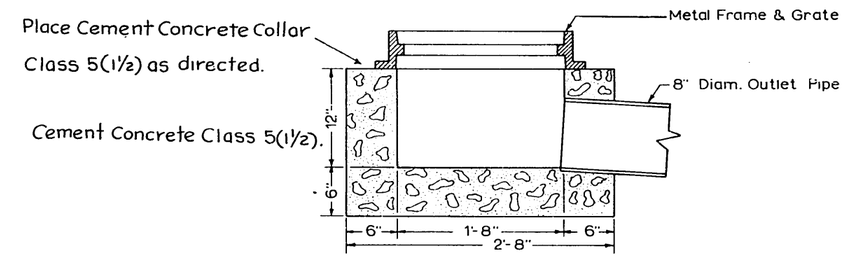
DO NOT SCALE

Type IV-A Curb Inlet
Masonry Construction

Standard Plan No. 57



Plan



Section A-A

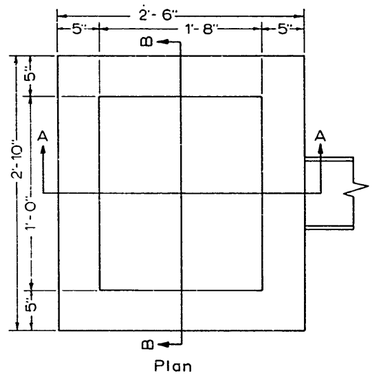
Payment

"Type IV Curb Inlet," per each.

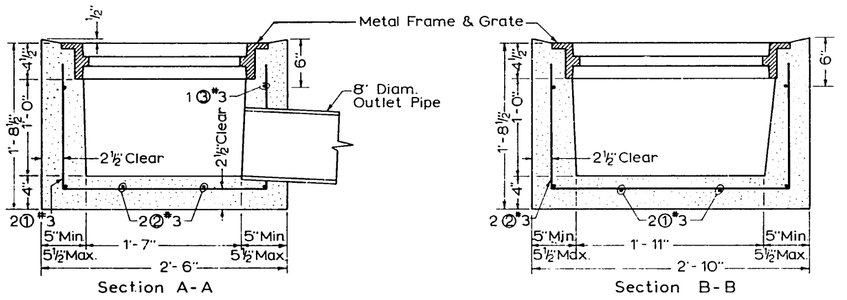
DO NOT SCALE

Type IV-B Curb Inlet
Cast in Place

Standard Plan No. 58

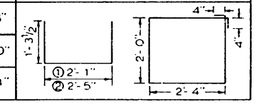


Payment
"Type IV Curb Inlet," per each.



Bar List
(For Precast Unit)
All dimensions are out to out

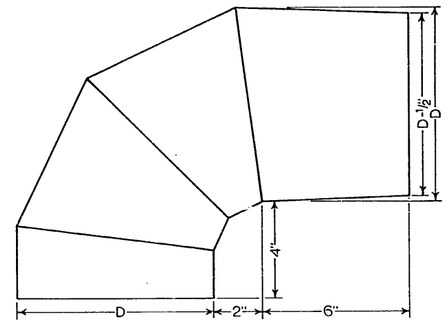
Mark	Location	No	Size	Length	Bending Diagram
1	Bottom Slab and Side Walls	2	3	4'-8"	
2	Bottom Slab and Side Walls	2	3	5'-0"	
3	Side Walls	2	3	9'-4"	



Do Not Scale

Type IV-C Curb Inlet
Precast

Standard Plan No. 59



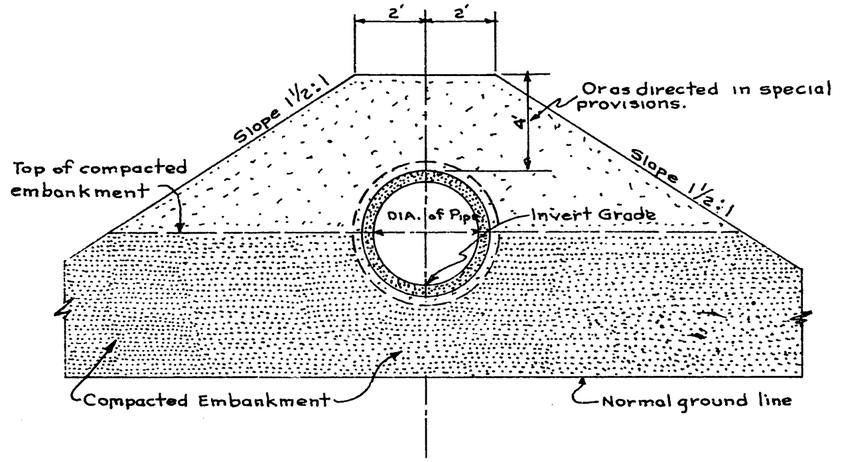
Note:
- Trap to be made of 22 Ga. Galvanized sheet metal.
- All joints to be seamed and soldered.
- All longitudinal joints to be riveted.
- Dimension "D" is nominal diameter of outlet pipe.

Payment
"Catch Basin Trap (size)," per each.

Do Not Scale

Catch Basin Trap

Standard Plan No. 60



Note:

Where normal ground line is below invert of pipe, an embankment, compacted as outlined in section 67-2.01 of these specifications, shall be constructed to the spring line of the pipe.

Pipe shall then be placed according to specifications and covered to the lines shown on this drawing, care being taken not to disturb pipe.

Material for embankment shall be as called for in Section 67-2.01 of these specifications.

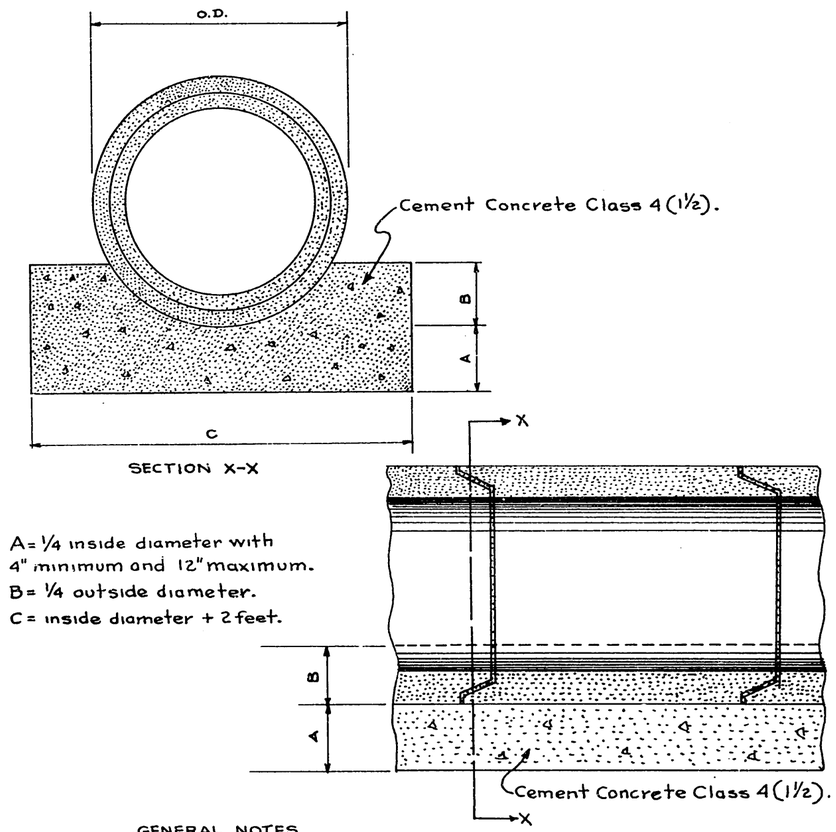
Payment

"Pipe Covering and Embankment," per cubic yard.

Do Not Scale

Pipe Covering & Embankment

Standard Plan No. 61



GENERAL NOTES.

Bedding need not be formed, provided minimum dimensions are maintained.

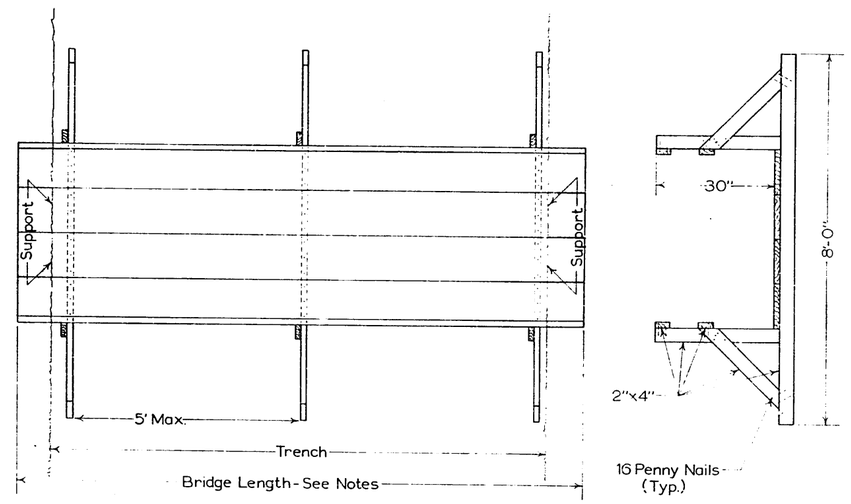
PAYMENT

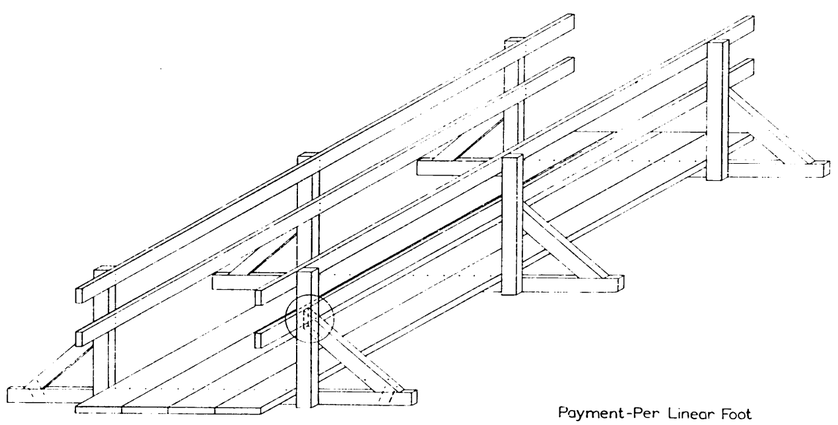
"Pipe Bedding Class 'A' for (size) Pipe," per linear foot.

Do Not Scale

Pipe Bedding Class 'A'

Standard Plan No. 62





Payment - Per Linear Foot

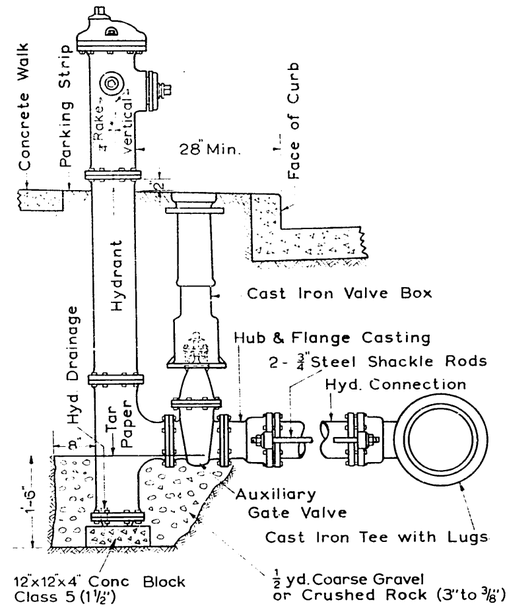
Lumber - Construction Grade
Posts and Rails 54S
Planks - Rough

Bridge Length - Plank Size
8'-12' . . . 2"x 12"
13'-16' . . . 3"x 12"
17'-20' . . . 4"x 12"

Do Not Scale

Temporary Pedestrian Crossing

Standard Plan No. 63



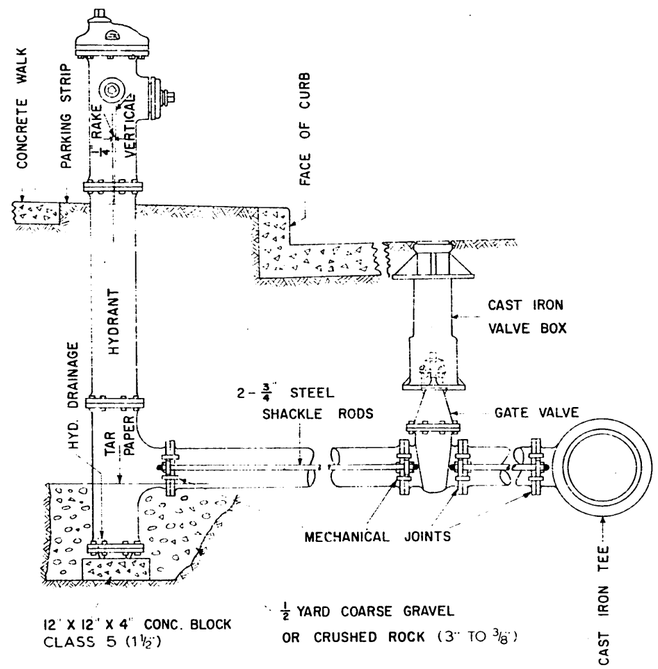
PAYMENT

"Hydrant, 6"(4") Connection," per each (See Specifications)
"6"(4") Hydrant Connection as "Watermains" per linear foot
"6"(4") Gate Valve," per each

Do Not Scale

Hydrant Setting, Type A

Standard Plan No. 65



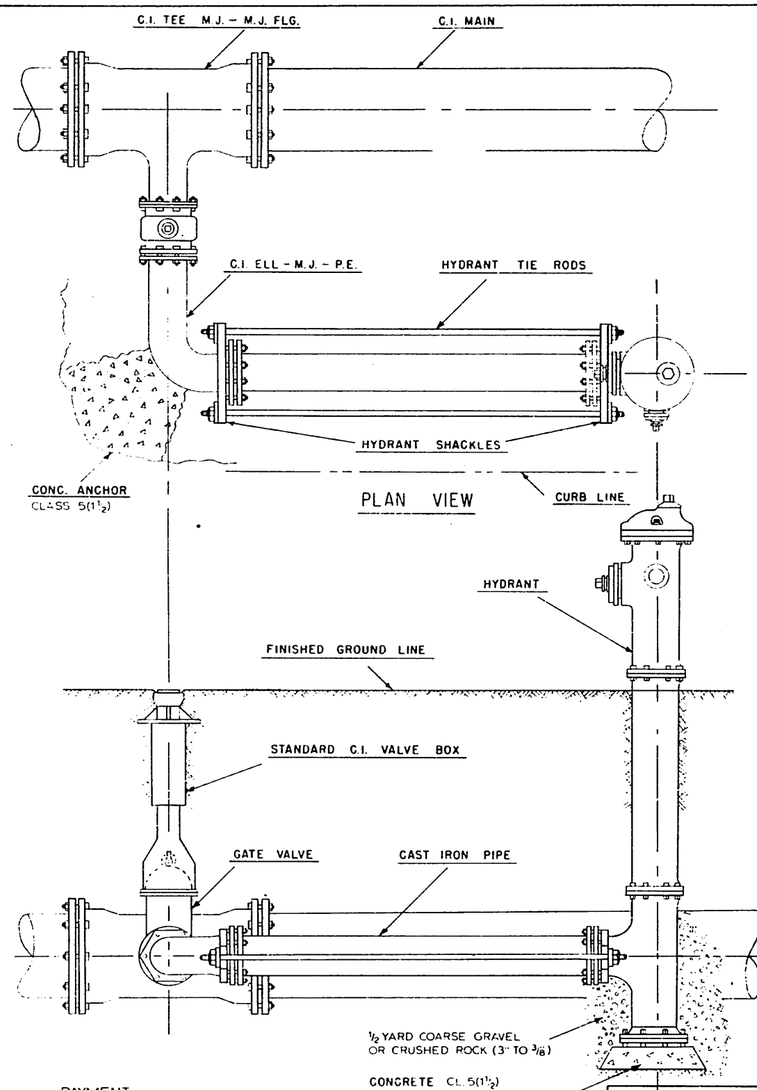
PAYMENT

"HYDRANT 6"(4") CONNECTION," PER EACH (SEE SPECIFICATIONS)
"6"(4") HYDRANT CONNECTION AS "WATERMAINS" PER LINEAR FOOT
"6"(4") GATE VALVE," PER EACH

DO NOT SCALE

Hydrant Setting, Type B

Standard Plan No. 66



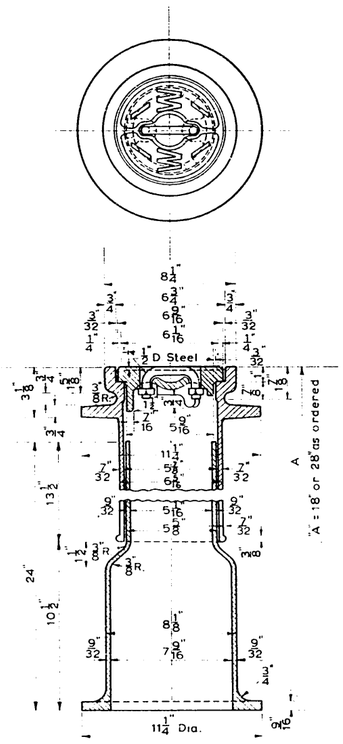
PAYMENT

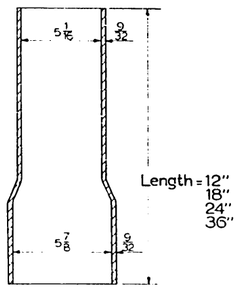
"HYDRANT, 6"(4") CONNECTION" PER EACH (SEE SPECIFICATIONS)
"6"(4") HYDRANT CONNECTION AS "WATERMAINS" PER LINEAR FOOT
"6"(4") GATE VALVE," PER EACH

DO NOT SCALE

Offset Hydrant Setting

Standard Plan No. 67





Extension Pieces

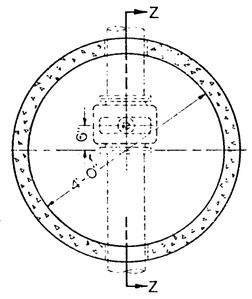
PAYMENT

"Cast Iron Valve Box", per each
"Valve Box Extension (length)", per each

DO NOT SCALE

Cast Iron Valve Box

Standard Plan No 68



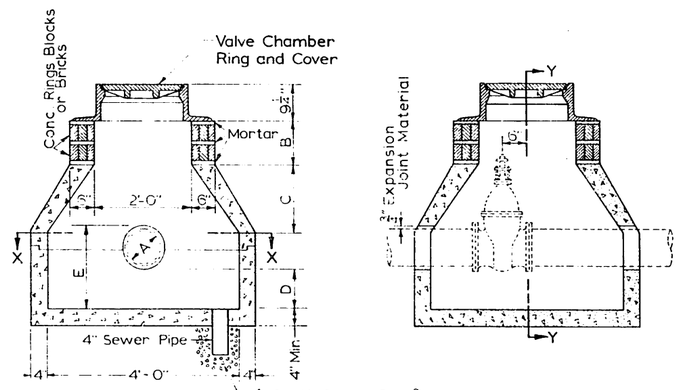
Section X-X

GENERAL NOTES

Valve Chamber Ring & Cover Standard Plan No 43
Concrete - Compressive strength 3,000 psi at 28 days
Gravel Drain ½ Cu. Yd. Gravel (3" to ⅜")

PAYMENT

"Valve Chamber, Standard," per each



Section Y-Y Section Z-Z

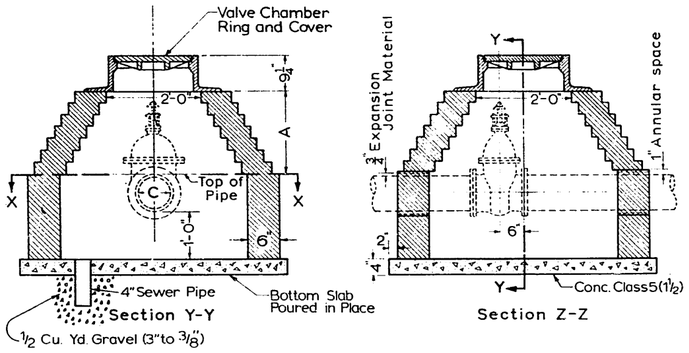
When "A"-Pipe Dia. is 4", 6", or 8"
"B" = 3" Min.
"C" = 1'-4" Max.
"D" = 10" Min.
"E" = 1'-9" Max.

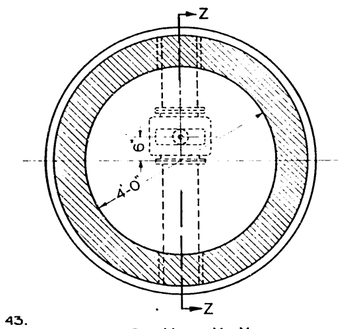
When "A"-Pipe Dia. is 12"
"B" = 11" Min.
"C" = 2'-1" Max.
"D" = 12" Min.
"E" = 2'-3" Max.

DO NOT SCALE

Valve Chamber, Standard Precast

Standard Plan No. 69





When C= 8" A= 21", not less
" C=12" A=29", " "

GENERAL NOTES

Bottom Slab Class 5 (1½") Concrete
Valve Chamber Ring & Cover Standard Plan No. 43.
Construction Alternates Precast Concrete (Plan No 69).
Cast in Place Concrete, Class 5 (1½)
Solid Concrete Blocks
Gravel Drain ½ Cu. Yd. Gravel (3" to ⅜")

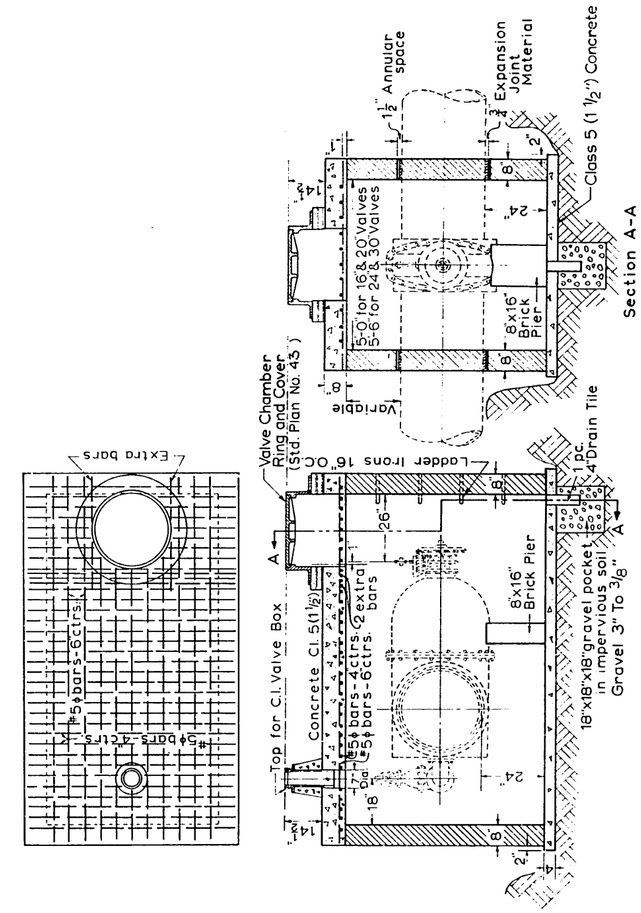
PAYMENT

"Valve Chamber, Standard," per each

DO NOT SCALE

Valve Chamber, Standard
Masonry Construction

Standard Plan No. 70



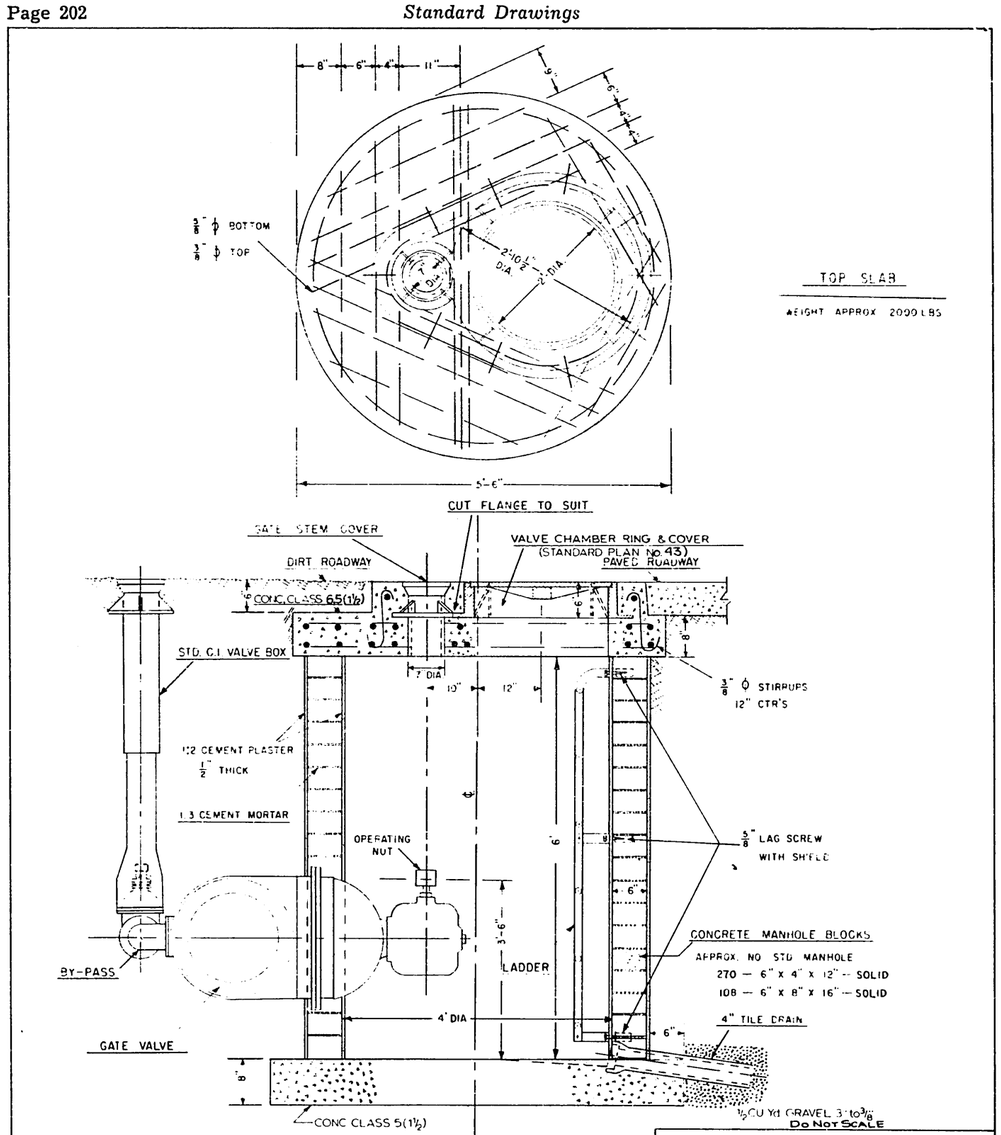
PAYMENT

"Valve Chamber, Large Type A," per each

DO NOT SCALE

VALVE CHAMBER,
LARGE, TYPE A

Standard Plan No. 71



NOTE DIA. OF VAULT MAY VARY WITH SIZE OF VALVE

NOTE. STEPS MAY BE USED UNLESS THE LADDER IS SPECIFIED

NOTE PRE-CAST VAULT MAY BE USED IN PLACE OF BLOCK

PAYMENT

"VALVE CHAMBER, LARGE TYPE B" PER EACH

Valve Chamber Large Type B

Standard Plan No. 72

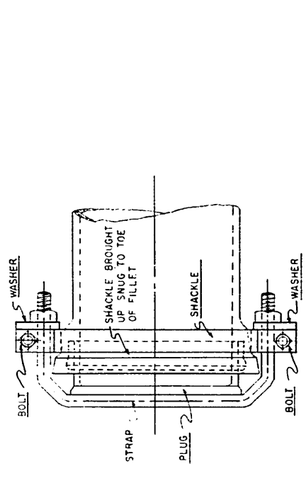
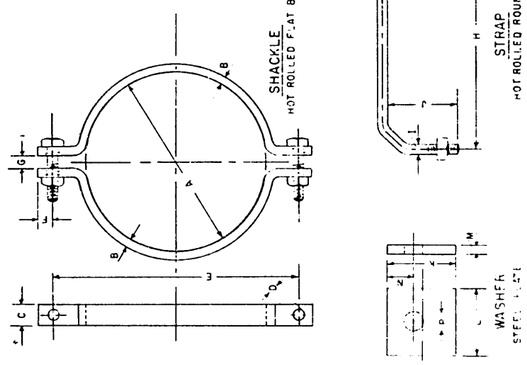


TABLE OF DIMENSIONS

SIZE OF PIPE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	BOLT
4"	7¼"	1"	1½"	13/16"	2¾"	1"	1"	10"	¾"	7"	2½"	3"	⅜"	1¼"	⅝"	¾" x 3"
6"	9½"	½"	1½"	1⅛"	6"	1"	1¼"	12"	¾"	8½"	3"	3"	⅜"	1¼"	⅝"	¾" x 4"
8"	11½"	½"	2"	1⅜"	19"	1"	1½"	14½"	¾"	8½"	3"	3½"	½"	1½"	⅝"	¾" x 4"
10"	14"	¾"	2¼"	1⅝"	22"	1"	1½"	17"	1"	9"	3½"	3½"	½"	1½"	⅝"	1" x 5"
12"	6¼"	¾"	2¼"	1⅝"	24"	1¼"	1½"	19½"	1"	9½"	3½"	4"	½"	1½"	⅝"	1" x 5"
14"	18½"	1"	2½"	1⅝"	26"	1¼"	2¼"	20¼"	1¼"	10"	4"	4"	¾"	1½"	⅝"	1" x 6"
16"	21"	1"	2½"	1⅝"	28"	1½"	2"	26½"	1⅜"	11"	4"	4½"	¾"	1½"	⅝"	1⅛" x 7"
18"	22¼"	1"	2¾"	1⅝"	30"	1½"	2"	26½"	1⅜"	12"	4½"	4½"	¾"	1½"	⅝"	1⅛" x 7"
20"	24½"	1"	2¾"	1⅝"	32"	1⅝"	2"	28½"	1½"	12"	5"	5"	½"	1½"	⅝"	1¼" x 7"



Do Not Scale

PAYMENT

SEE SPECIFICATIONS

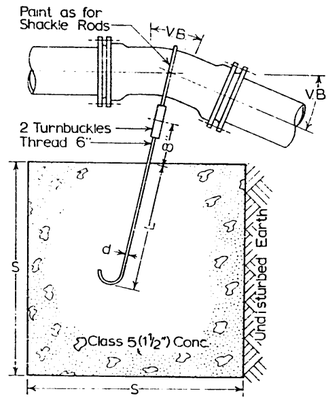
Plug and Shackle for Cast Iron Watermain

Standard Plan No. 73

Type "A" Blocking
for 11¼°-22½°-30° Vertical Bends

Pipe Size Nom. Diameter-Inches	Test Pressure psi	V.B. Vertical Bend Degrees	No. of cu. ft. of Conc. Blocking	S Side of Cube feet	d Diameter of Shackle Rods (2) inches	L Depth of Rods in Concrete feet
4"	300	11¼	8	2	5/8"	1.5
		22½	11	22		2.0
		30	17	26		
6"	300	11¼	11	22	5/8"	2.0
		22½	25	29		
		30	41	35		
8"	300	11¼	16	25	5/8"	2.0
		22½	47	36		
		30	70	41	3/4"	2.5
12"	250	11¼	32	32	5/8"	2.0
		22½	88	45	7/8"	3.0
		30	132	51		
16"	225	11¼	70	41	7/8"	3.0
		22½	184	5.7	1 1/8"	4.0
		30	275	6.5	1¼"	
20"	200	11¼	91	45	7/8"	3.0
		22½	225	61	1¼"	4.0
		30	330	69	1 3/8"	4.5
24"	200	11¼	128	50	1"	3.5
		22½	320	68	1 3/8"	4.5
		30	480	79	1 7/8"	5.5

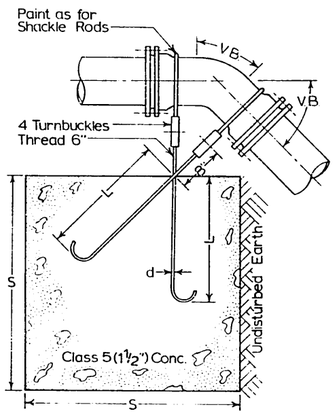
Type "A" Blocking
for 11¼°-22½°-30° Vertical Bends



Type "B" Blocking
for 45° Vertical Bends

Pipe Size Nom. Diameter-Inches	Test Pressure psi	V.B. Vertical Bend Degrees	No. of cu. ft. of Conc. Blocking	S Side of Cube feet	d Diameter of Shackle Rods (4) inches	L Depth of Rods in Concrete feet
4"	300	45	30	31	5/8"	2.0
6"			68	41		
8"			123	50		
12"	250		232	61	3/4"	2.5
16"	225		478	78	1 1/8"	4.0
20"	200		560	82	1¼"	
24"			820	94	1 3/8"	4.5

Type "B" Blocking
for 45° Vertical Bends

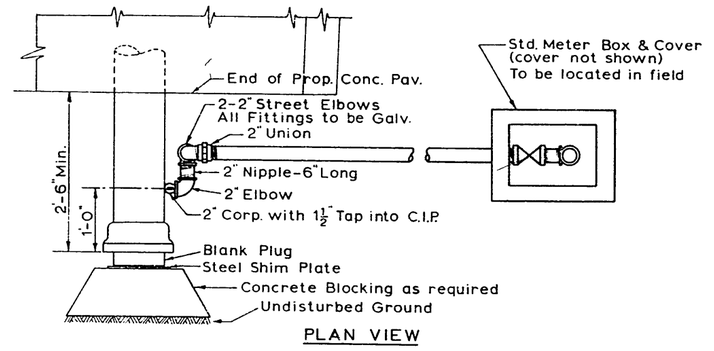


PAYMENT

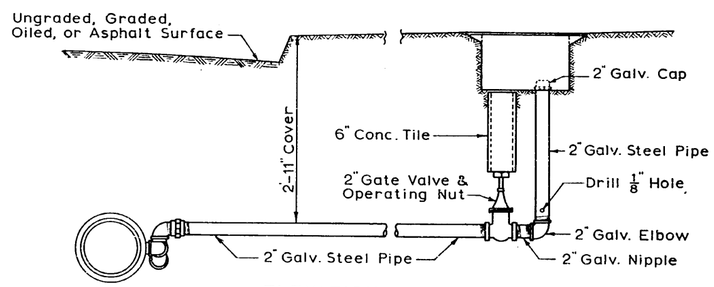
"Concrete Blocking, in place" per cu. yd.
"Shackle Rods" per pound

Do Not Scale

Blocking For Convex Vertical Bends

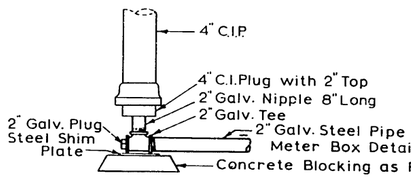


PLAN VIEW



ELEVATION VIEW

2" BLOW-OFF DETAIL FOR C.I. PIPE LARGER THAN 4 INCHES



PLAN VIEW

GENERAL NOTES

All Blocking Class 5 (1½") Concrete

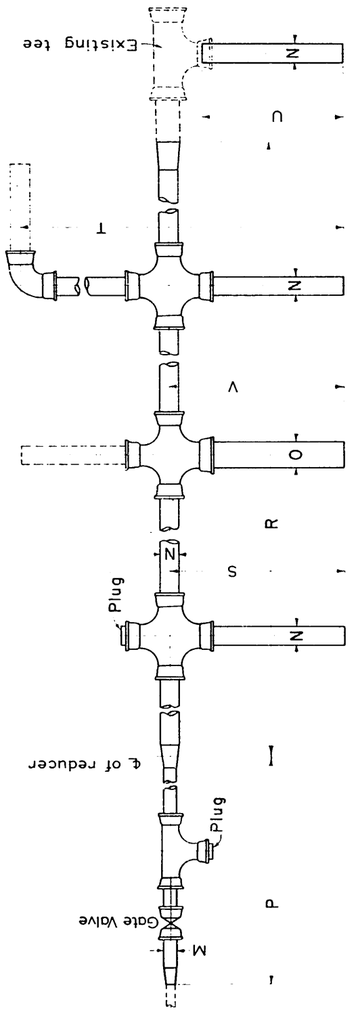
2" BLOW-OFF DETAIL FOR 4" C.I. PIPE

PAYMENT

"2" Blow-off Assembly" in Place, per each

Do Not Scale

2-inch Blow-off Assembly



Payment will be made for
P- linear feet of pipe of diameter "M"
R, S, T, & U- linear feet of pipe of diameter "N"
V- linear feet of pipe of diameter "O"
See Specifications for Details and for Alternate Method.

DO NOT SCALE

Watermain Payment Diagram

Standard Plan No. 76

INDEX TO SPECIFICATIONS

NOTE:

This is a somewhat abbreviated index of the Standard Specifications for Public Works Construction. If the reader is unable to find the particular item or subject he seeks in the index, he should refer to the related section in the Table of Contents at the beginning of the book.

Page 1 of the Table of Contents contains a complete list of all sections, by titles and consecutive numbers. Pages 3 through 12 of the Table of Contents contain complete breakdowns, in numerical sequence, of all sections into entitled subsections representing the related subject matters.

The heavier and bolder type interspersed throughout the index denotes the complete titles of the various sections as they occur in their alphabetic order. An incomplete listing of subjects in each section follows by indentation immediately below the section title.

A

B

C

(Continued on Next Page)

D

E

F

G

H

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J

K (None)

L

M

N

O

P

(Continued on Next Page)

Q

R

S

T

U

V

W

X-Y-Z (None)

MEMORANDA