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SPECIFICATIONS
FOR
RESTORATION OF FORD'S THEATER
511 TENTH STREET, N.W.
WASHINGTON, D.C.

CONTRACT NO. 14-10-0028-2849

September 25, 1964



ON MICROFILM

NATIONAL CAPITAL REGION

NATIONAL CAPITAL OFFICE
DESIGN & CONSTRUCTION
NATIONAL PARK SERVICE
1100 OHIO DRIVE, SW.
WASHINGTON, D.C. 20242



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INDEX TO SPECIFICATIONS
FOR
RESTORATION OF FORD'S THEATRE
511 10th STREET, NW.
WASHINGTON, D.C.

CONTRACT NO. 14-10-0028-2849

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REFERENCE

Small Business set aside

IFB 2849

DATE

September 25, 1964

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

NAME AND LOCATION OF PROJECT

Restoration of Ford's Theater,
511 Tenth Street, N.W., Washington, D.C.

DEPARTMENT OR AGENCY

Department of the Interior
National Park Service

BY (Issuing office)

NATIONAL CAPITAL OFFICE

Sealed bids in DUPLICATE for the work described herein will be received until

3:00 P.M., Eastern Standard Time, October 27, 1964

at Room 224
 1100 Ohio Drive, SW.
 Washington, D. C. 20242

and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

Plans and specifications may be obtained by applying to:

National Capital Office
Design and Construction, Room 224
1100 Ohio Drive, SW.
Washington, D. C. 20242

Telephone: 381-7322

A \$25 deposit will be required for each set of plans and specifications. Make checks payable to "National Capital Region". Bidders will receive full refund and non-bidders \$10 refund if sets are returned within 15 days after bid opening.

Guaranty will be required with each bid as follows: Twenty percent (20%) of the amount bid.

Performance Bond will be required as follows: Fifty percent (50%) of the contract price.

Payment Bond will be required as follows: Fifty percent (50%) of the contract price.

Description of work

Restoration of a historical theater consisting of demolition, foundation piles, concrete, masonry, structural steel, slate roofing and sheet metal work, insulation, lathing and plastering, terrazzo work, metal toilet partitions, plumbing, heating and air conditioning, electrical systems and miscellaneous work.

A SITE INSPECTION WILL BE HELD FOR PROSPECTIVE BIDDERS AT 10:00 A.M.,
WEDNESDAY, OCTOBER 7, 1964 AT THE SITE.

ATTACHMENT TO INVITATION FOR BIDS

Notice of Total Small Business Set Aside

Bids or proposals under this procurement are solicited from small business concerns only and this procurement is to be awarded only to one or more small business concerns. This action is based on a determination by the Contracting Officer and the Small Business Administration under the authority of Section 15 of the Small Business Act. A small business concern is any firm which meets the criteria established by Title 13, Chapter 1, Part 121, of the Code of Federal Regulations. Bids or proposals received from firms which are not small business concerns will be considered nonresponsive.

NOTE: A small business concern is identified in the certificate, appearing on the reverse face of the Bid Form, and which is to be completed thereon by each Bidder when submitting his bid.

Caution to Bidders - Late Bids

See the special provision entitled "Late Bids and Modifications or Withdrawals" which provides that late bids and modifications or withdrawals thereof sent through the mails ordinarily will be considered ONLY IF TIMELY MAILED BY REGISTERED MAIL OR BY CERTIFIED MAIL FOR WHICH A POSTMARKED RECEIPT HAS BEEN OBTAINED AS SPECIFIED IN SUCH PROVISION.

(See Modification to Par. 7 of Standard Form 22, Instructions to Bidders.)

Notice of Required Bidding Document

Attention is directed to Clause 44 of the GENERAL CONDITIONS of this contract which is quoted here in its entirety:

"44. POWER OF ATTORNEY:

All bid, payment, and performance bonds submitted for this contract must be accompanied by a "Power of Attorney" disclosing the authority of the agent or officer executing said bond or bonds on behalf of the Surety."

Nondiscrimination in Employment

"The Nondiscrimination in Employment clause elsewhere contained in or referred to in the contract terms of this invitation or contract is modified as provided by Section 201 of Executive Order 11114 of June 22, 1963 (28 Fed. Reg. 6486, June 25, 1963)."

GENERAL PROVISIONS (CONSTRUCTION CONTRACT)

1. DEFINITIONS

(a) The term "head of the agency" or "Secretary" as used herein means the Secretary, the Under Secretary, any Assistant Secretary, or any other head or assistant head of the executive or military department or other Federal agency; and the term "his duly authorized representative" means any person or persons or board (other than the Contracting Officer) authorized to act for the head of the agency or the Secretary.

(b) The term "Contracting Officer" as used herein means the person executing this contract on behalf of the Government and includes a duly appointed successor or authorized representative.

2. SPECIFICATIONS AND DRAWINGS

The Contractor shall keep on the work a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy either in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at his own risk and expense. The Contracting Officer shall furnish from time to time such detail drawings and other information as he may consider necessary, unless otherwise provided.

3. CHANGES

The Contracting Officer may, at any time, by written order, and without notice to the sureties, make changes in the drawings and/or specifications of this contract if within its general scope. If such changes cause an increase or decrease in the Contractor's cost of, or time required for, performance of the contract, an equitable adjustment shall be made and the contract modified in writing accordingly. Any claim of the Contractor for adjustment under this clause must be asserted in writing within 30 days from the date of receipt by the Contracting Officer of the notification of change unless the Contracting Officer grants a further period of time before the date of final payment under the contract. If the parties fail to agree upon the adjustment to be made, the dispute shall be determined as provided in Clause 6 of these General Provisions; but nothing provided in this clause shall excuse the Contractor from proceeding with the prosecution of the work as changed. Except as otherwise provided in this contract, no charge for any extra work or material will be allowed.

4. CHANGED CONDITIONS

The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (a) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (b) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do so materially differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of this contract, an equitable adjustment shall be made and the contract modified in writing accordingly. Any claim of the Contractor for adjustment hereunder shall not be allowed unless he has given notice as above required; or unless

the Contracting Officer grants a further period of time before the date of final payment under the contract. If the parties fail to agree upon the adjustment to be made, the dispute shall be determined as provided in Clause 6 of these General Provisions.

5. TERMINATION FOR DEFAULT—DAMAGES FOR DELAY—TIME EXTENSIONS

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within such time, the Government may, by written notice to the Contractor, terminate his right to proceed with the work or such part of the work as to which there has been delay. In such event the Government may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefor. Whether or not the Contractor's right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the Government resulting from his refusal or failure to complete the work within the specified time.

(b) If fixed and agreed liquidated damages are provided in the contract and if the Government so terminates the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If fixed and agreed liquidated damages are provided in the contract and if the Government does not so terminate the Contractor's right to proceed, the resulting damage will consist of such liquidated damages until the work is completed or accepted.

(d) The Contractor's right to proceed shall not be so terminated nor the Contractor charged with resulting damage if:

(1) The delay in the completion of the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, acts of the public enemy, acts of the Government in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or delays of subcontractors or suppliers arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and such subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any such delay (unless the Contracting Officer grants a further period of time before the date of final payment under the contract), notifies the Contracting Officer in writing of the causes of delay.

The Contracting Officer shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in his judgment, the findings of fact justify such an extension, and his findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in Clause 6 of these General Provisions.

(e) If, after notice of termination of the Contractor's right to proceed under the provisions of paragraph (a) of this clause, it is determined that the delay is excusable under the provisions of paragraph (d) of this clause, such notice of ter-

mination shall be deemed to have been issued pursuant to the clause of this contract entitled "Termination for Convenience of the Government," and the rights and obligations of the parties hereto shall in such event be governed by such clause. (This paragraph (e) applies only if this contract contains such termination clause.)

(f) The rights and remedies of the Government provided in this clause are in addition to any other rights and remedies provided by law or under this contract.

6. DISPUTES

(a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contracting Officer shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the head of the agency involved. The decision of the head of the agency or his duly authorized representative for the determination of such appeals shall be final and conclusive. This provision shall not be pleaded in any suit involving a question of fact arising under this contract as limiting judicial review of any such decision to cases where fraud by such official or his representative or board is alleged: *Provided, however*, that any such decision shall be final and conclusive unless the same is fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith or is not supported by substantial evidence. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

(b) This Disputes clause does not preclude consideration of questions of law in connection with decisions provided for in paragraph (a) above. Nothing in this contract, however, shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

7. PAYMENTS TO CONTRACTOR

(a) The Government will pay the contract price as hereinafter provided.

(b) The Government will make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer, at his discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration (1) if such consideration is specifically authorized by the contract and (2) if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized on the work covered by this contract.

(c) In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer, at any time after 50 percent of the work has been completed, finds that satisfactory progress is being made, he may authorize any of the remaining progress payments to be made in full. Also, whenever the work is substantially complete, the Contracting Officer, if he considers

the amount retained to be in excess of the amount adequate for the protection of the Government, at his discretion, may release to the Contractor all or a portion of such excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made therefor without retention of a percentage.

(d) All material and work covered by progress payments made shall thereupon become the sole property of the Government, but this provision shall not be construed as relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work, or as waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(e) Upon completion and acceptance of all work, the amount due the Contractor under this contract shall be paid upon the presentation of a properly executed voucher and after the Contractor shall have furnished the Government with a release, if required, of all claims against the Government arising by virtue of this contract, other than claims in stated amounts as may be specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned under the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), a release may also be required of the assignee.

8. ASSIGNMENT OF CLAIMS

(a) Pursuant to the provisions of the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), if this contract provides for payments aggregating \$1,000 or more, claims for moneys due or to become due the Contractor from the Government under this contract may be assigned to a bank, trust company, or other financing institution, including any Federal lending agency, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment shall cover all amounts payable under this contract and not already paid, and shall not be made to more than one party, except that any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Unless otherwise provided in this contract, payments to an assignee of any moneys due or to become due under this contract shall not, to the extent provided in said Act, as amended, be subject to reduction or setoff. (The preceding sentence applies only if this contract is made in time of war or national emergency as defined in said Act and is with the Department of Defense, the General Services Administration, the Atomic Energy Commission, the National Aeronautics and Space Administration, the Federal Aviation Agency, or any other department or agency of the United States designated by the President pursuant to Clause 4 of the proviso of section 1 of the Assignment of Claims Act of 1940, as amended by the Act of May 15, 1951, 65 Stat. 41.)

(b) In no event shall copies of this contract or of any plans, specifications, or other similar documents relating to work under this contract, if marked "Top Secret," "Secret," or "Confidential," be furnished to any assignee of any claim arising under this contract or to any other person not entitled to receive the same. However, a copy of any part or all of this contract so marked may be furnished, or any information contained therein may be disclosed, to such assignee upon the prior written authorization of the Contracting Officer.

9. MATERIAL AND WORKMANSHIP

(a) Unless otherwise specifically provided in this contract, all equipment, material, and articles incorporated in the work covered by this contract are to be new and of the most suitable grade for the purpose intended. Unless otherwise specifically provided in this contract, reference to any equipment, mate-

rial, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor may, at his option, use any equipment, material, article, or process which, in the judgment of the Contracting Officer, is equal to that named. The Contractor shall furnish to the Contracting Officer for his approval the name of the manufacturer, the model number, and other identifying data and information respecting the performance, capacity, nature, and rating of the machinery and mechanical and other equipment which the Contractor contemplates incorporating in the work. When required by this contract or when called for by the Contracting Officer, the Contractor shall furnish the Contracting Officer for approval full information concerning the material or articles which he contemplates incorporating in the work. When so directed, samples shall be submitted for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles installed or used without required approval shall be at the risk of subsequent rejection.

(b) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may, in writing, require the Contractor to remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

10. INSPECTION AND ACCEPTANCE

(a) Except as otherwise provided in this contract, inspection and test by the Government of material and workmanship required by this contract shall be made at reasonable times and at the site of the work, unless the Contracting Officer determines that such inspection or test of material which is to be incorporated in the work shall be made at the place of production, manufacture, or shipment of such material. To the extent specified by the Contracting Officer at the time of determining to make off-site inspection or test, such inspection or test shall be conclusive as to whether the material involved conforms to the contract requirements. Such off-site inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the Government after acceptance of the completed work under the terms of paragraph (f) of this clause, except as hereinabove provided.

(b) The Contractor shall, without charge, replace any material or correct any workmanship found by the Government not to conform to the contract requirements, unless in the public interest the Government consents to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(c) If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Government (1) may, by contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with Clause 5 of these General Provisions.

(d) The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspection and test as may be required by the Contracting Officer. All inspection and test by the Government shall be performed in such manner as not unnecessarily to delay the work. Special, full size, and performance tests shall be performed as described in this contract. The Contractor shall be charged with any additional cost of inspection when material and workmanship are not ready at the time specified by the Contractor for its inspection.

(e) Should it be considered necessary or advisable by the Government at any time before acceptance of the entire work

to make an examination of work already completed, by removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, an equitable adjustment shall be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction and, if completion of the work has been delayed thereby, he shall, in addition, be granted a suitable extension of time.

(f) Unless otherwise provided in this contract, acceptance by the Government shall be made as promptly as practicable after completion and inspection of all work required by this contract. Acceptance shall be final and conclusive except as regards latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Government's rights under any warranty or guarantee.

11. SUPERINTENDENCE BY CONTRACTOR

The Contractor shall give his personal superintendence to the work or have a competent foreman or superintendent, satisfactory to the Contracting Officer, on the work at all times during progress, with authority to act for him.

12. PERMITS AND RESPONSIBILITIES

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any applicable Federal, State, and municipal laws, codes, and regulations, in connection with the prosecution of the work. He shall be similarly responsible for all damages to persons or property that occur as a result of his fault or negligence. He shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. He shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire construction work, except for any completed unit of construction thereof which theretofore may have been accepted.

13. CONDITIONS AFFECTING THE WORK

The Contractor shall be responsible for having taken steps reasonably necessary to ascertain the nature and location of the work, and the general and local conditions which can affect the work or the cost thereof. Any failure by the Contractor to do so will not relieve him from responsibility for successfully performing the work without additional expense to the Government. The Government assumes no responsibility for any understanding or representations concerning conditions made by any of its officers or agents prior to the execution of this contract, unless such understanding or representations by the Government are expressly stated in the contract.

14. OTHER CONTRACTS

The Government may undertake or award other contracts for additional work, and the Contractor shall fully cooperate with such other contractors and Government employees and carefully fit his own work to such additional work as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor or by Government employees.

15. PATENT INDEMNITY

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now

or may hereafter be, for reasons of national security, ordered by the Government to be kept secret or otherwise withheld from issue) arising out of the performance of this contract or out of the use or disposal by or for the account of the Government of supplies furnished or construction work performed hereunder.

16. ADDITIONAL BOND SECURITY

If any surety upon any bond furnished in connection with this contract becomes unacceptable to the Government, or if any such surety fails to furnish reports as to his financial condition from time to time as requested by the Government, the Contractor shall promptly furnish such additional security as may be required from time to time to protect the interests of the Government and of persons supplying labor or materials in the prosecution of the work contemplated by this contract.

17. COVENANT AGAINST CONTINGENT FEES

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

18. OFFICIALS NOT TO BENEFIT

No Member of Congress or resident Commissioner shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

19. BUY AMERICAN

(a) Agreement. In accordance with the Buy American Act (41 U.S.C. 10a-10d) and Executive Order 10582, December 17, 1954 (3 CFR Supp.), the Contractor agrees that only domestic construction material will be used (by the Contractor, subcontractors, materialmen, and suppliers) in the performance of this contract, except for nondomestic material listed in the contract.

(b) Domestic construction material. "Construction material" means any article, material, or supply brought to the construction site for incorporation in the building or work. An unmanufactured construction material is a "domestic construction material" if it has been mined or produced in the United States. A manufactured construction material is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. "Component" means any article, material, or supply directly incorporated in a construction material.

(c) Domestic component. A component shall be considered to have been "mined, produced, or manufactured in the United States" (regardless of its source in fact) if the article, material, or supply in which it is incorporated was manufactured in the United States and the component is of a class or kind determined by the Government to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

20. CONVICT LABOR

In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment at hard labor.

21. NONDISCRIMINATION IN EMPLOYMENT

In connection with the performance of work under this contract, the Contractor agrees as follows:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Nondiscrimination clause.

(b) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

(c) The Contractor will send to each labor union or representative of workers with which he has a collective-bargaining agreement or other contract or understanding, a notice, to be provided by the agency Contracting Officer, advising the said labor union or workers' representative of the Contractor's commitments under this Nondiscrimination clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The Contractor will comply with all provisions of Executive Order No. 10925 of March 6, 1961, and of the rules, regulations, and relevant orders of the President's Committee on Equal Employment Opportunity created thereby.

(e) The Contractor will furnish all information and reports required by Executive Order No. 10925 of March 6, 1961, and by the rules, regulations, and orders of the said Committee, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Committee for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(f) In the event of the Contractor's noncompliance with the Nondiscrimination clause of this contract or with any of the said rules, regulations, or orders, this contract may be canceled in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 10925 of March 6, 1961, and such other sanctions may be imposed and remedies invoked as provided in the said Executive order or by rule, regulation, or order of the President's Committee on Equal Employment Opportunity, or as otherwise provided by law.

(g) The Contractor will include the provisions of the foregoing paragraphs (a) through (f) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the President's Committee on Equal Employment Opportunity issued pursuant to section 303 of Executive Order No. 10925 of March 6, 1961, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for non-compliance: *Provided, however*, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

ADDITIONAL MODIFICATIONS AND REVISIONS

1. Revision of Standard Form 23-A.

Substitute the following for paragraph (e) of Clause 5 (Termination for Default - Damages for Delay - Time Extensions);

(e) If, after notice of termination of the Contractor's right to proceed under the provisions of this clause, it is determined for any reason that the contractor was not in default under the provisions of this clause, or that the delay was excusable under the provisions of this clause, the rights and obligations of the parties shall, if the contract contains a clause providing for termination for convenience of the Government, be the same as if the notice of termination had been issued pursuant to such clause. If, in the foregoing circumstances, this contract does not contain a clause providing for termination for convenience of the Government, the contract shall be equitably adjusted to compensate for such termination and the contract modified accordingly; failure to agree to any such adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes."

2. Additional Equal Employment Opportunity Provisions.

The following paragraphs will be included in the contract: (See also Clause 21, Nondiscrimination in Employment of the General Provisions, Standard Form 23-A.)

"The Nondiscrimination in Employment clause elsewhere contained in or referred to in the contract terms of this invitation or contract is modified as provided by Section 201 of Executive Order 11114 of June 22, 1963 (28 Fed. Reg. 6486, June 25, 1963)."

"The (identity of the prime contracting entity) shall require each of its subcontractors (first-tier) to include in every subcontract with each of its subcontractors (second-tier) the following clause: The (identity of the second-tier subcontractor by name) shall incorporate by reference in each subcontract or purchase order with a subcontractor or supplier paragraphs (1) through (6) of Section 301 of Executive Order 10925 of March 6, 1961, unless exempted pursuant to the rules, regulations, and relevant orders of the President's Committee on Equal Employment Opportunity."

January 20, 1964

ADDITIONAL MODIFICATIONS AND REVISIONS (Cont'd)

3. Noncollusive Bids and Proposals.

CERTIFICATION OF NONCOLLUSION

- (a) By submission of this bid or proposal, the bidder or offeror certifies in connection with this procurement that:
 - (1) The price in this bid or proposal has been independently arrived at without collusion with any other bidder or offeror or with any competitor;
 - (2) Unless otherwise required by law, the price in this bid or proposal has not been knowingly disclosed and will not be knowingly disclosed prior to opening, in the case of a bid, or prior to award, in the case of a proposal, directly or indirectly to any other bidder or offeror or to any competitor; and
 - (3) No attempt has been or will be made to induce any other person or firm to submit or not to submit a bid or proposal.
- (b) The person signing this bid or proposal certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification.
- (c) This certification is not applicable to a foreign bidder or offeror submitting a bid or proposal for a contract which requires performance or delivery outside the United States, its possessions, and Puerto Rico.
- (d) A bid or proposal will not be considered for award where (a)(1), (a)(3), or (b) above has been deleted or modified. Where (a)(2) above has been deleted or modified, the bid or proposal will not be considered for award unless the bidder or offeror furnishes with the bid or proposal a signed statement which sets forth in detail the circumstances of the disclosure and the head of the agency, or his designee, determines that the disclosure was not made with collusive intent.

GENERAL CONDITIONS

1. DEFINITION OF TERMS:

Whenever the term "Contracting Officer" is used in these specifications, it is understood to refer to the Regional Director, National Capital Region, National Park Service, Department of the Interior, under whose supervision the work will be done. He will be represented on the work by as many assistants as may be necessary.

Whenever the term "Contractor" is used, it is understood to refer to the second party of the contract. Subcontractors, as such, will not be recognized.

Whenever "as directed", "required", "as permitted", "approval", "acceptance", or other words of similar import are used it shall be understood that the direction, requirements, permission, approval or acceptance of the Contracting Officer is intended unless stated otherwise.

2. BIDDERS TO VISIT SITE:

All bidders are expected to visit the site of the work and to inform themselves as to all existing conditions. Failure to do so will in no way relieve the successful bidder from the necessity of furnishing all equipment and materials and performing all work required for the completion of the contract in conformity with the specifications.

No allowance will be made for the failure of a bidder correctly to estimate the difficulties attending the execution of the work.

3. REPUTATION OF BIDDERS:

The reputation of bidders as being skillful and successful in carrying out the work of the type and magnitude required by these specifications, and the adequacy of their resources and facilities for accomplishing the work satisfactorily and within the specified time, will be considered in making the award.

The Contracting Officer shall have the right to submit questionnaires to the bidder concerning the latter's financial resources, experience and equipment, and to reject the bid if the bidder fails to reply to the questionnaires or if the replies thereto are unsatisfactory. The information contained in the replies to the questionnaires will be considered confidential.

4. SUBCONTRACTORS:

Upon request and previous to the award bidders shall submit lists of all subcontractors to whom they propose to sublet the various parts of the work. The Contracting Officer shall have the right to take such steps as he deems necessary to determine the ability of the subcontractors to handle their respective portions of the work successfully. Furthermore, bidders shall furnish to the Contracting Officer such information as may be required concerning the reputation and experience of the subcontractors and shall otherwise assist the Contracting Officer in ascertaining the fitness of the subcontractors for their respective parts of the work.

The Contracting Officer shall have the right to reject any bid if any of the subcontractors are found to be inexperienced in carrying out work of the type and magnitude required, and if the adequacy of their resources and facilities or if their reputation for doing only first-class work is not demonstrated to the satisfaction of the Contracting Officer. However, bidders may, with the prior permission of the Contracting Officer, revise the list by selecting other subcontractors until it becomes satisfactory to the Contracting Officer.

Subsequent to the award, the Contractor shall, if he has not previously done so, submit a complete list of subcontractors who will be engaged by him in the execution of the work. After the list of subcontractors has been submitted, no changes shall be made in it without the permission and approval of the Contracting Officer. The Contracting Officer will, however, permit the Contractor to take the work out of the hands of any or all of the subcontractors and complete it himself, if for any reason it becomes necessary or desirable for him to do so.

5. SPIRIT AND INTENT OF SPECIFICATIONS:

It is the spirit and intent of these specifications and of the drawings forming part of them, to provide that the work and all parts thereof shall be fully completed and suitable in every way for the purposes for which they are designed. The Contractor shall supply all materials and do all work which is described, or which may be reasonably implied, as being incidental to the work of this contract.

6. SUPERVISION AND INSPECTION:

All work done under this contract will be under the immediate supervision of duly qualified assistants, appointed by the Contracting Officer, whose salaries will be paid by the Government.

The Contractor shall remove, reconstruct, replace, and make good as directed, all defective materials and workmanship, without additional charge, and regardless of any previous approval or acceptance of such defective materials and workmanship.

In all questions relating to the interpretation of any part of these specifications, the decision of the Contracting Officer shall be final except as otherwise provided in Clause 6, Disputes, of the General Provisions, Standard Form 23A.

7. ERRORS AND OMISSIONS:

The Contractor shall not take advantage of any errors or omissions in these specifications or in the accompanying contract drawings as full instructions will always be given if such errors or omissions are discovered.

The Contractor shall immediately, upon his discovery of any statement or detail which is discrepant or which otherwise appears to be in error, bring the same to the attention of the Contracting Officer for decision or correction.

8. MINOR MODIFICATIONS:

The Contractor shall make such minor changes in the execution of the work to be done under these specifications, as in the judgment of the Contracting Officer may be necessary or expedient to carry out the intent of the contract. No increase over the contract price will be paid to the Contractor on account of such minor modification, provided that at the time the change is to be made the work involved has not already been executed. Work which materially increases the cost to the Contractor will not be ordered under the provision of this paragraph.

9. EXTRA WORK:

The Contractor shall perform all extra work not covered by these specifications which, in the judgment of the Contracting Officer may be necessary or expedient to carry out the intent of the contract or incidental in any way to the work of the contract, and which is ordered in writing by the Contracting Officer.

The cost of the respective items of extra work carried out under the provisions of this paragraph will be paid for by one or the other of the following methods, at the election of the Contracting Officer.

- (a) On the basis of a stated lump sum price, or other consideration fixed and agreed upon by negotiation between the Contracting Officer and the Contractor in advance, or
- (b) On the basis of the actual cost of the extra work (including the hire or rental of such plant as may be used exclusively for such extra work and including workman's compensation insurance, social security and unemployment and all applicable taxes, but excluding overhead), plus fifteen (15) percent of that cost to cover profit and all indirect charges against such extra work.

On proposals involving both increases and decreases in the amount of the contract, the allowance to cover profit and all indirect charges against the work shall apply to the net increase only.

In either case an appropriate extension of the working time if such be determined will also be fixed and agreed upon and stated in the written order in which the extra work is ordered in writing.

10. CONTRACT CHANGES:

The provisions of Clauses 3 and 4 of Standard Form 23A, General Provisions, are supplemented as follows: In considering claims for an adjustment of the contract, the value of the changes shall be determined by one or both of the methods of Paragraph 9. above.

11. PROTESTS:

If the Contractor considers any work demanded of him to be outside the requirements of the contract, or considers any record or ruling of the Contracting Officer, or of the inspector to be unfair, he shall immediately ask for written instructions or decision, and within ten (10) days after the receipt of the same he shall file a written protest with the Contracting Officer, stating clearly the basis of his objections. Unless the Contractor files protest as thus provided, he will be considered to have accepted the record or the ruling.

12. OWNERSHIP:

All parts and materials paid for shall become thereby the sole property of the Government, but this provision shall not be interpreted as relieving the Contractor from the sole responsibility for the proper care and protection of said parts and materials prior to the completion of the work and its final acceptance by the Government, or from any other of the provisions of this contract; nor shall this provision be interpreted as preventing the Contracting Officer from requiring the Contractor to store and handle the parts and materials so as to preserve them from danger.

If any materials or parts of the work be lost, damaged or destroyed by any cause or means whatsoever, the Contractor shall satisfactorily repair or replace the same at his own cost and shall be responsible for delays or incidental expenses that may result therefrom.

13. COMMENCEMENT, PROSECUTION AND COMPLETION:

The Contractor shall commence the work under this contract within ten (10) days after the date of receipt of notification to proceed. He shall prosecute the work with faithfulness and energy and in a neat and orderly manner so as to complete the entire work at the site within the time stated in Section 1.

The interval of time stated in Section 1 is hereby agreed upon as the time necessary for the completion of the entire work.

Any time extension granted due to the inability of the Contractor to secure materials in time to install within the agreed time limit, will apply only to the particular item and such work directly affected by such delay, and not to the entire contract.

14. LIQUIDATED DAMAGES:

The time of completion for the entire work as stated in the foregoing paragraph will be a part of the contract which will provide for liquidated damages in lieu of actual damages in the amount stated in Section 1 per calendar day for the entire delay in completing the work beyond the time fixed and agreed upon in Paragraph 13 and Section 1 for its completion or beyond such time as may be established because of justifiable extensions of time granted pursuant to other provisions of the contract.

15. PROGRAM OF CONSTRUCTION AND PLANT:

Except as is otherwise specified, the Contractor's procedure and methods of construction may, in general, be of his own choosing, provided they follow best general practice and are calculated to secure results which will satisfy the requirements of these specifications and the supervision of the work.

Before beginning any work, the Contractor shall outline and submit written revisions of the program as modifications may become necessary, or as may be required. Such outlines and revisions shall be in sufficient detail to enable the Contracting Officer to judge of the adequacy of the Contractor's operations and to anticipate such conditions as may tend to impair or retard the progress and completion of the work. The Contractor shall not proceed with the work until his program and layout have been approved in writing by the Contracting Officer.

The Contractor shall supply all plant, tools, and equipment of every kind, ample in quantity and capacity, in good working order, and suitable in character, to execute the work of the contract in accordance with the approved program.

16. APPORTIONING OF CONTRACT AMOUNT (LUMP SUM):

The Contractor shall prepare a well balanced schedule apportioning the amount of the contract among the various major items of the work that go to form the complete contract. The schedule shall be submitted to and approved by the Contracting Officer before the first partial payment. The total amount shown by the schedule shall equal the total amount of the contract price with the cost of bonds, overhead, preparatory work, etc., distributed over the items.

17. ESTIMATE OF QUANTITIES OF UNIT PRICE ITEMS:

The bidder's attention is called to the fact that the estimate of quantities given in the contract, specifications, drawings, or Standard Government Form of Bid is approximate only, is not guaranteed and should not be used without verification by the bidder.

It is hereby agreed that the quantities shown or listed are approximate only, and are mentioned solely for the purpose of comparing bids, and are subject to either increase or decrease as directed by the Contracting Officer.

18. INCREASED AND DECREASED QUANTITIES OF UNIT PRICE ITEMS:

In case of any increase or decrease in quantities of work or materials, directed by the Contracting Officer, the quantities actually done or furnished shall be paid for at the unit price bid and no claim for loss of anticipated profits shall be allowed in such increased or decreased quantities of work.

19. METHOD OF MEASUREMENT:

All work completed under this contract shall be measured by the Contracting Officer according to the United States Standard Measures, unless otherwise agreed upon in writing. Unless otherwise shown on the original plans for the contract, as awarded, all lengths and distances shall be measured horizontally. Unless otherwise shown on the plans, all depths and thicknesses shall be measured vertically.

20. DETAILED WORKING DRAWINGS:

The contract drawings are expected to serve as working drawings. Any other working drawings, shop drawings, catalogs and manufacturer's data which may be necessary in the execution of the work, except as indicated below, shall be prepared by the Contractor and shall be submitted in quadruplicate to the Contracting Officer for approval. The drawing will, if satisfactory, be approved and one print of each approved drawing will be returned to the Contractor for his information. In the event any submitted drawing is not entirely satisfactory, it will be approved subject to indicated corrections or notations, and the Contractor will be required to revise his drawings in accordance with the necessary noted changes and resubmit them for approval until approved. Submitted revised drawings shall also be in quadruplicate. The Contracting Officer will, however, furnish to the Contractor such additional minor drawings as may be reasonably considered part of the contract drawings. In addition, certain drawings, etc., are to be submitted as specified under the various sections to which they apply.

The Contractor shall report any errors found in the drawings to the Contracting Officer, who will make or approve the necessary corrections. The Government will not be responsible for errors in Contractor's drawings, even though approved. Payment for drawings, etc., revisions thereof and for copies furnished shall be included in the amounts paid for materials, equipment or work. The Contractor shall furnish as many copies of his drawings, etc., as the Contracting Officer may need in connection with the carrying out of the work.

21. MATERIAL AND SAMPLES:

Immediately after the signing of the contract, the Contractor shall furnish the Contracting Officer with a list of the companies who will supply materials for the work together with the names of the materials which each will furnish. Before actual operations at the site are begun, this list shall be amplified to show the trade name, catalog number, or other means of identification of the various manufacturer unless special permission is granted to deviate from this requirement. All materials and equipment entering into the new work shall be secured from manufacturers having a reputation for producing high-grade and acceptable materials.

The Contractor shall submit such samples of each type of material he proposes to use as the Contracting Officer may require. The Contracting Officer shall have the right to reject any or all samples which fail to meet the requirements of these specifications and to require that additional samples be submitted until an acceptable sample has been approved. No materials relative to which samples are to be submitted shall be delivered to the site of the work until samples of such materials have been accepted and approved in writing by the Contracting Officer.

22. TESTS:

All tests to determine whether or not materials proposed comply with the requirements of the specifications will be made by the Government and the cost thereof will be paid from funds available for the execution of the work. However, the Contractor shall furnish such samples as may be required by the Contracting Officer and the right will be reserved to sample and test any or all materials delivered at the site previous to their being incorporated into the work.

No materials sampled at the site shall be used until approved in writing subsequent to satisfactory tests, and no materials samples or represented by samples prior to delivery shall be delivered to the site prior to approval following such tests as may be made by the Contracting Officer.

The delivery to the site and the use in the work of any materials prior to approval will be at the responsibility of the Contractor.

23. CERTIFICATE OF COMPLIANCE:

When requested by the Contracting Officer, the Contractor shall submit a certificate executed by the manufacturer certifying that the materials or equipment to be incorporated in the work comply with the requirements of these specifications. This shall be submitted in addition to samples.

24. FEDERAL SPECIFICATIONS:

Where reference is made in these specifications to certain Federal Specifications, such Federal Specifications shall become and form a part of the contract and shall be considered as incorporated in these specifications. Bidders who are furnished plans and specifications, will, upon request, also be furnished with copies of such Federal Specifications together with their revisions and amendments, as may be applicable to the work.

The latest revised edition of such applicable Federal Specifications shall apply to this work.

25. DISTRICT OF COLUMBIA HIGHWAY SPECIFICATIONS:

Where reference is made in these specifications to certain sections of the "Standard Specifications for Pavements, Street and Alley Improvements and Work Incidental thereto; District of Columbia Department of Highway, 1957" (also referred to as D. C. Specifications), such specifications shall be considered part of these specifications in the same manner as if set forth in detail herein.

26. USE OF TRADE NAMES:

The use of the name of a manufacturer or of any specific brand in describing an item does not restrict bidders to that manufacturer's product or to the specific brand named. This method is used merely to indicate the particular type, design, character, or quality of the article desired. Bids will be considered on the products of other manufacturers and on other brands provided they conform to these general requirements.

27. PARK RULES AND REGULATIONS:

The Contractor and his subordinates shall at all times conduct themselves in strict accordance with the Park rules and regulations promulgated by the constituted authority, the Secretary of the Interior. Upon written request from the Contracting Officer, the Contractor shall remove from the work any official or employee who does not obey said Park rules and regulations, and any such official or employee so removed shall not be rehired or reemployed by the Contractor for any work to be done on this contract.

28. TRAFFIC PROVISIONS:

Except as is otherwise provided in these specifications, the Contractor shall so conduct his operations as not to interfere with the ordinary use of roads, walks, etc. He shall provide and maintain all temporary roadways, walks, barriers, colored lights, danger signals, and other devices necessary to provide for safety of the public and traffic.

29. SAFETY AND HEALTH PROVISION:

In order to protect the life and health of employees and other persons, prevent damage to property, materials, supplies, and equipment; and to avoid work interruptions, the Contractor shall, in the performance of this contract, comply with applicable provisions of Federal, State and Municipal safety, health and sanitation laws and codes.

The Contractor shall also comply with all pertinent provisions of the "Manual of Accident Prevention in Construction," (latest revised edition) of the Associated General Contractors of America, Inc., and amendments thereto. The Contracting Officer shall notify the Contractor, in writing, of any non-compliance and indicate to the Contractor the action to be taken. The Contractor shall, after receipt of such notice, immediately correct the conditions to which attention has been directed. Such notice when served on the Contractor or his representative(s) at the site of the work shall be deemed sufficient.

If the Contractor fails or refuses to comply promptly with requirements, the Contracting Officer may issue an order to suspend all or any part of the work. When satisfactory corrective action is taken, an order to resume work will be issued. No part of the time lost due to any such suspension order shall entitle the Contractor to any extension of time for the performance of the contract or to excess costs or damages.

The Contractor shall maintain an accurate record of, and shall report to the Contracting Officer in the manner and on the forms prescribed by the Contracting Agency, all cases of death, occupational diseases, or traumatic injury arising out of or in the course of employment incident to performance of work under this contract.

30. COMPENSATION INSURANCE:

The Contractor shall furnish compensation insurance for employees engaged in this work, and shall comply with the Workman's Compensation Laws of the State (or of the District of Columbia) in which the work is performed and shall give proof of such insurance satisfactory to the Contracting Officer.

31. TAXES:

If any Federal Sales or other Federal tax is imposed or changed after the date set for the opening of this bid and is made applicable to and paid by the Contractor on the articles or supplies herein contracted for, then the prices named in this bid will be increased or decreased accordingly.

The Contractor shall be liable for all applicable State and Local taxes. Some States and the District of Columbia exempt Contractors from certain taxes on materials for Federal construction. The Contractor shall inform himself fully regarding these exemptions.

32. USE OF SPACE:

The Contractor will be permitted to use such space adjacent to the site as may be deemed necessary by the Contracting Officer. However, nothing in this specification shall be construed as restricting the Contracting Officer from requiring the Contractor to vacate such space as, in the opinion of the former, may have been occupied unnecessarily or without authority.

Special attention shall be given the landscape features of the Park, and especial care taken to protect the natural surroundings. The Contractor shall not deface, injure, or destroy trees or shrubs, or remove or cut them without special authority. Any vegetation or ground surface damaged by departure from the above rules shall be replaced or restored as nearly as possible to original conditions by the Contractor at his expense.

33. SANITARY FACILITIES:

The Contractor shall erect suitable temporary sanitary facilities at locations approved by the Contracting Officer. Sanitary facilities shall be kept in an absolutely clean and sanitary condition at all times.

34. USE OF WATER:

Subject to the conditions stated below, the Contractor will be permitted to use, without charge, such reasonable amounts of water available on the site as may be necessary for his operations under these specifications.

The Contractor shall bear all expense of connecting with supply lines and shall remove at the completion of the work all such connections as may be necessary.

The Government will not be responsible for any additional costs or delays resulting from the failure of the service. The Contracting Officer shall have the right, at any time and without prior notice, to limit the Contractor's drawings on the service, if it is needed for other Government uses.

The Contractor will be expected to practice the same reasonable economy in his use of the service as he would were he paying for it himself. If such economy is not practiced, the privilege of using the facilities will be withdrawn.

35. LIGHTS:

The Contractor shall furnish and defray all costs incidental to furnishing suitable artificial light should natural light not be sufficient.

36. POWER:

The Contractor shall arrange for, furnish and defray all costs for all power for hoisting and other equipment of all descriptions required for the execution of the work.

37. HEAT:

The Contractor shall provide and defray all costs of providing sufficient heat as follows:

- (a) As necessary to protect all work, materials and equipment against injury from dampness and cold.
- (b) At all times during the placing, setting and curing of concrete, to insure the heating of the spaces involved to not less than 50 degrees Fahrenheit.
- (c) From the beginning of the application of plaster and during the setting and curing period, to produce a temperature in the spaces involved of not less than 50 degrees Fahrenheit.
- (d) For a period of ten days previous to the placing of interior wood finish and throughout the placing of this and other interior finishing, varnishing, painting, etc., and until the completion of the building, to produce a temperature of not less than 70 degrees Fahrenheit.

38. SUSPENSION OF WORK, CLIMATIC CONDITIONS, ETC.:

The Contracting Officer shall have the authority to suspend the work, wholly or in part for such period as he may deem necessary due to conditions which are considered unfavorable to the suitable prosecution of the work, or for failure on the part of the Contractor to carry out orders given or to perform any provisions of the contract. The Contractor shall immediately respect the written order of the Contracting Officer to suspend the work wholly or in part. The Contractor shall not suspend work without such written authority, and shall immediately resume work when conditions are favorable or when methods have been corrected, as approved by the Contracting Officer in writing.

39. PRICE ADJUSTMENT FOR SUSPENSION, DELAY, OR INTERRUPTION OF THE WORK:

(a) The Contracting Officer may order the Contractor in writing to suspend all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Government.

(b) If, without the fault or negligence of the Contractor, the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of the contract, or by his failure to act within the time specified in the contract (or if no time is specified, within a reasonable time), an adjustment shall be made by the Contracting Officer for any increase in the cost of performance of the contract (excluding profit) necessarily caused by the unreasonable period of such suspension, delay, or interruption, and the contract shall be modified in writing accordingly.. No adjustment shall be made to the extent that performance by the Contractor would have been prevented by other causes even if the work had not been so suspended, delayed, or interrupted. No claim under this clause shall be allowed (i) for any costs incurred more than twenty days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply where a suspension order has issued), and (ii) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption but not later than the date of final payment under the contract. Any dispute concerning a question of fact arising under this clause shall be subject to the Disputes clause.

40. RESPONSIBILITY FOR EMPLOYEES AND PLANT:

The Contractor shall be responsible for the safety of his employees, plant and materials, and for any injury or damage done to or by them from any source or cause, he shall save and hold the Government free from all claims for damages to any and all persons and/or property arising from the execution of the work covered by these specifications.

The Contractor shall make good at his own expense all damage to any property of the Government arising from his operations under these specifications, or from the fault or neglect of any of his employees.

41. SUNDAY, HOLIDAY, SATURDAY AND NIGHT WORK:

No work shall be done on Sundays or on days declared by Congress as holidays for per diem employees of the Government except in cases of emergency, and then only with the prior consent of the Contracting Officer; nor shall any work be done on Saturdays or at night without prior consent of the Contracting Officer.

42. REPORTS OF MATERIALS AND EMPLOYEES:

The Contractor shall, upon request of the Contracting Officer to do so, furnish to the latter copies of bills of all materials intended for use either in the permanent structure or in the plant or falsework.

The Contractor shall also, upon request of the Contracting Officer to do so, make daily reports to the Contracting Officer covering the amounts of materials received or enroute and the number and classification of all men engaged upon the work for the preceding day.

43. APPROVAL:

This contract shall be subject to the written approval of the Director, National Park Service, if it amounts to over \$200,000.00 and shall not be binding until so approved.

44. POWER OF ATTORNEY:

All bid, payment, and performance bonds submitted for this contract must be accompanied by a "Power of Attorney" disclosing the authority of the agent or officer executing said bond or bonds on behalf of the Surety.

45. PHOTOGRAPHS:

If so specified in Section 1 the Contractor shall have suitable photographs taken before the work of this contract has been started and immediately after its completion. In addition, photographs shall be taken on or immediately after the first day of each month, or as may be required by the Contracting Officer, to show clearly the rate of progress of the work on any day during the month when special or important work is being carried out.

The photographs shall be contact prints eight inches by ten inches in size. They shall be accurately trimmed to a uniform size so that they can be neatly bound in albums. The original negative, on film, three prints of each view mounted on linen with a one-inch folding margin on the left for binding and one print unmounted shall be furnished the Contracting Officer as soon as possible after the photographs are taken.

The views shall be sufficient in number and comprehensive enough in scope to provide a thorough pictorial history of the work. In a 3/4" margin on the bottom of the face of the photograph there shall be typed a title, the contract number, the date on which it was taken, and the direction the camera was facing. The negatives may be submitted with the monthly photographs or all with the final photographs. The cost thereof shall be included in the contract price.

46. REMOVAL OF RUBBISH:

Rubbish shall not be allowed to accumulate on the site, and the Contractor shall collect and remove, from time to time, such rubbish and debris incident to the execution of the contract, as, in the opinion of the Contracting Officer, may be undesirable or disfiguring on the premises. He shall also perform such snow and ice removal as is necessary for the execution of the work.

At the conclusion of the work, all parts thereof and the premises shall be left in a clean, neat condition, subject to the approval of the Contracting Officer.

47. RESTORATION:

The Contractor will be required to repair at his own expense all damage done to Government and to private property by or because of his work under the contract. Upon the completion of each portion of his contract, the Contractor shall remove all apparatus, plant, tools, surplus materials, rubbish, etc., and shall leave the premises clean, neat, orderly and otherwise in as good condition as they were before the beginning of the work.

The time necessary for the final restoration work is understood to be included in the time named for the completion of the entire work.

48. FINAL DRAWINGS:

If so specified in Section 1 after the entire work has been completed, the Contractor shall obtain from the Contracting Officer a complete set of blue-line prints of the original contract drawings for correction. Upon such prints, the Contractor shall indicate in a neat and accurate manner all changes and revisions in the original design and all extras which affect the permanent structures and which exist in the completed work. The alterations shall be made with colored ink, and shall be sufficiently clear and complete to enable the Contracting Officer to reproduce the changes on the original tracings. The cost of making the final drawings shall be borne by the Contractor and shall be included in the amounts bid for the entire work.

When all revisions showing the arrangement of the work, as finally installed, are made, the corrected prints shall be returned to the Contracting Officer. All final drawings shall be delivered to the Contracting Officer before final payment for the completed work will be made.

49. FINAL INSPECTION AND ACCEPTANCE OF WORK:

When all work provided and contemplated by this contract has been completed including cleanup and restoration, the Contractor shall so notify the Contracting Officer in writing, and the Contracting Officer will then make the final inspection. When defects, errors, and omissions disclosed by the final inspection have been corrected, acceptance will be given in writing; but until such acceptance, the Contractor will be responsible for the work covered by this contract.

At the option of the Contracting Officer acceptance may be given prior to the correction of such defects, errors and omissions which do not preclude the operation and use of the facility; however, in this event, final payment will be withheld until all corrections have been made.

50. TERMINATION OF CONTRACTOR'S RESPONSIBILITY:

This contract shall be considered complete when all work has been completed, the final inspection made and the work accepted in writing by the Contracting Officer. The Contractor will then be released from further obligation except on proof of error and as set forth in the performance bond and guaranty or guaranties.

51. GUARANTY:

All work under this contract shall be guarantied for one year from date of acceptance by the Government, except when a different period is specifically prescribed. All guaranties embraced in or required by this contract are subject to the terms of this paragraph unless otherwise expressly agreed in writing by the parties to the contract. Whenever work is required to be guarantied, the Contractor, when notified by the Contracting Officer must immediately (1) place in satisfactory condition in every particular any of the guarantied work and (2) make good all damages in the structures and grounds or equipment and contents thereof if such unsatisfactory condition or damage develops within the period stipulated by the guaranty and is due to the use of materials or workmanship which are inferior, defective, or not in accordance with this contract, and (3) make good any work, or materials or the equipment and contents of said structures or grounds which are disturbed in fulfilling the requirements of this contract or of any guaranty embraced in or required hereby.

The guaranty shall also include the correction and completion of defects, errors and omissions existing at the time of acceptance.

It is understood and agreed that the surety bond submitted by the Contractor shall support the required guaranties.

LABOR STANDARDS PROVISIONS

APPLICABLE TO CONTRACTS IN EXCESS OF \$2,000

1. DAVIS-BACON ACT (40 U.S.C. 276a-a(7))

(a) All mechanics and laborers employed or working directly upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Copeland Act (Anti-Kickback) Regulations (29 CFR, Part 3)) the full amounts due at time of payment, computed at wage rates not less than those contained in the wage determination decision of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor or subcontractor and such laborers and mechanics; and a copy of the wage determination decision shall be kept posted by the Contractor at the site of the work in a prominent place where it can be easily seen by the workers.

(b) In the event it is found by the Contracting Officer that any laborer or mechanic employed by the Contractor or any subcontractor directly on the site of the work covered by this contract has been or is being paid at a rate of wages less than the rate of wages required by paragraph (a) of this clause, the Contracting Officer may (1) by written notice to the Government Prime Contractor terminate his right to proceed with the work, or such part of the work as to which there has been a failure to pay said required wages, and (2) prosecute the work to completion by contract or otherwise, whereupon such Contractor and his sureties shall be liable to the Government for any excess costs occasioned the Government thereby.

(c) Paragraphs (a) and (b) of this clause shall apply to this contract to the extent that it is (1) a prime contract with the Government subject to the Davis-Bacon Act or (2) a subcontract under such prime contract.

2. EIGHT-HOUR LAWS—OVERTIME COMPENSATION

No laborer or mechanic doing any part of the work contemplated by this contract, in the employ of the Contractor or any subcontractor contracting for any part of said work contemplated, shall be required or permitted to work more than eight hours in any one calendar day upon such work, except upon the condition that compensation is paid to such laborer or mechanic in accordance with the provisions of this clause. The wages of every laborer and mechanic employed by the Contractor or any subcontractor engaged in the performance of this contract shall be computed on a basic day rate of eight hours per day and work in excess of eight hours per day is permitted only upon the condition that every such laborer and mechanic shall be compensated for all hours worked in excess of eight hours per day at not less than one and one-half times the basic rate of pay. For each violation of the requirements of this clause a penalty of five dollars shall be imposed for each laborer or mechanic for every calendar day in which such employee is required or permitted to labor more than eight hours upon said work without receiving compensation computed in accordance with this clause, and all penalties thus imposed shall be withheld for the use and benefit of the Government: *Provided*, That this stipulation shall be subject in all respects to the exceptions and provisions of the Eight-Hour Laws as set forth in 40 U.S.C. 321, 324, 325, 325a, and 326, which relate to hours of labor and compensation for overtime.

3. APPRENTICES

Apprentices will be permitted to work only under a bona fide apprenticeship program registered with a State Apprenticeship Council which is recognized by the Federal

Committee on Apprenticeship, U.S. Department of Labor; or if no such recognized Council exists in a State, under a program registered with the Bureau of Apprenticeship, U.S. Department of Labor.

4. PAYROLL RECORDS AND PAYROLLS

(a) Payroll records will be maintained during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records will contain the name and address of each such employee, his correct classification, rate of pay, daily and weekly number of hours worked, deductions made and actual wages paid. The Contractor will make his employment records available for inspection by authorized representatives of the Contracting Officer and the U.S. Department of Labor, and will permit such representatives to interview employees during working hours on the job.

(b) A certified copy of all payrolls will be submitted weekly to the Contracting Officer. The Government Prime Contractor will be responsible for the submission of certified copies of the payrolls of all subcontractors. The certification will affirm that the payrolls are correct and complete, that the wage rates contained therein are not less than the applicable rates contained in the wage determination decision of the Secretary of Labor attached to this contract, and that the classifications set forth for each laborer or mechanic conform with the work he performed.

5. COPELAND (ANTI-KICKBACK) ACT—NONREBATE OF WAGES

The regulations of the Secretary of Labor applicable to Contractors and subcontractors (29 CFR, Part 3), made pursuant to the Copeland Act, as amended (40 U.S.C. 276c) and to aid in the enforcement of the Anti-Kickback Act (18 U.S.C. 874) are made a part of this contract by reference. The Contractor will comply with these regulations and any amendments or modifications thereof and the Government Prime Contractor will be responsible for the submission of statements required of subcontractors thereunder. The foregoing shall apply except as the Secretary of Labor may specifically provide for reasonable limitations, variations, tolerances, and exemptions.

6. WITHHOLDING OF FUNDS TO ASSURE WAGE PAYMENT

There may be withheld from the Contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics employed by the Contractor or any subcontractor the full amount of wages required by this contract. In the event of failure to pay any laborer or mechanic all or part of the wages required by this contract, the Contracting Officer may take such action as may be necessary to cause the suspension, until such violations have ceased, of any further payment, advance, or guarantee of funds to or for the Government Prime Contractor.

7. SUBCONTRACTS—TERMINATION

The Contractor agrees to insert Clauses 1 through 7 hereof in all subcontracts and further agrees that a breach of any of the requirements of these clauses may be grounds for termination of this contract. The term "Contractor" as used in such clauses in any subcontract shall be deemed to refer to the subcontractor except in the phrase "Government Prime Contractor."



U. S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

LABOR STANDARDS PROVISIONS (Continued)

(Construction Contract)

8. LABOR PROVISIONS: The provisions of Clauses 1 through 7 of Standard Form 19A are modified and enlarged as follows:

(a) Classification of Labor. Any class of laborer and mechanic not listed in the schedule of minimum wage rates, and to be employed on the contract, shall be classified or reclassified by the Contractor or subcontractor conformably with such schedule, and such action shall be reported to the Contracting Officer for administrative review and report to the Secretary of Labor. In the event the interested parties cannot agree upon the classification or reclassification of the particular class of laborer and mechanic to be used the matter, accompanied by the recommendation of the Contracting Officer, will be referred to the Secretary of Labor for final determination.

(b) Local Labor Provisions. The minimum wage rates recited in the schedule are the minimum hourly rates which may be paid under the contract. It is the responsibility of the Contractor to inform himself as to local labor conditions such as length of work-day and work-week, overtime compensation, health and welfare contributions, labor supply, and prospective changes or adjustment of wage rates; no increase in the contract price will be allowed on account of the payment of wages at rates in excess of those specified in the schedule, or of those added thereto by agreement or by determination by the Secretary of Labor.

(c) Selection of Labor. Insofar as possible unskilled labor employed on this work shall be selected from lists furnished by the United States Employment Service. Labor from such lists employed on previous work by the Contractor may be employed on this work. The Contractor shall have on file proper Introduction Cards for all such labor employed.

The Contractor may utilize the services of the United States Employment Service for obtaining labor of the intermediate and skilled classes.

The Contractor is encouraged to participate in those bona fide apprenticeship programs of State Apprenticeship Councils recognized by the United States Department of Labor or registered with the Bureau of Apprenticeship of the United States Department of Labor.

(d) Compliance with Labor Provisions. Except upon submission of evidence of an honest dispute with respect to labor provisions herein, payments under the contract will not be made until receipt of payroll records containing required information and statements assuring compliance with such labor provisions. Upon demand the Contractor shall submit in writing to the Contracting Officer the names and addresses of all subcontractors, the amounts of their respective contracts, contract numbers, location of work, and description, scope, and nature of work.

(e) The Department of Labor has developed a weekly Payroll Form (SOL-184) and a Continuation Sheet (SOL-185) for optional use of the Contractor and subcontractors. This form, when properly filled out, will satisfy the requirements of Form 19A. If the Contractor elects to use these forms they are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., and may be available in the office of the Contracting Officer.

(f) Equipment Rental. No individual shall be employed as a laborer on this contract except on a wage basis, but this shall not be construed to prohibit the rental of teams, trucks, or other equipment from individuals. No such rental equipment, or any charges for feed, fuel, supplies or repairs on account of such agreement, shall cause any deduction from the wages accruing to any employee.

All of the above provisions shall also apply where work is to be performed by piece work, station work, or by subcontract. The minimum wage shall be exclusive of equipment rental or any equipment which the Contractor's employee may furnish for accomplishing this work.

In accordance with a decision of the Solicitor of Labor, dated September 13 and 26, 1961, the provisions of the Davis-Bacon Act and other related Acts will not be applied to bona fide owner-operators of trucks or other similar construction hauling equipment who are independent Contractors, when work is accomplished on a unit price basis for work performed, rather than on an hourly rental basis. The certified weekly payrolls shall include the names of such bona fide owner-operators, but need not show the hours worked nor the rate paid, but only the notation "Owner-Operator".

(g) Payrolls. The certified copy of the weekly payroll required to be submitted by the Contractor and all subcontractors shall be delivered to the Contracting Officer within seven days after the regular payment of the payroll period.

(h) Anti-Kickback Statement. Within seven days after the regular payment of the payroll period the Contractor and each subcontractor shall submit to the Contracting Officer the following statement:

STATEMENT OF COMPLIANCE

19

I, _____ (name of signatory party) _____ (title), do hereby state: that I pay or supervise the payment of the persons employed by _____ (contractor or subcontractor) on the _____ (building or work); that during the payroll period commencing on the _____ day of _____ 19_____, and ending the _____ day of _____ 19_____, all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said _____ (Contractor or subcontractor) from the full weekly wages earned, by any person and that no deductions have been made either directly or indirectly from the full weekly wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 CFR Part 3), issued by the Secretary of Labor under the Copeland Act, as amended (48 Sta. 948, 63 Stat. 108, 72 Stat. 967; 40 U.S.C. 276c), and described below:

(Paragraphs describing deductions, if any)

(Signature and Title)

***Article 2 of Standard Form 19A is hereby deleted and this Article 9 substituted therefor.**

****The last two lines of subparagraph (a) are hereby deleted and the following wording substituted therefor: "hours worked in excess of eight hours in any such calendar day or in excess of forty hours in any such workweek, as the case may be".**

9. CONTRACT WORK HOURS STANDARDS ACT-OVERTIME COMPENSATION (Public Law 87-581 dated August 13, 1962)

(a) Overtime requirements.

No contractor or subcontractor contracting for any part of the contract work shall require or permit any laborer or mechanic to be employed on such work in excess of eight hours in any calendar day or in excess of forty hours in any workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of forty hours in such workweek, whichever is the greater number of overtime hours. **

(b) Violations; liability for unpaid wages; liquidated damages.

In the event of any violation of the clause set forth in paragraph (a), the contractor and any subcontractor responsible therefor shall be liable to any affected employee for his unpaid wages. In addition, such contractor or subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed, with respect to each individual laborer or mechanic employed in violation of the clause (a), in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of eight hours or in excess of forty hours in a workweek without payment of the overtime wages required by the clause (a).

(c) Withholding for unpaid wages and liquidated damages.

The Federal agency for which the contract work is done or by which financial assistant for the work is provided may withhold, or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor, the full amount of wages required by the contract and such sums as may administratively be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for liquidated damages as provided in clause (b).

(d) The contractor agrees to insert the foregoing clauses (a), (b), and (c), and this clause (d), in all subcontracts.

10. MINIMUM WAGE RATES.

The Secretary of Labor has made a determination of the minimum prevailing wage rates which may be paid to the classes of labor to be employed on this project. In event that the term of that determination expires between the time of opening of bids and award of the contract, the Government reserves the right to make an award on the basis of a new wage rates determination obtained from the Secretary. The decision number and date with minimum rates for this project are as follows on the succeeding pages.

WAGE RATES

DETERMINATION OF THE SECRETARY OF LABOR

THESE MINIMUM HOURLY RATES OF WAGES SHALL APPLY ONLY
IF THE CONTRACT IS IN EXCESS OF \$2,000.00 IN AMOUNT.

DEPARTMENT, AGENCY, OR BUREAU Interior, National Park Service, WDC		DECISION NO. AD-725
DESCRIPTION OF WORK: Contract or contracts for buildings, roads, utilities, etc.		LAW CODE
LOCATION (CITY OR OTHER DESCRIPTION) Washington		DATE OF DECISION 8-10-64
STATE D.C.	COUNTY	EXPIRES 12-18-64
		SUPERSEDES DECISION NO.

10 D. C. Zone 1

	Per Hour	17 24	Per Hour
Asbestos Workers	\$4.80		\$4.875
Improvers:			3.475
1st year	2.40		2.975
2nd year	2.89		4.10
3rd year	3.49		
4th year	3.96		
Boilermakers	4.60		
Helpers	4.35		
Bricklayers	4.90		
Carpenters	3.975		
Cement Masons	4.15		
Grinding Machine, and Suspended Scaffolds	4.275		
Electricians	4.90		
Elevator Constructors	4.62		
" " Helpers	3.23		
" Probationary Helpers	2.31		
Glaziers	4.24		
Ironworkers, structural	4.80		
" Ornamental, Chain-link fence erector	4.80		
Reinforcing	4.45		
Laborers:			
Laborers	2.825		
Air Tool, etc.	2.975		
Landscapers	2.825		
Pipelayers (Concrete & Clay, etc.)	2.975		
Plasterer Tenders	3.15		
Scaffold builders, Pave Breakers, Towmasters, Buggy Mobiles,	2.975		
Scootcretes	2.975		
Spaders, Mortar men	2.975		
Powdermen	3.50		
Power saw, Well Points, Wrecker-Burners	3.075		
Open caissons, Test Pits, Pier	3.325		
Holes Underpinning	2.825		
Bottom Men	3.075		
Plumber's laborer	2.90		
Lathers	4.30		
Lead Burners	4.55		
Line Construction			
Linemen	4.90		
Cable splicers	4.90		
Equipment operator	4.90		
Truck with winch	4.17		
Truck pole or steel handling	4.17		
Groundmen (first year)	3.66		
" (experienced)	3.91		
Marble Setters			
Helpers			
Helpers, 1st 30 days (inexp.)			
Millwrights			
Painters:			
Brush			4.17
Paperhangers			4.17
Tapers			4.17
Steel, Structural			4.50
Swing Stage			4.50
Suspended Scaffold			4.50
Spray			4.17
Piledrivermen			4.10
Plasterers			4.30
Plumbers			4.91
Roofers:			
Composition and water proof workers			3.30
Mopmen, Slate, Tile, Precast and waterproofers			3.80
Helpers			2.75
Sheet Metal Workers			4.91
Soft Floor Layers			3.975
Sprinkler Fitters			4.275
Steamfitters, Refrigeration Mechanics, Air conditioning mechanics			4.96
Stone Masons			4.875
Stone Carvers			4.98
Terrazzo and Tile mechanics			4.475
Helpers			3.475
Stone fitters, trimmers & cutters			4.80
Truck Drivers:			
Dumps, to and including 8 wheels			2.575
Dumps over 8 wheels			2.675
Flats and Pick-ups			2.675
Tractor-pulls, Trailer Trucks			2.675
Grease, Oil, Sprinklers			2.575
Euclids, Dumpsters, Carryalls			2.975
Dumps, open tail gate			2.675
Helpers			2.425
Euclid Water sprinklers			2.975
Concrete Mixer driver			2.75
Riggers and Welders: Receive rate prescribed for craft performing operation to which such rigging and welding is incidental			

Before using apprentices on the job the contractor shall present to the Contracting Officer written evidence of registration of such employees in a program of a State apprenticeship and training agency approved and recognized by the U. S. Bureau of Apprenticeship and Training. In the absence of such a State agency, the contractor shall submit evidence of approval and registration by the U. S. Bureau of Apprenticeship and Training.

The contractor shall submit to the Contracting Officer written evidence of the established apprentice-journeyman ratios and wage rates in the project area, which will be the basis for establishing such ratios and rates for the project under the applicable contract provisions.

D. C. PEO- 1
1-R

Power Equipment Operators:

Per Hour

Backhoes, boom cats, cableways, cranes or derricks, draglines, elevating graders, hoists, elevators (permanent), paving mixers, piledriving engines, power shovels, tunnel shovels, tunnel mucking machines, batch plants, concrete pumps, locomotives (standard narrow gauge), power driven wheel scoops and scrapers 50 cu. yds. struck capacity or above	\$4.47
Hydraulic back hoes under 1/2 yd., mounted on tractors	4.32
Front end loaders (hi-lift), fork lifts	4.07
Air compressors (on steel)	4.14
Air compressors (except on steel), concrete mixers, mechanics and maintenance men, pumps, tunnel mechanics, tunnel motormen, welding machines, well points	3.89
Power driven wheel scoops and scrapers under 50 cu. yds. struck capacity, blade graders, motor graders, bulldozers	3.87
Rollers, asphalt spreaders, bull float finishing machines, concrete finishing machines, concrete spreaders, finegraders, form graders, concrete saws	3.67
Apprentice engineers:	
Firemen	3.31
Truck crane oilers	3.19
Oilers	3.14
Boilers, skeleton, trenching machines, tug boats, well drilling machines	4.06

10 D. C. 3-S
Paving and Incidental Grading

	<u>Per Hour</u>
Cement Masons (Finishers) Form Setters	\$2.85
Finishers Helper, Concrete Pavement	2.45
Asphalt Raker	2.60
Jackhammer	2.55
Asphalt Tamper, Shoveler (concrete)	2.50
Laborers	2.35
Truck Driver	
Straight Job	2.35
Tandem	2.45
Tractor Trailer	2.45
Power Equipment Operators:	
Gradall	3.25
Shovel	3.10
Crane, Paver	3.00
Asphalt Plant Engineer, Motor Grader, Roller (finish)	2.85
Asphalt Spreader, Tractor, Front-end loader (tracks)	
Bulldozer	2.70
Asphalt Plant mixer, Air Compressor, Finishing machine	
Mechanic Roller (rough) front end loader (rubber tired)	
Concrete spreader	2.60
Power Broom, Oilers	2.45
Asphalt heater-burner (self propelled)	2.50

D. C. EXCAVATION AND GRADING PREPARATORY TO PAVING

1-1

	<u>Per Hour</u>
Laborers	\$2.825
Truck Drivers:	
Dumps	2.575
Dumps over 8 wheels	2.675
Backhoes, boom cats, cableways, cranes or derricks, draglines, hoists, power shovels	4.47
Front-end loaders (hi-lift)	4.07
Power driven wheel scoops and scrapers (under 50 cu. yds. struck capacity), blade graders, motor grader, bulldozers	3.87
Rollers	3.67
Firemen	3.31
Oilers	3.14



SECTION 1

WORK, DRAWINGS, SPECIAL CONDITIONS

1-1. TIME FOR COMPLETION:

The work shall be completed within five hundred forty (540) calendar days from date of receipt of notice to proceed.

1-2. LIQUIDATED DAMAGES:

Liquidated damages in the amount of one hundred dollars (\$100) per calendar day for the entire delay in completing the work beyond the time agreed upon in paragraph 1-1 will be assessed.

1-3. WORK TO BE DONE:

The work to be executed under the contract shall consist of furnishing all labor, plant, machinery equipment, and materials for and carrying out therewith in accordance with these specifications and contract drawings the restoration of Ford's Theatre, 511 Tenth Street, NW., Washington, D. C.

1-4. CONTRACT DRAWINGS :

The following contract drawings approved by the Contracting Officer form a part of and are supplementary to these specifications:

<u>Title</u>	<u>Map File No.</u>
Architectural	85.11-63-1 thru 26
Structural	85.11-63-27 thru 37
Mechanical	85.11-63-38 thru 41
Plumbing	85.11-63-42 thru 43
Electrical	85.11-63-44 thru 47

Measurements for Structural Analysis, NCR Map File No. 85.11-1 thru 14, described in Paragraph 4 (B)(1), and Soil Boring and Test Information is available for inspection at National Capital Office of Design and Construction, Room 224, 1100 Ohio Drive, SW., Washington, D. C.

1-5. INSPECTION OF SITE:

An inspection of the site will take place at 10:00 A.M. Wednesday, October 7, 1964, at which time representatives of the Contracting Officer will be available in Lincoln Museum to answer questions by prospective bidders.

1-6 INFORMATIONAL SIGN:

The Contractor shall furnish and erect one (1) informational sign in accordance with drawing number NCP 48-266, Sign "C", a copy of which

is bound at the end of these specifications. Large scale copies, drawing number NCP 48-265A, of the informational sign will be furnished the successful bidder. The sign shall be erected at the beginning of the project where directed at least one (1) week prior to commencement of the work. The information to be placed on the sign shall be as follows:

FORD'S THEATRE
is being restored by
(Name of Contractor)
for
NATIONAL CAPITAL REGION

The Contracting Officer will furnish one "Mission 66" sign for the informational sign to be erected. The Contractor shall haul the sign from the National Capital Region yards at 515 New York Avenue, NE., Washington, D. C., and mount it above the informational sign as shown on the above-mentioned drawing.

1-7 LAYOUT OF WORK:

The entire work, and every part thereof, shall be accurately constructed in their required positions, and all parts of the work shall be in proper alignment and correct relative positions. The Contractor shall provide all frames, forms, falsework, shoring, guides, anchors, screeds, templates, and all temporary structures of every nature that may be required to insure these desired results. The amount stated in the contract shall cover and include all such work, materials, and construction.

Prior to initiation of the work, the Contracting Officer will establish fundamental alignment points and provide a bench mark.

The Contractor shall provide his own instruments and surveyors and shall lay out all work and determine all positions and elevations for all the work covered by this contract, using as beginnings such alignment points and bench marks as are mentioned above. The Contractor shall be responsible for the correctness of the work done by his surveyors, although such work will be subject to check and correction by the Contracting Officer. In the event of any discrepancy in the layout of the work, the matter shall at once be reported to the Contracting Officer for his decision or check, and for such adjustment as may be necessary.

The Contractor shall preserve all hubs and points set by the Contracting Officer. The cost of replacing any of these hubs and points that are destroyed by neglect or as a result of carelessness on the part of the Contractor shall be deducted from any amounts due or to become due to the Contractor.

1-8. FINAL DRAWINGS:

Final drawings will be required in accordance with Clause 34 of the General Conditions.

WORK, DRAWINGS, SPECIAL CONDITIONS

1-9. PHOTOGRAPHS:

Photographs shall be submitted in accordance with Clause 31 of the General Conditions.

1-10. SHOP DRAWINGS:

Furnish six (6) copies of all shop drawings, cuts, catalogs, and schedules for approval of the Contracting Officer. See also Clause 12 of the General Conditions.

1-11. REPUTATION OF BIDDERS:

Consideration will be given to past experience of bidders in this type of work in awarding of the contract and the right is reserved by the Government to reject any bidders not qualified in this type of work. See also Clause 3 of the General Conditions.

1-12. JOB FACILITIES:

The Contractor shall provide the following facilities at the site:

- A field office of an approved type with a suitable desk and telephone for the exclusive use of the Contracting Officer's representatives.

- A file of contract drawings and specifications.

- A file of approved shop drawings, catalog cuts, etc.

1-13. DAMAGE TO ADJACENT PROPERTIES:

Any damage by the construction to adjacent structures, walls, foundations, floors, roofs, furnishings of buildings, etc., shall be the responsibility of the contractor and shall be repaired and/or replaced by the contractor to the satisfaction of the property owner at no expense to the Government.

SECTION 2

DEMOLITION

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of all demolition as shown on the drawings and/or as described herein.

3. DEMOLITION

A. GENERAL

The structure is a historic one originally constructed for use as a theatre and shortly thereafter converted into three floors of offices and a partial basement. There is a wing to the north and a parking area to the south. It is the intent of these specifications to provide for the restoration of the structure to its appearance at the time of its original use. Insofar as the work of this Section is concerned, the work will consist of the removal of the entire interior of both main structure and north wing including all floors, columns, beams, masonry columns and other basement construction, stairs and all other internal construction and such other removal as may be necessary for the reconstruction of the theatre when carried out to its fullest extent as expressed herein and shown on the drawings. All windows and doors in exterior walls shall be removed at such time as this work is required.

This work shall be performed in such a manner as to adequately safeguard the stability of the outer walls and roof construction which is to remain. It is assumed that the present internal construction now provides this stability and that it can therefore be removed only when sufficient temporary or permanent bracing in the form of new construction has been installed to replace it.

Doors and windows, casings, frames and trim, all main stair members, and the spiral stair shall remain the property of the Government as shall all other material deemed to have value in the research in, or the construction of the building as may be decided by the Inspector on the site.

B. COORDINATION

The safety and stability of the portions of the structure to be preserved requires that the removal of the portions not to be preserved be done in several different stages at different times and in proper coordination with other work. (See Section 4 FOUNDATIONS and Section 5 GROUTING.)

Demolition

C. PROCEDURES

Unless otherwise instructed it can be assumed that the following stages of removal will be necessary.

(1) Remove portions of first floor on earth, concrete stoop and steps, temporary partitions and such other appurtenances as may be necessary for the performance of the work specified in Section 5 GROUTING.

(2) After grouting is completed, remove all plaster from interior face of exterior brick walls so that an examination of the wall for old joist and beam pockets, etc. can be made.

(3) Remove those portions of the structure necessary for the safe installation of the underpinning. Leave intact all portions providing lateral stability for the existing walls unless its removal is necessary for the underpinning work, in which case remove only after adequate bracing has been installed to insure the safety of the walls. Leave intact the second and third floors and their supporting columns.

(4) Remove attic skylight, floor, walls, and appurtenances. Remove masonry floor arches and supporting masonry walls in main building and ceilings and floors in annex. All removal to be done in coordination with shoring and bracing of existing walls. (See Section 4 FOUNDATIONS.) Leave intact such floor beams and joists and columns as can be utilized for the shoring and bracing. (The 1894 columns and beams may be removed without disturbing the 1865 construction. See drawings of existing conditions.)

(5) Remove roofs and appurtenances at such time as may be in coordination with other work. Take all necessary precautions to insure that the existing wood trusses which are to remain are not damaged.

(6) Remove alley vault in coordination with other work.

D. ALLEY VAULT

The alley vault roof and areaway and vault walls down to one foot below sub-grade shall be removed completely and disposed of off the site. The vault and areaway floors shall be broken into pieces of less than one cubic foot, if left in place, to facilitate drainage. The walls lower than one foot below alley sub-grade may be left in place.

E. PRECAUTIONS

The following conditions require extra precautions.

(1) The alley vault roof is not adequate to support heavy construction equipment.

(2) The existing roof trusses are overloaded.

(3) With the exception of the east wall, the masonry walls are of very poor construction.

(4) The north wall leans 9 inches southward.

(5) The floor and roof loads of #517 10th Street, N. W. are supported on the north wall.

F. HISTORICAL PRESERVATION

The integrity of all historical items pertaining to the original theatre shall be maintained. If during the process of demolition any feature indicating the probable construction of the original theatre comes to light it shall not be destroyed until adequate records, descriptions and photographs have been made for the permanent preservation of information provided by the feature and not until permission has been obtained from the Contracting Officer. Coordinate and cooperate with Government personnel who may be present for the detection of such information.

G. ADJACENT PROPERTY

Protect adjacent properties from damage by demolition work.

H. DUST.

Provide sufficient water sprinkler to lay the dust raised by demolition and to prevent dust nuisances to the public.

J. CODES

Comply with all applicable codes of the District of Columbia including the Building Code, Fire Regulations and Police Regulations.

SECTION 3

EARTHWORK

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials, and operations, including all labor, materials and equipment necessary for, and incidental to the completion of all earthwork as shown on the drawings and/or as described herein.

B. WORK INCLUDED

In general the work to be performed under this Section shall include, but is not necessarily limited to, the following:

- (1) Excavate, fill and backfill as required.
- (2) Remove excess material and any portions of existing construction not included under "Section 2, Demolition".
- (3) Provide all necessary sheet piling, bracing and cribbing, etc., as required to maintain cuts.
- (4) Provide earth fill as may be required.
- (5) All excavation as may be required for plumbing, heating, underground electrical work, tanks, pits, manholes, catch basins, inlets, etc., etc., is included.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Excavation for cast in place caissons and/or piles. See Section 4.
- (2) Porous fill such as gravel, etc., where required in utility or other trenches or under concrete slabs.
- (3) Note that there is no landscaping. Exterior work is limited, in general, to backfill.
- (4) Test borings and pits have been made and none are required under this Section.

Earthwork cont'd.

3. METHODS

A. EXCAVATION

(1) Materials to be excavated consist of rock, earth and all other materials encountered. Explorations have been made at site to assist Contractor in ascertaining the character of material to be encountered in excavating and results of these explorations are indicated on drawings. However, the Contracting Officer does not guarantee the nature of materials to be encountered nor that they will not vary from those indicated by explorations.

(2) Excavations shall be made to conform to dimensions and elevations indicated on the drawings and shall extend a sufficient distance from walls, footings and other work to allow for placing and removal of forms, installation of structural and mechanical appurtenances and all utility lines indicated on the drawings, and for inspection and testing procedures. All excavations shall be open-cut. NO undercutting will be permitted. Excavation shall be carried to the bottom of all unsuitable material or to elevations shown on the drawings, whichever is lower. Unsuitable bearing soil shall include but is not limited to the following:

- a. Soil containing peat, sod, roots or other material subject to decay.
- b. Soft, spongy or compressible soil, including silt, soft clay and loose fine sand.
- c. All fill material, including that around and under discontinued utilities.

(3) Where excavations made below elevations indicated are due to the Contractor's fault, excavation, if under slabs, shall be restored to proper elevation by installing approved porous fill material of required compacted thickness and, if under footings, heights of walls or depth of footings shall be increased as directed and at the Contractor's expense.

(4) When excavations for foundations have reached the prescribed depths, the Contracting Officer shall be notified and will make an inspection of the conditions. If the materials and conditions disclosed are not satisfactory to the Contracting Officer, instructions as to procedure will be given and adjustments of the contract made for additional excavation in accordance with Clause 6 of the General Conditions.

Earthwork, Cont'd.

(5) All excess and unsuitable material within the building site shall be removed from the Contracting Officer's property and disposed of by the Contractor. This includes all material to the bottom of the required construction levels, plus material below that which is herein defined as unsuitable.

a. The Contractor shall exercise extreme care to protect any live utility lines. He shall be responsible for locating such lines and installing adequate protection and for notifying the Contracting Officer immediately upon uncovering such lines and their appurtenances. The Contractor will be responsible for cost of repair or replacement of such lines.

B. DEWATERING

(1) All excavations and the site shall be kept free of standing water. No water from excavations shall be discharged onto privately owned property or where harmful erosion will result.

(2) Unsanitary conditions encountered shall be corrected or removed entirely, as directed by the Contracting Officer.

C. DRAINAGE

(1) Contractor shall control the grading around buildings so that ground is pitched to prevent water from running into the excavated areas or damaging the structures. Maintain all pits and trenches where footings are to be placed, free of water at all times. Provide all pumping required to keep excavated spaces clear of water during construction. Should any springs or running water be encountered in the excavation, the Contracting Officer shall be notified and the Contractor shall provide free discharge of it by trenches and drain to an appropriate point of disposal as directed. If permanent provision must be made for disposal of water, the contract price will be adjusted.

D. SHEETING, BRACING, SHORING, UNDERPINNING

(1) The Contractor shall make and hold safe by sheeting, bracing, shoring or underpinning in small sections all walls and banks of soil thereunder of existing adjacent structures, streets or other constructions or utilities which are to remain.

(2) The work shall be done in strict accordance with the best modern practice and shall be maintained for the duration of all work. Any and all damage to adjacent property shall be corrected at the Contractor's expense.

Earthwork, Cont'd.

(3) An adjustment will be made in the contract price in accordance with Clause 6 of the General Conditions if the Contracting Officer directs the contractor to leave any shoring in place.

(4) Excavation for underpinning existing walls of the building shall be performed by hand in alternate short sections approximately 3 feet wide and in accordance with the building code. Stagger the excavation for sections as directed.

E. FROST PROTECTION

(1) Do not place footings or slabs on frozen ground. When freezing temperature may be expected, do not excavate to the full depth indicated, unless the footings or slabs can be placed immediately after the excavation has been completed. Protect the bottoms so excavated from frost if placing of concrete is delayed.

F. ROCK EXCAVATION

(1) Material to be excavated is assumed to be earth and other materials that can be removed by power shovel, bulldozer, or other equipment normal to excavation work, but not requiring the use of explosives or drills. If rock, as herein defined, is encountered within the limits of excavation, the "Contract Price" will be adjusted in accordance with Clause 6 of the General Conditions.

(2) Rock is defined as stone or hard shale in original ledge, boulders over 1/2 cubic yard in volume, masonry or concrete that cannot be broken and removed by normal job equipment (power shovel 1/2 yard capacity, scoops, bulldozers) without the use of explosives or drills. This classification does not include materials such as loose rock, concrete or other materials that can be removed by means other than drilling and blasting or drilling and wedging, but which, for reasons of economy in excavating, the Contractor prefers to remove by drilling and blasting.

Earthwork, Cont'd.

(3) Before placing concrete or masonry on rock surfaces, the surfaces shall be leveled off, or shelved, to a slope not exceeding one inch per foot.

(4) When explosives are used, work shall be executed by experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Explosives shall be stored, handled and used in accordance with local regulations and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Incorporated. Any damage to foundations or other work caused by use of explosives shall be corrected at Contractor's expense. Explosives shall not be used except on the permission of the Contracting Officer.

G. FILL AND BACKFILL

(1) Promptly backfill excavations as work permits but not before concrete walls, piers and footings have attained full design strength.

(2) For backfilling use earth free from waste, organic material or other objectionable matter. Stone may not be larger than 1/2 cu. ft.; frozen material may not be used. Place backfill in uniform horizontal layers not over 12" deep; puddle tamp or roll them to make solid.

(3) When sheeting, shoring or bracing is removed, fill voids with sound materials.

4. DISPOSITION OF UTILITIES

A. GENERAL

(1) Rules and regulations governing the respective utilities shall be observed in executing all work under this Section.

B. PROTECTION

(1) Active utilities shown on the drawings shall be adequately protected from damage and removed or relocated only as indicated or specified. Where active utilities are encountered but are not shown on the drawings, the Contracting Officer shall be advised; the work shall be adequately protected, supported, or relocated as directed by the Contracting Officer.

C. CAPPING

(1) Inactive and abandoned utilities encountered in excavating and grading operations shall be reported to the Contracting Officer; they shall be removed, plugged or capped as directed by the Contracting Officer. In absence of specific requirements, plug or cap such utility lines at least 3 feet outside of new building walls, or as required by the local regulations.

SECTION 4

FOUNDATIONS

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of the foundations and to the completion of all underpinning, sheeting and shoring necessary for the completion of the work.

B. WORK INCLUDED

- (1) Shoring of existing walls.
- (2) Excavation for underpinning.
- (3) Installation of all piles.
- (4) Concrete for filling piles.
- (5) Sheeting and shoring of open excavations.
- (6) Underpinning of existing walls.
- (7) Removal of sheeting and shoring.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) General Excavation. See Section 3.
- (2) Concrete pile caps, footings, and retaining walls.
See Section 6.
- (3) General Demolition. See Section 2.

3. MATERIALS

A. PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the requirements specified in Section 6 CONCRETE and shall be Class A unless otherwise specified or shown on the drawings.

B. REINFORCING STEEL

The reinforcing steel shall conform to requirements specified in Section 6 CONCRETE.

C. STEEL PIPE PILES

Steel pipe piles shall consist of steel pipe conforming to the ASTM Standard Specifications for Welded and Seamless Steel Pipe Piles, ASTM Designation A-252.

D. STEEL BEARING PLATES, STRUCTURAL MEMBERS AND WEDGES

Steel for bearing plates, rolled structural members and wedges shall conform to the ASTM Standard Specifications for Steel for Bridges and Buildings, ASTM Designation A-7 or Specifications for Structural Steel, ASTM Designation A-36.

4. METHODS

A. SHEETING AND SHORING

All excavations shall be protected by sheet piling or adequate shores in accordance with the requirements of the Minimum Wage and Industrial Safety Board's Construction Safety Standards, current edition.

(1) Plans for sheeting and shoring shall be submitted to the Contracting Officer for approval. All sheeting and shoring work shall be in strict conformity with the approved plans. Shop drawings shall show any sheeting and shoring which contractor wishes to leave in place.

(2) Sheeting and shoring shall be performed by experienced workmen who are specialists in this work.

(3) All sheeting and shoring in public space shall conform to the requirements of the Building Code of the District of Columbia.

(4) All sheeting and shoring in public space must be approved by the District of Columbia Department of Licenses and Inspections.

(5) All timber sheeting and shoring to be left in place shall be pressure creosoted in conformity with the applicable Specifications of the American Wood Preservers Association.

B. BRACING EXISTING WALLS

(1) Existing Conditions

Detail measured drawings showing existing conditions are on file in the National Capital Office of the National Park Service and are available for inspection during office hours. These plans show the north wall leans to the south by as much as 9 inches and that the front wall bows inward. These conditions require extraordinary care in bracing and shoring.

(2) Observations for Movement

Qualified Engineers experienced in the observation of walls for movement shall be retained to observe the walls for settlement and for lateral movement near the top and bottom of the walls. Reports of these observations shall be made to the Contracting Officer as requested by him. Observation of any significant movement of the walls shall be

immediately reported to the Contracting Officer.

(3) Responsibility

The safety of the existing walls shall be paramount. They shall be shored, braced and otherwise made safe from movement or collapse throughout all phases of construction. The safety of the walls shall be the sole responsibility of the Contractor. However, the adequacy and methods of bracing shall be subject to the approval of the Contracting Officer, and the Contractor shall demonstrate to the satisfaction of the Contracting Officer that the methods proposed to be used are adequate. He shall submit plans prepared by a Registered Professional Engineer to the Contracting Officer for approval. All bracing and procedures shown on the approved plan shall be installed in accordance with the procedures outlined on the approved plan.

(a) The shoring and bracing plans shall show at least one typical section through each wall and the bracing therefor. The design of the bracing shall consider wind load on the roof and wall, eccentric loading on the walls (which are out of plumb by as much as 9 inches), possible eccentric loading on the underpinning piles (use 4 inch eccentricity for design) in addition to the usual loads. At corners or returns of the walls the ten feet adjacent to the corner or return may be considered as being supported by the return wall for walls above grade. Below grade the full earth thrust shall be supported. No lateral loading shall be transmitted to the underpinning piles.

(4) Procedures

Unless otherwise approved by the Contracting Officer the following provisions shall be incorporated in the shoring and bracing procedure.

(a) All floors, roof, walls and supporting columns except portions of first floor on ground shall be left in place until after grouting is completed.

(b) The roof, second and third floors and as much of the first floor as feasible and the supporting columns shall be left in place until after the underpinning is completed.

(c) Shoring below ground level shall be designed to support the full thrust of the earth on the walls as retaining wall.

(d) Bracing above ground level shall support the walls at locations spaced not more than 21 feet apart horizontally and vertically or by walers or studs spaced not more than 21 feet apart and running the full length or height of the walls. Diagonal bracing shall be used to transmit lateral loads to the ground.

(e) No bracing member shall be removed until the new floor slabs are in place and cured and other supporting members are in place unless the Contracting Officer has given his written permission for the removal of the member.

C. UNDERPINNING

The entire existing structure shall be supported on piles,

except for those parts to be removed and the three walls of the dressing room wing which border on private property. The underpinning shall be performed by a competent underpinning contractor experienced in this type of underpinning and who shall employ competent workmen experienced in this type of work.

(1) Drawing Approval

The Contractor shall submit the plan of underpinning and shoring for the approval of the Contracting Officer.

(a) The spacing and size of piles shall be as shown on the drawings unless otherwise approved by the Contracting Officer.

(b) The size, location and order of excavation of all approach pits shall be shown.

(c) Lagging and bracing for a typical approach and underpinning pit shall be shown.

(d) Order or procedure for each phase of the work shall be shown or clearly described.

(2) Bearing Plates

Steel bearing plates under the wall shall transmit the maximum jacking pressure to the wall by a bearing pressure of not more than 200 p.s.i.

(3) Underpinning Piles

Piles shall be jacked into place open end to the anticipated bearing strata, cleaned and filled with concrete, tested and securely wedged.

(a) Applicable provisions of Paragraphs titled INSTALLATION OF PILES; DEFECTIVE PILES; LINES, LEVELS AND RECORDS; CORRECTIVE MEASURES; and OBSTRUCTIONS TO PILE DRIVING as specified under Paragraph D "PILES" shall also apply to underpinning piles.

(b) The working load of each permanent underpinning pile shall not exceed two-thirds of the total jacking pressure used to obtain the required penetration if the load is held constant for ten hours without movement of the pile.

(c) Provisions shall be made for re-jacking and re-wedging all underpinning piles. (See Paragraph I, Pile Load Definition.)

(d) Piles shall be re-jacked and re-wedged in groups of three, before concreting, to 1-1/2 times the design load. The load shall be held until all settlement, if any, of the piles ceases. Then the loading shall be reduced to the design load and one end pile permanently wedged in place. The next group of three to be group tested shall include the two remaining piles of the previously tested group and the pile to be permanently wedged shall be the center pile of the previously tested group.

(c) Pile caps extending under walls shall be made to take their proper share of the load by wedging or jacking unless otherwise directed by the Contracting Officer.

(4) Reinforcing Wall

The existing walls shall be reinforced by the installation of such beams or structures as are necessary for the distribution of the jacking loads along the walls over distance sufficient to avoid overloading or damaging the wall.

D. PILES

(1) Type of Piles

(a) All underpinning jack-down piles shall be 14" sectional steel pipes with 3/8" or thicker walls.

(b) All piles under interior column footings, east wall of theatre, dressing room, and saloon walls shall be 10-3/4" steel pipe, 5/16" thick or thicker, driven open or closed end.

(c) Concrete for filling piles shall be Class A (3000#) concrete as defined in the District of Columbia Building Code and Specified elsewhere.

(d) The piles shall meet the requirements of District of Columbia Building Code.

(2) Length & Quantity of Piles for Bidding

The drawings show the number of piles, the elevation of the top of the pile caps and the probable top of underpinning. The estimated number of 14-inch piles is 53 and the design aggregate length is 2,500 linear feet. The estimated number of 10 3/4 inch piles is 137 and design aggregate length is 5,460 linear feet. See paragraph "J", page 4-11, for piling overruns and underruns.

(3) Boring & Soil Test Information

Boring data are shown in the drawings and Compression Test, Direct Shear Test and Consolidation Tests for the upper strata are available in the office of the Contracting Officer. The Contractor shall make his own interpretation of all soils information and shall be prepared for any and all contingencies and conditions encountered in the installation of piles.

(4) Installation of Piles

(a) Piles shall be installed with due consideration for safety of adjacent structures by a method which leaves their strength un-

impaired and which develops and retains the required load-bearing resistance. If any pile is damaged during installation, the damage shall be satisfactorily repaired or the pile rejected.

(b) All pertinent requirements of the District of Columbia Building Code shall be met unless otherwise specified.

(c) All installed piles, test piles and underpinning piles shall all bear in the same soil stratum, as determined from the test boring data.

(d) Tops of piles shall be cut off level at the elevation shown on the drawings.

(e) All pile casings forming each pile group shall be driven before any concrete is placed in the group. Generally, driven casings shall remain unfilled until all driving is completed within a radius of ten feet. All water and other foreign material shall be removed from the casings, and if required by the Contracting Office a drop light shall be provided so that the casings may be inspected. As soon as the casings are approved, concrete shall be deposited in each in one continuous operation until the casing is filled to the proper height.

(f) If during the driving of any piles, any piles previously driven shows signs of heaving or lifting, the Contractor shall redrive such piles to the required bearing capacity.

(g) Piles shall be accurately spotted, driven plumb with the ends of each tube perpendicular to the axis of such tube.

(h) Splices of piles shall adequately transmit the resultant vertical and lateral loads. Splices shall maintain true alignment of the pile. All splices shall develop not less than 50% of the value of the pile in bending.

(5) Defective Piles

(a) When any one pile or any pile group is installed with any of the following defects, corrective measures as specified herein will be required.

1. Out of plumb more than 2 per cent of the pile length.
2. Out of position so that the analytically calculated load on any pile exceed 110% of the designated load value.
3. Out of position so that the pile caps require revision of shape, or dimensions, or reinforcement.
4. Damaged by, or during, driving or damaged by soil pressure or collapse of the shell or buckling, tearing, or rupture of the shell.
5. Failure of the point to reach the bearing stratum specified.
6. Any other irregularity in a pile or piles making it unsuitable as a full load bearing pile.

(6) Corrective Measures

(a) Corrective measures shall consist of the redesign of the pile cap, or the driving of additional piles or addition of reinforced concrete straps or other measures, or a combination of any or all of these measures, as directed by the Contracting Officer after examination of the pile driving data and survey of location of piles. No corrective measures shall be taken except on instructions of or approval of the Contracting Officer. The design of corrective measures, when required, will be done by the Structural Engineers and shall be paid by the Contractor at the rate of 2-1/2 times the Architect and Engineer's design, drafting and administrative costs. Corrective measures where ordered by the Contracting Officer shall be made before proceeding with work which will place load on the piles. The cost of corrective measures shall be borne by the Contractor except for obstructions below 3 feet below the bottom of the pile cap as provided under paragraph (8) "Method of Payment".

(b) Abandoned piles shall be filled with concrete.

(7) Lines, Levels & Records

(a) The Contractor shall establish and locate all lines and levels and be responsible for the correct location of all piles.

(b) The Contractor shall prepare a drawing, suitable for blueprinting, on which each pile is numbered for identification. This drawing shall show the location of each and every pile as driven relative to the centerline of the columns or walls. The information on pile locations as driven shall be put on the drawing as soon as possible after measurement of same. The drawing shall show location of obstructed, damaged, compensating and abandoned piles. The measurement of pile locations shall be done by an Engineer licensed in the District of Columbia and he shall certify on the drawing to the correctness of the measurements. The Engineer's services shall be engaged, and paid for, by the Contractor. Prints of the drawing shall be furnished to the Contracting Officer from time to time, or as requested, to determine corrective measures required as specified herein. After completion of all pile installations the original drawing shall be turned over to the Contracting Officer.

(c) The Contractor shall keep an accurate record, on suitable forms for the purpose, of the total penetration of every pile, and the behavior of each pile during driving and the number of blows per foot for each one foot interval. The record shall show the tip elevation and the cut-off elevation, date and time of driving, and other pertinent data.

The piles shall be identified in this record to correspond with the identification on the drawing required by paragraph (b) above. The records shall be submitted to the Contracting Officer as the work progresses for examination, or comment, and to determine the necessity for, and type of, corrective measures.

(8) Method of Payment

(a) The pay lengths of piling shall be based on the total actual driven lengths of piling for the locations shown, measured below cut-off, and including abandoned and/or extra piles driven due to obstructions encountered below three feet below the bottom of the pile cap but

Excluding all other extra piles abandoned or driven for reasons other than obstructions below three feet below the bottom of the pile cap. The bid length of piling shall be as given under paragraph D(2) above. If the pay length exceeds the bid length, the Contractor will be paid extra at the rate of the Unit Extra Price per Foot as stated in his bid and if the pay length is less than the bid length, the Contractor will be paid less than the Contract price at the rate of the Unit Credit Price per Foot as stated in Par. J, below.

(b) The Contractor shall include in his bid an Additional Lump Sum Allowance of Fifteen Hundred (\$1500.00) Dollars for payment of the Contractor to the Structural Engineer and Architect for redesign of pile caps, straps, or other measures necessitated by obstructions below three feet below the bottom of the pile cap, and the redesign necessitated by any Approved changes in underpinning procedure. Payment shall be at the rate of 2-1/2 times the Architect and Engineer's design, drafting and administrative cost. If the cost amounts to more than this Allowance, the additional cost shall be borne by the Contractor. If the cost amounts to less than this Allowance, the saving shall revert to the Government. If no design changes are required, this whole Allowance shall revert to the Government.

(9) INSPECTION:

A competent and qualified Engineer employed by an independent testing laboratory and approved by the Contracting Officer shall be at the site at all times during the installation of the piles. The Engineer shall make and submit complete records of the installation to the Contracting Officer. The Contractor shall bear the cost of the inspector and all costs of inspection.

Each casing must be inspected and approved by the Inspector before being filled with concrete.

E. LOAD TEST

Before any load test is made the proposed apparatus and structure to be used in making the load test shall be approved by the Contracting Officer. All load tests shall be made under the supervision of the Contracting Officer and a complete record of each test shall be filed with him before driving any piles other than the test piles. Except as otherwise specified the equipment and procedure shall conform to Test for Load-Settlement Relationship for Individual Piles Under Vertical Axial Load, ASTM Designation D-1143.

(1) Loading Piles

Not less than three test piles shall be driven for each capacity pile used and not less than one of such test piles shall be test loaded. The test load shall be twice the proposed load value of the pile and shall be applied in increments of 1/4, 1/2, 3/4, 1, 1-1/4, 1-1/2,

1-3/4 and two times the proposed working load. Settlement readings made to an accuracy of 0.01 inch shall be taken before and after the application of each new load increment and at 1, 2, 4, 8, 15, 30, 60, 120 minutes and every two hours after the application of each load increment until application of the next load increment. Additional loads shall not be applied until the rate of settlement under the previous increment is less than 0.01 inch in one hour and not until 2 hours have elapsed, unless otherwise authorized by the Contracting Officer. The total test load shall remain in place until settlement does not exceed 0.01 inch in forty-eight hours.

(2) Removing Load

The total load shall be removed in decrements not exceeding one-fourth of the total test load and at intervals not less than one hour with measurements of the rebound being made immediately before and after each decrement. The final rebound shall be recorded 24 hours after the entire test load has been removed.

(3) Report

The report of the load test shall include the following information:

(a) A description of the soil conditions at the location of the test pile.

(b) A description of the pile and its driving record including the number of hammer blows per foot throughout the pile length and the final driving resistance in blows per inch for the last 3 inches of driving.

(c) A description of the hammer and its actual rate of operation during the driving of the test pile.

(d) A tabulation of the loads and settlement readings during the loading and unloading of the pile.

(e) A graphical representation of the test results in the form of a time-load-settlement curve.

(f) Remark covering any unusual occurrences during the driving or loading of the pile.

(4) Allowable Pile Load

The maximum allowable pile load shall be one-half that which produces a net settlement of not more than one-half inch, or which produces a gross settlement of one inch, whichever is less. Gross settlement is the total downward movement of the test pile which occurs under an applied test load. Net settlement is the gross settlement under test load minus the final rebound which occurs after removal of the applied test load. (See Paragraph I, PILE LOAD DEFINITION.)

(5) Use of Load Test Results

In the subsequent driving of the foundation piles for the structure, a pile shall be deemed to have a bearing value equal to that determined by the load test pile for that area of the Foundation when the foundation pile, using the same or equivalent make and model of pile hammer, and the same operation of the hammer with regard to speed, height of fall, stroke and pressure, and all other variable factors, shall develop equal or greater final resistance to driving than the load test pile. The foundation piles shall be driven to the depth at which the bearing conditions are similar to those of the test pile.

(6) Pile Groups

When the Contracting Officer has reason to doubt the safe load sustaining capacity of pile groups he may require group load tests up to one hundred and fifty per cent of the proposed group load.

F. INTERIOR FLOORS ON GROUND

Basement floors are designed to resist the horizontal thrust of the walls and must be in place and cured to 28 day design strength before shores or braces supporting lateral thrust of side walls are removed.

(a) Floor structure shall be supported on undisturbed natural earth, or on backfill compacted to the same bearing capacity as the natural earth.

(b) The sub-grade shall be established at the true grade shown on the plans and shall be approved by the Contracting Officer before the placing of the gravel.

G. SPREAD FOOTINGS

Spread footings shall be supported on natural earth and of the size and shape shown on the drawings.

(a) Soil shall be inspected for bearing value and approved by the Contracting Officer before concrete is placed.

H. PUMPING AND DRAINAGE

All excavations shall be kept free of water by pumping or by other means.

(a) Take necessary precautions to insure against loss of material from behind lagging or sheeting as brought in by flowing water.

(b) If at any time "mud boils" or "running sand" is encountered the pit or excavation shall be stopped and the Contracting

Officer immediately notified. If such conditions endanger the structure or adjacent structures the pit or excavation shall be immediately back-filled with gravel or other approved material and measures taken to relieve the hydraulic pressure before excavation is resumed.

I. PILE LOAD DEFINITION

For the purposes of this specification the "working load," "proposed load value," "allowable pile load" and other such terms describing the loads to which piles shall be tested is defined as the pile load shown on the drawings (20, 40 or 60 tons) plus 50% of the jacking or driving load obtained immediately above the sand strata encountered at approximate elevation minus twenty (-20).

For example, if the skin friction developed in the upper strata during jacking of a 60 ton pile is 20 tons the pile shall be tested as if it were a 70 ton pile, i.e., to 105 tons for 10 hours, and shall meet this requirement.

J. PILING OVERRUNS AND UNDERRUNS:

The Contractor shall submit a Unit Extra Price per foot for piles, driven and concrete filled, which may be in excess of the total design aggregate length of piles as stated under D 2(a) above.

If the aggregate total length of 14" piles is less than 2,500 linear feet the government will receive a credit of \$18.00 per linear foot.

If the aggregate total length of 10 3/4" piles is less than 5,460 linear feet the government will receive a credit of \$2.50 per linear foot.

SECTION 5

GROUTING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of the grouting of the hollow space in the existing masonry walls.

B. WORK INCLUDED

In general the work to be performed under this Section shall include but is not necessarily limited to the following:

(1) Provide and install grout in the void spaces of the south, west and north walls of the main building and in the west and north walls of the Dressing Room Wing. Grouting shall extend from bottom to top of walls.

(2) Provide and install such pointing or caulking as may be necessary at the face of the wall to make the wall contain the grout.

(3) Cleaning exterior brick work marred or stained by grouting.

(4) Washing interior of walls.

C. WORK NOT INCLUDED UNDER THIS SECTION

(1) Removal of floors and other portions of the building.

See Section 2.

(2) Excavation to one foot above bottom of wall.

See Section 3.

(3) General cleaning and pointing of the exterior brickwork.

See Section 3.

3. MATERIALS

A. GENERAL REQUIREMENTS

The materials used shall completely fill the voids, have strength to bond the wall together into a solid strong wall and prevent penetration of water or weather. Experimentation is encouraged but any and all deviations from the following requirements must be approved by the Contracting Officer.

B. PORTLAND CEMENT

Portland Cement shall comply with the "Standard Specifications for Portland Cement" (ASTM Designation C-150).

Grouting

C. WATER

Water shall be fresh, clean and free from injurious amounts of alkali, organic matter or other deleterious substances.

D. SAND

Sand if used shall be fine grained and of the same specific gravity as the cement used.

E. ADDITIVES

Additives shall comply with the applicable Federal Specification or the ASTM Specification for the type of additive used.

4. METHODS

A. GENERAL REQUIREMENTS

Grouting shall be carried out on the gravity principle in low lifts which do not produce pressures great enough to endanger the safety of the wall by forcing or blowing out the face work. The wall shall be first thoroughly washed out with water to make certain that all dust and dirt are completely removed and that the surrounding masonry is well moistened to receive the liquid cement and ensure adhesion. Experimentation to determine the most practical method to ensure that the wall is completely filled and bonded is encouraged but deviations from the following suggested procedures may be made only after approval of the Contracting Officer.

B. GROUTING APPARATUS

The grouting apparatus shall consist of one or more containers with an outlet in the bottom to which is attached a union with a 1-1/2 inch rubber hose terminating in a galvanized iron nozzle 3/4-inch in diameter fitted with a stop cock. A plug fitted to the outlet of the container and having a suitable handle extending above the top of the container shall be used to control the flow of the grout out of the container. A force cup or "plumber's helper" shall be used over the outlet of the container to give an additional impetus to the flow of grout if there should be a temporary stoppage or an air lock in the tube. Scaffolding adequate to raise the container above the portion of wall to be grouted and adequate to support two workmen and the required water and Portland cement will be required. Miscellaneous water hoses and containers necessary for washing out the wall and disposing of the wash water, tools for plugging leaks in the joints of the wall, equipment for drilling 1-inch diameter holes in the wall, scaffolding as necessary for the workmen to reach the portion of the wall being grouted and miscellaneous tools will be required.

C. HOLES FOR WASHING & GROUTING

Holes 1-inch in diameter shall be drilled about 4 feet apart horizontally and 2 feet apart vertically, preferably at wide joints and where horizontal and vertical joints meet, to a depth about 4 inches less than the thickness of the wall. The holes shall be staggered, that is, they shall be spaced alternately with those immediately above and below. The first row of holes shall be approximately one foot above the bottom of the foundation, the second row 6 inches higher and the rows above spaced 2 feet apart vertically above the second row.

Grouting

D. WASHING

Before grouting any section of the wall, except the bottom 1 foot height of foundation, the area to be grouted shall be first thoroughly washed out with water to make certain that all dust and dirt are completely removed and that the surrounding masonry is well moistened. A plentiful supply of water is essential for this work. The washing shall be both from the lower hole to the upper, from the upper to the lower, and from the row above the upper to the lower. The necessity for thorough washing out before grouting cannot be over emphasized. The washing shall continue until water poured in at the top runs clear at the bottom. Thin steel probes shall be used in the lower holes to assist the clearance of old decayed mortar.

E MIXING GROUT

A neat cement/water grout of proportions adjusted to a consistency which will maintain easy flow shall be used. The grout shall be of as rich a consistency as will flow into the voids of the wall being grouted. A proportion of 1-1/2 parts of water to 1 part of cement by volume shall be used as a trial mix.

(1) To mix the grout the cement shall be emptied into the water and stirred continuously until the required consistency is obtained. Thorough mixing is essential and must be continued until the whole of the cement is in suspension and no solids remain in the bottom of the container.

(2) Use only fresh cement completely free of lumps. The cement at time of use shall conform to the ASTM requirements for fineness. The cement shall pass a standard No. 100 sieve with no particles retained on the sieve.

(3) A pozzolanic material and a grout fluidifier shall be used in accordance with the manufacturer's instructions, unless otherwise directed by the Contracting Officer.

(4) Sand or similar aggregates may be added to the grout providing the following requirements are met:

(a) The aggregate shall be fine grained.

(b) The aggregate shall have the same specific gravity as the cement and not settle out of solution separately.

(c) The flow characteristics of the grout shall not be impaired.

(d) Neither the tensile strength, bond strength, or water resistance quality of the grout shall be impaired more than 10%.

(e) The Contractor shall prove to the Contracting Officer's satisfaction that the above requirements are met and obtain his approval for the proposed mix.

(f) The mix shall be altered as directed by the Contracting Officer when in his opinion the alteration is necessary to meet the above requirements.

Grouting

F. PREPARATION FOR GROUTING

Before grouting is commenced be certain that all cavities have been thoroughly washed out and that all open joints have been plugged with hemp tow, clay or other suitable material pressed into the joint with a steel tool for a depth of 1-1/2 inches or 2 inches. Have ample material and workmen available for continuously and completely grouting the area to be grouted without interruption. The nozzle of the delivery tube shall be inserted in the lowest hole and well caulked. The grout vessel shall be supported a few feet above the outlet hole. Ample scaffolding, workmen, caulking material and wash water shall be available to insure that the exterior face bricks are not stained by escaping mortar.

G. GROUTING

The flow of grout must be controlled both at the nozzle by use of the stop-cock and at the grout vessel by use of the plug to regulate the flow into the grout tube. The flow should be maintained as continuously as possible. If the grout does not flow freely place the rubber force cup over the hole in the bottom of the vessel and assist the flow by pumping vigorously. Continue the operation without removing the nozzle until the grout rises up the wall and begins to flow out of the waste hole at the top of the section of wall under treatment. (2 feet up and over from the entrance hole.) Remove the nozzle from the hole and plug hole. Move nozzle horizontally to the next hole and repeat the operation. It may be necessary to plug the adjacent holes on the level of the grouting plug. Repeat the grouting operation, proceeding horizontally around the walls until the walls have been completely grouted up to a level before starting the next lift. The grout must have a "set" of at least 4 hours before the next lift is started. It shall be demonstrated that the previous lift is in fact set before starting the next lift. As soon as the cement is firm remove the hemp tow or caulking previously placed in the open joints and permit excess water to seep away.

H. FOUNDATION

The foundations shall be grouted in a manner similar to that for the walls except that the lower 18 inches shall be grouted by injecting the grout into holes drilled 12 inches above the bottom of the foundation until it flows out of waste holes 6 inches above and half way between injection holes. This grouting of the foundation from the bottom to 18 inches above shall be carried out without washing.

J. COMPLETENESS

All void space in the walls shall be completely filled with grout. The spacing of the holes and other procedures shall be varied as necessary to insure the filling of all voids. When doubt exists as to the filling of any area by the grout, additional holes shall be drilled in that area to check the grout penetration and if necessary for the filling of that area the additional holes shall be used for grouting.

K. PRECAUTIONS

The Contractor must take all precautions necessary, and accept responsibility, for the safety of the structure at all times. Take

all necessary precautions to see that the adjacent property owners suffer no damages. The soil under the foundation must not be weakened by wetting. The windows which are to remain must not be damaged. The floors must not be loaded beyond their capacity. The chimneys which are to be used as chases for steel columns shall not be obstructed by grout. If at any time it appears that the washing or grouting of the wall may be causing settlement or other movement within the wall the operation shall be stopped, the wall drained and measures taken to detect any movement of the wall.

L. CLEAN UP

Leave all face brick and other exposed surfaces clean and unstained. Remove all caulking and plugs from the wall. Remove all equipment and scaffolding used in the work. Remove all debris resulting from the work and leave the premises clean and orderly.

SECTION 6

CONCRETE

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operations, including all labor, materials and equipment necessary for and incidental to the completion of all Portland Cement Concrete work.

B. WORK INCLUDED

In general the work to be performed under this Section shall include but is not necessarily limited to, the following:

(1) Provide and install all reinforced concrete beams, walls, slabs and columns complete with reinforcing.

(2) Provide and install all concrete for structural steel fire-proofing including reinforcing.

(3) Installation of materials specified under other Sections which are to be built into the work of this Section.

C. WORK NOT INCLUDED UNDER THIS SECTION

(1) Grouting of masonry walls. See Section 5.

3. MATERIALS

A. GENERAL REQUIREMENTS

Materials shall comply with applicable Federal Specifications except as otherwise specified.

B. PORTLAND CEMENT--SS-C-192b

Portland Cement shall comply with the "Standard Specifications for Portland Cement" (ASTM Designation C-150) and shall be Type 1 or Type 3 for use when high-early strength is required.

C. CONCRETE AGGREGATE--SS-A-281b

(1) Concrete aggregate shall comply with the "Standard Specifications for Concrete Aggregates" (ASTM Designation C-33), except that aggregates failing to meet these specifications but which have been shown by special test or actual service to produce concrete of the required quality may be used under Par. 4, B, Method 2 where authorized by the Contracting Officer.

(2) The maximum size of the aggregate $3/4$ " except for footings which may be $1-1/2$ ". The maximum size of the aggregate may also be not larger than one-fifth ($1/5$) of the narrowest dimension between forms of the member for which the concrete is to be used nor larger than three-fourths ($3/4$) of the minimum clear spacing between reinforcing bars.

D. WATER

Added water shall be fresh, clean and free from injurious amounts of alkali, organic matter, or other deleterious substances. The maximum amount of water allowed for concrete mixes as specified shall include any free water in the aggregates.

E. METAL REINFORCEMENT--QQ-S-632b

Reinforcing bars to conform to the requirements of the "Standard Specifications for Minimum Requirements for the Deformations of Deformed Steel Bars for Concrete Reinforcement" ASTM Designation A-305, and the "Standard Specifications for Billet-Steel Bars for Concrete Reinforcement" (ASTM Designation A15-62T) intermediate grade.

(1) When reinforcing bars are to be welded these ASTM specifications shall be supplemented by requirements assuring satisfactory weldability in conformity with AWS D 12.1, "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction".

(2) Welded wire fabric or cold-drawn wire for concrete reinforcement shall conform to the requirements of the "Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement" (ASTM Designation A-82) and "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement" (ASTM Designation A-185).

(3) Metal accessories shall be provided including all spacers, chairs, ties and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place.

(4) Mill and shop inspections will be made by a Government Representative, unless such inspection is waived by the Service. In case mill inspection is waived, the Contractor shall furnish certified copies of the mill test and analysis showing that the material to be used is in conformity to the contract requirements.

F. ADMIXTURES

Admixtures if used shall conform to the applicable following ASTM requirements:

(1) "Specifications for Air-Entraining Admixtures for Concrete" (ASTM C260).

(2) "Specifications for Chemical Admixtures for Concrete" (ASTM C494).

(3) "Specifications for Fly Ash for Use as an Admixture in Portland Cement Concrete" (ASTM C350).

(4) "Specifications for Raw or Calcined Natural Pozzolans for Use as Admixtures in Portland Cement Concrete" (ASTM C402).

G. METAL ANCHOR SLOTS

Provide anchor slots in concrete for securing masonry facing and masonry partitions to concrete. Form slots of 24 gauge galvanized iron shaped to give double anchorage into concrete, with shoulder and dove-tailed sides. Punch slots 12 inches on center for securing to forms; furnish staples and end caps. Seal face of slots with tape or pack with felt strips to prevent entrance of cement or grout. The anchors for inserting in slots are included under other sections.

H. METAL FLASHING REGLETS

Reglets set in concrete forms to receive metal flashings shall be formed in size and shape shown of 26 gauge galvanized metal. Set reglets straight and at proper locations.

J. EXPANSION JOINT FILLER

For interior, treated pre-moulded Celotex "Flexcel", "Kapco" Fiberglas or equal. For exterior slabs on earth, use pure cork.

4. CONCRETE QUALITY & TESTS

A. CONCRETE QUALITY

(1) The allowable stresses for the design of this structure are based on the specified minimum 28-day compressive strength of the concrete, or on the specified minimum compressive strength at the earlier age at which the concrete may be expected to receive its full load. The strengths of concrete at specified ages for which all parts of the structure were designed are shown on the plans. All concrete shall be in accordance with the D. C. Building Code unless otherwise specified. Class "AA" - $F'C=3750$, Class "A" - $F'C=3000$, Class "B" - $F'C=2500$ Class "C" - $F'C=2000$.

(2) No concrete exposed to the action of freezing weather shall have a water content exceeding 6 gal. per sack of Portland Cement.

(3) The minimum cement content for any concrete shall be 5 bags per cubic yard.

B. METHOD OF DETERMINING STRENGTH OF CONCRETE

The determination of the proportions of cement, aggregate and water to attain the required strengths shall be made by one of the following methods:

(1) Method 1. Proportioned in accordance with Paragraph 3-8129 "Concrete Proportions and Classification" of D. C. Building Code. Concrete made from average materials: When no preliminary tests of the materials to be used are made, the water content per sack of cement shall not exceed the values in the following table. Method 2 shall be employed when artificial aggregates or admixtures are used.

Class of Concrete	Water Content U. S. gal. per 94-lb. sack of cement	Assumed compressive strength at 28 days, lb. per sq. in.
B	7-1/4	2,500
A	6-1/2	3,000
AA	5-1/2	3,750

Note: In interpreting this table, surface water contained in the aggregate must be included as part of the mixing water in computing the water content.

(2) Method 2. For combinations of materials previously evaluated, or to be established by trial mixes. Controlled Concrete: Proportioned in accordance with paragraph 3-8130 "Controlled Concrete" of D. C. Building Code. Proportions of the materials and water content other than those shown on the above table may be used provided that the strength-quality of the concrete proposed for use in the structure shall be established by tests which shall be made in advance of the beginning of operations, using the consistencies suitable for the work and in accordance with the "Standard Method of Making Concrete Compression and Flexure Test Specimens in the Laboratory" (ASTM Designation C-192) and the "Standard Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM Designation C-39). A curve representing the relation between the water content and the average 28-day compressive strength or earlier strength at which the concrete is to receive its full working load, shall be established for a range of values including all the compressive strengths called for on the plans. The curve shall be established by at least three points, each point representing average values from at least four test specimens. Amount of water used in the concrete for the structure as determined from the curve, shall correspond to a strength which is 35 per cent greater than that called for on the plans. No substitutions shall be made in the materials used on the work without additional tests in accordance herewith to show that the quality of the concrete is satisfactory.

C. CONCRETE PROPORTIONS AND CONSISTENCY

(1) The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement with the method of placing employed on the work, but without permitting the material to segregate or excess free water to collect on the surface. The combined aggregates shall be of such composition of sizes that when separated on the No. 4 standard sieve, the weight passing the sieve (fine aggregate) shall not be less than 30 percent nor greater than 50 per cent of the total unless otherwise required by the Contracting Officer, and with the exception that these proportions do not necessarily apply to lightweight aggregates.

(2) The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked at any time during the work. (Whenever practicable measurement should be by weight rather than by volume.) Ready-mixed concrete shall conform to the "Standard Specifications for Ready-Mixed Concrete" (ASTM Designation C-94).

(3) Concrete in which an air-entraining agent is used shall contain not less than 3 per cent nor more than 6 per cent of entrained air, by volume

(4) Concrete shall be Class "A" (3000 lbs/sq. in.) unless otherwise specified or shown on the drawings.

(5) Aggregates shall be separately stored and separately measured by weight (or equivalent volume) for each batch. Fractional sacks of cement shall be weighed for each batch.

(6) Any necessary changes in concrete mixtures to meet the requirements specified for strength and for proportions and consistency shall be made without change in contract price and to the satisfaction of the Contracting Officer.

(7) Slump. Concrete shall be tested for consistency at the mixer, or at the place of deposit if delivered ready mixed. A complete batch shall be mixed as specified and then dumped. The sample shall be taken immediately from the batch and tested under the directions of the Contracting Officer and in accordance with ASTM Standard C-143 (current issue). The slump shall be within the following limits:

2 inches to 5 inches for pavement and reinforced walls and footings.

2 inches to 4 inches for concrete of footings, pile caps, substructure walls and sloping balcony slabs.

3 inches to 6 inches for all other concrete.

Where vibration is used, the slump shall approach the minimum specified above.

D. STRENGTH & TESTS

(1) During the progress of the work, compression test specimens shall be made, cured and tested by the Contractor, at his expense, in accordance with ASTM Standard C-31 (current issue) and C-39 (current issue) of every class of concrete required. Test specimens shall be taken from batches of concrete as selected by the Contracting Officer. The curing, as required, and the testing shall be done in a laboratory approved by the Contracting Officer. Not less than three specimens shall be made for each test, nor less than one test for each 100 cubic yards or fraction thereof of concrete of each class for each day's run. The Contracting Officer may require a reasonable number of additional tests during the progress of the work. Specimens shall be cured under laboratory conditions except that when, in the opinion of the Contracting Officer, there is a possibility of the surrounding air temperature falling below 40 degrees F., he may require additional specimens to be cured under job conditions.

(2) The standard age of test specimens shall be 28 days for Types I cements and 7 days for Types III cements. However, the age for Types I cements may be reduced to 7 days, provided the relations of strengths at the ends of the short and long periods is established by tests satisfactory to the Contracting Officer.

(3) If the average strength of the cylinders, or more than 20% of the cylinders, cured under laboratory conditions for any class of concrete falls below the compressive strength required by the contract, the Contracting Officer shall have the authority to order the Contractor to change the

proportions and/or the water content for the remainder of that class of concrete. Thereupon, the Contractor shall make whatever change is necessary to produce concrete of the strength required at no additional expense to the Government. If the average strength of the cylinders cured under job conditions falls below the required strength, the Contracting Officer shall have the authority to require conditions of temperature and moisture necessary to secure the required strength and may require tests of hardened concrete in accordance with ASTM Standard C-42 (current issue) or load tests to be made on the portions of the structure so affected.

(4) The Contracting Officer shall have the right to order a load test on any portion of the structure where conditions are such as to cause doubt about the safety of the structure. Failure of the concrete to meet the required strength tests in laboratory tests shall be such a condition. Such load tests shall be carried out in accordance with the requirements of American Concrete Institute (ACI 318-63).

(5) If the Contracting Officer determines that the proper strength of concrete has not been produced in the structure, all concrete in the areas involved, shall be removed and replaced at the Contractor's expense without damage to adjacent structure.

(6) If an air-entraining agent is used, the Contractor shall demonstrate compliance with specified limits for entrained air by tests on the fresh concrete in accordance with ASTM Tentative C-173 (current issue), unless such tests are waived by the Contracting Officer.

5. METHODS

A. MIXING AND PLACING CONCRETE

(1) Preparation of Equipment and Place of Deposit

(a) Before placing concrete, all equipment for mixing and transporting the concrete shall be cleaned, all debris and ice shall be removed from the places to be occupied by the concrete, forms shall be thoroughly wetted (except in freezing weather) or oiled, and masonry filler units that will be in contact with concrete shall be well drenched (except in freezing weather), and the reinforcement shall be thoroughly cleaned of ice or other coatings.

(b) Water shall be removed from place of deposit before concrete is placed unless otherwise permitted by the Contracting Officer.

(2) Mixing of Concrete

(a) The concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged.

(b) For job-mixed concrete, the mixer shall be rotated at a speed recommended by the manufacturer and mixing shall be continued for at least 1-1/2 minutes after all materials are in the mixer.

(c) Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in the "Standard Specifications

for Ready-Mixed Concrete" (ASTM Designation C-94). With each load of concrete delivered to the job there shall be furnished by the ready-mixed concrete producer duplicate delivery tickets, one for the Contractor and one for the Contracting Officer. Delivery tickets shall provide the following:

- a. Date.
- b. Name of ready-mixed concrete plant.
- c. Job location to which delivered.
- d. Contractor to whom delivered.
- e. Type and brand name of cement.
- f. Class and cement content in bags per cu. yd. of concrete.
- g. Truck number.
- h. Time dispatched.
- i. Amount of delivered concrete in load in cubic yards.
- j. Admixtures in concrete, if any.
- k. Maximum size of aggregate.

(d) The cement-water ratio shall be accurately controlled for each batch.

(3) Conveying

(a) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of the materials.

(b) Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design to insure a practically continuous flow of concrete at the delivery and without separation of the materials.

(4) Placing Concrete

Concrete shall not be placed until forms, reinforcement, pipes, conduits, waterproofing, etc. have been inspected and written permission given by the Contracting Officer to proceed with the work. Concrete shall not be placed on frozen ground nor on surfaces which are covered with frost. Wood forms that are not mill-oiled or plastic-coated shall be damp when the concrete is placed. The American Concrete Institute recommendations as given in "Recommended Practice for Measuring, Mixing and Placing Concrete" (ACI 614) shall be used as a guide for placement procedures unless otherwise specified.

(a) Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The concreting shall be carried on at such a rate that the concrete is at all times workable and flows readily into the space between the bars. No concrete that has partially hardened or been contaminated by foreign material shall be deposited on the work, nor shall retempered concrete be used. Concrete shall not be allowed to drop freely from a height of more than 5'-0".

(b) When concreting is once started, it shall be carried on as a continuous operation until the placing of the panel or section is completed. The top surface shall be generally level. When construction joints are necessary, they shall be made in accordance with Paragraph 5, D (3).

(c) All concrete shall be thoroughly compacted by suitable means during the operation of placing, and shall be thoroughly worked around reinforcement, embedded fixtures and into the corners of the forms.

(d) Where conditions make compacting difficult, or where the reinforcement is congested, batches of mortar containing the same proportion of cement to sand as used in the concrete shall first be deposited in the forms.

(e) Concrete on the soffits of steel framing shall be placed from one side and forced through to the other side.

(f) Concrete that is not covered by the forms and for which a cement finish is required shall not be placed until it can be finished as specified.

(g) The rate and methods of placing concrete and the arrangement of construction joint bulkheads shall be such that the concrete between construction joints shall be placed in a continuous operation, with not more than 1/2-hour of lapsed time between pours.

(h) Before placing new concrete on or against hardened concrete, the forms shall be re-tightened, the surface of the hardened concrete roughened and thoroughly cleaned of foreign matter and laitance and moistened with water.

(i) Construction joints in concrete for which metallic waterproofing is required, including the joints where floor slabs abut walls and columns shall be given a brush-on coat of metallic waterproofing mortar, consisting of equal parts of Portland cement and metallic waterproofing, before adjacent concrete is placed.

(j) Concrete shall be protected against rapid drying and shall be kept moist for at least six days. See specifications under "Curing". Concrete that has not set shall be protected during heavy rains.

(k) Concrete shall be finished true to line and grade and finished as specified under "Finishing".

(l) Observe "Hot and Cold Weather Precautions".

B. REINFORCING STEEL

Reinforcing metal shall include bars, stirrups and fabric and the spacers, chairs, ties, etc., as required and necessary for assembling, placing and supporting the metal in place. Metal shall be clean and free from loose scale or flake rust or any coating that destroys or reduces the bond to the concrete. Metal shall be kept clean until used, or shall be cleaned with wire brushes before placing. Spacers and chairs that rest on the forms for concrete soffits that will be exposed in the finished work, shall have plastic covered legs.

(1) Fabrication

Reinforcement shall be cut and cold bent to exact dimensions and lengths required to comply with the details and intent of the design drawings. Hooks, bending radii and tolerances shall conform to the details shown in the American Concrete Institute "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315 - current edition).

(2) Placing

Reinforcement shall be accurately placed and securely fastened and supported, so as to prevent displacement before or during pouring operations, exactly in positions indicated on structural drawings. High chairs spaced not more than 4 feet on centers and #5 support bars at proper spacing shall be used to hold top bars rigidly in position. Bottom bars shall rest on bolsters spaced not more than 4 feet on center. The number of supports shall not be less than that recommended by the Concrete Reinforcing Steel Institute. All supporting spacing and tying devices are subject to the approval of the Contracting Officer. In all instances specified clearances to face of concrete shall be safeguarded. At splices, bars shall be lapped 40 bar diameters, placed in contact and wired together. Splices are permissible only at points of minimum stress.

(3) Concrete Protection for Reinforcement

The metal reinforcement shall be protected by the thickness of concrete indicated in the plans. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

- (a) Where concrete is deposited against ground without the use of forms, not less than 3 inches.
- (b) Where concrete is exposed to the weather, or exposed to the ground but is placed in forms, not less than 2 inches for bars more than 5/8 in. in diameter and 1-1/2 in. for bars 5/8 in. or less in diameter.
- (c) In slabs and walls not exposed to the ground or to the weather, not less than 3/4 inch.
- (d) In beams, girders and columns not exposed to the ground or to the weather, not less than 1-1/2 inches.
- (e) In all cases the thickness of concrete over the reinforcement shall be at least equal to the diameter of bars.

(4) Placing Tolerance

Unless otherwise specified by the Contracting Officer, reinforcing shall be placed in specified positions within the following tolerances:

- (a) Depth, d , in flexural members, walls, and columns: $\pm 1/4$ inch.
- (b) Longitudinal location of bends and ends of bars ± 2 inches, except that specified clearances to face of concrete shall be safeguarded.
- (c) Fabric in slabs on ground $\pm 1/2$ -inch except that specified clearances to face of concrete shall be safeguarded.

(5) Fireproofing

- (a) In concrete around steel beams, use No. 10 gauge wire loops spaced 6 inches apart, or other equivalent reinforcement, and keep 3/4-inch away from the flat surfaces of the steel.

(b) In concrete coverings of steel columns, use wire fabric having No. 9 gauge horizontal wires 4 inches on center and No. 12 gauge vertical wires 12 inches on center, lapped 4 inches at joints and wired to 1/2-inch vertical corner bars which shall be clipped to the columns and hold the fabric away from the steel.

(6) Shop Drawings

Bending and assembling diagrams showing shapes, dimensions and details of bars and accessories are required. No work shall be fabricated by the Contractor until approval has been given. Six prints of finally approved shop drawings will be required.

(a) All shop drawings submitted shall bear the stamp of approval of the Contractor as evidence that the drawings have been checked by the Contractor.

(b) Approval of shop drawings indicates compliance with intent as to general arrangement and section areas of steel bars, it does not relieve the Contractor of the requirement to follow design drawings to their full intent unless departures have been specifically approved by the Contracting Officer.

C. FORMS

(1) Design

(a) Forms shall conform to the required shape, lines and dimensions of the members, have smooth faces with tight, flush joints and be set to the required lines and levels. They shall be substantial, sufficiently tight to prevent leakage of mortar and be properly braced or tied together to maintain position and shape. The inside of forms shall be clean and free from frost when the concrete is placed.

(b) Except as otherwise shown, forms for beams, girders, columns and pilasters shall provide for a 1-inch chamfer on the exposed external corners. Chamfers on columns, pilasters and exposed external corner shall finish with a cove or bevel about 8 inches above finish floor and 2 inches above wainscots.

(c) Forms for walls, columns or piers shall have removable panels at the bottom for cleaning and inspection.

(d) Where concrete is exposed as a finished surface (whether or not it is to be painted) on the interior of the building, the forms shall be of concrete form plywood not less than 5/8 inch thick that is grade marked mill-oiled and edge-sealed, or plastic-coated and edge-sealed, conforming to Commercial Standard CS45-55, or the forms shall be lined with 1/4 inch plywood conforming to the above standard or with 3/16 inch hardboard, LLL-H-35. All joints between adjacent sheets of form plywood shall be backed solidly by framing members and both edges nailed to the same framing member every 8 inches. Finished edges and surfaces of concrete shall be true and undamaged.

(e) Forms or form linings that are reused shall be reconditioned for each pouring so as to be suitable to produce the concrete finish specified, and to the satisfaction of the Contracting Officer.

(f) Where soil conditions will permit excavation to accurate sizes without bracing, side forms for footings may be omitted.

(2) Removal of Forms

Forms shall be removed in such a manner as to insure the complete safety of the structure. Where the structure as a whole is supported on shores, the removable wall forms, beams and girder sides, column and similar vertical forms may be removed after 7 days, or after 24 hours providing the exposed surfaces are "cured" as hereinafter specified. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support safely their weight and the load thereon.

(3) Patching

Directly after the forms have been removed, all exposed tie wires, stapled ends, etc. shall be removed from concrete surfaces to be exposed. Cut ties flush with finished surfaces of all other concrete. Fins shall be cut off and rough places rubbed smooth. Honeycomb surfaces, stone pockets and other irregularities shall be filled with cement mortar. Do not patch any surfaces until examination of surface has been made and approval of patching method given by the Contracting Officer.

D. OPENINGS, EMBEDDED PIPE & CONSTRUCTION JOINTS

(1) Conduits & Sleeves

(a) Sleeves, conduits or other pipes passing through floors, walls or beams shall be of such size or in such location as not to impair unduly the strength of the construction. Electric conduits and other pipes with their fittings shall not displace concrete required for fireproofing.

(b) Drawings to scale showing the dimensions and locations of all pipes sleeves and openings shall be prepared and submitted to the Contracting Officer for his approval. All sleeves and pipes thinner than standard steel pipe having a nominal inside diameter of over 2 inches or spaced less than 3 diameters on center must be approved by the Contracting Officer before concrete may be placed in the pour containing the sleeve.

(c) Except when plans of conduits and pipes are approved by the Contracting Officer embedded pipes or conduits shall be not larger in outside diameter than $1/3$ the thickness of the slab or wall in which they are embedded nor shall they be spaced closer than 3 diameters on center nor so located as to impair unduly the strength of the construction.

(d) Conduits and pipes larger than $3/4$ " diameter may be embedded in the concrete of beams or columns only when approved by the Contracting Officer.

(e) Pipes which contain liquid, gas or vapor may be embedded in structural concrete only when approved by the Contracting Officer.

(f) Pipes and conduits embedded in structural concrete shall be placed and held near the center of the slab or wall and well away from areas of maximum shear.

(2) Openings

(a) Unless otherwise detailed on the drawings provide 2 additional number 6 bars (one top and one bottom) on 4 sides of all openings greater than $\frac{2}{3}$ the slab or wall thickness. Extend bars 30 inches beyond opening.

(b) All openings must be approved by the Contracting Officer before concreting may be started for the pour containing the opening.

(3) Construction Joints

(a) Construction joints shall be located as shown on the drawings unless otherwise approved by the Contracting Officer.

(b) Joints not indicated on the plans shall be so made and located as to least impair the strength of the structure. Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned and all laitance removed. In addition to the foregoing, vertical joints shall be thoroughly wetted and slushed with a coat of neat cement grout immediately before placing of new concrete, except that metallic waterproofing shall be used instead of grout for all joints below grade.

(c) At least 2 hours must elapse after depositing concrete in the columns or walls before depositing in beams, girders or slabs supported thereon. Beams, girders, brackets, column capitals and haunches shall be considered as part of the structural system and shall be placed integrally therewith.

(d) Construction joints shall be located near the middle of the spans of slabs, beams, or girders, unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam. In this last case, provision shall be made for shear by use of inclined reinforcement. Where possible, without deviating from above requirements, locate slab construction joints under partitions, furred areas or other locations which will be concealed by later construction.

(e) Unless otherwise shown on the drawings all construction joints shall have a key $1\frac{1}{2}" \times \frac{1}{3}$ the depth or width of the member as directed by the Contracting Officer. Dowels of #5 bars 48 inches long at 15" on center shall be provided at the center of all slabs or walls unless otherwise shown on the drawings.

E. FINISHING

All concrete shall be constructed true to line and grade and to the dimensions shown on the drawings. Particular attention shall be paid to striking off the sloping floor surfaces to the proper contour.

(1) Monolithic Finish

Integral Monolithic Finish - used for all slabs unless otherwise noted. Produce integral finish by striking surfaces of structural slabs at proper level; remove all surface water, laitance, dirt; apply monolithic finish of mix specified below to slab before it has set.

(a) For floors to receive resilient floor covering, use dry mix consisting of 1 part Portland Cement, 2 parts sand thoroughly mixed; spread dry over screed wet slab. Trowel floors with steel trowel to produce smooth, dense surface.

(b) For all other floors, platforms, steps having exposed integral cement finish, produce finish by tamping concrete to force aggregate away from surface, then screed at proper level. Surface then floated, lightly troweled. When concrete has set sufficiently to ring under trowel, given second troweling to produce smooth, dense surface.

(2) Terrazzo Finish

Concrete under terrazzo floors shall be well tamped and struck off to a true even surface 2 inches below the finished surface.

(3) Wood Floor

Concrete under wood floors shall be well tamped and struck off to a true even surface at the grade shown in the details shown on the drawings. Take special care to leave all wood sleepers, anchor bolts and sleeper anchor clips at their precise proper elevation and location.

(4) Liquid Floor Hardener

After the specified curing period and as soon as practicable after the concrete and cement finish have become dry, all interior cement floors except cement floors covered with asphalt tile and vinyl tile shall be treated with an aqueous solution containing not less than 2 pounds of magnesium fluosilicate and zinc fluosilicate crystalline salts per gallon of solution. Not less than 0.5 pound of salt content shall be zinc fluosilicate. The liquid hardener shall be delivered ready for use and in the original containers bearing the manufacturer's registered brand and trademark.

(a) The surfaces shall be clean and dry and the hardener applied freely and evenly in three coats, allowing at least 24 hours between coats. For the first coat, one part hardener to 3 parts water; second coat, one part hardener to 2 parts water; third coat, one part hardener to one part water. Apply at the rate of one gallon of mixture to each 100 square feet of floor surface for each coat.

(b) After the final action is completed, any surplus material shall be removed from the surface by scrubbing and mopping with water, leaving the cement work clean and without discoloration.

(c) Liquid membrane curing compound that will cure, harden and dustproof concrete floors in one operation may be used in place of the liquid floor hardener at the option of the Contractor. The liquid shall be clear, applied in one coat to concrete surfaces as soon as practicable after final troweling, using not more than one gallon to each 300 square feet. The liquid shall conform to requirements of ASTM C-309 (current issue) and when applied shall not whiten, stain or have any deleterious effects on the concrete floors. The liquid shall not be used on concrete floors that are to be covered with finished flooring applied with adhesive.

(d) The treads and platforms of cement steps and stairs without metal safety treads (both exterior and interior) and cement floors so indicated, shall be made non-slip by embedding in the surface an abrasive aggregate of aluminum oxide (Al_2O_3) applied uniformly at the rate of not less than 2-1/4 pounds per square yard. The aggregate shall pass a 1/8-inch mesh and be retained on 1/32-inch mesh screen.

(5) Surfaces to Receive Applied Finish

In general, surfaces of concrete that are to receive an applied finish after the forms are removed, shall be treated by any one of the following methods as selected by the Contractor:

(a) Applying to the inside of the forms a compound which retards the setting of the surface cement. The retarder shall not affect the setting of the cement to a depth of more than 1/8 inch, nor delay the setting of surface cement beyond a reasonable time after removal of forms. All soft and loose material shall be removed before the finish is applied.

(b) Removing the surface of the concrete to a depth of at least 1/16-inch over the entire area by mechanical means with no untreated surfaces visible, exposing the aggregate and leaving a clean, granular surface.

(c) Forming dovetail cavities in the concrete surface by using inserts made of synthetic rubber or other flexible material that is oil resistant attached to the forms and placed 6 inches on center each way. The inserts shall be about 3/8-inch deep by 2 inches in diameter and so designed that they will collapse and be removed from the concrete with the forms or may be removed individually. Inserts, if not damaged, may be reused.

F. CURING

Concrete shall be maintained above 50° F. and in a moist condition for at least the first 7 days after placing, except that high-early-strength concrete shall be so maintained for at least the first 3 days.

(1) Cement finishes on inclined and horizontal surfaces shall be covered with mats (DDD-M-148), or paper (UU-P-264a), or pure polyethylene plastic sheets .004 inch thick, within 24 hours after finishing. The covering shall be lapped at joints and maintained in good condition for at least 10 days.

(2) The protection on floors shall be maintained in good condition until the installation of permanent floor covering or until removal of covering is directed, and until final acceptance of the work.

(3) Concrete vertical surfaces require no curing other than that provided by the form providing the forms are not removed during the curing period. When forms are removed during the curing period the concrete shall be kept continuously moist by spraying with water as frequently as drying conditions may require, and if necessary protected by suitable temporary coverings.

G. HOT AND COLD WEATHER PRECAUTIONS

(1) Cold Weather Requirements

(a) Adequate equipment shall be provided for heating the

concrete materials and protecting the concrete during freezing or near freezing weather. No frozen materials or materials containing ice shall be used.

(b) All concrete materials and all reinforcement, forms, fillers and ground with which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40° F. or whenever in the opinion of the Contracting Officer atmospheric temperatures will probably be below this limit within 24 hours after placing, all concrete placed in the forms shall have a temperature of between 60° F. and 90° F., and adequate means shall be provided for maintaining a temperature of not less than 70° F. for 3 days or 50° F. for 5 days except when high early-strength concrete is used the temperature shall be maintained at not less than 70° F. for 2 days or 50° F. for 3 days or for as much more time as is necessary to insure proper curing of the concrete. The housing, covering or other protection used in connection with curing shall remain in place and intact at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing.

(2) Hot Weather Precautions

When placing concrete under conditions of high temperature, low humidity, strong sunshine and high winds place concrete at a low temperature and start curing as soon as possible.

The concrete shall have a temperature of not less than 50° F. or more than 80° F. after placing.

H. FASTENINGS, INSERTS, ANCHORS, ETC.

Anchors, bolts, dowels, sleeves, thimbles, slots, inserts, etc., as required for other work shall be properly located in cooperation with other trades and built in as the work progresses. Among other things, attention is directed to the following:

Slots and inserts specified elsewhere with the anchors for masonry facing, finishing and furring materials.

Slots or anchors for bonding masonry walls or partitions abutting unfurred concrete walls, piers or columns.

Anchorage for structural, miscellaneous and ornamental metalwork.

Anchors for bucks and frames of doors.

Anchors for wood sleepers.

Anchors for wood framing and nailers.

Hangers for suspended ceilings.

Sleeves, thimbles, hangers and hanger inserts for piping and ducts.

Inserts of contraction joints and control joints.

Concrete

Make proper provision for setting all metalwork as required by the drawings and Standard Details noted thereon.

Metal access panels furnished and located under Mechanical and Electrical Equipment. See Miscellaneous and Ornamental Metal Work.

(1) Make special provision for fastening metal lath, grounds, furring, hangers, and other accessories of plasterwork. For wire accessories, see "Lathing & Plastering".

(2) Masonry Anchors. Set anchor slots straight at proper location and securely fasten to forms to prevent displacement while concrete is being poured. Place slots at locations shown on drawings and in general at the following locations:

(a) Where concrete walls or beams more than 16 inches high are faced with masonry veneer, place slots vertically and space 24 inches apart.

(b) Where concrete columns are faced with masonry, or where a masonry partition or masonry wall abuts such a column, provide one continuous vertical anchor slot in each side of column as required to receive anchors for the facing or abutting masonry.

J. SLABS ON GROUND

Place concrete floor slabs on earth over well tamped subgrade.

(1) Gravel Fill

Coarse backfill for seepage beds under Basement floor slab, and under other floor slabs on grade, shall be gravel or broken stone, from sizes No. 4 to 2 inches, free from soft lumps and foreign material.

(2) Seepage beds or coarse fill under concrete slabs shall be covered with reinforced paper (UU-P-264a), pure polyethylene plastic sheets not less than .008 inch thick, or polyethylene coated reinforced paper at the option of the Contractor, lapped not less than 6 inches, before the concrete is poured. The polyethylene coated reinforced paper shall consist of clear or black polyethylene film not less than 2 mils (.002) inch thick laminated to paper backing of 2 sheets of 30-pound Kraft paper, UU-P-147b, Type IV, Class A, that has been given the rot-resistant treatment conforming to the Soil Block Test, dated September 1955, issued by the Federal Housing Administration.

(3) Immediately after placing polyethylene or paper over porous fill, place concrete to required thickness and strike off at proper level to receive waterproofing or finishes specified. Repair any tears which may occur.

(4) All construction joints in basement slabs on ground and in basement walls shall receive two brush coats of metallic waterproofing. One coat shall be applied soon after the construction joint of the first pour is stripped. The second coat shall be applied immediately before placing of the second pour and the fresh concrete shall be placed while the waterproofing is still wet. Allow time between coats for oxidization. Metallic waterproofing shall be Ironite or approved equal.

(5) Place 6" x 6" - #6/#6 wire mesh in all slabs on grade unless otherwise noted on plan.

K. PAVING ON PUBLIC SPACE

Sidewalk and alley paving in public space shall conform to the requirements of the District of Columbia Department of Highways, Standard Specifications for Street and Alley Improvements, current edition, as revised.

(1) Sidewalks, 4" Portland cement concrete.

(2) Alley paving, 7" Portland cement concrete.

L. CEMENT BASE

Cement base shall be one part Portland cement and not more than three parts sand, run in place and troweled smooth; the top edge to be parallel with the surface of the connecting floor, ramp or stair inclines. Where plaster finish or cement wainscot occurs above the base, the top edge of the base shall finish against metal grounds specified under "Lathing & Plastering".

SECTION 7

STRUCTURAL STEEL WORK

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operations, including all labor, materials and equipment necessary for and incidental to the completion of all structural metal, miscellaneous iron, loose lintels and appurtenances complete as shown on the drawings and/or as described herein.

B. WORK INCLUDED

In general the work to be performed under this Section shall include, but is not necessarily limited to the following:

- (1) Provide and install structural steel frame.
- (2) Provide and install structural decorative cast steel columns.
- (3) Provide loose steel lintels and install all lintels weighing over 200 pounds.
- (4) Paint structural steel and lintels.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Steel stairs. See Section 16.
- (2) Steel fire escape and ladders. See Section 16.
- (3) Steel joists. See Section 14.
- (4) Metal doors and stall partitions. See Sections 12 and 17.
- (5) Foundation piles. See Section 4.

3. MATERIALS

A. GENERAL REQUIREMENTS

(1) Codes

The current rules and practices set forth in the Code of Standard Practice for Steel Buildings and Bridges and the specifications

for the Design, Fabrication and Erection of Structural Steel for Buildings of the American Institute of Steel Construction, shall govern this work, except as otherwise noted on the drawings or as otherwise specified. Welding shall be in accordance with the Standard Code for Arc and Gas Welding in Building Construction of the American Welding Society.

(2) Shop Drawings

Complete shop drawings shall be furnished by the steel fabricator covering all items and shall be submitted to the Contracting Officer for approval. Manufacturing or fabrication of any materials or performing of any work prior to approval of shop drawings will be entirely at the risk of the Contractor.

(3) Mill Reports

The Contractor shall furnish, without extra cost to the Government, two certified copies of mill reports covering the chemical and physical properties of all the steel used in the work under this specification.

(4) Substitutions

Substitutions of sections, or modification of details shall be made only after approved by the Contracting Officer.

(5) Responsibility for Errors

The Contractor alone shall be responsible for all errors of fabrication and for the correct fitting of all structural members. Approval of shop drawings indicates compliance with intent as to general arrangement and does not relieve the Contractor of the requirement to follow design drawings to their fullest extent unless departure has been specifically approved by the Contracting Officer.

(6) Anchor Bolts, Bearing Plates, Loose Lintels, etc.

Anchor bolts, bearing plates and loose lintels are to be furnished under this Section, delivered near place for use, but shall be set under specifications for MASONRY or CONCRETE, except when any piece weighs over 200 pounds it shall be set under this Section (STRUCTURAL STEEL WORK). The Contractor shall furnish instructions for the setting of anchor bolts and bearing plates and shall ascertain that the items are properly set before erection of the steel. All wall bearing ends of beams shall have anchors and bearing plates and where size is not specified on contract drawing they shall be made of sufficient size to fully develop the capacity of the beam. See mechanical drawings for lintels required over openings for ducts, piping and other equipment. All lintels to have 8" minimum bearing.

(7) Inspection

The material to be furnished under this specification shall be subject to test and inspections in the mill, shop and field by Government inspectors. Inspections and tests will be conducted at no expense to the Contractor providing the materials tested meet specifications, otherwise the cost of inspections and tests shall be borne by the Contractor.

Inspections and tests shall not relieve the Contractor of his responsibility to furnish satisfactory materials, and the Government reserves the right to reject any material at any time before final acceptance of the structure.

B. STRUCTURAL STEEL

(1) Source

All materials shall be of domestic origin.

(2) Structural Members

Except where noted otherwise all steel shall conform to ASTM Specification A-36.

(3) Bolts

Bolts in all connections shall conform to ASTM Specification A-325 unless otherwise indicated on the drawing, where "erection bolts" conforming to ASTM Specification A-307 may be used.

(4) Steel Piles

Steel piles shall conform to the requirements specified in Section 4, FOUNDATIONS.

(5) Welding Electrodes

Welding electrodes for manual shielded metal arc-welding shall conform to the E-60 or E-70 series of ASTM Specifications A-233, specification for Mild Steel Arc-Welding Electrodes.

C. CAST STEEL

Exposed columns supporting balconies shall be of steel cast to the dimensions shown on the architectural drawings.

(1) Steel shall conform to the ASTM requirements for "Mild-to-Medium-Strength Carbon-Steel Castings for General Application, ASTM A27-60, Grade 65-35. The minimum strength requirements for this steel are as follows:

Tensile Strength	65,000 p.s.i.
Yield Strength	33,000 p.s.i.
Elongation in 2 inches	24%
Reduction in Area	35%

(2) Heat treatment to relieve stresses is required.

D. PAINT

Paint for all steel shall be an approved brand of zinc chromate primer. This approval shall be in writing after submission of proposed brand name for approval.

4. METHODS

A. ANCHOR BOLTS

Anchor bolts shall be in their precise correct location before base plates are set into position. If adjusting "sleeves" are used the anchor bolts shall be longer than the length shown on the plan a distance equal to the length of the sleeve. "Heating" of the bolts is specifically prohibited.

B. BASE PLATES

(1) Each column base plate shall be provided with three leveling screws.

(2) The location of each column base plate shall not be in error more than 1/16 inch in either a horizontal or vertical direction or out of level by more than the ratio of 1:500.

(3) The Contractor shall certify to the Contracting Officer that the above location requirements have been met before any columns are erected.

(4) The entire bearing area of base plates shall be solidly grouted with a Portland cement and sand grout mixed in the proportions of 1 to 2.

C. FABRICATION AND ERECTION

(1) Torch Cutting

Torch-cutting will not be permitted for member edges which are to be welded. The use of a gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Its use will be permitted on minor members not under stress only after the approval of the Contracting Officer has been obtained.

(2) Fitting

Drift pins shall be used only to bring together the several parts; they shall not be used in such manner as to distort or damage the metal. Small errors in fit may be corrected by reaming if this course is approved by the Contracting Officer. Large errors shall be cause for rejection of the affected members.

(3) Holes

Holes for the attachment of work by other trades shall be provided as required but only after obtaining written approval of the Contracting Officer. Holes shall be punched or drilled; cutting torch shall not be used.

(4) Connections

Connections shall meet the requirements of the current American Institute of Steel Construction specifications for Structural Joints Using ASTM A325 Bolts.

(5) Bracing

Temporary bracing shall be used as necessary to carry up the steel frame true and plumb. The bracing of the masonry walls as specified under DEMOLITION is of paramount importance and shall have its effectiveness in no way impaired by the erection or bracing of the steel framing. The bracing of the steel frame shall be arranged so as to give additional support to the leaning masonry walls where practical. No shore or brace stabilizing a masonry wall shall be removed without the prior approval of the Contracting Officer.

(6) Bearing Plates & Anchors

Bearing plates and anchors shall be provided for all beams, other than angle lintels, bearing on masonry walls. Bearing plates and angle lintels shall be set to correct alignment and elevation in a bed of mortar. Provide angle anchors for all beams.

(7) Welding

Welding shall be in accordance with the current Standard Code for Arc and Gas Welding in Building Construction of the American Welding Society. Welds shall be made only by operators who have been pre-qualified by tests as prescribed in the "Standard Qualification Procedure" of AWS and who shall carry evidence of such qualification. No welds shall be made by any person whose qualifications have not been previously approved by both the District of Columbia Department of Building Inspection and the Contracting Officer. No welding shall be done when the ambient temperature is lower than 32° F. All welding shall conform to the requirements of the AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings except as otherwise noted on the drawings or herein specified.

(8) Columns in Old Wall

All columns adjacent to or imbedded in the old north or south walls of the theatre shall be spliced for 80% of moment capacity of the column and shall extend to within 4 feet of the top of the wall and be securely anchored to the wall.

D. PAINT

(1) Shop Painting

Except where encased in concrete and excepting edges and surface areas adjacent to edges to be field welded all steel work shall be given one shop coat.

(2) All steel work shall be thoroughly cleaned of loose scale, rust and foreign matter and be dry when painted.

(3) Parts inaccessible after assembly shall be given two shop coats of paint of different color.

(4) Contact surfaces shall be cleaned by effective means before assembly but not painted.

(5) Surfaces which are to be welded after erection shall not receive a shop coat of paint or if painted such paint shall be removed before field welding for a distance of at least 2 inches either side of the joint.

(6) Field Painting

All bolts, field welds, abrasions and other damaged paint areas shall be spot painted with the same material used for the shop coat immediately after erection except those encased in concrete.

(7) All structural steel not encased in concrete shall receive one field coat of paint of a different color from the shop coat. Surfaces not readily accessible after erection shall be painted before erection. All others shall be painted after erection.

(8) Apply field coat only after Contracting Officer has inspected and approved spot painting of shop coat. Apply field coat well in advance of masonry work.

(9) Steel lintels shall receive one field coat of approved paint before installation.

(10) Cast steel columns shall receive one shop coat and one field coat of approved paint before installation.

SECTION 7A
STEEL JOISTS

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operations, including all labor, materials and equipment necessary for and incidental to the completion of all steel floor joists and long span steel ceiling joists as shown on the drawings and/or as described herein.

B. WORK INCLUDED

In general the work to be performed under this Section shall include but is not necessarily limited to the following:

- (1) Provide and install open web steel floor joists.
- (2) Provide and install corrugum over floor joists.
- (3) Provide and install long span open web steel ceiling joists.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Steel roof purlins. See Section 7.
- (2) Ceiling hangers and furring channels. See Section 19.
- (3) Fly gallery and paint bridge. See Section 16.
- (4) Steel stair beams and stringers. See Section 16.
- (5) Steel fire escape and ladders. See Section 16.

3. MATERIALS

A. GENERAL REQUIREMENTS

(1) Codes

The current rules and practices set forth in the Code of Standard Practice for Steel Buildings and Bridges and the specification for Open Web Steel Joists of the American Institute of Steel Construction, shall govern this work, except as otherwise noted on the drawings or as otherwise specified. Welding shall be in accordance with the Standard Code for Arc and Gas Welding in Building Construction of the American Welding Society.

(2) Shop Drawings

Complete shop drawings shall be furnished by the steel joist manufacturer and submitted to the Contracting Officer for approval. Manufacturing of any materials, or performing of any work prior to approval of shop drawings will be entirely at the risk of the Contractor.

(3) Mill Reports

The Contractor shall furnish without extra cost to the Government, two certified copies of mill reports covering the chemical and physical properties of all the steel used in the work under this specification.

(4) Substitutions

Substitutions of sections, or modification of details shall be made only after approved by the Contracting Officer.

(5) Responsibility for Errors

The Contractor alone shall be responsible for all errors of fabrication and for the correct fitting of all structural members. Approval of shop drawings indicates compliance with intent as to general arrangement and does not relieve the Contractor of the requirement to follow design drawings to their fullest extent unless departure has been specifically approved by the Contracting Officer.

(6) Inspection

The material to be furnished under this specification shall be subject to test and inspections in the shop and field by Government inspectors. Inspections and tests will be conducted at no expense to the Contractor providing the materials tested meet specifications, otherwise the cost of inspections and tests shall be borne by the Contractor. Inspections and tests shall not relieve the Contractor of his responsibility to furnish satisfactory materials, and the Government reserves the right to reject any material at any time before final acceptance of the structure.

B. STEEL JOISTS

(1) Source

All materials shall be of domestic origin.

(2) Structural Members

Except where noted otherwise all steel shall conform to ASTM Specification A-36.

(3) Welding Electrodes

Welding electrodes for manual shielded metal arc-welding

shall conform to the E-60 or E-70 series of ASTM Specifications A-233, specification for Mild Steel Arc-Welding Electrodes.

(4) Bolts

Bolts in all connections shall conform to ASTM Specification A-325 unless otherwise indicated on the drawing, where "erection bolts" conforming to ASTM Specification A-307 may be used.

C. PAINT

Paint for all steel shall be an approved brand of zinc chromate primer. This approval shall be in writing after submission of proposed brand name for approval.

D. CORRUFORM

The permanent metal form over the steel floor joists shall be galvanized standard weight (steel thickness 0.015") corrugated sheet steel equal to standard "Corruform" as manufactured by Granco Steel Products Company. Sheets shall be hot-dip galvanized 1.25 oz. per square foot.

4. METHODS

A. END SUPPORTS

The ends of steel joists shall extend a distance of not less than 4 inches over masonry or poured concrete supports and not less than 2-1/2 inches over steel supports.

B. END ANCHORAGE

(1) Masonry Support

Joists resting on masonry supports shall be bedded in mortar and anchored thereto with an anchor equivalent to a 3/8-inch round steel bar not less than 10" long. Every third joist in floors shall be anchored.

(2) Steel Supports

End of joists resting on steel supports shall be attached thereto by either a minimum of two welds 1 inch long or a 1/2-inch bolt.

C. BEARING PLATES & ANCHORS

Bearing plates and anchor bolts shall be provided for all long span ceiling joists over the top of existing theatre walls. At least 18 inches of brick wall below the plate shall be removed and rebuilt together with anchor bolts and shall be fully grouted. Bearing plates shall set in a bed of mortar to correct alignment and elevation.

D. FABRICATION AND ERECTION

(1) Care shall be exercised at all times to avoid damage

through careless handling and storage. Joist shall be unloaded from truck or car and stacked either by hand or by crane. Dropping of joists shall not be permitted.

(2) Immediately after joists are set in place all bridging shall be completely installed and the joists permanently fastened into place before the application of any loads.

(3) During the construction period, care shall be exercised to avoid excessive concentrated loads. Loads shall be distributed so that the carrying capacity of any steel joist is not exceeded.

(4) For long span ceiling joist hoisting cables shall not be released until two bracings nearest the third points of the span are installed and the joist ends have been restrained laterally.

(5) Bolt Connections

Bolts for connections shall meet the requirements of the current American Institute of Steel Construction specifications for structural joints using ASTM A-325 Bolts, unless noted otherwise on the plan.

(6) Welded Connections

Welds shall be made only by operators who have been pre-qualified by tests as prescribed in the "Standard Qualification Procedure" of AWS and who shall carry evidence of such qualification. No welding shall be done when the ambient temperature is lower than 32°F.

(7) Torch Cutting

Torch-cutting will not be permitted for member edges which are to be welded. The use of a gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the joists. Its use will be permitted on minor members not under stress only after the approval of the Contracting Officer has been obtained.

(8) Fitting

Small errors in fit may be corrected by reaming if this course is approved by the Contracting Officer. Large errors shall be cause for rejection of the affected members.

(9) Holes

Holes for the attachment of work by other trades shall be provided as required but only after obtaining written approval of the Contracting Officer. Holes shall be punched or drilled; cutting torch shall not be used.

E. PAINTING

(1) Shop Painting

All joists and bracing members shall be given one shop coat.

(2) Field Painting

Immediately after completion of erection, all bolts, field welds, abrasions and other damaged paint areas shall be spot painted with the same material used for the shop coat immediately after erection. Apply one field coat after Contracting Officer has inspected and approved spot painting of shop coat.

F. INSTALLATION OF CORRUFORM

(1) Corruform sheets shall have end lap occur over structural supports. Sheets shall overlap a minimum of 2" at end laps and 1 rib at side laps.

(2) Attach sheets to each supporting joist by welding through the two sheets at side laps. Welding washers shall be placed in the rib of the top sheet and a plug weld made through the washer and sheets to the supporting steel. At end laps provide one additional weld in center rib.

SECTION 8

MASONRY WORK

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The Contractor shall provide all items, articles, materials, and operations including all labor, materials, and equipment necessary for and incidental to the completion of all masonry work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

(1) GENERAL

The work to be done includes, but is not necessarily limited to, the following:

- (a) Provide and install all clay brick.
- (b) Provide and install all concrete masonry units.
- (c) Lay up sample walls.
- (d) Build in all bolts, anchors, nailing blocks, inserts, etc., indicated on the contract drawings or necessary to the proper completion of the work; these will be furnished under Section 16, where not specified under this Section.
- (e) Build in all door and window frames, vents, conduits, etc. as furnished and set under other Sections.
- (f) Clean masonry and remove surplus material and waste.

C. WORK NOT INCLUDED UNDER THIS SECTION

(1) GENERAL

The following are not included:

- (a) Concrete work of any description. See Section 6.
- (b) Furnishing and locating bolts, anchors, metal attachments, etc., except as noted.

Masonry Work - Cont'd.

(c) Furnishing or placing any structural steel.

(d) Furnishing or placing shoring, templates or similar carpentry work required by the specifications.

3. MASONRY MATERIALS

A. GENERAL

All materials shall comply with the following specifications and requirements.

(1) BRICK, FACE

ASTM Specification C-216, Grade MW, Type FBS or FBA. In general the brick shall closely approximate the existing material in size, color and texture. Samples shall be furnished for the approval of the Contracting Officer.

(2) BRICK, COMMON

Federal Specification SS-B-656, red; medium or hard grade; standard size 8" x 3 3/4" x 2 1/4".

(3) CONCRETE MASONRY UNITS, HOLLOW

Federal Specification SS-C-621 (1), Type II, sizes as required or as indicated.

(4) CONCRETE MASONRY UNITS, SOLID

ASTM Specification C-145-59, Grade B, sizes as required or as indicated.

NOTE: Non load bearing units shall be used for interior non-bearing partitions, where masonry furring is indicated. Solid load bearing units shall be used at locations shown and where concentrated loads occur. Hollow load bearing units shall be used at all other locations.

(5) GROUND BRICK ARCHES

Where flat brick arches are indicated, the brick shall be ground at the plant to details shown and packed and identified for use on the job. Brick shall be face brick as specified above.

(6) FLUE LINING AND THIMBLES

Where these are called for they shall be sound, hard burned clay. They shall be unwarped, free from cracks and spalls, of cross section indicated.

(7) PRECAST CONCRETE LINTELS

Precast concrete lintels shall be provided over all openings in concrete masonry unit walls for which steel lintels are not indicated. These shall be to sizes shown or required, be reinforced, be fabricated from 2500 psi concrete at 28 days and be properly cured. Lintels shall be free of cracks and chipped or broken edges; exposed surfaces shall have a uniformly smooth texture. Top shall be identified as to schedule number.

(8) ANCHORS AND TIES

(a) These shall be of zinc or copper coated steel. Zinc coating on steel other than wire shall conform to ASTM specification A-153-60, on wire to ASTM specification A-116-57, class 2. Copper coating shall conform to ASTM Specification B-227-57, grade 30HS. The extent and location shall be as indicated on the drawings and/or as hereinafter specified. Where not otherwise indicated they shall be as required by the D. C. building code.

(b) Wire Mesh Ties shall be of not lighter than 16 ga. (0.0625") zinc coated steel wire woven into 1/2" mesh, cut in strips 1" narrower than the width of walls in which ties are used.

(c) Wire Ties shall be Z shaped or looped at both ends and be not lighter than 10 ga. (0.1350") zinc coated steel wire.

(d) Corrugated or Crimped Ties shall be not less than 16 ga. (0.0598") zinc coated sheet steel not less than 6" long. Or they may be of copper covered steel.

(e) Dovetail Type Masonry Anchors for fastening masonry to slot inserts in concrete shall be especially produced for the purpose; be of not less than 16 ga. zinc coated sheet steel, 7/8" wide turned up 1/4" at the end or with a 1/2" dia. hold within 1/2" of the end.

(9) JOINT REINFORCEMENT

Steel reinforcement for use in horizontal bed joints of concrete masonry units shall be prefabricated type formed of zinc coated cold drawn steel wire, ASTM Spec. A-116-57, class 2. Side wires shall be #9 or larger gauge, deformed; cross wires shall be #12 or larger gauge, smooth or deformed, butt welded to side wires, spaced not more than 8 inches apart. Use special pieces at corners and inter-sections. It shall be similar to Dur-O-Wal.

Masonry Work, Cont'd.

(1) REINFORCING RODS

Where steel rods for lintels or elsewhere are not otherwise specified, they shall conform to ASTM Specs. A15-587 or A16-59T. Bars larger than #3 shall be deformed in accordance with ASTM Spec. A305-56T.

4. MORTAR MATERIALS

A. PORTLAND CEMENT

Shall conform to Federal Specification SS-C-192d. Cement shall be light gray except to match existing mortar.

B. MASONRY CEMENT

Shall conform to Federal Specification SS-C-181e. gray in color except as otherwise noted.

C. LIME

Hydrated lime shall conform to Federal Specification SS-L-361.

Quicklime shall conform to ASTM Spec. C5-55 and shall be slaked in accordance with the manufacturer's specifications.

D. LIME PUTTY

Lime putty shall be a stiff mixture of lime and water and be kept moist until used. If made from quicklime it shall be slaked and soaked for at least 24 hours before using; if made from Type S hydrated lime, may be used immediately.

E. SAND

Sand shall conform to ASTM Spec. C144-52T except that sand for mortar in joints 1/4" wide or less shall pass a #16 sieve.

F. WATER

Water shall be clean and potable.

5. SAMPLES

A. SAMPLES OF MATERIALS

Prior to installation, 5 individual properly identified samples of face brick, common brick and 2 samples of concrete masonry units shall be submitted for the approval of the Contracting Officer.

Masonry Work, Cont'd.

These shall indicate the extreme variations of color and texture. In addition, one sample of sand, wall ties and anchors and of joint reinforcement shall be provided. The names of all other materials for which samples are not requested shall be submitted for approval. No materials shall be either ordered or installed until written approval has been received. If samples are not satisfactory, additional samples shall be furnished as requested.

B. SAMPLE WALL PANELS

Before the installation of any masonry materials, erect at the job site sample wall panels of facing brick and concrete masonry units about 4'-0" long by 2'-6" high. These shall show the color range, texture, bond, mortar joint and workmanship. No masonry work shall be done until the sample panel of the work involved has been approved. The panels shall remain until the work is completed and may not be altered. They shall serve as the standard of comparison.

6. METHODS

A. GENERAL REQUIREMENTS

- (1) Do not lay masonry when the temperature of the outside air is below 40 degrees F. unless suitable means as approved by the Contracting Officer are provided to heat materials, protect work from cold and frost and insure that mortar will harden without freezing. No anti-freeze ingredient shall be used in the mortar.
- (2) Protect facing material against staining, and keep tops of walls covered with non-staining waterproof coverings when work is not in progress. When work is resumed, top surface of work shall be cleaned of all loose mortar and, in drying weather, thoroughly wet, except for concrete masonry units.
- (3) Brick having absorption rates of more than 0.025 oz. per square inch per minute shall be wetted sufficiently so that the rate of absorption when laid does not exceed this amount. All units shall be free from water adhering to their surfaces when they are laid in the wall. Do not wet concrete masonry units or gypsum tile.
- (4) Before closing up any pipe, duct or similar inaccessible spaces or shafts with masonry, remove all rubbish and sweep out the area to be enclosed.
- (5) Masonry partitions shall be braced or reinforced in accordance with the District of Columbia Building Code.
- (6) Provide level and solid bearing in masonry walls directly under poured concrete slabs, structural steel beams, trusses, and steel joists. Solid bearing shall be of sizes and thickness indicated.

Masonry Work, Cont'd.

(7) Where fresh masonry joins masonry that is partially set or totally set, clean the exposed surface of the set masonry and wet it lightly so as to obtain the best possible bond with the new work. Remove all loose brick and mortar. If it is necessary to "stop off" a horizontal run of masonry, this shall be done by racking back one-half brick length in each course. Tothing will not be permitted.

(8) Consult other trades and make provisions that will permit the installation of their work in such a manner as to avoid cutting and patching. Build in work specified under other Sections, as necessary, and as the work progresses. Set steel lintels in beds of mortar. Fill spaces around jams and heads of metal door bucks and frames solidly with mortar.

(9) Store materials under cover in a dry place and in a manner to prevent damage or intrusion of foreign matter. During freezing weather protect all masonry units with tarpaulins or other suitable material. Store concrete masonry units and gypsum tile units under covers that will permit circulation of air and prevent excessive moisture absorption. Store cement, lime and air-setting mortars in water-tight sheds with elevated floors. Keep structural facing tile, both glazed and unglazed, and architectural terra cotta under cover at all times. Protect reinforcement from the elements; immediately before placing, reinforcement shall be free from loose rust, ice or other foreign coatings that will destroy or reduce the bond. Concrete masonry units and gypsum tile units shall be protected against wetting prior to use.

B. LAYING BRICK

(1) Lay brick plumb, level and true to line in full beds of mortar. Where drawings do not indicate the bond, the work shall follow the adjoining work. In general, work shall be bonded physically. When not possible, metal ties spaced according to the D. C. Building Code may be employed. All joints in brick work and between brick and other materials shall be filled with mortar as each course is laid. Head joints shall be buttered and shoved to insure full mortar joints.

(2) Where through bonding is not possible, bond brickwork to backing by metal ties. Bond brick to concrete columns and gandrills with metal ties. Where brick facing occurs against concrete, place anchors in every fifth course of brick and space 2 feet apart horizontally; secure anchors to metal slots.

(3) Where exterior masonry walls are faced with brick, parge the face of the back-up with a 3/8" thick coating of mortar before the facing brick is laid.

Masonry Work, Cont'd.

(4) Make joints in brickwork uniform and not more than 3/8" wide except where otherwise required to match adjoining work. After setting, joints shall be tooled to match approved sample. Close all cracks and crevices. Exterior joints below grade shall be trowel pointed.

(5) Where spandrel or other flashing or waterproofing turns out and terminates in horizontal mortar joints and over top of steel lintels or shelf angles, provide weep holes in the mortar joint to permit water to drain from the wall. Space weep holes approximately 24 inches apart horizontally. Form weep holes by pressing short lengths of oil-soaked 5/16 inch diameter braided cotton sash cord into the mortar bed while soft. When mortar has set, pull the cords from wall

(6) Build in flashings, flashing blocks, across panels and other work at locations indicated on drawings, or as required.

C. LAYING CONCRETE UNIT MASONRY

(1) GENERAL

(a) Set units plumb and true to line. All units shall be laid with level horizontal joints. Except where shown or specified otherwise, units shall be laid in running bond.

(b) All interior masonry unit partitions shall terminate against beam soffits or structural ceilings. Do not wedge them tight against structural members, but provide a paper joint between them. Partitions occurring in conjunction with hung ceilings shall terminate not less than 4" above them.

(c) Where electric conduit, outlet and switch boxes occur, grind and cut units before building in services. Coordinate work with Electrical Sub-contractor. Cutting of all units exposed in finished work shall be done with an approved type of power saw.

(d) Continuous wire mesh ties specified shall be laid in every third horizontal joint of partitions around stair wells and wherever partitions are 8" or more in thickness.

(e) Bond each course of all units at corners in a masonry bond and at intersections with metal ties, anchors, or joint reinforcement spaced vertically not exceeding 48". Filling in with brick will only be permitted where brick and units will not be exposed in finish work.

(f) Partitions of units abutting exterior walls, columns or other partitions shall be bonded thereto physically or be anchored thereto each 4'-0" with metal anchors 2'-0" long by 1/4" by 1 1/2", with ends turned up 2".

Masonry Work, Cont'd.

(g) Joints of concrete masonry units that will be exposed or painted shall be cut flush and tooled to form a conclave joint.

(2) CONCRETE MASONRY UNITS

(a) Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells except that webs also shall be bedded in all courses of piers, columns, pilasters, in starting course on footings and solid foundation walls and around cells that are to be reinforced or filled with grout. Lay solid units with full head and bed joints. Make joints uniform, approximately 3/8 inch thick unless indicated otherwise.

(b) Where cast-in-place lintels are used in concrete masonry unit partitions, furring, or back-up, they shall be formed in place with special shaped bond-beam or lintel units as hereinbefore specified. Lintels shall be reinforced as detailed and filled with 2500 psi concrete. Lintels shall have a minimum of 8 inch bearing at ends. Provide temporary support under lintels as necessary.

D. POINTING AND CLEANING MASONRY

(1) GENERAL

(a) Point all holes in exposed masonry. Cut out defective joints and repoint them with mortar.

(b) All exposed masonry shall be cleaned thoroughly. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20 sq. ft. in a location approved by the Contracting Officer. No further cleaning work shall proceed until the sample area has been approved by the Contracting Officer, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface of unglazed clay masonry, on which no green efflorescence appears, shall be thoroughly wetted with clear water and then scrubbed with a solution of not more than 1 part hydrochloric (muriatic) acid to 9 parts water, followed immediately by a thorough rinsing with clear water. If the masonry is cleaned with an acid solution, all sash, metal lintels, louvers and other corrodible parts shall be thoroughly protected. Green efflorescence shall be removed in accordance with the unit masonry product manufacturer's recommendation.

(c) Acid solutions shall not be used for cleaning glazed structural facing tile, glazed brick, architectural terra cotta or glazed or unglazed concrete masonry units. Upon completion of the work, all exposed surfaces of glazed wall units and architectural terra cotta shall be washed with soap powder and warm water, applied with a scrubbing brush, and then rinsed thoroughly with clear water. Metal cleaning tools and brushes, or abrasive powders shall not be used.

(d) Concrete masonry units shall have all loose mortar cleaned off and all stains removed.

SECTION 9

EXTERIOR CUT STONE

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials, and equipment necessary for, and incidental to, the completion of all exterior cut stone as shown on the drawings and/or as specified herein.

B. WORK INCLUDED

(1) The work required under this Section consists of providing and installing granite steps at entrances to the building from 10th Street as shown on the drawings.

(2) The existing grey granite steps shall be reused in the new work with the addition thereto of new matching material.

3. MATERIALS

A. GRANITE

(1) Shall match existing in texture and finish. Granite shall otherwise conform to the specifications of the National Building Quarries Association.

(2) Stone shall be sound and free from defects that would impair its strength, durability or appearance. The color and texture shall be within the range of variations specified and as represented by the approved sample.

(3) The patching or hiding of defects will not be permitted, unless specified otherwise. Any stone with chips or stains on the face to be exposed shall be corrected by redressing or recleaning, or shall be replaced with new stone as determined by the Contracting Officer at the site.

(4) Natural variations in color and markings that are characteristic of the quarry from which the stone is obtained will be acceptable provided they do not, in the opinion of the Contracting Officer, impair its strength or durability.

Exterior Cut Stone, Cont'd.

B. ANCHORS, DOWELS, CRAMPS AND FASTENINGS

(1) Provide all anchors, dowels, cramps, clips, bolts, etc. shown or necessary to fasten and anchor the stone properly in place. Except where otherwise specified, these items shall be fabricated from steel or wrought iron with a hot dipped galvanized coating applied after forming. Steel wire shall be zinc coated in accordance with ASTM Specification A 116-57, class 2. The sizes, shapes type and location of all anchoring and fastenings shall be as indicated on details and the approved shop drawings.

C. MORTAR MATERIALS

(1) Portland Cement shall conform to Federal Specification SS-C-192d and shall in general be light gray except to match existing mortar.

(2) Hydrated lime shall conform to Fed. Spec. SS-L-351.

(3) Lime Putty shall be a stiff mixture of lime and water and be kept moist until used. If made from quicklime it shall be slaked and soaked for at least 24 hours before using; if made from Type S hydrated lime it may be used immediately.

(4) Sand shall conform to ASTM Spec. C144-52T except that sand for mortar in joints 1/4" wide or less shall pass a #16 sieve. Sand for pointing joints of exterior steps shall be white.

(5) Water shall be clean and potable.

(6) Mortar shall be composed of 1 part nonstaining water proofed Portland cement, 1 part hydrated lime or lime putty, and 4 parts sand, by volume. Mortar shall not be used until it has been mixed to a thoroughly homogeneous mass and allowed to set for 1 hour. Use mortar within 2 hours after mixing. Do not retemper.

4. METHODS

A. CUTTING AND FABRICATION

(1) Cut stone accurately to shape and dimensions with joints and bonding as shown. Cut exposed faces straight and true with sharp lines and arrises. Beds and joints shall be straight and at right angles to face. Except where otherwise indicated, backs shall be sawn or dressed parallel to face of walls. Stone coming on contact with structural work shall be checked out to fit with ample clearances. Stone resting on structural work shall have beds shaped to fit supports.

Exterior Cut Stone

Exterior Cut Stone, Cont'd.

(2) Make joints 1/4 inch wide unless otherwise indicated on drawings. Reveals of openings shall be without vertical joints. Cut reglet grooves for flashing where indicated; make reglets 5/8 inch wide and 3/4 inch deep.

(3) Stones with exposed top surfaces shall be cut to set on their natural beds and to have a wash on the top surface. Cut holes and sinkages for all anchors, cramps, and dowels as necessary. Provide lewis holes for lifting all stones weighing more than 100 pounds; locate holes at least 2 inches from any soffits or exposed face. Cut sinkage for cramps on bed side of each coping joint unless dowels or bolts are used to secure coping. Cut grooves in stone over lintels and shelf angles to receive lugs or dowels as necessary. Include all cutting and drilling necessary for installation of work of other trades as shown on drawings and specified under other sections.

B. SETTING

(1) Do not set stone in freezing weather unless suitable means are provided to heat the materials, protect the work from cold and frost, and insure that mortar and grout will harden without freezing. No anti-freeze ingredient shall be used in the mortar or grout.

(2) Stone shall be set by experienced stone masons. Thoroughly clean stone, then sponge with clean water just before setting. When setting in cold weather, clean stone by brushing instead of sponging.

(3) Set each stone plumb, level and true to line in a full bed of mortar and tap to even bearing. Sawing through mortar joints to correct bearing or adjust joint will not be permitted. Do not use pinch bar on exposed face of stone.

(4) Parge entire back of each piece of granite with 1/2 inch of setting mortar. Allow parging to harden before stone is backed up. Except for bonded work and where stone is an integral part of the masonry, a minimum clear space of 1 inch shall be maintained between the stone and back-up wall.

(5) The exact type, size and spacing of anchors shall be as indicated on the approved shop drawings. Generally, each facing stone shall have a minimum of two anchors, with four anchors for each stone up to 20 square feet in surface area and at least two additional anchors for each additional 10 square feet of surface area. Set and adjust all anchors, cramps and dowels accurately and fill holes and sinkages with mortar.

(6) Soft wood wedges soaked in water may be used where necessary to prevent crushings of mortar by large stones; wedges must be removed when dry and before pointing. Keep face of stone free from mortar.

Exterior Cut Stone, Cont'd.

(7) Except where otherwise indicated or specified, set stone in a solid bed of non-staining mortar with joints a minimum of 1/4 inch wide. Fill vertical joints, except expansion joints and joints on wash surfaces, full depth with mortar; before mortar has set, rake joints back 3/4 inch from face to allow for pointing with mortar or with back-up material and caulking compound as indicated or specified.

C. POINTING

(1) GENERAL REQUIREMENTS

No pointing or caulking shall be done when temperature is below 35 degrees F. Before pointing, brush joints clean and carefully remove all wedges and lead buttons so that pointing will be continuous. A small section of stone work shall be pointed with mortar mixed as hereinbefore specified. Just prior to pointing, wet joints thoroughly with clean water; then fill joints with mortar flush with face of stone. When mortar has become thumb print hard rub joints with an approved concave jointing tool.

5. SAMPLES

A. Before proceeding with any stone work, submit to Contracting Officer for approval sufficient samples of each kind and finish of stone specified. Samples shall be at least 3/4 inches thick by 8 x 12 inch face size, finished as specified and represent the extremes as well as the average of color range, markings and characteristics which the Contractor proposed to furnish.

B. Samples shall be clearly labeled on the back or be tagged with the names of the stone, the quarry, the project, the Contractor, the subcontractor and the location at which it is to be used.

6. SHIPPING, STORING, PROTECTION AND CLEANING

A. Deliver stone from plant to job in accordance with schedule and in proper setting sequence. Stone, when stored, shall be clear of the ground and be adequately protected to prevent staining. After work has been completed, it shall be properly cleaned and protected until acceptance.

END OF SECTION 9

SECTION 10

ROOFING AND SHEET METAL

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of all roofing and sheet metal work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

In general the work to be performed under this Section shall include, but is not necessarily limited to the provision and installation of the following:

- (1) Remove existing slate roof from main structure and replace it, using existing material augmented as described below.
- (2) Slate roof on saloon wing.
- (3) Standing seam roof on dressing room wing.
- (4) All flashing and counter flashing.
- (5) All hung gutters and downspouts.
- (6) Slate roofing on ventilators.
- (7) Rigid insulation on ventilators.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Flashings around pipes, passing thru roofs.
See Section 28.
- (2) Wood blocking and nailers for securing flashings, etc.
See Section 18.
- (3) Cast iron boots at bottom of downspouts.
See Section 16.

3. MATERIALS

A. GENERAL REQUIREMENTS

(1) SURFACES

Surfaces to which roofing and sheet metal are to be applied shall be even, smooth, sound, thoroughly clean and dry and

Roofing and Sheet Metal, Cont'd.

free from all defects that might affect the application. Report any unsatisfactory surfaces to Contracting Officer.

(2) MATERIALS TO BE BUILT-IN

Materials furnished under this Section which are to be built-in by other trades shall be delivered to the site in time to avoid delays to construction progress.

(3) ACCESSORIES

All accessories or other items essential to the completeness of the roofing and sheet metal installation, though not specifically shown or specified, shall be provided. All such items, unless otherwise shown on the drawings or specified, shall be of the same kind of material as the item to which applied. Nails, screws, and bolts shall be of the types best suited for the purpose intended, and shall be of a composition that is compatible with the metal to which it will contact.

(4) DISSIMILAR MATERIALS

Where sheet metal abuts or members into adjacent dissimilar materials, the juncture shall be executed in a manner that will prevent electrolysis between the two materials.

(5) WORKMANSHIP

Except as otherwise shown on drawings or specified, the workmanship of sheet metal work, method of forming joints, anchoring cleating, provisions for expansion, etc. shall conform to the standard details and recommendations of the Copper and Brass Research Association in effect on the date of this specification.

B. SHEET METAL MATERIALS

(1) GENERAL

The type and locations of the various kinds, gauges, thickness and finish of sheet metal to be used is specified hereinafter under the individual items; however, where sheet metal is indicated on drawings and kind or type of metal is not definitely specified or noted, 16 oz. light cold-rolled uncoated copper shall be provided.

(2) COPPER

Copper shall conform to Federal Specification QQ-C576b. It shall weigh not less than 16 oz. per sq. ft. Copper shall be roofing temper or cornice temper and shall be used for all sheet metal work not otherwise called for. Where copper is not otherwise specified, it shall be light, cold rolled, not less than 16 oz. per sq. ft.

Roofing and Sheet Metal, Cont'd.

(3) SOLDER

Solder shall conform to Federal Specification QQ-S-571c(2) Grade A as required, and shall contain 50 percent tin and 50% lead unless otherwise specified.

(4) LEAD

Lead shall be sheet lead, weighing not less than 4 lbs. per sq. ft. and shall conform to Federal Specification QQ-L-201a(1)

C. INSULATION MATERIALS

Roof insulation shall be fiber type 1" thick conforming to Federal Specification LLL-I-535. It shall be asphalt impregnated, possess the qualities of a vapor barrier and be suitable for installation on steep roofs and have a C value of .36.

D. SLATE ROOFING MATERIALS

(1) SLATE

Slate shall conform to Federal Specification SS-S-451, applicable grade. It shall be dense, hard rock, punched for two holes each. No cracked slate may be used; exposed corners shall be practically full. On covered ends, no broken corners which sacrifice nailing strength or water tightness will be allowed.

(2) ROOFING FELT

Roofing felt shall be asphalt saturated, Type I, 15 lbs. conforming to Federal Specification HH-F-191a(2).

(3) NAILS

Nails shall be copper "slate head" nails not less than 3" l., #10 wire nails.

(4) SLATER'S CEMENT

Slater's cement shall be an elastic waterproof material which will not stain stone, corrode copper or be adversely affected by long exposure to extreme outside temperature. It shall form a thin tough skin on exposed surfaces, but remain plastic underneath. It shall match generally the color of the roofing.

4. METHODS

A. SLATE ROOFS

(1) Apply slate on roofs at locations indicated. Lay slate in straight, even courses, parallel with eaves. Lay slate to match existing; each course breaking joints with each succeeding course.

Roofing and Sheet Metal, Cont'd.

Double slate at eaves and start slate over wood strip to obtain flat contact with the next slate. Place nails so as not to pierce flashing; use two nails of type and size hereinbefore specified, for each slate. Exposed nails permitted only at ridges and hips, and nail heads must be pointed with slater's cement. Build in metal base flashing as slate is being laid. Replace all broken or cracked slate when roofing is completed and replace all defective slate after one year of installation.

(2) Form ridges using the combing method with end joints butted and grain of slate vertical. Use slate of uniform width. Bed slate at ridges in slater's cement in addition to nailing; fill all open joints with cement to make them watertight. Flash ridge prior to laying slate.

(3) Form hips using the mitered method with coursing on each side of hip aligned. Use slate of uniform width. Bed slate at hips in slater's cement in addition to nailing; fill all open joints with cement to make them watertight.

(4) Neatly fit slate around all pipes, ventilators and other vertical surfaces.

(5) Nails shall not be driven so far as to produce a strain on the slate.

(6) On completion, all slate must be sound, whole and clean and the roof shall be left watertight and neat in every respect.

B. FELT

(1) Felt, as specified above shall be laid in horizontal layers, with joints lapped toward the eaves at least 2", well secured along laps and ends as necessary to properly secure it in place. Mop between plies and broom felt until smooth.

(2) It shall lap all hips and ridges at least 12" to form double thickness.

C. STANDING SEAM COPPER ROOFING

(1) Cover roof surfaces of Dressing Room wing where indicated as "standing seam metal" with 16 oz. cold-rolled copper, laid with standing seams and using either the roll or pan method. First, cover the roofing surfaces with asphalt-saturated felt, lapped 3 inches and turned up 6 inches on abutting vertical surfaces; double felt in valleys, over hips, and ridges. Nail felt on 8-inch centers. Use copper nails driven through sheet copper. Apply a layer of rosin-sized building paper, lapped 2 inches and nailed to the roof, over the roofing felt, to prevent the metal roofing from sticking to the felt.

Roofing and Sheet Metal, Cont'd.

(2) Metal roofing sheets shall be 20 inches by 96 inches or 120 inches in size. Double-lock the sheets together to form a strip 20 inches wide by the length of the roof slope. Stagger cross seams in adjacent strips. Fasten roofing to sheathing or to wood nailing strips with 16 oz. cold-rolled copper cleats, 2 inches wide and spaced 12 inches on center along standing seams. For the pan method of application, form sheets 20 inches wide x 96 inches or 120 inches long; total lengths of pans shall not exceed 30 feet.

(3) Space seams 16-3/4 inches on centers and finish them 1-inch high except on curved roofs where they shall finish 1/2 inch high. Make first fold single, 1/2 inch wide and second fold double, 1/2 inch wide. Make locked portion of finished standing seams 5 plies thick. Form ridges and hips with standing seams as specified for main roof.

(4) Form valleys of separate strips not more than 10 feet long. Lap joints 6 inches. Extend valley sheet under roofing sheets 6 inches on each side and fasten with 2 inch wide cleats, 18 inches on centers. At valley line, fold and lock roofing sheets to valley cleats spaced 18 inches apart.

(5) At eaves, make connection to gutters or flashing as detailed, loose locked and unsoldered, or welded. At eaves without gutters, hook ends of roofing strips over a previously placed 24 oz. cold-rolled copper edge strip. Fasten edge strips with copper nails spaced 4 inches apart.

(6) At gable rake, turn edges of roofing sheets up 1-1/2 inches and lock into a 16 oz. cold rolled copper fascia strip, forming a standing seam 1 inch high. Fasten a continuous edge strip of 24 oz. cold rolled copper to edge of roof boarding with copper nails spaced 4 inches apart. Hook roofing sheets over the edge strip.

(7) Where metal roofs abut roofs of other materials, extend metal roofing under abutting roofs, at least 6 inches. Where metal roofs abut vertical surfaces, turn edges of sheets up 4 inches to form base flashing.

D. COPPER GUTTERS

(1) Provide half-round metal gutters at eaves of all roofs. Fabricate gutters from 16 oz. copper. Form gutters in 8 to 10 ft. long sections, to sizes and shapes indicated. Join sections by tongue-and-groove slip joints. Fill joints with a thick mixture of white lead paste. Provide all necessary end pieces, caps, outlet tubes and miters; solder, or weld with no flux, and make watertight.

(2) Support gutters on metal hangers located near ends and spaced not over 36 inches apart. Slope gutters to downspouts at a uniform rate of 1/16 inch per foot. Hangers not shown or specified otherwise shall be formed of 1-inch by 1/8 inch copper, extending 6 inches on roof and fastened thereto with 2 countersunk brass screws of a type adapted for the purpose. Install a hanger strip into the bead on each side of gutter and bolt to brass hanger bar with 3/8 inch brass stove bolt.

Roofing and Sheet Metal, Cont'd.

E. COPPER DOWNSPOUTS

(1) Provide metal downspouts on outside walls from all gutters as indicated. Fabricate downspouts from 16 oz. copper. Form downspouts to sizes and shapes indicated in 8 to 10 ft. lengths. Telescope end joints 1 1/2 inches and lock longitudinal joints. Fasten downspouts to walls with 20 oz. copper straps, 3 inches wide.

F. FLASHING

(1) COPPER BASE FLASHING

(a) Provide metal base flashings where roofs abut vertical surfaces without a cant strip, and at other locations as indicated on drawings. Fabricate base flashings from 16 oz. copper.

(b) On sloping slate and sheet metal roofs, build in base flashing with each course of roofing material. Lap each piece of flashing over underlying flashing at least 4 inches and extend it up under the cap flashing 4 inches.

(2) COPPER CAP FLASHING

(a) Provide metal cap flashing at top edges of metal base flashings, and at other locations indicated on drawings. Fabricate cap flashings from 16 oz. copper.

(b) Form flashing in 8 foot lengths, except where shorter pieces are required; lap end joints 3 inches; do not solder joints. Make flashing continuous at angles. Cap flashing shall overlap base flashing a minimum of 3 inches, except at canopies where it shall overlap 4-1/2 inches.

(c) Extend cap flashing into masonry walls not less than 4 inches. Where cap flashing terminates in raked joints or reglets, fasten flashing with lead wedges every 12 inches. Fill reglets on horizontal surfaces continuously with lead compound or mortar. Fill reglets on vertical surfaces with thiokol or silicone based synthetic rubber caulking compound of color matching adjacent.

(d) Where cap flashing connects to preformed lock in through-wall flashing, form upper edge of cap flashing to engage the preformed lock. When installed, cap shall provide a spring action against base flashing.

(e) Where sloping slate roofs abut vertical surfaces, install continuous step flashings of separate pieces woven in with each course of slate. Install each step to overlap underlying step by 4 inches; do not solder joints.

Roofing and Sheet Metal, Cont'd.

G. INSULATION

- (1) Apply red rosin sheathing paper lapped 2" and nailed.
- (2) Lay 2 layers of felt as specified in (B)(1) above.
- (3) Apply insulation, embedding boards in heavy mopping of asphalt for steep roof pitch. Nail insulation on 12" centers with barbed roofing nails, having not less than 1-1/4" nor more than 1-1/2" penetration into roof plank. Butt joints; succeeding rows shall break joints.
- (4) Neatly cut and fit insulation around all openings in roof; leave 1/4" joint between insulation and all vertical surfaces.
- (5) Water Cut-offs: Provide water cut-offs of 12 inch strips of roofing felt, bedded in hot bitumen. Extend felt over top surfaces of insulation at least 4 inches and on to roof surface at least 4 inches; lap strips 3 inches at ends. Locate cut-offs 24 inches from and parallel to intersecting vertical surfaces, around pipes and vents and at intermediate cross joints at intervals approximately 20 feet in each direction.
- (6) Protection: Insulation and roof decks shall be dry when insulation is installed. After installation, keep insulation dry until permanent roofing or other covering is applied. Protect insulation from damage due to construction operations. Only as much insulation shall be laid as can be covered by roofing the same day.

END OF SECTION 10

SECTION 11

WOOD ROOF DECKING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The Contractor shall provide all items, articles, materials and operations including all labor, materials and equipment necessary for and incidental to the completion of all Wood Roof Decking. Work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

In general the work to be performed under this Section shall include, but is not necessarily limited to the following:

(1) Provide and install wood plank roof decks on all roofs except those on the ventilators.

(2) Where required as accessory items in order to make the installation complete, purlins, angles, stops, end angles, wood nailers, and other similar items needed to fit the structural framing members shall be furnished.

C. WORK NOT INCLUDED UNDER THIS SECTION

(1) Structural framing for support of decks, except accessories.

(2) Rigid board insulation on decks (included under Section 10).

(3) Suspension system or furring for ceilings below the deck.
See Section 19.

(4) Cutting or drilling of openings in the deck for the passage of pipes, ducts and for attachment of other items shall be performed at the project site by the respective trades requiring the openings or attachments.

3. MATERIALS

A. WOOD ROOF PLANK

(1) Plank shall be standard 2" nominal (1 5/8") x 6" nominal 5 1/8" face) S2S&G M.T & G longleaf southern pine flooring or decking #1 dimension, 1500f stress grade.

Wood Roof Decking, Cont'd.

4. METHODS

A. GENERAL

(1) Spike plank firmly to wood purlins; stagger joints so that no two joints occur in same line.

(2) Form cants, curbs, drainage saddles, etc., to shapes and details indicated and provide a smooth finish to receive the insulation, roof covering and flashings.

END OF SECTION 11

SECTION 12

HOLLOW METAL DOORS AND FRAMES

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all hollow metal doors and frames as shown on the drawings and/or as described herein.

B. WORK INCLUDED

The work includes the provision of hollow metal doors and frames. No other work is included in this Section.

3. MATERIALS

A. GENERAL

(1) Doors and frames shall be equal to Truscon Standard metal doors and frames as produced by the Republic Steel Corporation. Citation of this manufacturer is on the basis of a standard in the trade and is in no way intended to preclude the use of equivalent products of other manufacturers.

(2) UNDERWRITERS LABELLED DOORS AND FRAMES - shall be 1-3/4" thick, sound deadened, in general conformity with Truscon Series 57, flush.

(3) NON-LABELLED DOORS AND FRAMES - shall be 1-3/8" thick, sound deadened, in general conformity with Truscon Series 50, flush.

B.

(1) Exposed members of hollow steel work shall be prime grade, cold rolled sheet steel that has been properly annealed and process leveled and has smooth, clean surfaces. Doors are to be insulated with spun mineral wool. Double doors shall be equipped with astragals. Concealed structural or reinforcing members shall be of well finished sheet stock or rolled shapes.

Hollow Metal Doors and Frames, Cont'd.

(2) Thickness specified below is either decimal equivalent of manufacturers' standard guage or standard guage as given in Fed. Spec. QQ-S-363(2) for low carbon steel sheets:

Door frames	0.075 inch
Door Plates	No. 18 guage
Vertical stiffeners	No. 16 guage
Top and Bottom Channels	No. 16 guage
Vertical Edge Reinforcement	No. 14 guage

(3) WORKMANSHIP

All shapes shall be formed, rolled and formed or cold drawn, according to guage and profile, with contours and arrises as true and sharp as can be produced in the thickness of metal required.

Construction joints of steel work shall be welded in full depth and width. Exposed surfaces of welded joints shall be dressed to produce invisible connections. Spot welding shall be used in preference to rivets, screws or bolts.

The finished work shall be free from defects. Plain surfaces shall be smooth and free from warp or buckle. Moulded members shall be clean cut, straight and true. Mitters shall be well formed and in true alinement. Fastenings shall be concealed where practicable. Cutouts shall be accurately located and made to fit the hardware. Reinforcement shall be of ample size to stiffen the sheet metal against the strain of the service required and to prevent sagging or other displacement.

Glass panels shall be designed for interior or exterior glazing.

(4) HARDWARE REINFORCEMENT

(a) Concealed metal reinforcement, welded in place and tapped for hardware fastenings, shall be provided in frames, using steel for steel work as follows:

For door closers in frames -- Plates not less than 0.150 inch thick, of suitable length for suitable fastenings, of width equal to the distance between face plates of door; all plates to be continuous welded.

(b) Fitting of hardware shall be done at the factory, either to templates or to the hardware, as may be required.

Hollow Metal Doors and Frames, Cont'd.

(5) FRAMES

(a) All frames shall be combination buck and jamb type, channel section, rebated for the doors and the corners mitered and full welded. Edges of flanges shall be turned to form retainers for adjustable anchors. Frames shall be furnished with cutouts and concealed reinforcement for hardware as specified herein. Reinforcement shall have box covers welded in place. The bottom of frames shall be at the indicated finished floor level and secured to the structural slab with concealed clip angles.

(b) The single transom shall be fixed sash, manufacturers standard integral with the steel double door buck.

(6) ANCHORS

(a) Adjustable anchors for frames and rough bucks in masonry shall be of steel, T shaped and of the same thickness as the metal of the frames or bucks. The head shall be either integral with the stem, or be so lapped and welded thereto as to give equivalent strength, and shall positively engage the retainers on both flanges of each jamb member when in place. The stem shall be corrugated or perforated for mortar bond and extend 12 inches into the masonry where possible. Anchors shall be placed near the top and bottom of each jamb and at points not more than 25 inches apart and shall lie flat in the masonry joints.

(b) Floor anchors shall be 1/2 inch in diameter, be fitted with lock nut and traveling nut for vertical adjustment and extend not less than 2 inches into the concrete or masonry below. The lower ends of the anchors shall be grouted in place or fitted with expansion sleeves.

(7) FINISH

(a) The finish coats consist of brush coats of paint or enamel applied at the site. The metal shall be cleaned and Prime Finish applied at the factory.

(b) Prime Finish: All metal surfaces shall be cleaned and given one dip or spray coat of rust-inhibitive, metallic oxide paint on all exposed and inaccessible surfaces, and then baked. All surfaces that will be exposed shall then be given a mineral filler in one or two coats as necessary to conceal all surface blemishes and insure a smooth even finish, followed by one coat of metallic oxide primer. Each filler and prime coat shall be separately baked and properly sanded to a smooth surface.

Hollow Metal Doors and Frames, Cont'd.

C. HARDWARE

Shall be of the manufacturer's standard design except as noted.

(1) HINGES shall be full mortise type, steel, ball bearing, prime coated.

(2) CLOSERS shall be overhead, concealed, for 1-3/4" doors, with underwriter's approved fusible link hold open arm, and shall be enclosed type, surface attached for 1-3/8" doors.

(3) OTHER hardware will be supplied under another Section but doors shall be prepared to receive kick plates and pull bars in addition to that described above.

D. SHOP DRAWINGS AND SAMPLES

(1) SHOP DRAWINGS: Submit 5 copies of shop drawings of all items specified herein to Contracting Officer for approval. Obtain approval of drawings prior to proceeding with manufacturing. Shop drawings shall indicate: elevations of each door type; details of each frame type; location in the building for each item; conditions at openings with various wall thicknesses and materials; typical and special details of construction; methods of assembling sections; location and installation requirements for hardware; size, shape and thickness of materials; joints and connections.

(2) SAMPLES: Submit sample corner sections of metal frames and hollow metal doors to Contracting Officer for approval. Sample section shall indicate all details of construction and finish. Submit samples of accessories for approval as directed.

E. PROTECTION AND CLEANING

(1) PROTECTION: Protect doors and frames from damage during transportation and at the job site under cover on wood blocking or on suitable floors. After installation, protect doors and frames from damage during subsequent construction activities. Damaged work will be rejected and shall be replaced with new work. Factory enameled finished work shall be shipped in cartons or other suitable containers.

(2) CLEANING: Upon completion, metal surfaces of doors and frames that are completely factory finished, shall be thoroughly cleaned and touched-up as recommended by the door manufacturer.

END OF SECTION 12

SECTION 13

DAMPPROOFING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all dampproofing work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

(1) GENERAL

The work to be done includes, but is not necessarily limited to, the following:

- (a) Membrane waterproofing under concrete slabs in basement.
- (b) Metallic mortar coat waterproofing on inside of exterior walls below grade.
- (c) Dampproofing inside of exterior walls except at stage above grade.
- (d) Flashing over all spandrel beams and lintels.
- (e) Tile underdrains.
- (f) Waterproofing exterior masonry walls.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Miscellaneous and incidental flashing is described under Roofing and Sheet Metal Work.

3. MATERIALS

- A. FELT, asphalt saturated, Type I, 15 lbs. shall conform to Fed. Spec. HH-F-191a(2).

Dampproofing, Cont'd.

B. ASPHALT shall conform to Fed. Spec. SS-A-666(1), grade as applicable.

C. CEMENT, asphaltic base shall conform to Fed. Spec. SS-C-153, Type I.

D. DAMPROOFING PAINT shall be a bituminous compound with coal tar base, gray or black.

E. FLASHING shall be 3 oz. copper, reinforced with interlacing sisal fibers bonded with two asphalt layers to heavy creped kraft paper.

F. METALLIC WATERPROOFING shall be pulverized clean gray iron of which 40% shall pass a 200 mesh screen, impregnated with an oxidizing agent capable of producing complete oxidation within 24 hours after application.

G. TILE DRAINS shall be 4 inch diameter agricultural drain tile with standard fittings at corners and angles.

H. WATERPROOFING shall be a transparent, silicone base masonry waterproofing complying with Federal Specification SS-W-00110.

4. METHODS

A. MEMBRANE WATERPROOFING

(1) Coat surfaces to be waterproofed with asphalt primer, 1 gallon per square, and follow with 30 pounds of hot asphalt per square.

(2) Apply fabric using 30 pounds of asphalt cement per square and spread evenly between each sheet. Lay fabric "shingle method" and lap end joints 12 inches. Over each top sheet apply coating of hot asphalt, quantities as before.

(3) Repeat, to produce 2 plies of membrane.

(4) Extend membrane well into the recess in the wall and mop thoroughly.

B. METALLIC WATERPROOFING

(1) Metallic waterproofing shall be applied on interior faces of all exterior walls from top of basement structural slabs to grade.

Dampproofing, Cont'd.

(2) First coat shall be composed of 1 part Portland cement, 2 parts sand (by volume) and 15 pounds of metallic compound to each bag of cement. Mix to trowelling consistency and apply on wall to thickness of 3/8 inch. Scratch surface to provide bond for second coat.

(3) Second coat shall be composed of 1 part Portland cement and 2 parts sand, by volume. Mix to trowelling consistency and apply over wet scratch coat. Total thickness shall be 5/8" minimum. Trowel and float finish coat to a true even surface and keep damp until properly cured.

C. SPANDREL WATERPROOFING

(1) Apply fabric in one thickness, copper side out, and all joints well lapped. Secure fabric to masonry or concrete surfaces and at lapped joints with mastic. Apply a coat of asphalt primer on concrete and allow to dry before applying mastic. Where anchors, pipes and inserts puncture waterproofing, seal with mastic. Waterproofing shall be water tight.

D. INTERIOR DAMPPROOFING

(1) Apply one coat of asphalt primer and one heavy coat of dampproofing to the inside faces of all exterior masonry walls above grade, both new and existing. It is assumed that all plaster shall have been removed from these walls in existing construction. Material shall be applied under pressure to form a heavy continuous unbroken coat over entire surfaces without sagging.

E. TILE FOUNDATION DRAINS

Lay tile on a bed of gravel. There shall be one line around inside perimeter of walls and additional interior lines as shown. The tile room shall be slightly graded to a low point in the Mechanical Equipment room as shown. Tile shall be laid with butt joints slightly open and be covered with strips of burlap on top and sides, with bottom of joint left open.

F. WATERPROOFING

All open exterior masonry joints shall have been cut out and carefully pointed up. To the dry walls shall be applied 2 full coats of the transparent waterproofing by sprayings allowing at least 12 hours between coats.

Dampproofing, Cont'd.

G. GUARANTEE

Contractor shall furnish the Contracting Officer with a written guarantee in which he agrees to correct and repair at his own expense any leaks which may occur in or around surfaces which are waterproofed. This guarantee shall not include the dampproofing of interior faces of existing exterior walls.

END OF SECTION 13

SECTION 14

GLASS AND GLAZING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all glass and glazing as shown on the drawings and/or as described herein.

B. WORK INCLUDED

- (1) All window glass and glazing.
- (2) All door glass and glazing.

3. MATERIALS

A. GLASS

(1) Shall in general be clear flat drawn window glass, double strength, B quality, conforming to Federal Specification DD-G-451a. The type and manufacture of the glass shall be approved by the Contracting Officer and all glass shall be properly labelled.

B. WIRE GLASS

(1) For use only where called for in steel doors shall be polished wired glass 1/4 inch thick.

C. PUTTY

(1) For wood sash shall be white lead and whiting putty or mastic glazing compound. For steel doors it shall be metal sash glazing compound.

4. METHODS

A. GLASS SIZES

Shall be obtained from work at the building or from the manufacturer of the frames, sash, etc. in which glass is to be set. Care shall be taken to provide proper clearances between glass and muntins, etc.

Glass and Glazing, Cont'd.

B. GLAZING EXTERIOR WOOD FRAMES, PUTTY

Paint or oil rebate so that putty will adhere. Bed glass in putty. Secure glass with zinc glazier's points 10" apart; face putty. Run putty neatly, cleanly, even with frame members inside edge.

C. GLAZING EXTERIOR WOOD FRAMES, BEADS

Wood doors shall be glazed with beads. Remove and reset glazing beads carefully, so as to avoid marking or defacing sash. Set glass without putty bed. Putty after setting to prevent rattling.

D. BREAKAGE

Replace breakage caused in executing work or by faulty installation without extra cost to the Contracting Officer.

E. ACCEPTANCE

Improperly set glass or glass which does not fully meet requirements of its grade shall not be accepted. Such work shall not be accepted and the glass shall be replaced without extra cost to the government.

END OF SECTION 14

Glass and Glazing

14-2

SECTION 15

INSULATION

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The Contractor shall provide all items, articles, materials and operations including all labor, materials and equipment necessary for and incidental to the completion of all insulation work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

(1) GENERAL

The work to be done includes but is not necessarily limited to the following:

- (a) Provide and install perimeter insulation.
- (b) Provide and install batt or blanket insulation.

C. WORK NOT INCLUDED UNDER THIS SECTION

(1) GENERAL

The following are not included:

- (a) Providing and installing rigid board type insulation over wood plank roofs. This is specified under Roofing and Sheet Metal.

3. MATERIALS

A. PERIMETER INSULATION

- (1) Shall be compressed mineral wool or fiber glass conforming to Federal Specification HH-1-562, 1" thick, 24" wide and 48" long.

- (2) Shall be mineral wool or fiber glass conforming to Federal Specification HH-1-521c(1) in 3" batts or blanket.

Insulation

Insulation, Cont'd.

4. METHODS

A. PERIMETER INSULATION

Install perimeter insulation in 24" widths around all perimeters under basement floor slab in strict accordance with the manufacturer's recommendations.

B. BATT OR BLANKET INSULATION

Shall be installed over the ceiling of the saloon wing, in strict accordance with the manufacturer's recommendations.

END OF SECTION 15.

SECTION 16

MISCELLANEOUS AND ORNAMENTAL METAL WORK

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all miscellaneous and ornamental metal work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

See "Materials" below for descriptions of the specific items to be supplied.

C. WORK NOT INCLUDED UNDER THIS SECTION

The following items are specified under other sections of the specifications: anchors, bolts, sleeves and supports required for the installation of plumbing, heating, air conditioning and electrical equipment; metal fastening devices for stone setting; structural steel members; metal doors and frames; metal toilet compartments; metal studs, channels, etc. in connection with lathing and plastering. See also drawings, schedules and other sections of the specification.

3. MATERIALS

A. GENERAL

(1) Cast Iron shall be soft gray iron, true to pattern, smooth and straight and free from defects impairing strength, durability or appearance and shall conform to Fed. Spec. QQ-I-652a.

(2) Malleable Iron shall be high grade white iron castings, fully annealed and of uniform ductile structure throughout, and shall conform to Fed. Spec. QQ-I-666c.

(3) Wrought Iron shall be genuine wrought iron conforming to Fed. Spec. QQ-I-6866 where applicable; otherwise to A.S.T.M. Spec. A41 for bolts, rods and bars; A42 for plates and A162 for sheets.

Miscellaneous and Ornamental Metal Work, Cont'd.

(4) Steel shall conform to the applicable Fed. Spec. (QQ-S series) for structural and cast steel. Architectural and miscellaneous steel not otherwise indicated or specified shall be mild steel.

(5) Bronze shall be extruded from a soft architectural bronze. Handrails shall have a bright, polished finish.

B. STEEL LINTELS

Where not otherwise specified shall be furnished. They shall be of the size noted on the lintel schedule and shall have a six inch bearing at each end unless otherwise shown. Bolt or weld lintels together where required and to receive other work.

C. SAFETY TREAD NOSINGS

(1) Provide stock safety tread nosings for treads of exterior stairs from mechanical equipment room to grade. They shall be cast iron abrasive surface 3-1/2" wide, fitted with anchors.

(2) They shall be 6 inches shorter than treads, be set flush with top surface of treads and platforms and be fastened with brass countersunk bolts or screws to anchors set in concrete.

D. METAL LADDERS

(1) Vertical ladders shall be 18" wide and shall run from stage to each fly gallery and from each fly gallery to catwalk at gridiron, and elsewhere as shown. They shall have 2" x 3/8" bar sides, 5/8" round rungs 12" on centers and lugs for fastening not over 8'-0" apart, bolted to wall with 1/2" bolts into expansion shields or lead plugs.

(2) "Ships" ladders shall be 24" wide and shall run from each fly gallery to the paint bridge and from museum gallery to stage. Strings shall be 6" x 3/8"; treads shall be cast, of size to fit strings, 1/2" thick, with lugs, and be bolted to them. There shall be a single 1" diameter wrought iron pipe rail with bolted connections and screwed fittings throughout; see details.

E. EXISTING SPIRAL STAIR

The existing spiral stair to the attic will have been removed under another Section. This contractor shall include in his price the cost of reconditioning this stair and installing it on the stage where directed, by means of the attachments new in use or ones similar to them.

Miscellaneous and Ornamental Metal Work, Cont'd.

F. STEEL STAIRS

(1) Stair stringers where not otherwise shown shall be 10" x 1-1/2" x 8.4 lb. channels with 1-1/4" x 1-1/4" x 1/8" steel angle brackets. Risers and subreads shall be plain, for attachment of 1-1/2" slate treads. Railings shall be as shown on the details.

(2) Include all anchors, bolts, angles, hangers, supports and other accessories needed for complete assembly and installation. Stair members concealed in the final assembly may be riveted or welded. Connections exposed in the final work must be bolted, with flush heads. Erect stairs accurately and secure in place as detailed on approved shop drawings.

(3) Sub platform to be of No. 12 gauge steel reinforced and recessed for concrete fill and slate finish.

(4) Provide slips for fastening wire lath to all soffits. Wire lath and plaster by others.

(5) Note that on the stair to the Family Circle, the existing stair risers are to be adapted and attached to the face of the sub-risers and the existing hand rail is to be re-used. See Details.

G. PIPE RAILINGS

Furnish pipe railings for fly galleries, paint bridge, exterior stairs from mechanical equipment room and wherever else shown or noted. In general these shall be 2 rail 1-1/2" wrought iron pipe, height 36" except where otherwise shown, ball type fittings, posts spaced about 6'-0" on centers, flanged base fittings, bolted connections.

H. ACCESS DOORS

(1) Provide cleanout door of size shown at base of chimney.

(2) Provide standard Donley or equal access doors as required for plumbing and electrical access and of sizes shown or required. Refer to mechanical and electrical drawings for locations.

I. SALOON FACADE

Provide plate or structural steel members as detailed for the faces of the piers and fascia at the first floor facade of the saloon to simulate the appearance of a cast iron facade. Connections required to simulate the appearance of a single unit may be welded, with the welds ground to near-invisibility; connections between units shall be by flush head bolts or countersunk flat head machine screws. Attach cast mouldings as shown.

Miscellaneous and Ornamental Metal Work, Cont'd.

J. CAST COLUMN CAPS AND BASES

The columns supporting the parquet, dress circle and family circle will be pipe columns specified under structural steel. Those supporting the dress and family circle shall have cast iron caps and bases attached to them after erection. A model plaster or clay, shall be furnished in full size of these caps and bases together with the manufacturer's intent as to manufacture and installation for the review and approval of the Contracting Officer.

K. CAST IRON WINDOW TRIM

The sills, consoles, key blocks, brackets and other trim of the windows facing 10th Street are cast iron. It is intended that these be carefully removed, cut down to the dimensions shown, re-assembled and reinstalled. The method by which the contractor proposes to accomplish this shall be submitted to the Contracting Officer for review and approval.

L. BOLTS, FASTENINGS, ETC.

Bolts, fastenings and other devices required in the construction not specified under other sections, and normally provided under this Section shall be provided.

M. BRONZE HANDRAILS

Shall be according to details and notes on drawings.

4. WORKMANSHIP

A. Steel and wrought iron shall be well formed to shape and size. Shearing and punching shall leave clean, true lines and surfaces. Weld or rivet permanent connections except where work is to show in which case use screws or bolts. Heads shall be countersunk, screwed up tight and threads nicked or burred to prevent loosening. Curved work shall be evenly sprung.

B. Castings shall be sound and free from warp, holes, or other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arrises. Machined joints, where required, shall be milled to a close fit. Provide necessary rabbetts, lugs and brackets so that work can be assembled in a neat and substantial manner.

C. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall be formed to exclude water. Provide holes and connections for the work of other trades.

Miscellaneous and Ornamental Metal Work, Cont'd.

5. PAINING AND PROTECTIVE COATING

A. All ferrous metal shall be properly cleaned and given one shop coat of red lead, zinc chromate or other approved rust resisting paint. Anchors that are built into masonry or concrete shall be coated with asphalt paint unless specified to be galvanized. Where hot dip galvanized or zinc coated metal is required it shall not be shop primed unless specifically called for, but all abraded places and weldings shall be touched up with aluminum paint. Galvanizing shall be in accordance with the specifications of the American Hot Dip Galvanizer's Association.

6. SHOP DRAWINGS

A. Before any fabrication is begun, shop drawings of all miscellaneous metal items shall be submitted to the Contracting Officer for approval. The drawings shall show sizes of metal, method of assembly, hardware and anchorage or connection with other work.

16-3(N). CAST IRON BOOTS

Downspouts shall terminate in cast iron boots of stock design and pattern, of proper size to accommodate downspouts. Downspouts shall be calked into boots with oakum and lead and cement mortar.

END OF SECTION 16

SECTION 17

METAL TOILET PARTITIONS

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operations, including all labor, materials and equipment necessary for and incidental to, the completion of all metal toilet partition work as shown on the drawings and/or as described herein.

B. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Toilet room accessories, See Section 27.

3. MATERIALS

A. GENERAL

Stall partitions shall be flush type with pilasters and braced headrail.

B. DOORS AND PARTITIONS

(1) Doors and partitions shall be 1 inch thick and shall be composed of two sheets of cold rolled furniture finished steel, assembled over and cemented under pressure to a 7/8 inch thick sound deadening fiber core. Partitions 57 inches wide and 58 inches high shall be 20 gauge steel; smaller sizes shall be of 22 gauge steel. The two face plates shall have formed edges and shall be sealed together with continuous drawn locking strips.

(2) Partitions and enclosures shall be 58 inches high and shall be set 12 inches above the floor.

C. PILASTERS AND URINAL SCREENS

(1) Pilasters and urinal screens shall be 1½ inches thick of two sheets of steel, same gage and finish as specified for Doors and Partitions. Height of pilaster to extend from floor to headrail. Interlocking strips on pilasters mitred and welded at corners. Pilasters, when set in place, shall be anchored to floor by means of fittings providing for vertical adjustments. The urinal partitions shall not be cantilevered but shall be properly supported from floor to ceiling.

Metal Toilet Partitions, Cont'd.

D. HEADRAIL

(1) Partitions and pilasters, when set in place, shall be securely braced with continuous 1 inch by 1½" tubular steel overhead bracing, attached and bolted through top of pilasters; tubular bracing shall extend full length of installation and over end compartment and be fastened onto wall bracket.

(2) Headrails shall be 12 inches above the top of enclosures, partitions and doors.

E. FITTINGS

(1) Floor fittings shall be either 3" polished stainless steel or brass, chrome plated, or nickel bronze and shall be adjustable to compensate for irregularities in the floor, to which they shall be secured with expansion bolts. Finish shall be natural buffed. Top rail fittings shall be pressed steel or malleable iron finished same as partitions.

F. HARDWARE

(1) Doors shall be hung on gravity type brass hinges with concealed ball bearing rollers. Hinges shall be adjustable. Each door shall be equipped with a cast pull, stops, rubber tipped boat hook and slide bar catch of chrome plated white metal. Door hardware shall be attached with brass, chrome plated through sleeve bolts with theft proof heads.

G. FINISH

(1) All surfaces excepting hardware shall be cleaned and sanded smooth preparatory to application of finish paint. Apply synthetic enamel in two (2) coats by modern mechanical methods and bake to a uniform, smooth, lustrous protective finish.

(2) Colors shall be as selected by Contracting Officer from manufacturer's standards.

4. METHODS

A. ERECTION

(1) Toilet partitions shall be secured in place with expansion bolts, toggle bolts or other means appropriate to the construction encountered. Panels shall be secured to walls by means of continuous U-shaped channels and the finished work made strong, rigid and free from defects.

B. SHOP DRAWINGS

(1) Complete shop drawings covering all items of installation shall be submitted to Contracting Officer for approval prior to ordering any materials, fabricating any items, or delivery of any items or materials to project site.

Metal Toilet Partitions, Cont'd.

(2) Shop drawings shall show all dimensions, all details of construction, installation and relation to adjoining and related work; and all reinforcement, anchorage and other work required for complete installation and shall be checked for accuracy by Contractor before submitting to Contracting Officer. Contractor shall stamp thereon his approval and date of same on each drawing prior to submission to Contracting Officer. Shop drawings shall show quality and gauges of material.

C. PROTECTION

(1) After erection and until completion of the general contract, all work under this section shall be protected as may be found necessary to avoid damage of any nature. Any part or parts which may become damaged or broken shall be replaced by the Contractor at no additional cost to the Government.

D. CERTIFICATION

(1) The Contractor shall obtain a written certification signed by an officer of the manufacturing firm to the effect that the products furnished for this project conform to these specifications.

END OF SECTION 17

SECTION 18

CARPENTRY AND MILLWORK

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to the completion of all carpentry and millwork as shown on the drawings and/or as described herein.

B. WORK INCLUDED

In general the work to be performed under this Section shall include, but is not necessarily limited to, furnishing and installing the following:

- (1) All rough and finish carpentry.
- (2) All wood furring, blocking, etc., both where shown and where required for incidental work.
- (3) All wood doors, frames and trim.
- (4) All wood sash, frames and trim.
- (5) All wood wainscots, chair rails, cornice or crown mouldings.
- (6) Wood steppings for seating.
- (7) Repair and patching of existing work as noted, with particular reference to exterior cornice and pediment.
- (8) All rough hardware.
- (9) Install, only, all finish hardware.
- (10) Shelving, etc.
- (11) Fly galleries, pin rails, paint bridge.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Insulation. See Section 15.
- (2) Furnishing finish hardware. See Section 26.

3. MATERIALS

A. GENERAL

Materials shall comply with the following Federal specifications or Commercial Standards.

- | | |
|-------------------------------|----------------|
| (1) Nails, wire and staples - | FF-N-105(2) |
| (2) Lumber - Hardwood | MM-L-00736a |
| Softwood | MM-L-00751f(1) |
| (3) Douglas fir plywood | CS 45-60 |
| (4) Wood doors | CS 171-58 |

B. GRADES, ETC.

(1) LUMBER

(a) Each piece of yard and structural lumber shall bear the official grade stamp of the appropriate inspection bureau or association. Framing lumber shall be Pacific coast Douglas Fir, construction grade, with f at 1,500 psi and e at 1,760,000 psi. Stress grade shall be shown in the stamp.

(b) Lumber shall be surfaced four sides and the dressed sizes of yard and structural lumber shall conform to Department of Commerce Simplified Practice Recommendation R16.

(c) Moisture content of boards and dimension lumber shall not exceed 19 per cent and for finish wood and millwork shall not exceed 12 per cent.

(d) All lumber to be attached to or bear on or against masonry or concrete shall be treated in accordance with Federal Specification TT-W-571, using one of the following:

<u>Preservative</u>	<u>Minimum net retention pounds per cubic foot</u>
Pentachlorophenol solution	6.0
Wolman salts (Tanalith) - dry salt	.35
Chromated Zinc Chloride - dry salt	.75

After using dry salt, the moisture content shall be reduced to 19 per cent. Lumber sawed or cut after treatment shall have cut surface well brush-coated with same preservative previously used.

(e) All lumber and finish not included in Par. B(1)(d) above shall be fire protected by the full cell process in accordance with the recommended practices of the American Wood Preserving Association, Specification C-20 and in a manner meeting the requirements of the Underwriter's Laboratories, inc., and as approved by the Contracting Officer. Evidence of compliance shall be provided.

(2) SOFTWOOD

- (a) Trim, interior, C Select Northern or Idaho White Pine.
- (b) Trim, exterior, Cypress, C Select.
- (c) Shelving and miscellaneous (other than plywood) - free of knot holes, loose knots, wane, decay and splits longer than width of piece.
- (d) Frames, sash, doors, etc. - Grade C, Select, Northern or Idaho White Pine.

(e) Plywood - Grade A-D, Douglas Fir Plywood Assoc. Use exterior type throughout.

C. ROUGH HARDWARE

(1) Provide and install all rough hardware and metal fastenings as shown on drawings, specified herein or required for proper installation of carpentry and millwork. Nails, spikes, screws, bolts, and similar items shall be of sizes and types to rigidly secure members in place. See the various headings hereinafter specified for specific sizes and type of rough hardware required.

Carpentry and Millwork, Cont'd.

D. FRAMING

(1) Wood framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels and rigidly secured in place. Do not use shims for leveling on wood or metal bearings. Slate or tile shims with full bearings may be used for leveling on masonry or concrete.

(2) Frame headers and trimmers around chimneys and for passage of pipes, ducts and other openings in floors and roofs. Headers over 4 feet long and trimmers supporting double headers shall be doubled.

(3) Double joists under partitions that run parallel to joists. Provide at least 4 inch bearing at ends of joists and rafters; where built into masonry and concrete, cut joist ends with a 3 inch bevel. Anchor ends of every 3rd joist to masonry walls with 1/4 by 1-1/4 inch metal tee or strap anchors with wall ends bent 4 inches and joist end extended out on joist at least 16 inches and secured thereto with 3 spikes. Joists parallel to masonry walls shall be anchored thereto every 8 feet.

(4) Bridge floor joist and rafters of flat roofs having a span of over 8 feet and less than 16 feet with one row of cross bridging; bridge spans over 16 feet with two rows. Bridging shall be 1 x 3 inch material accurately cut and fitted and nailed with 10 penny nails at each end.

(5) Set wood studs 16 inches on center, unless otherwise noted; use a single bottom plate and double top plates. Rest studs directly on top of beams or girders directly under. Double studs at all openings and triple at corners and partition intersections. Provide for each floor height, one row of horizontal bridging, of same material as studs, cut in and securely nailed. Make provision for securing plumbing fixtures to stud walls.

E. WOOD GROUNDS

(1) Provide wood grounds and blocking of size and shape required for plaster work, for securing wood trim and where required to secure other work or equipment in place. Set grounds true to line, level or plumb and well secured in place. Wood blocking or nailers on steel framing shall be bolted thereto.

F. WOOD BUCKS

(1) Provide bucks for doors indicated. Construct wood bucks of 2 inch stock and of width shown or required. Bucks shall be preservative treated. Anchor bucks into masonry walls with 2 anchors on each jamb. Anchors shall be 3/16 inch x 1-1/4 inch metal straps at least 8 inches long with ends turned 1 inch and spiked to back of buck; or 1/2 inch diameter bolts at least 12 inches long with square head and washer on end built into masonry. Countersink exposed bolt heads on face of buck.

G. WOOD FURRING

(1) Provide 1" x 3" inch wood furring on interior face of new exterior masonry walls requiring lath and 2 x 4's or as otherwise shown on existing masonry walls. Furr as required on interior

Carpentry and Millwork, Cont'd.

masonry partitions and columns for securing finish. Erect furring vertically or horizontally as required; space furring 16 inches on centers and securely fasten at points not to exceed 3 foot centers with masonry nails, by toggle or expansion bolts or other approved device. Wood plugs shall not be used. Install furring around openings and at corners; erect furring plumb and level and shim out as required.

H. WOOD SLEEPERS

(1) Provide wood sleepers for all wood floors, steppings, etc. Sleepers shall be pressure treated, of 2 x 3 inch stock, either square-edged or beveled, 1/2 inch on both edges. Space sleepers not more than 16" inches on centers and at right angles to finish flooring. Provide sleepers at ends and around openings for nailing ends of flooring. Shim under sleepers to make tops level; use slate, cement grout or wood wedges soaked in creosote for shims.

(2) Anchor sleepers to metal clips set in concrete as specified under Concrete. Wood sleepers on balconies and parquet shall be attached with 1/2" bolts 2'-6" o.c, bolts to be embedded securely in concrete. Concrete fill between sleepers is specified under Concrete Work

I. SHEATHING

(1) Where sheathing is required, it shall be exterior type Douglas Fir plywood, meeting in every respect, and be applied in accordance with, the standards of the Douglas Fir Plywood Association. It shall be not less than 1/2" in thickness for a span of 16" grain of face plys across supports and continuous over 2 or more spans.

J. SUB-FLOORING

(1) See I, above, except that the material shall be not less than 5/8" in thickness over spans of 16", grain and continuity as above.

K. PRESERVATIVE AND PRESSURE TREATMENT

(1) All wood window frames, door frames, louver frames, wood sash, wood doors, wood bucks, wood nailers for roof flashing in exterior walls shall be preservative treated in accordance with minimum standards established by National Woodwork Manufacturers Association, Inc. and shall bear their "Seal of Approval", or be accompanied by an affidavit from manufacturer identifying each shipment and certifying that they have been preservative treated in accordance with minimum standards of the above Association. Surfaces cut after treatment shall be brush coated with preservative.

Carpentry and Millwork, Cont'd.

(2) All wood sleepers or nailing strips in concrete, wood cant strips etc. shall be pressure treated with either coal tar creosote, zinc chloride, zinc-meta-arsenite or wolman salts with arsenic content. Treatment shall be in accordance with Standard Specifications of American Wood Preserver's Association for treating structural timbers. Furnish certificate from treating plant stating that material delivered has been pressure treated as specified and give name of preservative and quantity retained per cubic foot of material. Brush coat surfaces cut after treatment with a heavy coat of preservative.

(3) See also paragraph B(1)(d).

L. BUILDING PAPER

(1) Where wood sub-floors and wood wall sheathing may be required, cover them with 15 lbs. saturated felt. Felt for walls shall have a vapor porosity substantially higher than that of any papers or films used as a vapor barrier on heated side of the wall. Felt for floors shall be 15 pound. Apply felt with lapped joints and temporarily secure in place until finished flooring is placed over it.

M. WINDOW FRAMES

(1) Construct window frames to sizes and details shown on drawings, sills and parting strips shall be clear straight grain wood. Frames shall be preservative treated. Kerf sills on bottom to control warping. Mill frames for double hung windows to receive cord and weight type balances. Where indicated, groove sills and provide water bars of No. 10 gauge hot-dipped galvanized metal one-inch wide by length of sill. Frames for hinges and fixed sash shall have rebates as shown. Assemble joints with white-lead paste.

(2) Deliver frames with brick mould fitted and tacked on loosely to permit removal for application of caulking after frames are built into walls. Provide a reinforced Kraft paper windstop tacked to back of frames at heads and jambs.

(3) All surfaces of frames, except pulley stiles and parting strips of double hung windows shall be given a prime coat of lead and oil paint before shipment or upon arrival at the job.

(4) Set window frames plumb and level and brace until built in. Anchor each frame into masonry wall with three 1-1/4 x 3/16 inch metal anchors on each side of jamb. Place top and bottom anchors 8 inches from head and sill. Anchors shall extend into masonry 8 inches with ends turned 1-inch and secured to back side of frames with two No. 10 wood screws. Coat anchors with asphalt. For frames over 7 feet high, use 4 anchors on each jamb.

Carpentry and Millwork

Carpentry and Millwork, Cont'd.

N. WOOD SASH

- (1) Construct double hung sash in accordance with detail drawings. Sash shall be preservative treated.
- (2) Sash shall have mortised and tenoned joints with joints of stiles and rails pinned. Mill sash as required to receive sash.
- (3) Prime all surfaces except edges with lead and oil paint before shipment or glazing or upon arrival at job.
- (4) Except as otherwise detailed or specified herein, fabricate and assemble sash in accordance with standards of the National Woodwork Manufacturer's Association Inc.

O. WOOD DOOR FRAMES

- (1) Fabricate exterior wood door frames of sizes shown. Groove or kerf on the back and rebate at both edges from the solid. Outside frames in masonry openings shall have applied staff beads installed after frames are set and caulked. Wood sills at outside doors shall be clear Southern Pine worked with wash and drop from 1-3/4 inch stock.
- (2) Fabricate interior wood door frames. Frames shall be 1-1/4 inch stock and have applied stops.
- (3) Set door frames plumb and level and brace until built in. Anchor wood frames, without rough bucks, to masonry with three 1-1/4 by 3/16 inch metal anchors on each side of jamb. Place top and bottom anchors 8 inches from head and floor. Anchors shall extend into masonry 8 inches with ends turned 1-inch., and secured to back side of frames with No. 10 wood screws. Coat anchors with asphalt. Frames in openings having rough wood bucks shall be secured to bucks with nails. For frames over 8 ft high, use 4 anchors on each jamb.

P. WOOD DOORS

(1) GENERAL

(a) Meeting stile edges of pairs of double acting doors shall be rounded and meeting stile edges of all other pairs of interior doors, except sliding doors, shall be beveled; no astragal required. Meeting stile edges of pairs of exterior doors without door closers shall be beveled and fitted with astragal of same species as face of door. Sliding doors shall have top and bottom edges grooved and sanded as detailed to receive tracks or guides.

Carpentry and Millwork, Cont'd.

(b) Assemble joints in doors with water-resistant glue; keep doors under pressure until glue has thoroughly set. The finished door shall be sanded smooth, have tight joints and clean cut mouldings. Faces shall be free from defects or machine marks that will show through the finish. Provide wood bead stops for securing glass in doors.

(2) WOOD PANEL DOORS

(a) All panel doors shall have solid stiles and rails and be framed, mortise and tenon construction. Doors shall have raised or flat panels as shown. Raised panels shall be of same species as stiles and rails and be as detailed. Flat panels shall be of the same species plywood as detailed.

Q. WOOD FACED STAIRS

(1) Treads, nosings and landings shall be 1-1/16 inch thick of clear, kiln dried white oak. Risers and finished strings shall be same grade and of thickness shown. Treads and risers shall be tongued and glued together and be housed, wedged and glued into closed face of strings. Open face strings shall be mitered to risers and scribed to underside of treads. Provide nosings with bed mould at exposed edge of floors and platforms. Treads and/or risers shall be attached to blocks or strips on face of concrete.

(2) Handrails shall be stock profile clear white oak attached with screws to channel top of steel stair rail. Provide all parts necessary for complete assembly.

R. MILLWORK AND TRIM

(1) Exterior and interior millwork and trim shall conform to design and details shown. Where practicable, work shall be finished and assembled at mill. All millwork and trim shall be finished smooth and free from machine or tool marks that will show through the finish. All nail heads shall be set to receive putty. Exterior cornice material shall be repaired as required.

(2) All joints shall be tight and formed to conceal shrinkage. Shop miters 4 inches or more from heel to point shall be glued and locked. Make dowels and tenons to a driving fit. Make outside joints to exclude water and set in white lead paste or waterproof glue. Make shop joints of interior work with waterproof glue or hot glue under pressure.

(3) Door and window trim shall be in single lengths without splicing; corners shall be mitered. Rebate window stools over sills and cut returns on ends of stools and aprons. Running finish shall be in long lengths and jointed only where solid fastenings can be made. End joints in built-up members shall be well distributed. Miter exterior corners and cope interior angles.

Carpentry and Millwork, Cont'd.

(4) Assemble panel work in such manner to allow free movement of panels. Prime or stain panels before framing into place. Applied mouldings shall be secured to stiles and rails and not to panels.

(5) Provide blocking and lookouts as required for securing work in place. Do not install any trim, panelling or other material until all surfaces have been primed and back-primed. Where required, carefully scribe woodwork to plaster and other adjacent work.

S. WOOD SHELVING

(1) Shelves where indicated in closets, etc., shall be 3/4 inch material. Each shelf in closets etc. shall be supported on a continuous wood cleat at walls; where hook strips occur under bottom shelf, shelf may be supported on hook strip. Secure cleats to masonry walls with 1/4 inch expansion or toggle bolts spaced 2 feet apart. Closets not otherwise detailed shall be provided with two shelves and a 1-3/8 inch hardwood hanging pole.

(2) All shelving shall be securely braced against warping and sagging; scribe shelves to adjacent construction. Secure coat hooks to hook strips where specified; space hooks 12 inches on center. Provide intermediate supports for shelves over 4 feet long. Metal brackets supporting shelves shall be either aluminum or dull chrome finish.

(3) Install hook strips in all spaces where indicated on details and under bottom shelf of all clothes closets. Strips shall be 3/4 inch by 5-1/2 inch with edges rounded to 1/2 inch radius, except top edge supporting a shelf above which shall be square. Secure hooks to strips at approximately 12 inch centers. Fasten hook strips to masonry wall with toggle bolts approximately 24 inches apart.

T. WOOD WAINSCOT

(1) Wood wainscot shall be stock beaded "ceiling boards" T & G 1/2" inch thick yellow pine where exposed. For screen in boxes and wherever else called for to be covered, shall be nominal plain 1 x 4 Western Pine Boards T & G or shiplapped.

U. WOOD COLUMNS

(1) Shall be fabricated at the mill according to details. Build up of narrow staves with interlocking glued joints, turned to proper radius with entasis. Coat ends of joints with white lead paste before assembly. Columns shall be complete with bases and be provided with means for attaching separate composition caps.

Carpentry and Millwork, Cont'd.

V. ROOF SKYLIGHTS

(1) Construct skylights according to details on drawings. Rim to be of 2 x 4 material secured at corners with screws made to fit over curb with proper clearances. Curb to be of 2" nominal stock covered with sheet metal.

W. CAULKING

(1) Shall conform to Federal Specification TTC-598, Grade 1. It shall be equal to H. F. Fred Kuhls "Elastic" caulking compound.

4. METHODS

A. STORAGE AND PROTECTION

(1) Stack framing lumber and plywood to insure proper ventilation and drainage. Protect lumber and plywood from the elements. Protect millwork and flooring against dampness during and after delivery. Store under cover in a well-ventilated building and where not exposed to extreme changes of temperature or humidity. Do not store or install millwork and flooring in any part of building until concrete, masonry and plaster work is dry.

B. TEMPORARY ENCLOSURES

(1) Provide temporary wood doors and cloth or transparent plastic covered wood window frames for exterior wall openings during plastering and until the building has dried out. Windows may be glazed instead of fitted with temporary closures if glass is carefully protected.

C. SHOP DRAWINGS

(1) Before proceeding with the work, prepare and submit to the Contracting Officer for approval, shop drawings of all millwork. Drawings shall indicate kind of material, size of members, method of securing members together and to adjacent work.

D. CARPENTRY

(1) Carefully lay out, cut fit and erect all framing, blocking, sheathing and other items of carpentry as shown, in such a way as to minimize shrinkage and insure stability. All cutting, framing and fitting necessary for the accommodation and support of other work shall be done as required. Spiking, nailing and bolting shall be done in a workmanlike manner; all protruding nails shall be clinched. Lumber shall be drilled accurately for bolts, and all bolts shall be fitted with suitable washers. The work shall be constructed in the most careful and thorough manner with horizontal lines straight and level and vertical lines plumb and true.

Carpentry and Millwork, Cont'd.

(2) Centers and shores for all masonry arches and where else required shall be provided and installed as required, maintained in position and removed from premises before completion.

(3) Wood grounds, both temporary and permanent, shall be provided and installed as required for plastering and other work and shall be accurately and securely set. In general, grounds shall be $1\frac{1}{2}$ inches wide except that less width shall be provided where narrow metal or other trim occurs so that such trim will entirely cover grounds. Grounds shall be secured to masonry and concrete with approved nailing plugs, to hollow concrete masonry units with toggle bolts, and to metal lath by approved wire clips or wire.

E. FRAMING

(1) Roof framing: Members shall be assembled, fitted and set to exact slopes shown or noted on drawings. Tops of rafters shall form a true plane. Plates shall be set level in beds of fresh mortar and secured to walls with proper anchor bolts at corners and at intermediate points approximately 4 feet apart. Valleys shall be straight and true intersections of roof planes. Blocking shall be provided between rafters, trusses where necessary to form nailings for roof sheathing.

(2) Plywood shall be applied with the grain of face plies across bearings and nailed on 6 inch centers at panel edges and on 12 inch centers at intermediate bearings, using 8 penny nails for $\frac{3}{4}$ inch plywood.

F. FINISH CARPENTRY

(1) All work shall be carefully executed. Open joints, split wood and rough finishing of any kind will be rejected.

(2) Paneling shall be carefully laid out to preclude unnecessary cutting.

(3) Only experienced finish carpenters may be employed on the work.

(4) Fitting, hanging and trimming: Doors shall be fitted hung and trimmed as indicated on the drawings. Doors shall have $\frac{1}{16}$ inch clearance at sides and top, and $\frac{3}{16}$ inch clearance over thresholds, unless other is directed by the Contracting Officer. Doors in openings without thresholds shall have $\frac{3}{8}$ inch clearance. Doors $1\frac{3}{4}$ inches or more in thickness shall have the lock or latch edge beveled at the rate of $\frac{1}{8}$ inch in 2 inches. Doors shall be hung and trimmed with hardware as specified in Finish Hardware.

Carpentry and Millwork, Cont'd.

(5) Interior finish including doors shall not be brought into building until plaster is thoroughly dry. Finish may be stored at the site only in weathertight sheds and at the risk of the Contractor. Interior finish shall be milled, fabricated and erected as shown on the drawings. Interior finish shall be machine-sanded at the mill and sandpapered smooth at the building when necessary. All interior trim including base, casings, etc., shall be special mouldings. Interior trim to be set against plaster, concrete or concrete block shall be run with hollow backs. Trim shall be secured with fine finishing nails and with screws and glue where required. Joints shall be made in an approved manner to conceal shrinkage and be tight. Nails shall be set for putty-stopping. Wood finish shall be set straight, plumb or level, in perfect alignment and shall be closely fitted. Door trim shall be in single lengths. Base shall be in long lengths.

G. APPLICATION OF HARDWARE

(1) Receive, store and be responsible for all finished hardware. Properly tag, index and file all keys in key cabinet or as directed. Apply hardware in accordance with manufacturer's instructions, fit accurately, apply securely and adjust carefully. Use care not to injure work when applying hardware. When necessary remove and replace doors so they may have bottoms painted.

(2) The location of hardware in connection with wood and hollow metal doors shall be as follows unless otherwise shown on drawings: Center door knobs 38 inches above finished floor. Center door pulls 40 inches and push plates 45 inches above finished floor. Center single push bars 48 inches above finished floor. Locate upper edge of top hinge 5 inches below head of frame; locate lower edge of bottom hinge 10 inches above finished floor; space center hinges equal distance between top and bottom hinges.

(3) Cover door knobs and pulls with heavy cloth until painting is completed. Prior to completion of building, examine all doors, sash and other movable parts; adjust as required and leave hardware in good working order.

END OF SECTION 18

Carpentry and Millwork
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SECTION 19

LATHING AND PLASTERING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all lathing and plastering work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

- (1) See drawings and schedules for areas requiring plaster, metal furring and suspended ceilings.
- (2) Acoustical plaster treatment of areas so indicated.
- (3) Decorative plaster work, balcony faces, balustrades at boxes, run plaster mouldings on main ceiling and elsewhere as indicated.
- (4) Plaster partitions on metal stud furring.
- (5) Stair soffits.
- (6) Installation of metal plaster rings for recessed lighting.
- (7) Installation of metal access doors and panels on plaster walls and ceilings.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Brown and scratch coats behind ceramic tile wainscots is specified under "Ceramic Tile".
- (2) Provision of metal access doors and frames, plaster rings for lighting fixtures, is included under other sections.

3. GENERAL PRECAUTIONS AND PREPARATION

A. SCAFFOLDING

- (1) The provisions and erection of all scaffolding required for Lathing and Plastering

Lathing and Plastering, Cont'd.

the work under this section is the responsibility of this contractor. All Federal and/or local safety provisions must be carefully observed.

B. LOCAL ORDINANCES

- (1) All local ordinances affecting this work shall be adhered to

C. INSPECTION

- (1) This contractor shall inspect all surfaces to which his work is to be attached or from which it is to be suspended, etc. If such surfaces are not suitable in his estimation for the attachment, suspension or erection of his work as the case may be, he shall notify the General Contractor who will arrange to have the surfaces put in proper condition before lathing and plastering is begun.

- (2) Beginning of work by this contractor will be considered as his acceptance of such surfaces.

D. COOPERATION WITH OTHERS

- (1) This contractor shall coordinate his work with that of other trades which may be involved to the intent that the general work may be prosecuted without delay.

4. MATERIALS

A. DELIVERY AND PROTECTION

- (1) Deliver all manufactured materials in the original packages, containers or bundles bearing the name and brand of the manufacturer. Except as may be otherwise specified herein, the mixing, installation and application of the manufactured material shall be in strict accordance with the printed instructions of the manufacturer.

- (2) Protect plaster, lath and all cementitious materials against dampness until used. Store materials off the ground, under cover and away from sweating walls and other damp surfaces. Protect metal accessories in a manner to prevent rusting. Do not install rusted metal accessories in the work.

B. PLASTER MATERIALS

(1) GYPSUM PLASTER

SS-P-402, Type N (Neat) or Type W (Wood fibered), at the option of the Contractor. Neat plaster shall be fibered for scratch coat.

(2) CALCINED GYPSUM

SS-P-402, Type G.

Lathing and Plastering, Cont'd.

(3) HIGH STRENGTH GYPSUM PLASTER

SS-P-402, Type N, for base coats and Type G for finish coats; except that the minimum strengths in pounds per square inch when fully dry shall be 5000 for compressive and 500 for tensile when tested in accordance with A.S.T.M. Designation C26 - Current Issue.

(4) HYDRATED LIME

SS-L-351, except that the total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) in the hydrated product as delivered on the site shall not exceed 8 per cent by weight.

(5) PULVERIZED QUICK LIME

SS-Q-351. All shall pass a No. 20 sieve and not less than 90 per cent shall pass a No. 50 sieve. After slaking to a putty, it shall show at the end of 72 hours that the total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) in the hydrated product does not exceed 8 per cent by weight, calculated on the basis of the lime solids in the putty.

(6) PORTLAND CEMENT

SS-C-192b, Type 1, or Type 1A.

(7) KEENE'S CEMENT

SS-C-161, Type I.

(8) ACOUSTICAL PLASTER

Acoustical plaster shall be Gold Bond "Sprayolite" or approved equal, color, natural white.

(9) SAND

Sand shall be well screened, suitably sized and graded, clean, sharp and shall comply with ASTM C35.

(10) WATER

Water shall be clean, fresh and free from alkali.

(11) CHEMICAL BONDING AGENT

Material shall be a resinous, water emulsion, of brushing or spraying consistency that will bond new base coat or finish coat of plaster to concrete or other structurally sound surfaces. Material shall be of a type that will not cause discoloration of the finished plaster surface under any condition; it shall provide a lasting

Lathing and Plastering, Cont'd.

bond between the plaster and the concrete and shall not be affected by freezing, heat, acid or dampness. Material will be approved only upon submission of proof of compliance with these specifications. Deliver material to job in original containers with seals unbroken, do not reduce.

C. LATHING MATERIALS

(1) METAL LATH

Lath shall be expanded metal conforming to the requirements of Fed. Spec. QQ-B-101c(1), Type F3/8R - 3/8 inch rib base.

(2) NAILS

Nails for metal lathing shall be thin, flat, hook head, diamond point, and zinc coated. No substitutions are to be made without prior consent of the Contracting Officer.

(3) METAL ACCESSORIES

Metal accessories such as grounds, base screeds, casing corner beads and concealed picture moulding, shall be zinc-coated sheet metal not less than 26 gauge, with expanded or perforated flanges or clips so shaped as to permit complete embedment in the plaster.

(4) HANGERS AND INSERTS

Hangers shall be of ample length. Inserts and other means of attachment, as installed, shall develop the full strength of the hangers used. Steel flats shall be 1 x 3/16 or 1-1/4 x 1/8 inches, with 7/16 inch diameter holes punched on the center line and equipped with 3/8 inch diameter bolts; no hole less than 3/8 inch from an end. Rods shall be 3/16 inch diameter. Steel to be zinc-coated, cadmium-plated or painted.

(5) METAL FURRING

Either hot rolled or cold rolled steel shapes, except where hot-rolled shapes are specified; painted with rust inhibitive paint, except where zinc-coated (galv.) finish is shown or specified.

(6) COLD-ROLLED CHANNELS

Flanges not less than 7/16 inch wide and the following minimum weights per 1,000 linear feet: 300 pounds for 3/4 inch, 475 pounds for 1-1/2 inch, 590 pounds for 2 inch.

(7) HOT-ROLLED CHANNELS

The following minimum weights per 1,000 linear feet: 300 pounds for 3/4 inch, 410 pounds for 1 inch, 1120 pounds for 1-1/2 inch, and 1260 pounds for 2 inch.

Lathing and Plastering, Cont'd.

Furring for beams and irregular surfaces: Brackets shall be not lighter than 1 inch hot-rolled channels or 1 x 3/16 inch flats.

(8) METAL STUDS

Metal studs shall be similar to Bostwick Steel Lath Co's. "Chan-L-Form".

5. SYSTEMS

A. METAL FURRING

Provide metal furring at locations indicated on drawings, as specified herein and elsewhere required to provide a suitable base for plastering; furr pipe chases over 12 inches wide; provide furring over exposed ducts. Include all steel shapes, clips, crimped band irons, wire and other attachments necessary to bring plaster to lines indicated. Where furring is shown or required and the sizes or spacing of members is not indicated, it shall consist of 3/4 inch steel channels spaced not more than 16 inches on center and with adequate bracing. Secure furring to adjacent construction by suitable means.

B. SUSPENDED CEILINGS

(1) EXTENT AND LOCATION

Provide suspended and plastered ceilings in rooms and spaces so designated on the finish schedule. Finished ceiling heights shall be as indicated.

(2) MAIN RUNNER CHANNELS

Main runner channels shall consist of 1-1/2 inch cold rolled painted channels weighing not less than 475 lbs. per 1000 lin. ft. Space runner channels not more than 3-1/2 feet on centers and 3 inches from parallel walls. Support runner channels at each end and at 3-foot intervals with hangers of .125 inch diameter monel wire. Embed looped ends of hangers in concrete a minimum of 2-inches or secure to approved inserts that will develop full strength of hangers. Attach hangers to steel construction by wrapping around the steel construction. The lower ends of wire hangers shall be saddle-tied or wrapped around the runner channels in a manner to develop the full strength of hanger and prevent turning or twisting of the channels. Where runner channels are spliced, overlap ends not less than 12 inches with flanges interlocked; secure splice near each end with (16) (18) gauge tie wire or equivalent clips.

(3) CROSS FURRING CHANNELS

Cross furring shall consist of 3/4 inch cold rolled painted channels weighing not less than 300 lbs. per 1000 lin. ft. Attach cross furring channels to runner channels at right angles and securely

Lathing and Plastering, Cont'd.

saddle-tie with .062 inch diameter monel wire, or secure with equivalent clips or attachments. Space furring channels 16 inches on centers unless otherwise indicated or specified. Provide framing around recessed lighting fixtures, light coves, diffusers, access panels and other openings in ceilings. Where curved furring channels are required for arched and coved ceilings, the channels shall be shop fabricated and bent to proper curves and radius. Where furring channels are spliced, overlap ends not less than 8 inches with flanges interlocked; secure splice near each end with 16 gauge tie wire or equivalent clips.

C. FURRED CEILINGS

(1) EXTENT AND LOCATION

Provide furred ceilings on underside of steel joists where their spacing is over 24 inches apart and requiring plaster; on underside of stair soffits and landings and at other locations noted on drawings. Furring for ceilings shall consist of 3/4 inch cold rolled painted channels weighing not less than 300 lbs per 1000 lin. ft.

(2) ATTACHMENT

Attach furring channels directly to bottom of each steel joist or concrete rib and to the underside of soffits, landings, etc. Space furring channels 16 inches on centers unless other spacing is indicated. When securing to cast-in-place concrete joists or ribs, use No. 10 gauge galvanized steel tie wire with looped end embedded in concrete a minimum of 2-inches, or an approved type of insert of equivalent strength. When securing to steel joists, use a saddletie of No. 16 gauge galvanized steel wire around bottom chord of joists. Where furring channels are spliced, overlap ends not less than 8 inches with flanges interlocked; secure splice near each end with 16 gauge tie wire or equivalent clips.

6. METHODS

A. METAL LATH

(1) EXTENT AND LOCATION

Metal lath shall be used as a plaster base for furred and suspended plaster ceilings, over metal furring, on solid plaster partitions, and for all other locations where metal lath is indicated on drawings.

(2) JOINTS

Bridge joints with self-furring metal lath between masonry and concrete surfaces in same plane and requiring plaster. Extend metal lath from lathed surfaces over at least 6 inches onto masonry and concrete surfaces when they are in same plane with lath.

Lathing and Plastering, Cont'd.

(3) APPLICATION

(a) Lap rib lath $1/2$ inch at sides, or by nesting side ribs depending upon the type and depth of ribs. Lap all metal lath 1-inch at ends or by nesting. Make and stagger end laps over supports or lace together between supports with tie wire. Secure side joints to supports and between supports. Space all other attachments for securing lath not more than 6-inches apart.

(b) Secure lath to metal supports and to adjacent lath with 18 gauge galvanized annealed tie wire or 12 gauge spring steel clips, galvanized or painted. Secure lath to masonry by nailing into joints with 1- $1/4$ inch No. 9 plasterboard nails; secure lath to concrete by wire or other inserts placed in forms, or with power driven fasteners.

(c) Secure lath to horizontal wood supports with 1- $1/2$ inch long, 11 gauge, barbed roofer's nails with $7/16$ inch head. Secure lath to vertical wood supports with 14 gauge wire staples, 4 penny common nails or 1-inch long roofing nails with $7/16$ inch head. When fastening rib lath and stiffened lath, use longer nails and staples to provide same penetration into wood supports.

(d) Where metal lath for contact ceilings is applied directly to underside of steel joists without furring, secure lath to joists by double loops of 16 gauge galvanized annealed steel wire, with the ends of each loop twisted together. Approved type of clips or fasteners which afford equal carrying strength may be used in place of the wire; installation shall follow manufacturer's recommendations.

B. METAL ACCESSORIES

(1) MATERIALS AND CONSTRUCTION

Unless indicated or specified otherwise, metal corner beads, base screeds, casing beads, plaster stop beads, expansion beads and picture mould beads shall be fabricated from zinc-coated steel, not lighter than 26 gauge. Provide accessories with perforated or expanded flanges or other suitable attachments that will permit complete embedment of the accessory in the plaster. The ground dimension of beads and stops shall be suitable for the plaster thickness. Steel accessories shall have a factory-prime coat of rust-inhibitive paint. Where bull-nose corner beads are required for arched or curved openings, the beads shall be shop-bent to required radius.

(2) CORNER BEADS

Provide metal corner beads at all vertical external corners to be plastered and at heads and jambs of windows and other openings without frames occurring in plastered walls. Install beads at other horizontal and vertical plaster corners where so indicated on drawings. Beads for vertical corners above ceramic tile wainscots shall be of

Lathing and Plastering, Cont'd.

same radius as the tile or masonry below. Provide 3/4 inch radius bull-nose beads on walls having plastic wall covering. Corner beads for all other plastered corners, except where corner guards are shown, shall be the small nose type.

(3) EXPANSION BEADS

Provide metal expansion beads in plaster ceilings of Theatre and in walls. Beads shall be double stop type of size and shape similar to No. 15 as manufactured by Inland Steel Products Co.

(4) BASE SCREEDS

Provide base screeds at joint between tops of terrazzo base and plaster walls. Screeds for flush cast-in-place terrazzo base shall consist of a 1/16 inch thick strip 5/8 inch deep and fastened to a continuous plate of 26 gauge galvanized steel approximately 1-1/2 inches wide. Screeds for projecting terrazzo and cement bases shall be of 26 gauge galvanized steel similar to No. 74 as manufactured by Inland Steel Products Co.

(5) CORNERITES

Provide metal cornerites on all plastered interior angles wherever lath is used on one or both sides of angle, on internal corners of masonry that are plastered and where the masonry is not mechanically bonded, and at all other interior plastered corners. Cornerite strips may be omitted where metal lath from one surface is continued around angle at least 4-inches. Cornerites will not be required at angle between walls and skim coat plaster ceilings applied over bonding agent direct to concrete slabs. Fabricate cornerite strips from 2.5 lb. flat expanded metal lath bent at right angles to form 3-inch legs on each side. Fasten cornerites at edges to lath and other surfaces in a manner to secure them firmly in position; do not nail to structural framing.

(6) INSTALLATION

Set vertical beads plumb and horizontal beads level and true arrises and neat mitres. Secure at ends and not more than 12 inches apart with galvanized staples, wire ties or concrete nails, staggered. Beads for curved and arched corners shall be uniformly curved to required radius.

C. METAL STUDS

(1) FLOOR-CEILING ATTACHMENT

Runner track shall be aligned accurately according to partition layout and be secured to concrete slabs with 1/2" concrete stub nails or power driven anchors spaced not more than 24" o.c. or secured to suspended ceilings by wire ties not more than 16" o.c.

Lathing and Plastering, Cont'd.

(2) STUD ERECTION

Studs shall be placed vertically in the runner track at spacings as recommended for the type of lath. They shall be secured to the track by pairs of shoes tied to stud with double strand 18 gauge galvanized tie wire. The entire assembly shall be strictly according to the recommendations of the manufacturer of the material.

D. METAL ACCESS DOORS AND FRAMES

(1) LOCATION AND SIZES

Set metal access doors and access panels of sizes shown, complete with frames and hardware, for all locations indicated on drawings to be installed in plaster walls and ceilings. Where access doors or panels are indicated and sizes are not designated, provide doors size 16" x 20". Consult both architectural and mechanical drawings for location and sizes of doors and panels. Access doors or panels to be set in unplastered walls or ceiling, are included under another section of the specification.

(2) CONSTRUCTION

Construct frames of steel not lighter than 16 gauge with 20 gauge expanded or perforated metal wings designated to finish flush with plaster. Doors shall be flush type, constructed of steel not lighter than 14-gauge, and have concealed hinges and screw-driver operated latch. Doors for electrical work shall be provided with manufacturer's standard utility type locks. Doors for plumbing work shall be removable type and held in place by concealed slips and latches.

(3) INSTALLATION

Set access frames in place at proper locations, straight and true. Securely anchor frames to adjacent furring or structural framing in accordance with manufacturer's recommendations.

E. CHEMICAL BONDING AGENT

Prior to the application of the bonding agent, remove all dirt, dust, oil, grease wax and loose material from surfaces to be coated. Apply bonding agent by brush, roller or spray in accordance with manufacturer's directions and to completely cover the surface.

F. PLASTER BASE COATS

(1) TYPES, LOCATION, MIXES

(a) GYPSUM - SAND BASE - Use gypsum-sand base coats for all interior plastering, except for Portland cement plaster, skim coat plaster and where other type of base coats are indicated or specified. Mix in following proportions:

Lathing and Plastering, Cont'd.

1. Scratch (first) Coat on Lath: 100 lbs of fibered gypsum plaster to not more than 2-cu. ft. (12 No. 2 shovels) of sand.
2. Scratch (first) Coat on Unit Masonry: 100 lbs of unfibered gypsum plaster to not more than 3 cu. ft. (18 No. 2 shovels) of sand.
3. Brown (second) Coat on Three Coat-Work: 100 lbs of unfibered gypsum plaster to not more than 3 cu. ft. (18 No. 2 shovels) of sand when applied over lath and not more than 4 cu. ft. (24 No. 2 shevels) of sand when applied over masonry.

(2) APPLICATION

(a) GENERAL PROVISIONS - Before plastering inspect surfaces to receive plaster and see that grounds, furring, screeds, base screeds, corner beads, casing beads, plaster stops, corner lath, metal trim and lath are secured in place. See that grounds are set to receive the specified thickness of plaster. Inspect metal accessories, metal lath and metal frames for rusting or other conditions that will stain the finished plaster; correct such conditions by touching up with aluminum paint. When necessary dampen masonry and concrete surfaces (except gypsum block) by brushing or spraying with clean water just before plastering.

(b) SPECIAL PROVISIONS - At the intersections of plastered masonry walls and plastered ceilings, the base coats and finish coat of plaster on walls shall be cut thru to masonry with a trowel or other sharp edge tool. Make cut on a straight line at ceiling. Where metal plaster stops are provided at the intersections to break the continuity and provide free movement, the cut thru operation shall be omitted.

1. The base coat of gypsum plaster to receive acoustical plaster finish coat shall be floated or darbied to a uniform even finish.

2. The gypsum plaster brown coat on walls to receive ceramic tile applied with adhesive shall be floated smooth, straight and plumb to within 1/8 inch in either direction. All inside corners shall be straight, plumb and sharp. External corners shall be straight and plumb and fitted with metal corner beads. Where plaster occurs above wall tile, the finish coat shall be applied before the tile and trowelled down to a "feather edge" just below the top of wainscot.

3. Where ceramic tile is set in conventional mortar bed, the portland cement plaster behind tile shall be floated straight and plumb and scratched with nail float.

4. Where acoustical tile is applied direct to plaster with adhesive, float brown coat to true even surface to receive tile.

Lathing and Plastering, Cont'd.

5. Where plaster abuts metal trim (or other material finishing flush with the plaster) form a straight "V" or other clean-cut type of joint around trim.

(c) THREE COAT WORK - Apply scratch (first) coat with sufficient material and force to adhere firmly to plaster base; prior to final set, scratch with a scarficer or scratcher to produce a suitable bond for the next coat. Scratch coat on concrete (except skim coat) shall be a thin coat of bond plaster followed by a brown coat of gypsum-perlite or gypsum-vermiculite plaster and troweled into the scratch coat before it has set. Apply brown (second) coat to true planes and screed in both directions to within 1/8 inch of the finished surface; float and leave rough to receive finish (third) coat. Scratch coat must be dry before brown coat is applied, except on concrete surfaces. (At Contractor's option, a chemical bonding agent as hereinbefore specified may be substituted for the scratch coat of bond plaster on concrete surfaces).

G. PLASTER FINISH COATS

(1) TYPES, LOCATION, MIXES

(a) KEENE'S CEMENT FINISH - Use Keene's cement finish coat for locations scheduled on drawings. Apply over base coat of gypsum-sand plaster. Keene's cement finish coat shall be a hard finish mixed in proportions of 100 lbs. of Keene's cement to not more than 25 lbs. of dry hydrated lime.

1. When Keene's cement finish is applied over a gypsum-vermiculite or gypsum-perlite base coat, not less than 1/2 cu. ft. of fine silica sand or perlite fines for each 100 lbs. of Keene's cement shall be added to the mix. Sand shall pass through a 30 mesh screen and at least 40 percent retained on a 100 mesh screen.

(b) ACOUSTICAL PLASTER FINISH - Use acoustical plaster finish coat for locations scheduled on drawings. Apply over a base coat of gypsum plaster. Mix with water to consistency required for the method of application and in accordance with manufacturer's directions.

(c) WHITE COAT TROWEL FINISH - Use white coat finish over base coats of gypsum or lime plaster on all surfaces requiring plaster, except where other type finish coat is indicated or specified. The white finish coat shall consist of gypsum gauging plaster and lime putty mixed in the proportions of 1-part gauging plaster and lime putty mixed in the proportions of 1-part gauging plaster to not more than 3-parts of lime putty by volume; or 100 lbs. gauging plaster to (200 lbs.) - (300 lbs.) of dry hydrated lime by weight. At contractor's option, a factory prepared gypsum finish coat similar to Gold Bond trowel finish as manufactured by National Gypsum Co. may be used for white coat trowel finish; mix with water only and follow manufacturer's directions.

Lathing and Plastering, Cont'd.

(2) APPLICATION OF FINISH COATS

(a) GENERAL

1. The thickness of finish coats shall be from 1/16 to 1/8 inch. Apply finish coats to a partially dry base coat or to a thoroughly dry base coat that has been evenly wetted; the use of excessive water shall be avoided. In general, base coats shall be dampened uniformly to the degree recommended by the manufacturer for the materials and methods used in the base coats and finish coat. The finish coat of portland cement plaster shall be moist cured by keeping it damp 48 hours after application.

2. At intersections of plastered masonry walls and plastered ceilings, the base coats and finish coat of plaster on walls shall be cut-thru to masonry with a trowel or other sharp edge tool. Make cut on a straight line at ceiling; where metal plaster stops are provided at the intersections to break the continuity and provide free movement, the cut-thru operation may be omitted.

3. Finished plaster that is stained or otherwise discolored (and not requiring a paint of some other finish) will not be accepted.

(b) TROWEL FINISH (ON KEENE'S CEMENT)

Apply finish coats over base coat to true even surface; allow to draw a few minutes and then steel trowel to a smooth finish, free from blemishes and irregularities; use the proper amount of water. Continue troweling on Keene's cement until the finish sets.

(c) FLOAT FINISH

Apply finish coat over base coats to true even surface and then float first with a wood, then with a rubber float to produce the texture to match approved sample. Finished surface shall be uniform in texture and color and free from slick spots or other blemishes.

(d) ACOUSTICAL PLASTER

Apply acoustical plaster to thickness required to obtain the manufacturer's specified noise reduction coefficient rating (NRC). Apply by troweling or spraying in accordance with manufacturer's directions to obtain a strippled finish and matching approved samples in texture and color.

H. ORNAMENTAL PLASTER

(1) Execute ornamental plaster as shown on the details by mechanics skilled in this work.

(2) Run cornices, moldings and other molded features full, straight and true, with an approved brand of molding plaster. Use clean cut metal templates conforming to indicated profiles. See that
Lathing and Plastering 19-12

Lathing and Plastering, Cont'd.

moldings, lines, etc. are in perfect alignment, with true intersections and accurate miters at corners and angles.

(3) Run cast or enriched work, or other ornamental work which cannot satisfactorily be run in place, in the shop, or in the field, using an approved brand of casting plaster and gelatine moulds. Pack the work solidly with jute or burlap, reinforce as necessary with wood or galvanized iron, strike securely and wire in place securely with 16 gauge copper wire. Make joints carefully and point neatly in a nearly invisible manner. Remove rough spots with fine sandpaper. Leave work in proper condition ready for decoration.

(4) Submit full size models of balcony front and other indicated ornamentation for the approval of the Contracting Officer.

I. PRECAUTIONS AND PREPARATION FOR PLASTER

(1) TEMPERATURE AND VENTILATION

Maintain a minimum temperature of 50 degrees F. in spaces to be plastered for at least 7 days prior to plastering, during plastering and until plaster has cured. Protect plaster from freezing and from uneven or too rapid drying. Do not apply plaster to surfaces that contain frost. After plaster has set hard, provide and maintain free circulation of air to prevent sweat-outs.

(2) SEQUENCE OF OPERATION

Complete all plastering in rooms and spaces where acoustical treatment is required before acoustical material is installed. In rooms having mortar-set ceramic tile, marble or glazed structural tile wainscots, do not apply finish coat of plaster on walls above wainscot until wainscot work has been completed. In rooms having terrazzo base and plaster walls, apply finish coat of plaster after terrazzo base has been completed.

(3) PROTECTION

Where finished surfaces such as tile, terrazzo, stone, metal frames, metal windows, metal partitions, etc. have been installed in rooms prior to completion of plaster work, the finished surfaces shall be protected from damage during plastering. Protection shall consist of covering with a non-staining kraft paper or polyethylene sheet and joints sealed with tape or adhesive. Metal frames may be protected with a removable type of masking tape or an approved type of non-staining petroleum jelly mixed in accordance with manufacturer's directions. Maintain protection in place during plastering and remove when plaster work is completed. Any damage to finished surfaces caused as the result of plaster operation shall be corrected and the cost thereof paid by the plastering sub-contractor.

Lathing and Plastering, Cont'd.

J. MIXING PLASTER

Mixing of plaster shall be done in mechanical type mixers, except that hand mixing may be used when approved by the Contracting Officer. Provide a sufficient number of mixers to carry on the work. Measurements shall be by volume or weight as specified. Do not use any frozen, caked or lumpy materials, or material that has partially set. Retempered plaster that has partially set shall not be used. Clean mixer of all set or hardened material before materials for a new batch are loaded. Keep mixing tools and equipment clean. Mix each batch separately. The mixing sequence and cycle of operations and time shall be in accordance with the material manufacturer's directions.

K. PATCHING

Upon completion, point-up plaster around trim and other work. Cut out and patch defective and damaged plaster. Patching of plaster shall match existing work in texture and finish and, at joining with plaster previously applied, shall finish flush and smooth.

END OF SECTION 19

SECTION 20

TERRAZZO

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

(A) GENERAL

The work required under this Section includes the provision and installation of all articles, items, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all terrazzo work as shown on the drawings and/or as described herein.

(B) WORK INCLUDED

In general the work to be performed under this Section shall include, but is not necessarily limited to, the following:

- (1) Providing and installing terrazzo floors.
- (2) Providing and installing terrazzo base.
- (3) Providing and installing terrazzo stair treads and/or risers.

(C) WORK NOT INCLUDED UNDER THIS SECTION

- (1) Providing and installing floor drains in terrazzo.
See "Plumbing".

3. MATERIALS

A. PORTLAND CEMENT

Shall conform to Federal Specification SS-C-192d, gray or white as required to match approved samples.

B. SAND

Clean hard natural sand, conforming to ASTM C33-59 specifications for fine aggregates.

C. MARBLE CHIPS

Standard quarry products, of sizes, colors and kinds required by the color plates specified.

Terrazzo, Cont'd.

D. COLOR PIGMENT

Lime proof, non-fading mineral pigments; of colors and quantities required by the color plates specified.

E. CURING COMPOUND

A liquid membrane-forming compound conforming to ASTM specification C 309-58 Type 1, translucent.

F. SEALING AND CLEANING SOLUTIONS

Shall be Super-Shine-All and Super Onex-Seal as manufactured by the Hillyard Chemical Co. of St. Louis, Mo., or approved equal. They shall be neutral liquids free of harmful alkali or acid or metallic salts or other strong ingredients which might harm the floor. They shall be delivered to the job site in sealed containers bearing the manufacturer's label.

G. HEAVY TOP DIVIDER STRIPS

Construct exposed top member of half-hard brass 1/8 inch wide and not less than 1/4 inch deep. Construct bottom member of same material, solid zinc or zinc coated steel, not less than 18 gauge, with suitable anchorage features and a continuous straight edge at bottom. Overall height of strip shall be 1-1/4 inch. Provide heavy top strips between edge of terrazzo floors and walls and to divide terrazzo floors into square or rectangular sections not larger than 25 square feet each.

H. METAL REINFORCEMENT

Provide No. 18 gauge welded wire fabric, 2 x 2 inch mesh, for cast-in-place floors at locations where reinforcing is specified. Provide No. 14 gauge welded wire fabric, 2 x 2 inch mesh and 3/8 inch diameter steel pencil rods for all pre-cast terrazzo.

I. TERRAZZO COMPOSITION AND COLORS

Shall be such as to produce an effect similar to that shown in Universal Atlas Cement Division of U. S. Steel, plate 210, Sweet's catalogue.

J. TERRAZZO BASE

Shall be plain, square base, rounded nose top, 6" high, of same composition as Terrazzo. It may be cast in place or be precast,

Terrazzo, Cont'd.

set in mortar. If precast it shall be 1-1/4" thick; if cast in place there shall be a minimum of 3/8" terrazzo topping.

4. METHODS

A. ACCEPTANCE OF SURFACES

Prior to installing any terrazzo, the contractor shall inspect sub-floors and wall surfaces which are to receive terrazzo; he shall notify the General Contractor in writing of any serious defects or conditions that will interfere with, or prevent a satisfactory terrazzo installation; he shall not proceed with installation of the work until such defects or conditions have been corrected. The starting of installation work in a room or space shall imply acceptance of the surfaces to receive the terrazzo in that space.

B. PREPARATION OF STRUCTURAL SLABS

(1) Before placing the underbed for cast-in-place bonded terrazzo floors, sweep slabs clean and remove any plaster, mortar, dirt, oil and other conditions that will interfere with bonding to the concrete slab. Saturate slabs with water; remove excess, or allow to dry until surface water disappears. On the wet slab slush and broom with neat cement grout immediately ahead of placing the underbed. When recessed type door closers are required in terrazzo floors, make provisions in slabs for setting the boxes to receive the closers at the proper locations to avoid cutting and patching.

(2) In general, the specifications of the National Terrazzo and Mosaic Asso., Inc. shall be followed in this work.

C. UNDERBED

(1) MIX

The underbed to receive terrazzo topping shall consist of 1-part portland cement and 4 parts sand; add water and thoroughly mix to proper consistency.

(2) PLACING UNDERBED

The underbed for floors and base shall be spread and screened to true, level or plumb surface, finishing not less than 3/8 inch back of finished face of bases and other vertical surfaces and not less than 5/8 inch below finished level for floors, except as indicated or specified otherwise.

Terrazzo, Cont'd.

(3) PLACING DIVIDER STRIPS

(a) While the underbed is in a semi-plastic state, install divider strips of type and spacing indicated or specified. Set strips accurately and straight, at proper height and with tight fitting joints at intersections.

(b) Set recessed type edging strips so that the resilient floors will finish flush with the adjoining terrazzo floor; where the joint occurs at door, locate strip under center of door.

(c) Where terrazzo borders are required in floors, the divider strips shall extend through the borders at intervals not to exceed 60 inches and be at right angles to the run of border.

D. TERRAZZO TOPPING

(1) MIX

The topping mix shall be in proportions of 200 pounds of marble chips to 94 pounds (one bag) of portland cement, mixed dry; add mineral color pigment in quantity required by formulae of color plates specified; add not more than 5-1/2 gallons of clean water for each bag of cement and mix thoroughly.

(2) INSTALLATION

(a) Place topping after underbed has hardened sufficiently to withstand rolling, but not to exceed one day after placing. Saturate underbed with water, remove excess and then slush and broom surface with neat cement grout immediately ahead of topping mix; use same color of cement and pigment as required for matrix. Place terrazzo topping to thickness specified and then sprinkle with wet marble chips of the composition and percentage required by the formula specified. Topping shall be uniform in composition and the same marble chips that appear on surface shall be used for entire thickness. Trowel and pack base with proper form; roll floors with heavy roller until superfluous cement and water have been extracted. Hand trowel to an even surface, exposing the lines of strips on a level with the topping.

(b) The finished thickness of the terrazzo shall be 1-3/4".

(3) CURING

Cure terrazzo topping by keeping it damp for a minimum of 6 days after placing. Curing methods shall consist of covering with non-staining reinforced Kraft paper, plastic sheets, curing mats or sand; or by coating with a clean liquid curing compound as hereinbefore specified.

Terrazzo, Cont'd.

(4) SURFACING

After curing, perform initial and final grinding with water and abrasive grit stones of proper size to obtain the finish specified; use No. 24 grit stones for initial grinding and No. 80 for final grinding. Do not reduce height over shelf of recessed edging strips below the height specified. Rub by hand all inaccessible places. After initial grinding or rubbing, grout surfaces with neat portland cement paste of creamy consistency, filling all voids, use cement and coloring corresponding to topping mix for grouting. Let grout remain on surfaces until final grinding, but not less than 2 days. Final grinding shall produce surface of same texture as approved samples. The finished surface shall match approved samples and show approximately 70 percent of marble chips. Terrazzo shall be level or straight within a tolerance of 1/16 inch between divider strips, when tested with straight edge. Protect walls, floors and other work adjacent to terrazzo from grinding stones and from splashing while grinding is in progress.

(5) NON-SLIP FINISH

(a) Provide a heavy-duty non-slip finish for cast-in-place terrazzo stair treads, landing, and platforms.

(b) Obtain heavy-duty non-slip finish by incorporating abrasive aggregate in the terrazzo topping mix in the proportions of 200 pounds abrasive aggregate, 400 pounds of marble chips and three bags (282) pounds of cement; thoroughly mix dry, add water and install as specified for regular topping. The finished terrazzo shall have a minimum of 35 percent abrasive aggregate to marble chips exposed on the surface.

E. CLEANING AND SEALING TERRAZZO

After final grinding, thoroughly clean all terrazzo surfaces, using a neutral type cleaning solution in accordance with the manufacturer's directions. After surfaces are dry, wash and rinse and apply a coat of penetrating sealing solution. Upon completion, machine buff terrazzo surfaces and leave in clean finished condition. Protect finished terrazzo surfaces from damage until acceptance by Contracting Officer; do not use wax on finished terrazzo.

END OF SECTION 20

SECTION 21

CERAMIC TILE, MARBLE, SLATE

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The Contractor shall provide all items, articles, materials and operations including all labor, materials and equipment necessary for and incidental to the completion of all ceramic tile work as shown on the drawings and/or as described herein, including mortar setting beds and wall plaster coats.

B. WORK INCLUDED

(1) GENERAL

The work to be done includes, but is not necessarily limited to, the following:

(a) Provide and install ceramic tile floors, wainscots and/or walls in spaces as indicated on the Materials and Finish Schedule.

(b) Provide and install marble thresholds at openings between ceramic tile floors and floors of other materials.

(c) Provide and install slate treads and landing surfaces on stairs as indicated on drawings and schedules.

C. WORK NOT INCLUDED UNDER THIS SECTION

(1) GENERAL - The following are not included:

(a) Furring behind tile wainscots.

3. MATERIALS

A. GENERAL

(1) QUALITY, GRADE AND CERTIFICATE

Tile shall comply with requirements of Federal Specification SS-T-308b, and with modifications as specified herein. Tile shall be of a grade specified and all containers grade-sealed in accordance with minimum grade specifications described in SPR-R61-61. In addition to grade seal, furnish Contracting Officer with master grade certificate stating grade, kind of tile, identification marks

Ceramic Tile, Marble, Slate

Ceramic Tile, Marble, Slate, Cont'd.

for tile packages and the name and location of job; certificate shall be signed by the manufacturer and issued before shipment of tile is made. Deliver containers to site with seals unbroken. Tile must be of American manufacture. Tile shall be as manufactured by the Mosaic Tile Co., U. S. Ceramic Tile Co., Cambridge Tile Co., or approved equal.

(2) FACTORY MOUNTING

Factory mounting into sheets of patterns selected shall be required for all ceramic mosaic tile and other tile hereinafter designated as "mounted". The specific type of mounting shall be optional with the contractor.

(3) COLORS AND PATTERNS

Colors and patterns of tile shall be as selected by the Contracting Officer.

B. FLOOR TILE

(1) Standard grade, unglazed dust-pressed or extruded natural clay type, not less than 1/4 inch thick with cushion edges, and in nominal face sizes of 1" x 1", 1" x 2" and 2" x 2". Provide all necessary shapes and trimmers of similar tile for curbs, depressions, corners etc. Use this tile for all floors as shown on Material and Finish Schedule.

C. WALL TILE

(1) Shall be standard grade, glazed tile not less than 5/16" thick, cushion edged, in a colored matte glazed finish and in nominal face size of 4 1/4" x 4 1/4". Spacer lugs or other similar devices shall be provided on the edges of the tile, or the tile may be furnished mounted at the factory on the manufacturers standard sheets.

D. TRIM SHAPES

(1) Trim shapes shall be of same type, color, thickness and finish as wall tile. Provide trim and base shapes in accordance with requirements listed below. Shape numbers referred to are standard with Tile Council of America, Inc. unless otherwise noted. In addition to shapes listed, provide tile stops and returns as required at jambs of doors and other frames at locations where they do not project a sufficient distance to provide a stop for the tile.

(2) Make interior corners of wainscot field coved by using combination angle and stretcher shapes.

(3) Make internal corners of cap and base coved. Form round internal corners of cap and base using combination angle and stretcher shapes No. ABR and ABL. Where surface type trim is used, internal corners shall be square.

Ceramic Tile, Marble, Slate, Cont'd.

(4) Make all external corners of wall tile rounded, using combination angle and stretcher shapes No. AM 4402.

(5) Use cove base No. A-3481, size $4\frac{1}{4}$ x $8\frac{1}{2}$ inches, under tile walls and wainscots where floor is tile and set in conventional mortar setting bed.

(6) Use bullnose cap No. A-4402 at top of conventional mortar set wainscots when tile projects beyond face of plaster above.

(7) Use double bullnose shape No. A-7440 for jambs, heads and curbs, of showers and for caps of low partitions.

(8) Use two pieces of single bullnose for jambs, heads, curbs, caps of low partitions, etc., where dimension cannot be supplied in double bullnose shape.

E. MATERIAL FOR SETTING TILE

(1) PORTLAND CEMENT

Shall conform to Federal Specification SS-C-192d, white

(2) HYDRATED LIME

Shall conform to Federal Specification SS-L-361(1).

(3) SAND

ASTM C-144-52T, washed clean and graded; use fine sand passing a 1/16 inch mesh screen when mixed for grouting; use white sand with white cement.

(4) WATER

Shall be clean and potable.

(5) WIRE MESH REINFORCEMENT

Welded wire fabric 2 by 2 inch mesh of 16/16 wire weighing not less than 13 lbs. per 100 sq. ft. or 3 by 3 inch mesh of 13/13 wire weighing not less than 10 lbs. per 100 sq. ft. Use wire mesh to reinforce the conventional type mortar setting beds where required.

(6) METAL LATH

Flat expanded or flat rib expanded, weighing not less than (3.4) - (4.0) lbs. per square yard; when applied over masonry, concrete or other solid backing, lath shall be self-furring type. Use metal lath on walls and ceilings over wood furring to receive the cement plaster scratch coat for wall tile set with conventional mortar bed, only when scratch coat is included herein.

Ceramic Tile, Marble, Slate, Cont'd.

F. MARBLE THRESHOLDS

Shall be raised saddles, $1\frac{1}{4}$ " thick, beveled, same width as jamb, Vermont Mariposa Danby marble.

G. SLATE

For stairtreads and landings shall be natural stone, blue-black in color, $1\frac{1}{4}$ " thick; nosings shall be slightly rounded.

H. SAMPLES

(1) Submit samples in duplicate of the following materials to Contracting Officer for approval. Approval must be obtained prior to delivery.

(a) Panels of wall tile not less than four tiles to each panel, for each color and type of tile to be used.

(b) Panels of floor tile approximately 8 inches square of each type and pattern of tile used.

(c) Samples of each type of trim shape and each type of accessory specified.

(d) Samples of slate and marble.

4. METHODS

A. GENERAL

(1) LAYING OUT WORK

Where possible, lay out work so that no tile less than half size occurs. For heights stated in feet and inches, maintain full courses to produce nearest attainable heights without cutting tile. Align joints in wall tile vertically and horizontally except where other patterns are shown or specified. Align joints in floor tile at right angles to each other and straight with walls to conform to patterns selected. Obtain exact locations of expansion joints and accessories before installing tile.

(2) ACCEPTANCE OF SURFACES

Prior to installing any tile the contractor shall inspect sub-floors and wall surfaces which are to receive tile covering; he shall notify the Contracting Officer in writing of any serious defects or condition that will interfere with, or prevent a satisfactory tile installation; he shall not proceed with installation until such defects or conditions have been corrected. The starting of installation work in a room or space shall imply acceptance of the surfaces to receive the tile in that space.

Ceramic Tile, Marble, Slate, Cont'd.

B. INSTALLATION

(1) COMPLIANCE WITH STANDARDS

Except as otherwise indicated on drawings or specified, the installation of all tile shall be in accordance with the applicable General Requirements for Inspection, Preparation, Protection, Workmanship and Application as described in the following adopted and proposed American Standard Specifications:

(a) A108.1-1958 Glazed Ceramic Wall Tile Installed in Portland Cement Mortars.

(b) A108.2-1958 Ceramic Mosaic Tile Installed in Portland Cement Mortars.

(2) SPECIAL REQUIREMENTS

(a) The specific requirements listed below are intended to supplement, clarify and modify the above referenced standard specifications for installation of tile to suit this project. In addition, refer to and follow the above standards for specific requirements concerning delivery and storage of materials; tolerances permitted for acceptable wall and floor surfaces; protection of tile work; temperature for setting; mortar mixes, curing and cleaning.

(b) Unless glazed wall tile has spacer lugs on edges, use string or other approved method to separate tile and provide approximately 1/16 inch wide joints for grouting.

(c) Use white cement for grouting wall tile and white cement for grouting floor tile.

(3) EXTRA TILE

(a) Upon completion of work, the contractor shall deliver extra tile of same size, pattern and colors as used on the job to Contracting Officer for use in future repair and maintenance work. Furnish tile in original boxes, properly marked, in quantities as listed below and in types and colors as directed.

(1) Glazed wall tile 10 square feet.

(2) Unglazed floor tile 10 square feet.

(3) Base 10 lineal feet.

(4) Caps 10 lineal feet.

END OF SECTION 21

SECTION 22

WOOD FLOORING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all wood flooring as shown on the drawings and/or as described herein.

3. WORK INCLUDED

In general, the work to be performed under this Section shall include, but is not necessarily limited to, the following:

A. Wood stage flooring.

B. Wood flooring in orchestra, parquet, dress circle and family circle.

C. Wood flooring in south (saloon) wing.

D. Wood flooring in north (dressing room) wing.

4. MATERIALS

A. FLOORING

Flooring shall be B and B Southern Yellow pine, 25/32" thick and 3-1/4" face width, T & G. It shall have a moisture content of not more than 15%. For the first floor lobby it shall be edge grain; elsewhere it may be mixed edge and flat grain.

B. GRADE MARKING

Each piece of framing lumber and each board shall comply with the American Lumber Standards, SPR 16, and with specific grading requirements of the association recognized as covering the species used and under whose grading rules it is produced. Each piece of framing lumber and each board shall be identified by the grade-mark of a recognized association or independent inspection agency. Such association or independent inspection agency shall be certified by the Board of Review, American Lumber Standards Committee, Washington, D. C., to grade the species.

Wood Flooring, Cont'd.

5. METHODS

A. GENERAL

Concrete subfloors and sleepers must be clean, free of plastering, dirt or other foreign matter and be thoroughly dry before finish flooring is laid. Lay 15 lb. asphalt saturated felt as flooring proceeds. Do not bring finish flooring into building until the plaster is thoroughly dry and the building is ready for same.

B. LAYING FLOORING

Flooring shall be laid with close joints driven up tightly and be blind nailed with 8d cut steel nails into each sleeper. Alternate joints so that there will be at least 2 boards between them. Provide space for expansion at walls and partitions. Sand flooring, hand scrape at edges or wherever surfaces are not accessible by machine. Leave floors clean and dust free and in perfect condition for finishing. After sanding, protect floors until finish has been applied. After finishing has dried, protect walking areas with building paper or polyethylene mats.

END OF SECTION 22

SECTION 23

VINYL TILE

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all vinyl tile work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

(1) GENERAL

The work to be done includes, but is not necessarily limited to, the following:

(a) Provision and installation of vinyl tile on floor of museum and gallery.

(b) Cleaning, waxing and polishing of all work installed under this section.

(c) Heat and ventilation of at least 70° F. shall be maintained in the area receiving the installation, including material being installed therein, for 24 hours prior to, during, and for 24 hours after the installation.

3. MATERIALS

A. VINYL TILE shall be first-quality material, 1/8" thick, 12" x 12" tiles, composed of thermoplastic binder, fillers and pigments. The thermoplastic binder shall consist of a polyvinyl chloride resin or a copolymer resin thereof, thoroughly blended with suitable plasticizers and stabilizers to form a dimensionally stable and resilient flooring. It shall be dense but resilient and highly resistant to abrasion. Homogeneous tile shall not have a supporting back. Tile shall be accurately cut with square edges. Commercial grade tile shall be capable of withstanding heavy furniture loads of 300 lbs. per square inch without exhibiting permanent indentation. It shall be in the price and color range represented by Congoleum Nairn's "Wonderflor" solid vinyl tile or equal.

Vinyl Tile, Cont'd.

B. LINING FELT shall be a product manufactured by, or approved for use by, the manufacturer of the vinyl tile.

C. ADHESIVE - See B, above, and shall also be suitable for use on concrete slab floors below grade.

D. RUBBER BASE shall be top set, 1/8" thick, with molded top set cove, preformed end stops and external corners.

4. METHODS

A. SUBFLOOR

(1) The vinyl tile shall be installed on a subfloor of concrete, which this contractor shall inspect before starting work.

(2) Notify the Contracting Officer of any defects in the subfloor. Do not proceed until such defects have been corrected. Starting of work by this contractor will imply his acceptance of the subfloor.

(3) The subfloor will be delivered to this contractor broom clean, free of all foreign matter and thoroughly dry.

(4) Fill all cracks, expansion joints, etc., in concrete subfloors with a water resistant, non-shrinking, non-crumbling patching compound troweled to the proper level.

B. LAYING

(1) The vinyl tile must be installed in strict accordance with the manufacturer's approved specification, and only by mechanics thoroughly experienced in this work.

(2) The base shall be firmly cemented to the wall with the manufacturer's approved adhesive.

C. SAMPLES

(1) The manufacturer's standard sample selection shall be furnished for the selection of color and pattern by the Contracting Officer. 4 full size tile of each color selected shall be furnished the Contracting Officer for further approval before ordering tile.

Vinyl Tile, Cont'd.

D. GUARANTEE

This contractor shall guarantee that all work executed under this section of the specification will be free from defects in material and workmanship, provided any such defect is brought to the attention of the contractor in writing within one year after completion of the work. Upon such notice, the contractor shall, at his own expense, make the necessary repairs or replacements of the defective work in question. The owner shall, however, be responsible for the removal and replacement of all fixtures and equipment attached to the surface on which the work will be done.

END OF SECTION 23

SECTION 24

VINYL WALL COVERING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all vinyl wall covering work, as shown on the drawings and/or as described herein.

B. WORK INCLUDED

(1) GENERAL

The work to be done includes, but is not necessarily limited to, the following:

(a) Provision and installation of vinyl wall covering on walls of museum and gallery and elsewhere as indicated on the Materials and Finish Schedule.

3. MATERIALS

Material shall be a vinyl coated fabric meeting the following requirements:

Finish weight, 24 oz. per lineal yd., 54 inch width.

Fabric weight, 6 oz. type 2.35 osnaberg.

Gauge, 22 mils.

Fire resistance: conforming to Fed. Spec. CCC-A-00700.

Shrinkage: 0.5%.

Patterns and color to be selected by the contracting officer from a material price range not to exceed 30¢ per square foot.

4. METHODS

A. WALL CONDITIONS

All surfaces shall be clean, dry, smooth, alkaline free and structurally sound. Surfaces shall be adequately tested for dryness to the satisfaction of the Contracting Officer.

Vinyl Wall Covering
24-1

Vinyl Wall Covering, Cont'd.

B. APPLICATION

If pattern requires it, see that uniformity is maintained. Material shall be hung using paper hanging methods and following the specifications of the manufacturer. Apply manufacturer's recommended adhesive to back of material with a six inch stiff nylon bristle brush and use a broad bladed knife to smooth material to wall surface. Use butt method to hang material if pattern permits; otherwise lap material and use seam cutter. Test installation sample for degree of adhesion before proceeding with the work.

C. CLEANING

- (1) All excess adhesive shall be removed with a damp cloth.
- (2) After installation is completed, all debris shall be removed and the premises left in an orderly condition.

D. SAMPLES

The manufacturer's standard pattern book shall be provided for pattern selection. A sample of the selected material large enough to include the pattern, if any, shall be furnished for the approval of the Contracting Officer.

END OF SECTION 24

SECTION 25

PAINTING AND FINISHING

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all painting and finishing work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

The work to be performed under this Section includes, but is not necessarily limited to, the following:

- (1) Paint all exposed surfaces on the interior and exterior of the building as noted on the schedule.
- (2) Furnish all tools, scaffolding, ladders, etc.
- (3) Clean all surfaces of runs, spatters, etc.
- (4) Refer to drawings, schedules, etc., for work to be done.

C. WORK NOT INCLUDED UNDER THIS SECTION

- (1) Finishing of non-ferrous metals except as noted under "Preparation."
- (2) Finishing of materials and surfaces already factory finished.
- (3) Shop or prime coats specified under other sections.

3. MATERIALS

A. APPLICABLE FEDERAL SPECIFICATIONS

(1) All materials used in the work shall be approved by the Contracting Officer and shall conform to the following Federal Specifications:

Linseed Oil, raw-----	TT-L-215a
Linseed Oil, boiled-----	TT-L-190a
Turpentine (for paint) Type 1-----	TT-T-801a
White Lead; basic carbonate, Type B or C-----	TT-W-251e
Thinner, Paint, Volatile Mineral Spirits-----	TT-T-291a(1)
Red Lead, Dry and Paste in Oil-----	TT-R-191b(1)
Paint; Cement-water, powder, white & tints-----	TT-P-21(2)
Paint, latex base, interior-----	TT-P-29b
Paint, alkyd for interior use-----	TT-P-30b
Paint, exterior type-----	TT-P-102a
Sealer, penetrating-----	TT-S-171

Painting and Finishing, Cont'd.

(2) Products shall be accompanied by evidence of their compliance with the appropriate Federal Specification. A list of such products which the contractor proposed to use in the work shall be submitted for the approval of the Contracting Officer. No product without the approval will be allowed on the job.

B. COLORS, SAMPLES AND SELECTION

(1) The contractor shall submit color and material samples of all paint work to the Contracting Officer for approval prior to ordering. Samples shall be made up of the same number of coats specified in each case.

(2) Prepare for approval three 12" x 12" panels of each color selected, in advance of painting work, with materials specified. Painting undertaken before Contracting Officer's approval of sample panels will be subject to rejection. Samples shall be on metal for paint on metal, on wall board for paint on plaster, on concrete masonry unit for masonry. The Contracting Officer may request sample paint panels applied to a wall, door or single units of any other parts of the work.

(3) Colors will be selected by the Contracting Officer; he will furnish the Contractor a schedule of color chips and locations for various colors. Selected color chips may or may not be ready mixed colors; furnish all colors, whether ready-mixed or intermixed. The Contracting Officer will not be restricted in number of colors selected. Where paint is mixed to color selection, the Contracting Officer will make final decision on accuracy.

4. PREPARATION

A. WOOD

Sandpaper to smooth and even surface and then dust off. After priming or stain coat has been applied, thoroughly fill nail and other holes, and cracks with plastic wood or putty; for natural finished work, putty shall be colored to match the wood.

B. STEEL AND IRON

Remove grease, rust scale and dust and touch up any chipped or abraded places on items that have been shop coated. Where steel and iron have a heavy coating of scale, it shall be removed by wire brushing or sand blasting as necessary to produce a satisfactory surface for painting.

C. GALVANIZED METAL

Thoroughly clean with gasoline and coat with a solution consisting of 4 ounces of copper sulphate in one gallon of water. Permit coating to remain on surface at least 12 hours, and dust off with stiff brushes.

D. COPPER

Clean and give one brush coat of linseed oil.

Painting and Finishing, Cont'd.

E. PLASTER

(1) Fill all holes and cracks. Do not use sandpaper on plaster surfaces to be painted. Before painting any plaster, surfaces shall first be tested with a moisture testing device especially designed for this purpose. No paint or sealer shall be applied on plaster when the moisture content exceeds 8% as determined by the testing device. Test sufficient areas in each space, and as often as necessary, to determine the proper moisture content for painting.

(2) Plaster surfaces less than 30 days old, which are to receive oil paint shall first be washed with a solution composed of 4 pounds of zinc sulphate to each gallon of water and allowed to dry thoroughly before primer or sealer is applied; add phenolphthalein or washing blue in solution to prevent skipping areas.

F. GENERAL

(1) Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection of such items. Upon completion of each space, replace above items. Remove doors if necessary to paint bottom edge. Use only skilled mechanics for removing and connecting above items. Where painted signs or numerals are applied on glass doors, the glass shall be thoroughly cleaned with soap and water prior to painting.

(2) Before beginning work this contractor shall have assigned to him a room or space in which to store his materials and mix paints and finishes. This room shall be well ventilated and be locked. Surfaces shall be protected from splatter and the room or space thoroughly and completely cleaned after completion of the work.

5. FORMULAS

A. GENERAL

The numbered formulas which follow refer to symbols on the Material and Finish Schedules.

B. FORMULA (1) FLAT FINISH ON MASONRY CONCRETE AND PORTLAND CEMENT PLASTER.

- (1) First Coat: Cement base primer.
- (2) Second Coat: Latex paint, flat.

C. FORMULA (2) SEMI GLOSS PAINT ON WOOD, INTERIOR

- (1) First Coat: Enamel undercoat.
- (2) Second Coat: Half undercoat; half semigloss enamel.
- (3) Third Coat: Semi -gloss enamel.

Painting and Finishing, Cont'd.

D. FORMULA (3): SEMI GLOSS PAINT ON GYPSUM PLASTER, INTERIOR

- (1) First Coat: Alkyd type primer-sealer.
- (2) Second Coat: Semi gloss alkyd type interior finish.
- (3) Third Coat: Semi gloss alkyd type interior finish.

E. FORMULA (4): ENAMEL ON GYPSUM PLASTER, INTERIOR

- (1) First Coat: Primer sealer - alkyd type.
- (2) Second Coat: Undercoater - alkyd type.
- (3) Third Coat: Half undercoater, half full gloss.
- (4) Fourth Coat: Full gloss.

F. FORMULA (5): WOOD FLOOR FINISH

- (1) First Coat: Stain, color to be selected.
- (2) Second Coat: Penetrating sealer.
- (3) Third Coat: Penetrating sealer.
- (4) Fourth Coat: Paste wax, buffed.

G. FORMULA (6): FLAT PAINT ON GYPSUM PLASTER, INTERIOR

- (1) First Coat: Alkyd type primer - sealer.
- (2) Second Coat: Flat type alkyd.
- (3) Third Coat: Flat type alkyd.

H. FORMULA (7): FLAT PAINT ON WOOD

- (1) First Coat: Flat type alkyd.
- (2) Second Coat: Flat type alkyd.
- (3) Third Coat: Flat type alkyd.

I. EXPOSED UNCOVERED PIPES, DUCTS, SUPPORTS, ETC.

- (1) First Coat: Heat resistant paint.
- (2) Second Coat: Heat resistant paint.

J. EXTERIOR PAINT, WOOD

- (1) First Coat: Exterior primer.
- (2) Second Coat: Exterior paint.
- (3) Third Coat: Exterior paint.

K. EXTERIOR PAINT, METAL

- (1) First Coat: Rust inhibiting primer (where not already primed)
- (2) Second Coat: Rust inhibiting finish.
- (3) Third Coat: Rust inhibiting finish.

Painting and Finishing, Cont'd.

6. WORKMANSHIP

A. GENERAL

- (1) All work shall be done under favorable weather conditions and in a manner acceptable to the Contracting Officer.
- (2) At least 24 hours shall elapse between coats.
- (3) Properly protect all floors and adjacent work, furniture, etc.
- (4) Take all necessary precautions against fire.
- (5) Workmanship of the very best; all materials spread and smoothly flowed on without runs, sags or brush marks.
- (6) Employ only skilled mechanics.
- (7) All surfaces to be painted or finished shall be cleaned free of loose dirt and dust before painting and finishing are started.
- (8) Each coat of paint or enamel shall be slightly darker than the preceding coat unless otherwise directed.
- (9) All coats thoroughly dry before applying succeeding coats.
- (10) All work where a coat of material has been applied must be inspected and approved by the Contracting Officer before application of succeeding specified coats; otherwise no credit for the coat applied will be given and the Contractor hereby assumes responsibility to recoat the work in question.
- (11) Tops, bottoms and edges of door, shelves, drawers shall be finished same as balance of doors after fitting by carpenter. Paint all edges of lumber core doors to match door before finishing exterior surface.
- (12) Inside of closed cabinets, closets and drawers shall be finished.
- (13) Paint behind all cabinets, fixtures and equipment not flat against the wall at time paint is applied.
- (14) Paint all cabinets and millwork without factory finish.
- (15) Borderline of two different colors shall be straight and even.

7. CALKING

A. A thiokol type polysulphide compound, 2 part mixture; H. B. Fred Kuhls' "Elasticseal" or equal.

B. All steel door bucks in unplastered walls and all exterior door and window frames shall be made weather-tight with an approved calking compound. The calking shall be full and flush, applied from both sides and shall be applied according to the manufacturer's recommendations.

C. Any joints usually calked but not specifically mentioned either in the contract drawings or these specifications shall be calked.

D. Where required by job conditions, spaces to be calked shall first be calked with picked oakum, free of staining materials, before finish calking is applied.

Painting and Finishing, Cont'd.

8. PROTECTION

A. Drop cloths shall be used to protect floors and other finish work from damage during the execution of the work under this section. Work not to be finished under this section shall be protected against spatter, stain, or soiling. Each type of finished surface shall be protected against defacement by other or subsequent finish.

B. Remove or protect hardware, hardware accessories, plates, lighting fixtures and similar items in place prior to painting. Have proper workmen disconnect and move them to allow painting surfaces; replace upon completion of work.

C. Any damage to other work shall be corrected to restore the materials to the satisfaction of the Contracting Officer.

9. TOUCHING UP

At the completion of all other work specified, all work shall be touched up and restored where damaged or defaced and the entire work left free from blemishes.

10. CLEANING

All cloths, waste and paper that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work all staging, scaffolding and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil or stains on adjacent surfaces shall be removed and the entire job left clean and acceptable.

END OF SECTION 25

SECTION 26

HARDWARE ALLOWANCE

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all finish hardware as shown on the drawings and/or as described herein.

3. HARDWARE ALLOWANCE

A. ALLOWANCE

Include in the contract price the amount of \$15,000.00 (Fifteen Thousand Dollars) to cover selection by the Contracting Officer of finishing hardware. This allowance is the net amount, including sales tax, if any, available for purchase by the Contractor, and is exclusive of profit, overhead and handling charges.

B. IF COSTS ARE EXCEEDED

If costs are exceeded in the actual purchase of the selected items, the government will pay the excess costs. If the costs of the selections are less than the allowance, the difference will be deducted from the stipulated sum. No additional overhead, profit, etc., will be paid for; provision for any such costs shall be included in the bid price.

C. TEMPLATES, ETC.

All templates and other instructions for installing the hardware shall be furnished.

D. MATERIALS FURNISHED UNDER THIS SECTION BUT INSTALLED BY OTHERS

All finishing hardware shall be installed under "Carpentry and Millwork", which see.

E. HARDWARE SPECIFIED ELSEWHERE

Hardware normally furnished with other items shall be provided as called for. Toilet room accessories are not included in the hardware allowance but are specified elsewhere.

Hardware Allowance, Cont'd.

F. RECEIVING, ETC.

Receiving, checking, storing, distribution and safeguarding of hardware purchased under this allowance shall be included.

END OF SECTION 26

Hardware Allowance
26-2

SECTION 27

TOILET ROOM ACCESSORIES

1. GENERAL

The applicable provisions of the "General Conditions" shall govern the work under this Section.

2. SCOPE OF WORK

A. GENERAL

The work required under this Section includes the provision and installation of all items, articles, materials and operations, including all labor, materials and equipment necessary for, and incidental to, the completion of all toilet room accessories, work as shown on the drawings and/or as described herein.

B. WORK INCLUDED

The work includes the furnishing and installing of all toilet room accessories except as noted below.

C. WORK NOT INCLUDED UNDER THIS SECTION

Hardware previously specified under another section for metal stall compartments is not included.

D. MATERIALS

(1) GENERAL

Accessories shall conform to Fed. Spec. WW-P-541b unless otherwise modified herein, and shall be the numbers referred to in the following schedule.

(a) Each Toilet Stall: 1 toilet paper holder, type 433.

(b) Each Toilet Room: 1 Waste receptacle, 16-inch diameter at top by 32 inches high, constructed of expanded metal with solid metal base and heavy wire ring at the top - enameled. 2 coat hooks, type 419. 3 cast brass chrome plated robe hooks.

(c) Each Lavatory: 1 Mirror, 18" x 24" of 1/4" polished plate glass. Silvering hermetically sealed by electro-copper backs, with 18 gauge angle chromium plated brass frame 3/8" wide x 5/8", and 24 gauge steel back covering plate zinc-coated. Mirrors to be anchored to walls by means of concealed hangers not readily removable. 1 metal shelf, type 426M.

(d) Each Service Sink: 1 metal shelf, type 426M. 1 soap dish, type 407; 2 coat hooks, type 419.

Toilet Room Accessories, Cont'd.

E. INSTALLATION

(1) Accessories shall be located as indicated on drawings or as directed by the Contracting Officer and in accordance with the specifications.

(2) Where 6 x 6 inch accessories are set in 4-1/4 x 4-1/4 inch tile wainscot, locate accessory in center of a four tile square and use special 'L' or mitered tile shapes to fill in around accessory.

(3) Where accessories are required to be set in plaster of paris, they shall be thoroughly bedded and allowed to set firmly. Where accessories are set with screws, provide the necessary grounds, inserts, screws and bolts as required to provide suitable anchorage. Use brass screws or bolts for securing concealed members and use oval head chromium plated screws and bolts where exposed.

(4) Unless otherwise indicated on drawings the approximate height from floor to center of accessories shall be as follows:

Individual mirrors over lavatories - 64 inches.
Soap holders over lavatories - 40 to 44 inches.
Toilet paper holders - 28 to 30 inches.
Robe hooks - 66 inches.

F. SAMPLES

(1) Submit samples or cuts whichever is requested of each type and size of accessory to Contracting Officer for approval. Approved samples may be installed in the work.

SECTION 28

PLUMBING

28-1 GENERAL: The applicable provisions of the "General Conditions" shall govern the work under this Section.

28-2 SCOPE OF WORK:

a. General: The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of all plumbing work as shown on the drawings and/or as described herein.

b. Specifications: Required materials not covered by the detailed specifications shall meet the requirements of the applicable specifications listed hereinbefore, and shall be of the required class, grade, and type. Shop tests of pipe, valves, and fittings, required by Federal Specifications to be conducted in the presence of a Government Inspector are waived.

c. Utilities: Water and drainage piping shall be extended 5 feet outside the building where it shall be capped or plugged. Utilities shall be installed below the frostline. If the trenches are closed or the pipes are otherwise covered before being connected to the street mains, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means.

d. Cross connections and interconnections: No plumbing fixture, device, or pipe shall be installed that will provide a cross connection or interconnection between a distributing supply for drinking or domestic purposes and a polluted supply, such as a drainage system or a soil or waste pipe, in such a manner as to make possible the backflow of sewage, polluted water, or waste into the water supply system.

e. Drawings: Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions, at no additional cost to the Government.

f. Cutting and repairing: The work shall be carefully laid out in advance, and no excessive cutting of construction will be permitted. Damage to buildings, piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Government.

g. Protection to fixtures, materials and equipment: Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. Upon completion of all work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

28-3. APPROVAL OF MATERIALS, FIXTURES AND EQUIPMENT: As soon as practicable and within 30 days after receipt of notice to proceed and before any materials, fixtures, or equipment are purchased, the Contractor shall submit for approval by the Contracting Officer a complete schedule, in triplicate, of materials, fixtures, and equipment to be incorporated in the work, together with the names and addresses of the manufacturers and their catalog item numbers and trade names. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of the materials, fixtures, and equipment under this provision shall not be construed as authorizing any deviations from the specifications unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided the contractor clearly states such differences and provided all essential requirements of the specification are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

28-4 EXCAVATING, TRENCHING, AND BACKFILLING:

a. Excavating and trenching: Trenches for all underground pipelines shall be excavated to the required depths. Bottoms of trenches

shall be tamped hard and graded to secure the required fall. Bell holes shall be excavated so that the entire length of the pipe will rest on solid ground. Rock, where encountered, shall be excavated 6 inches below bottom of pipe; before pipe is laid, the space between the underside of the pipe and the rock surface shall be filled with gravel. Sewer and water pipes shall be laid in separate trenches, except where otherwise noted on the drawings.

b. Backfilling: After pipelines have been tested, inspected, and approved by the Contracting Officer, and prior to backfilling, the forms shall be removed and the excavation cleaned of trash and debris. Material for backfill shall consist of the excavation, or borrow of sand or gravel, and shall be free of trash, lumber, or other debris. Backfill shall be placed in horizontal layers not exceeding 9 inches in thickness and shall be properly moistened. Each layer shall be compacted to a density that will prevent excessive settlement or shrinkage. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage.

28.5 MATERIALS AND EQUIPMENT: The following materials and equipment shall conform to the respective specifications and other requirements specified below:

a. Caulking lead: Federal Specification QQ-L-156, type I

b. Fittings:

(1) Cast Iron soil pipe and fittings: Federal Specification WW-P-401, (class SV and class XH).

(2) Cast iron threaded fittings: Federal Specification WW-P-501, class A or B

(3) Drainage fittings: Federal Specification WW-P-491.

(4) Fittings for copper tubing: Cast or wrought bronze or wrought copper, soldered joint or brazed joint or flared type, as herein-after specified, completely fabricated at the factory. Bronze fittings shall contain not less than 85 percent copper and shall conform to the applicable requirements of Federal Specification WW-P-460. Fittings on type L tubing shall be of cast bronze, wrought bronze, or wrought copper and shall be of the soldered joint type. Fittings on type K tubing shall be of cast bronze and shall be of the flared joint type.

(5) Malleable iron fittings: Federal Specification WW-P-521, type II.

(6) Nipples: Federal Specification WW-N-351, same material as pipe system where used.

(7) Unions: Federal Specification WW-U-516, WW-U-531, or

WW-F-406, as applicable.

c. Pipe and tubing:

(1) Cast iron soil pipe: Federal Specification WW-P-401, Class Sv, Class XH.

(2) Copper tubing: Federal Specification WW-T-799, type K or L as hereinafter specified.

(3) Steel pipe: Federal Specification WW-P-406, class 2.

(4) Wrought iron pipe: Federal Specification WW-P-441, class A, zinc coated.

d. Plumbing fixtures and drains: Federal Specification WW-P-541b, except as specified otherwise.

e. Plumbing fixture setting compound: Federal Specification HH-C-536.

f. Plumbing fixture setting gaskets: Federal Specification HH-G-116, type best suited for the work.

g. Sheet lead: Federal Specification QQ-L-201, grade B

h. Twisted jute packing: Federal Specification HH-P-11y. Type I, dry, shall be used for caulking type II cast iron water pipe; type II, tarred, for caulking cast iron soil pipe, or clay or concrete pipe when joints are sealed with lead or concrete; and type III, oiled, for caulking vitreous glazed pipe when joints are sealed with bituminous caulking compounds.

i. Valves:

(1) Angle, check and globe valves: Federal Specification WW-V-51, class A or B, type as suitable for the application, and where used in connection with copper tubing, modified therefor.

(2) Gate valves: Federal Specification WW-V-54, type I, II, or III, class A or B, or Federal Specification WW-V-58, type I or II, class A or B, as applicable; and where used in connection with copper tubing, modified therefor.

28-6. SOIL, WASTE, DRAIN AND VENT PIPING: Underground soil, waste, and drain pipe and fittings shall be coated or uncoated hub-and-spigot cast iron. Above ground soil, waste, drain, and vent piping, including interior downspouts, shall be galvanized steel, galvanized wrought iron, or hub-and-spigot cast iron pipe. Fittings for above ground piping shall be drainage pattern for all threaded drain and waste piping, and cast

iron soil fittings for hub and spigot pipe. Fittings on all dry vents shall be malleable iron or cast iron.

a. Installation:

(1) Drainage and vent pipes: Horizontal soil and waste pipes shall have a grade of 1/4 inch per foot where possible, and never less than 1/8 inch per foot. All main vertical soil and waste stacks shall be extended full size to the roofline and above as vents, except where otherwise specifically indicated. Where practicable, two or more vent pipes shall be connected and extended as one pipe through the roof. Vent pipes in roof spaces shall be run as close as possible to the underside of the roof without forming traps in pipes, using fittings as required. Vertical vent pipes may be connected into one main vent riser above vented fixtures. Where a circuit vent pipe from any fixture or line of fixture is connected to a vent line serving other fixtures, the connection shall be at least 4 feet above the floor on which the fixtures are located to prevent the use of any vent line as a waste. Horizontal waste lines receiving the discharge from two or more fixtures shall be provided with end vents, unless separate venting of fixture is noted. Branch connections to exterior downspouts shall terminate 3 inches above finished grade. Cast iron hub and spigot pipes inside buildings shall be extended 6 inches above the lowest floor where the floor is supported on the ground, and 6 inches aboveground where the lowest floor is self supporting.

(2) Fittings: Changes in pipe size on soil, waste, and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45 degree wyes, long or short sweep 1/4 bends, 1/6, or 1/8, or 1/16 bends, or by a combination of those or equivalent fittings. Single and double sanitary tees and 1/4 bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweeps not less than 3 inches in diameter may be used where the change in direction of flow is either from horizontal to vertical or from vertical to horizontal, and may be used for making necessary offsets between the ceiling and the next floor above.

(3) Union connections: Slip joints will be permitted only in trap seals or on the inlet side of the traps. Tucker or hub drainage fittings shall be used to make union connections wherever practicable. Use of long screws and bushings is prohibited.

b. Joints:

(1) Cast Iron pipe: Joints in hub and spigot cast iron soil, waste, and vent pipes, or between cast iron soil, waste, and vent pipes and threaded pipe, or caulking ferrules, shall be firmly packed with oakum or hemp and caulked with lead at least 1 inch deep.

(2) Threaded pipe: Threaded joints shall have American-National taper screw threads conforming to Federal Specification GGG-P-351, with graphite and oil compound applied to the male thread. Connections between threaded pipe and soil pipe shall be similar, and the threaded pipe shall have a ring or half coupling screwed on to form a spigot end.

28-7. CLEANOUT PLUGS AND TEST TEES: Cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast iron hub and spigot pipe shall consist of a long sweep 1/4 bend or one or two 1/8 bends extended to the place indicated on the drawings, or, if not indicated to an easily accessible place. An extra-heavy cast brass ferrule with countersunk trap screw cover shall be caulked into the hub of the fitting and shall be flush with the floor. Where cleanouts in connection with threaded pipe are indicated and are accessible, they shall be cast iron drainage, T-pattern, 90 - degree branch fittings with extra heavy brass screw plugs of the same size as the pipe up to and including 4 inches. Test tees with cast brass cleanout plug shall be installed at the foot of all soil, waste, drain, and vent stacks that extend vertically through the roof, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building.

28-8 FLASHINGS: Vent pipes and roof drains shall be flashed and made watertight at the roof with not lighter than 4 pound sheet lead. Flashings shall be extended up the vent pipes a minimum of 6 inches where threaded standard cast iron or malleable iron recess roof couplings shall be installed to form counterflashing or rain guards for pipe. Flashings in connection with cast iron pipe vents shall be turned down into the pipes or hubs. Flashing shields shall extend not less than 8 inches from the vent pipes and roof drains in all directions. Flashing installed in connection with roof drains shall be clamped or soldered watertight.

28-9. TRAPS: Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap. Traps are specified to be supplied with the fixtures, except traps for grease interceptors. Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on bell and spigot pipe shall be cast iron. Traps installed on threaded pipe shall be recess drainage pattern.

28-10. DRAINS AND BACKWATER VALVES: Floor drains shall be made of high grade, strong, tough, even grained metals. Castings shall be free from blowholes, porosity, hard spots, excessive shrinkage, cracks, or other injurious defects; shall be smooth and well cleaned both inside and outside; and shall have all fins and roughness removed. Castings shall not be repaired, plugged, brazed, or burned in. The wall thickness of iron castings shall not be less than 1/4 inch. Chromium plating shall conform to Federal Specification WW-P-541. The size of the drains shall be determined by the branch sizes indicated on the drawings. Drains installed in connection

with waterproofed floors shall be equipped with clamping devices. When drains are installed in connection with membrane waterproofing, a piece of 6 pound sheet lead, 2 feet square, shall be mopped between the layers in an approved manner. When drains are installed with metal waterproofing, the metal shall be clamped, caulked, or soldered watertight to the drain.

a. Drains:

(1) Boiler room drains shall be combined drain and trap equipped with hinged grate, removable bucket, and threaded brass cleanout with brass backwater valve. The removable sediment bucket shall have rounded corners to eliminate fouling, and shall be equipped with handgrips. Drain and trap shall be of double wall construction leaving no internal or concealed wall partitions and shall have a minimum water seal of 4 inches. The grate area shall be not less than 100 square inches.

b. Backwater valves may be separate from floor drains or may be a combination floor drain, P-trap, and backwater valve, as shown on the drawings. Valves shall have cast iron bodies with cleanouts of sufficient size to permit removal of interior parts. Valves shall be of the flap type, hinged or pivoted, with revolving discs. Hinge pivots, discs, and seats shall be of nonferrous metal. Normal position of the discs shall be slightly open. Cleanouts shall be extended to finished floor and fitted with threaded countersunk plugs. Wherever cleanouts extend through membrane waterproofing, membrane clamping devices shall be provided.

28-11 WATER PIPE, FITTINGS AND CONNECTIONS:

a. Copper tubing and fittings shall be used for domestic water inside the building. Aboveground tubing shall be type L hard drawn. Underground tubing less than 3 inches in size shall be type K annealed. Fittings shall be cast brass or wrought copper suitable for sweat connections for use with hard drawn tubing, and flared pattern for annealed tubing.

b. Installation: A gate valve and drain on the service line shall be installed inside the building. Service piping shall be installed below the frostline. The piping shall be extended to all fixtures, outlets, and equipment from the gate valve. The cold-water system shall be installed with a fall toward the shutoff valve. Plugged or capped fittings shall be provided for draining low points of the piping system except where valved outlets are shown on drawings. Outlets shall be capped or plugged as indicated on the drawings, and left ready for future connections. Bends formed with hydraulic-operated pipe benders are acceptable. Connections between copper tubing and ferrous materials shall be made with insulated fittings to prevent electrolytic action.

(1) Mains, branches, and runouts: Piping shall be installed as indicated on the drawings. Pipe shall be cut accurately to measurements established at the building by the contractor, and shall be worked

into place without springing or forcing. Care shall be taken not to weaken structural portions of the building. Aboveground piping shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branch pipes from service lines may be taken from top, bottom, or side of main using such crossover fittings as may be required by structural or installation conditions. Service pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than $\frac{1}{2}$ inch between finished covering and other work and not less than $\frac{1}{2}$ inch between finished covering on the different services. No water pipe shall be buried in floors unless specifically indicated on drawings or approved. Changes in pipe sizes shall be made with reducing fittings. Use of long screws and bushings will not be permitted.

(2) Pipe drains indicated on the drawings shall consist of $\frac{1}{2}$ inch globe valves with renewable discs and $\frac{3}{4}$ inch hose nipples. Additional drains shall be installed at low points on the hot water piping, and all piping shall grade down to the drains.

(3) Expansion and contraction of piping: Allowance for expansion and contraction shall be made throughout. Horizontal runs over 50 feet long shall be anchored to the wall or to the supporting construction about midway on the run to force the expansion movement to divide equally, half at each end. Sufficient flexibility shall be provided on all branch runouts from mains to risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that the piping will spring enough to allow for expansion without straining.

(4) Air chambers shall be provided on all hot and cold supplies near each faucet, control valve, or flush valve, except lawn faucets, wall hydrants, and hose bibs. If not definitely shown on drawings, air chambers shall consist of a 12 inch length of pipe of same diameter as the branch supply, capped.

c. Joints:

(1) Flared or sweated tubing shall be cut square, and burrs shall be removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Installation shall be made by competent workmen in accordance with manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for soldered fittings shall be made with a noncorrosive paste flux and solid string or wire solder composed of 40 percent tin and 60 percent lead. Cored solder will not be permitted. Joints for flared type fittings shall be of the compression pattern. Joints in copper pipe and tubing 2- $\frac{1}{2}$ inches in diameter and larger shall be made with heat applied uniformly around the entire circumference of the pipe and fittings by a multiflame circular torch.

d. Sterilization: The entire water distribution system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine conforming to Federal Specification BB-C-120 or calcium hypochlorite or chlorinated lime conforming to Federal Specification O-C-114, and shall be introduced into the system in an approved manner. The sterilizing solution shall be allowed to remain in the system for 8 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 part per million, unless otherwise directed.

28-12. VALVES shall be provided on all supplies to fixtures as specified under TYPES OF FIXTURES AND FIXTURE TRIMMINGS. Valves indicated in connection with runouts, risers, branches, and mains shall be in accordance with this specification. No valve shall be installed in any line with its stem below the horizontal. All valves shall be gate valves unless otherwise specified or indicated. Valves up to and including 3 inches shall be all brass with threaded ends for ferrous pipe and sweat-type connections for tubing, and shall have wrought bodies.

28-13 UNIONS on ferrous pipe 2 inches in diameter and smaller shall be malleable iron in accordance with Federal Specification WW-U-531, type B, zinc coated. Unions on copper tubing 2 inches in diameter and smaller shall be brass, composition B, conforming to Federal Specification W-U-516. Unions on water piping $2\frac{1}{2}$ inches in diameter and larger shall be flange pattern conforming to Federal Specification WW-F-406, and shall be brass or bronze 150 pound class on copper tubing and 125 pound class on ferrous pipe. Gaskets for flanged unions shall be of the best quality fiber, plastic, or leather. Unions shall be concealed in walls, ceilings, or partitions.

28-14 HOSE FAUCETS shall be brass with $\frac{1}{2}$ inch male inlet threads, hexagon shoulder, and $\frac{3}{4}$ inch hose connection, Federal Specification WW-P-541, type 65.

28-15. WALL HYDRANTS shall conform to Federal Specification WW-P-541, type 205

28-16. DRINKING WATER DISPENSERS shall conform to Federal Specification OO-C-566, and shall be of the type and size indicated on drawings.

28-17. ELECTRIC WATER HEATERS shall conform to Federal Specifications W-H-196, type II. Each tank shall be glass lined and equipped with a magnesium anode. The size, capacity, voltage, and combined wattage of heating elements shall be not less than indicated. Wiring shall be so arranged that, when required by thermostats, both heating elements will operate simultaneously.

28-18. RELIEF VALVES: Temperature and pressure relief valves

shall conform to Military Specification MIL-V-13612. Type I valves shall be installed when the heat input is less than 100,000 B.t.u. per hour, and when the storage is less than 120 gallons. If either or both of the specified conditions are reached or exceeded, type II and type III valves shall be installed. Vacuum relief valves shall be installed on each cold water branch connection to electric water heaters at an elevation above the top of the heater. The vacuum relief shall be designed to prevent damage to the water heaters in the event of vacuum conditions caused by a reverse flow of water from within the equipment.

28-19. INSULATION: After tests have been completed and surfaces cleaned, insulation shall be installed on all aboveground water pipes, Insulation shall be installed on pipes in furred spaces, and wall chases. Insulation shall not be installed on chromium plated pipes.

a. Insulation for pipes, valves, and fittings: Where fixture supplies drop from overhead, the insulation shall stop 6 feet above the floor. The end of the insulation shall be fitted with a metal protector supported by a ceiling plate secured by means of a setscrew. Where pipes are located in wall chases and space does not permit installation of sectional insulation, the insulation may be omitted, provided the chases are packed with mineral or rock wool, magnesia, or asbestos. Insulation shall be continuous and shall extend full thickness through walls and floors except floors laid on ground, and sleeve sizes shall be determined accordingly. Sizing and finish painting shall conform to SECTION: PAINTING, GENERAL.

(1) All pipe insulation except chilled water pipe insulation shall conform to Federal Specification HH-I-562, type II, class I, or Federal Specification HH-I-552, type I, class A, except that vapor barrier jackets shall be provided and installed as specified above.

(2) Insulation on valves and fittings: All valves and fittings shall be insulated with premolded, prefabricated segments of pipe insulation of the same material and thickness as the adjoining pipe insulation.

(3) Vapor barrier jackets shall be installed over all insulation, including valves and fittings. The jackets shall consist of paper and aluminum foil laminated. Longitudinal joints shall lap not less than 1½ inches, and joint ends shall have a 4 inch sealing strip. All joints shall be sealed with an adhesive. Moisture seals shall be provided to prevent water from condensing as a result of open areas. Insulation on flanges, valves, and fittings shall be vapor sealed by applying glass cloth tape that overlaps the adjoining covering and sealing with two brush coats of vapor barrier adhesive. The ends of insulation, breaks at hangers, and punctures shall be moisture sealed with a noncombustible mastic. Jackets, adhesive, and mastic shall be noncombustible. Stapling will not be permitted.

28-20. PIPE SLEEVES, HANGERS, AND FIXTURE SUPPORTS shall be furnished and set, and the contractor shall be responsible for their proper and permanent location.

a. Pipe sleeves shall be installed for pipes passing through footings, floors, and walls. Clearance between sleeves and pipe covering and/or pipes shall be approximately 1/4 inch. Construction shall not be cut except where approved by the Contracting Officer. Where cutting of construction is permitted, the construction shall be repaired to match its original condition. Sleeves located in exterior walls and floors on and below grade shall be sealed to make the space between pipe and sleeve watertight with a sealing compound of plastic bituminous cement blended with asbestos fiber. Sleeves shall not be installed in structural members except where indicated or where the contractor has received prior approval of the Contracting Officer. Sleeves are not required for hydrants.

(1) Sheet metal or fiber sleeves: Sleeves of galvanized sheet steel having a nominal weight of not less than 0.906 pound per square foot (No. 26 galvanized sheet gauge) or fiber sleeves not less than 1/4 inch thick shall be installed where pipes pass through floors on and above grade, except as specified hereinafter for toilet rooms and shall be installed in interior walls and partitions.

(2) Steel iron pipe size pipe sleeves shall be installed for pipes that will pass through exterior walls and floors in toilet rooms. Sleeves that pass through floors shall extend 1 to 2 inches above the floor. The space between sleeve and pipe and/or pipe covering shall be sealed with plastic bituminous cement blended with asbestos fiber.

(3) Flashing sleeves shall be installed where pipes pass through waterproofing membrane. The sleeves shall be provided with an integral flashing flange or a clamping device to which a 6 pound lead flashing shield shall be clamped or soldered. The shield shall extend 8 inches from the pipe and shall be thoroughly mopped into the membrane. The space between the sleeve and pipe shall be made watertight by inserting an oakum gasket, filling the remaining space with lead, and thoroughly caulking.

b. Pipe hangers, inserts, and supports: Hangers shall conform to Federal Specification WW-H-171. Inserts shall be types 18 and 19, and shall be installed before the concrete is poured. Beam clamps shall be types 20, 21, 28, 29, 30 and 31. Hangers and supports shall be installed at dimensions not exceeding the maximum limits, and at intervals to keep the pipe in alignment and to carry the weight of the pipe and contents.

(1) Horizontal piping: Hangers and supports shall be installed as specified hereinafter, and at locations not more than 3 feet from the end of each runout. A hanger shall be installed not over 1 foot from each change in direction of piping. Hangers and turnbuckles shall be types 1, 9, 11, 12 and 13. Type 6 hanger with adjustable swivel nut may be used to support pipes from toilet rooms to main stacks when space does not permit the use of turnbuckles. Brackets for support of piping at walls shall conform to type 35. In lieu of separate hangers, the contractor may submit for approval by the Contracting Officer a detail drawing of trapeze

hangers with turnbuckles on rods and a solid or split ring clamp for each pipe which he proposes to furnish. Rings shall have a diameter large enough to include the covering for chilled water piping, and a type 41 protective saddle shall be installed with each hanger.

(a) Cast Iron Soil pipe shall be supported at not more than 5 foot intervals, and supports shall be located near each hub.

(b) Threaded pipe shall be supported at 10 feet intervals.

(c) Copper tubing shall be supported at not more than 6 foot intervals for tubing up to 1½ inches in size and 10 foot intervals for tubing 2 inches and larger. Hangers for copper tubing shall have proper size rings to suit outside diameter of tubing.

(d) Underground piping shall be laid on a firm bed for its entire length, except where support is otherwise provided.

(2) Vertical piping: Supports shall be spaced as specified hereinafter, and at locations not more than 8 feet from end of riser. Pipe clamps shall be type 8.

(a) Cast iron and threaded pipe shall be supported at each floor and at intervals of not more than 20 feet.

(b) Copper tubing shall be supported at each floor, and between floors by stays or braces to prevent rattle and vibration.

c. Supports and fastenings for fixtures and equipment: Fixtures and equipment shall be supported and fastened in a satisfactory manner. Where secured to concrete or brickwork walls, fixtures and equipment shall be fastened with brass bolts or machine screws in lead or corrosion resisting metal, sleeve type anchorage units or with brass expansion bolts. Expansion bolts shall be 1/4 inch brass bolts with 20 threads to the inch and of sufficient length to extend at least 3 inches into solid concrete or brickwork, and shall be fitted with loose tubing or sleeves of proper length to bring expansion sleeves into the solid concrete or brick wall. Wood screws, where used, shall go into solid wood, such as wood inserts, floor joists, studs, or solid pieces set between studs. Through bolts shall be provided with plates or washers at back, set so that the heads, nuts, and washers will be concealed. Exposed heads of bolts and nuts shall be hexagonal with rounded tops finished and chromium plated; exposed ends of bolts shall be concealed by chromium plated hexagonal nuts. Exposed nuts and heads of screws shall be provided with chromium plated brass washers.

28-21. FLOOR, WALL, AND CEILING PLATES: Exposed insulated and uninsulated pipes through floors, finished walls, or finished ceilings shall be fitted with chromium plated or enameled cast iron or steel plates.

Plates shall be large enough to completely close the hole around the pipes and shall be square, octagonal, or round, with the least dimension not less than 1 1/2 inches larger than the diameter of the pipe. Plates shall be secured in an approved manner.

28-22 ELECTRICAL WORK: Controls, and switching and protective devices required for the proper operation of the equipment shall be furnished under this section of the specifications and shall conform to SECTION: ELECTRICAL WORK, INTERIOR. Final connections to electrical equipment and the installation and connections to all related control and protective equipment, shall be accomplished as a part of the electrical work under SECTION: ELECTRICAL WORK, INTERIOR. A complete electrical connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical control device shall be submitted to the Contracting Officer for approval.

28-23 PAINTING. Exterior surfaces of piping to be installed in or through concrete shall be given one coat of acid resisting paint having a bituminous base. Pipe hangers, supports, and other iron work concealed or in unfinished spaces shall be thoroughly cleaned and painted with one coat of black asphaltic varnish. Finish painting of exposed pipe, pipe covering, hangers, supports, and other work shall conform to SECTION: PAINTING, GENERAL.

28-24. TYPES OF FIXTURES AND FIXTURE TRIMMINGS specified herein shall be furnished and installed complete with all trimmings and fittings, unless otherwise specified under the item. The item numbers correspond with the "P" numbers shown at the plumbing fixtures on the drawings.

a. General requirements: References made herein to outfit numbers and figure numbers of vitreous china and enameled cast iron plumbing fixtures are to Federal Specification WW-P-541, unless otherwise indicated. Fixtures and trimmings not covered by Federal Specification WW-P-541 shall be considered special, but shall be of equal quality and material. Generally, all fixtures except water closets and urinals shall have the water supply above the rim. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, loose key pattern stops for supplies shall be furnished and installed with fixtures. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor plates, wall plates, and escutcheons shall be as specified hereinbefore or as covered by the outfit numbers. Exposed fixture trimmings and fittings shall be chromium plated on nickel plated brass with polished, bright surfaces conforming to Federal Specification WW-P-541.

b. Cross connections: Fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into the water supply system.

c. Fixture connections: Where space conditions will not permit

standard fittings in conjunction with the cast iron floor flange, special short radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gas tight and watertight with a closet setting compound in accordance with Federal Specification HH-C-536, or with gaskets in accordance with Federal Specification HH-G-116. Use of rubber gaskets or putty will not be permitted for these connections. Bolts shall be not less than 1/4 inch in diameter and shall be equipped with chromium plated nuts and washers. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first class joint with the closet setting compound or gasket and fixture used; no fixture shall be set in place until the Contracting Officer has examined and approved the flange.

d. Flush Valves shall be of the nonhold-open type.

e. Traps: Where cast brass P-traps, type 106 are required by Federal Specification WW-P-541, brass tube P-traps, type 114, shall be installed in lieu of type 106.

f. Fixtures:

(1) P-1, Water Closet: Outfit VW16 with CEW white seat.

(2) P-2, Urinal: Outfit VU13W less chair carrier.

(3) P-3, Lavatory: Outfit VL20F with type RV supplies.

(4) P-4, Service sink: Outfit ES24G.

28-25. INSPECTION AND TESTS:

a. Methods of sampling, inspecting, and testing fixtures shall conform to Federal Specification WW-P-541.

b. Tests for plumbing system: Soil, waste, vent and water piping shall be tested by the contractor and approved before acceptance. Underground soil and waste piping shall be tested before backfilling. Equipment required for test shall be furnished by the contractor at no additional cost to the Government.

(1) Drainage and venting system piping shall be tested with water or air before the fixtures are installed. After plumbing fixtures have been set and their traps filled with water, the entire drainage and venting system shall be submitted to a final test with smoke or peppermint.

(a) Water Test shall be applied to the drainage and venting system either in its entirety or in sections. If the entire system is tested, all openings in the pipes shall be tightly closed except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening except the highest

opening of the section under test shall be tightly plugged, and each section shall be filled with water and tested with at least a 10 foot head of water. In testing successive sections, at least the upper 10 feet of the next preceeding section shall be tested so that each joint or pipe in the building except the uppermost 10 feet of the system has been submitted to a test of at least a ten foot head of water. The water shall be kept in the system or in the portion under test, for at least 15 minutes before the inspection starts; the system shall then be tight at all joints.

(b) Air test: If tests are made with air, a pressure of not less than 5 pounds per square inch shall be applied with a force pump and maintained at least 15 minutes without leakage. A mercury column gauge shall be used in making the air test.

(c) Final Test: When the smoke test is employed, the smoke shall be produced by a smoke machine, and a pressure equal to 1 inch water column shall be maintained for 15 minutes before inspection starts. When the peppermint test is preferred, 2 ounces of peppermint shall be introduced into each line or stack. Defects discovered shall be eliminated by resetting the fixtures and equipment with new gaskets.

(2) Water system: When the roughing-in is completed and before the fixtures are set, the entire hot and cold water piping systems shall be tested at a hydrosatic pressure of not less than 100 pounds per square inch gauge, and proved tight at this pressure for not less than 30 minutes in order to permit inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately as described for the entire system.

(3) Defective work: If inspection or test shows defects, such defective work or material shall be replaced and inspection and tests repeated. Repairs to piping shall be made with new material. No caulking of screwed joints or holes will be acceptable.

(4) Cleaning adjusting: At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipes, valves and fitting shall be cleaned of grease, metal cuttings, and sludge that may have accumulated from operation of the system during the test. Any stoppage, discoloration or other damage to the finish, furnishings, or parts of the building, due to the contractor's failure to properly clean the piping system, shall be repaired by the contractor without cost to the Government. When the work is complete, the hot water system shall be adjusted for uniform circulation. Flush valves and other parts of the work shall be adjusted for quiet operation. Automatic control devices shall be adjusted for proper operation.

28-26. GUARANTEE: The following equipment to be furnished under this section shall be guaranteed for a period of 1 year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design, and workmanship:

Plumbing
28-15

Drinking water dispenser

Relief valves

Fixtures

Water heating

upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, the new replacement part or parts shall be furnished and installed promptly by the contractor at no additional cost to the Government.

28-27. SPRINKLER SYSTEM: A fire automatic sprinkler system shall be installed in the rafter space and in the mechanical equipment room as shown on the drawings. The system shall be designed and installed in accordance with Pamphlet No. 13 of the National Board of Fire Underwriters. The installation work shall be performed by a firm skilled in the installation of automatic sprinkler systems and one recognized as reliable in this class of work. The sprinkler system contractor shall submit drawings for approval of the installation before starting the work. The work when completed will be inspected by the District of Columbia Fire Marshal and any and all work found to be a departure from the National Board of Fire Underwriters' Code and the District of Columbia Fire Marshall Standards shall be corrected by the contractor without any change in the contract price. The drawings of the work submitted by the contractor for approval of installation before the starting of the work will be submitted in turn to the District of Columbia Fire Marshal for approval by the Contracting Officer or before the starting of the work. The system shall be what is known as a dry system. The system shall be erected to drain with drain valves provided.

a. Materials used for the work to be constructed under this Section shall be as follows:

Pipe Standard weight genuine wrought iron, black.

Fittings, where required..... Standard black malleable iron sprinkler system type.

Fittings, general... 150 p. s. i. air tested black malleable iron.

Valves, service entrance.....	Standard flanged OS and Y iron body bronze trim gate, 4 inch.
Valves, 2 inch and under.....	Standard all brass or bronze screwed gate.
Fire Department connections.....	4" Fire Underwriter's approved Siamese hose valve, American Standard thread.
Sprinkler heads (rafter space).....	212 degree
Sprinkler heads (Mechanical Equipment Room)	165 degree
Alarm valve.....	Underwriter's approved.
Check valve.....	Underwriter's approved.

b. Installation: The piping work shall begin at the 4 inch water service entering the saloon basement and rise upwards with 4 inch pipe feeding the system. The riser shall be fitted with an O.S. and Y. master gate valve, check valve and other fittings in accordance with the Fire Underwriter's Pamphlet No. 13. All 4 inch valves at this point shall be standard cast iron flanged. From this point the piping shall run to the Siamese hose fitting and system as shown on the drawings.

c. The sprinkler grid shall be formed by receding size pipe as noted on the drawing. Pipe size reductions shall be made by means of eccentric reducers. Spans on the header between laterals and spans on the laterals between sprinkler heads shall be made with one piece of pipe. The use of couplings, unions, or remnants of pipe will not be permitted. Drain valves will be 3/4 inch extra heavy brass gate fitted with 3/4 inch hose thread adaptors. All pipe shall be standard black genuine wrought iron, standard black malleable iron sprinkler system type or 150 p.s.i. air tested where sprinkler system type are not required according to the code. Headers and laterals shall be erected to true lateral alignment and without bellies.

d. Threaded pipe joints: Threaded pipe joints shall be reamed smooth at their ends and flush with the inside wall of the pipe or tube

All threaded connections, both male and female, shall be properly cleaned before jointing. All threaded connections shall be made up with red lead paste or a thread compound approved by the Contracting Officer. The red lead or thread compound shall be uniformly applied to the male thread only. Thread shall be properly cut. Tearing of threads by dull and worn dies will not be permitted. The length of threads shall be a full die plus one thread. All thread shall be right hand.

e. Welded pipe joints: Welded pipe joints will not be permitted except in special cases and then only on permission of the Contracting Officer. Welding shall be done preferably in the shop and when in the field under the instructions of the American Standard Code for Pressure Piping, B31.1-1951 or subsequent revisions thereof.

f. Hangers, brackets, etc.: All vertical and horizontal runs of piping shall be properly supported to hold them rigid, plumb or level, as the case may be and all such supports shall be to the approval of the Contracting Officer. Perforated pipe strap material will not be permitted. All pipe supports shall be painted to the approval of the Contracting Officer.

g. Tests: All piping work upon its completion shall be tested in the following manner:

(1) All piping work shall be tested to 125 p. si. gauge pressure by means of compressed air held over night. Should the pressure over night drop reasonably due only to temperature change, the test shall be considered satisfactory; otherwise, corrective work shall be done where leaks occurred and the test repeated. Tests shall continue until the entire system has been proven satisfactory.

(2) Pressure gauges used in the tests shall be of a recognized standard make and shall be approved by the Contracting Officer.

(3) All tests shall be made in the presence of a representative of the Contracting Officer.

END OF SECTION 28

SECTION 29

VENTILATING SYSTEM, MECHANICAL

29-1. GENERAL: The applicable provisions of the "General Conditions" shall govern the work under this Section.

29-2. SCOPE OF WORK:

a. General: The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of all ventilating work as shown on the drawings and/or as described herein.

29-3. GENERAL: The contract drawings indicate the extent and general arrangement of the ventilating system. The contractor shall be responsible for installing the proposed system as indicated, without violation of applicable codes, standards, or specification requirements. Except where dimensions are shown to locate ductwork or equipment, the drawings show duct size and arrangement only. Equipment, ductwork, and piping arrangements submitted shall fit into the space as indicated, and shall allow adequate and approved clearances for entry, servicing and maintenance.

a. Capacities of all equipment and materials shall be not less than those indicated.

b. Conformance to agency requirements: Where materials or equipment are specified to conform to the requirements of the Underwriters' Laboratories, Inc., the contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of or listing in the Underwriter's Laboratories, Inc., will be acceptable as sufficient evidence that the items conform to the requirements of the Underwriters' Laboratories, Inc. In lieu of such stamp, label, or listing, the contractor may submit a written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements specified hereinbefore, including methods of testing of the specified agencies.

c. Nameplates: Each major component of the equipment shall have the manufacturer's name and address, and the component catalog number on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable. In lieu of a nameplate, the manufacturer's name or trademark may be cast integrally with, stamped on, or otherwise permanently marked on the items of equipment..

d. Prevention of rust: Surfaces of ferrous sheet metal not otherwise specified shall be given a rust-inhibiting coating. Unless otherwise approved by the Contracting Officer, the rust-inhibiting coating shall consist of hot-dip galvanizing, an approved plastic coating, or bonderizing or phosphatizing followed by the application of a suitable rust-inhibiting primer and finish paint. The coating shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal test Method Standard No. 141. Immediately upon removal of the panel from the test, the film shall not show any visible blistering or rust spots, and there shall be not over 1/8 inch of rust creepage on either side of the scratch mark. Where rust inhibitor is specified hereinafter, any of the above methods will be acceptable.

e. Protection from moving parts: Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts so located that personnel can come in close proximity thereto, shall be fully enclosed or properly guarded.

f. Spare-parts data: As soon as practicable after approval of the list of materials and equipment and, if possible, not later than 4 months prior to the date of beneficial occupancy, the contractor shall furnish spare-parts data for each different item of equipment and material listed.

The data shall include a complete list of parts and supplies with current unit prices and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the contractor of any responsibilities under the guarantee specified hereinafter.

g. Standard products: The materials and equipment to be furnished under this section of the specifications shall be the standard catalog products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate materials and equipment that have been in satisfactory use for at least 2 years. Where two or more units of the same type of equipment are required, these units shall be the products of a single manufacturer.

h. Verification of dimensions: The contractor shall visit the premises and thoroughly familiarize himself with all details of the work and the working conditions, to verify all dimensions, and to advise the Contracting Officer of any discrepancy before starting the work.

29-04. MATERIALS shall conform to the respective specifications and other requirements specified herein:

a. Aluminum sheets: Federal Specification QQ-A-359, quarter hard temper, or Military Specification MIL-A-52174.

b. Asbestos: ASTM Standard D1571-58T, commercial grade.

c. Asphalt Varnish: Federal Specification TT-V-51.

d. Copper sheets: Federal Specification QQ-C-576.

e. Fibrous glass: Military Specification MIL-I-22023.

f. Iron and steel sheets, other than for registers, grilles, and certain indicated ducts and hoods, shall conform to Federal Specification QQ-S-775, type I, class d. Steel sheets for registers and grilles shall conform to Federal Specifications QQ-S-698, condition and finish standard with the manufacturer. Corrosion-resistant steel for ducts and hoods shall conform to Federal Specification QQ-S-682, class 302.

g. Wire screening:

(1) Bird Screens: Federal Specification RR-W-370, two-by-two mesh per inch.

(2) Insect screens: Federal Specification RR-S-141, type I, II, or III.

29-05. MATERIALS LIST: As soon as practicable, and before starting installation of any materials or equipment, the contractor shall submit to the Contracting Officer for approval a complete list in triplicate, of materials and equipment to be incorporated in the work. This list shall include catalog numbers, cuts and such other descriptive data as may be required. No consideration will be given to partial lists submitted from time to time. Approval of materials and equipment will be based on manufacturer's published data and will be tentative subject to submission of complete shop drawings indicating compliance with the contract documents.

29-06. SHOP DRAWINGS: After receiving tentative approval of the materials and equipment on the materials list, and before installation of any of these items, the contractor shall submit complete shop drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Shop drawings for the following items shall be submitted at one time in order to demonstrate that these items have been properly coordinated and will function properly with each other: Fans and exhaust hoods. Shop drawings shall be submitted also for the following items: Splitters, dampers, air deflectors, fire dampers, diffusers, registers, grilles, and such other items as the Contracting Officer may direct. If departures from the contract drawings are deemed necessary by the contractor, details of such departures including changes in related portions of the project and the reasons therefor shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

29-07. WORKMANSHIP: Materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

29-08. FANS shall be tested in accordance with the test procedures of the Air Moving and Conditioning Association, Inc., and shall conform to the AMCA standards where applicable standards exist. The AMCA certified-rating seal, where granted, will be evidence of conformance to this requirement. In the absence of the seal for fans covered by AMCA codes, the manufacturer's certificate of conformance to the above standards, including test procedures, shall be submitted. Units not covered by present AMCA codes shall be tested in accordance with present AMCA test procedures, and the manufacturer's rating certificate to this effect shall be submitted. Fans may be directly or indirectly connected with a V-belt drive unless otherwise specified. V-belt drives where used, shall be designed for not less than 150 percent of the connected driving capacity. Motors for V-belt drives shall be provided with adjustable rails, bases, or other means for taking up the slack. Fire-safety switches of the thermostatic type shall be provided for each exhaust fan to de-energize the fan if the exhaust air exceeds 125 degrees F. Fans and motors shall be provided with vibration isolation supports of mountings.

Each fan shall be selected to produce the specified capacity at a noise level not in excess of that set forth by good engineering practice for the particular space and environment being ventilated. Any fan that is deemed by the Contracting Officer to be objectionably noisy for the surrounding area, shall be replaced by a unit with an approved noise level, at no additional cost to the Government. Bearings shall be accessible for lubrication without dismantling fan or disconnecting ducts.

a. Centrifugal fans: Impeller wheels shall be of the multiblade type, with forward or backward curved blades, shall be heavily and rigidly constructed, accurately balanced both statically and dynamically, and free from objectionable vibration and noise. Fan blades may be flat or airfoil design. Fan wheels may have one-extra-long bearing between the fan wheel and the drive. The bearings shall be self-aligning and self-oiling with adequate oil reservoirs, or may be the sealed ball-bearing type. The fan shafts shall be of steel, and shall be provided with key seats and keys for the impeller hubs and fan pulleys. Smaller sizes may have flattened shaft and setscrews. Each fan outlet shall be of ample proportions and shall be equipped with removable angles and bolts for attaching flexible connections. Motor enclosures shall be the dripproof type.

b. Propeller fans and motors shall be supported on heavy metal frames designed for wall mounting. Fan wheels less than 24 inches in diameter shall be directly connected to the motor, and fans 24 inches in diameter or larger shall be connected to the motor by a V-belt drive. Fans shall conform to Military Specification MIL-F-16081. Motor enclosures shall be the open type. Fan motor shall be under control of room thermostat set to turn fan on for temperature rise.

c. Centrifugal roof-type unit shall have a centrifugal fan directly connected or belt-connected to the motor. The fan motor shall be enclosed in an air-cooled motor compartment outside of the exhaust airstream. Fan-motor enclosures shall be the dripproof type. The unit shall meet all conditions specified in paragraph: Centrifugal fan hereinbefore, except as follows:

(1) Sealed, permanently lubricated sleeve or ball bearings with suitable provision for end-thrust, shall be provided.

(2) Weather-tight housing including adequately turned-down rectangular base shall be rigidly constructed of durable aluminum, copper, steel, or other approved material suitable protected against corrosion.

29-09. BACKDRAFT DAMPERS consisting of a set of delicately balanced louvers that open automatically when the fan starts and close by gravity when the fan stops, shall be provided for each exhaust fan. The louvers shall be constructed of galvanized iron or steel weighing not less than 0.90625 pound per square foot (26 gauge), or of sheet aluminum of equal strength. The edges of the blades shall be provided with felt strips to prevent rattling. The damper blades shall be supported on metal frames.

29-10. DUCTWORK:

2. General: Ducts shall be constructed and erected in a workmanlike manner. The ductwork shall be constructed of zinc-coated iron or steel sheets or of aluminum sheets. Ducts, unless otherwise approved shall conform to the dimensions indicated and shall be straight and smooth on the inside, with joints neatly finished. Ducts shall be anchored securely to the building in an approved manner and shall be so installed as to be completely free from vibration under all conditions of operation. Curved elbows shall have a centerline radius not less than 1-1/2 times the width of the duct. Air turns shall be installed in abrupt elbows. The air turns shall consist of curved metal blades or vanes, so arranged as to permit the air to make the abrupt turns without appreciable turbulence. Air turns shall be quiet and free from vibration when the system is in operation. Sheetmetal ducts shall be properly braced and reinforced with zinc-coated steel angles or other approved structural members spaced not over 4 feet on centers. Joints shall be made substantially airtight, and no dust marks from air leaks shall show at connections, grille or diffusers. Laps shall be made in the direction of the airflow. All edges and slips shall be hammered down to leave a smooth interior duct finish. All button or bolt connections in standing seams shall be spaced not more than 4 inches on fixed centers, and shall be at the same centerline throughout the entire length of the duct. Transformation shall be made with a slope ration of 7:1 unless otherwise approved. All ducts shall have cross break of sufficient center height to assure rigidity in the duct section. Unless otherwise indicated, the sheetmetal ducts and stiffeners shall conform to tables I and II. Sheet-metal work required in connection with exhaust systems shall conform to the requirements of the National Board of Fire Underwriters Standard No. 91.

Table I. Sheet-metal thickness for rectangular duct construction

Aluminum thickness (inch)	Galv. sheet gage	Maximum side (inches)	Type of transverse joint connections	Bracing
0.020	26	Up to 12	S, drive, pocket, or bar slips on 7-ft. 10-in. centers.	None
		13 to 24	S, drive, pocket or bar slips on 7-ft. 10-in. centers.	None
0.025	24	25 to 30	S, drive, 1-in. pocket or 1-in. bar slips on 7-ft. 10-in. centers.	1 x 1 x 1/8-in. angles 4 ft. from joint.

1. For normal pressures and velocities used in typical ventilating and air-conditioning systems. Where special rigidity or stiffness is required, ducts should be constructed of metal two gauges heavier. All uninsulated ducts 18 in. and larger should be cross broken. Cross breaking may be omitted on uninsulated ducts if metal two gauges heavier is used.

2. Other joint connections of equivalent mechanical strength and airtightness may be used.

b. Splitters, dampers, and air deflectors:

(1) Splitters and dampers: Hand-operated dampers with locking quadrants, multileaf dampers, and splitter dampers shall be installed where indicated or necessary for proper control and balancing of air distribution. All dampers shall have an accessible operating mechanism. Exposed parts of operating mechanisms occurring in finished portions of the building shall be chromium plated with all exposed edges rounded. Splitter dampers shall be operated by a 3/16 inch rod brought through the side of the duct and locked with a setscrew and bushing. Two rods shall be provided for splitter dampers over 8 inches in size. Dampers and splitters shall be constructed of material two gauges heavier than the duct. All multileaf dampers shall be the opposed blade type with a maximum blade width of 12 inches. Two or more blades shall be used when the blade width is more than 12 inches. Splitter dampers shall be of sufficient length to close off either branch duct.

(2) Air deflectors shall be provided in all square elbows, duct-mounted supply outlets, and tap-in branch-takeoff connections. Air deflectors shall be factory fabricated.

c. Fire dampers shall be provided as required by the National Board of Fire Underwriters Standard No. 90A or No. 91. Dampers shall be installed under sufficient tension to prevent rattling or vibration.

d. Hinged duct-access doors shall be provided at all automatic dampers, fire dampers, and all other apparatus requiring service and inspection in the duct system. Access door shall be 15 inches by 18 inches in size unless otherwise indicated. Doors shall be provided with zinc coated hinges having bronze pins and two approved brass fasteners.

e. Duct test holes: Holes with patches in ducts and plenums shall be provided where directed or where necessary for using pitot tubes for taking air measurements to balance the air systems. Test holes in insulated ducts or plenums shall be provided with extensions and plug fittings.

f. Apparatus connections: At points where sheet-metal connections are made to fans, or where ducts of dissimilar metals are connected, a flexible connection of 15 ounce woven asbestos or other approved noncombustible material approximately 6 inches in width conforming to ASTM Standard D1571, shall be installed and securely fastened by zinc-coated iron clinch type draw bands.

29-11. GRILLES AND REGISTERS:

a. General: All grilles and registers indicated shall be furnished and installed in such a manner as to distribute the specified quantity of air evenly over the space intended without causing noticeable drafts of air moving over 50 f.p.m. in an occupied zone, or dead spots in any part of the conditioned area. The outlets shall operate to maintain uniform temperatures throughout the space and shall not introduce undue resistance to the airflow. A schedule of all air inlets and outlets shall be submitted to the Contracting Officer indicating location, specified air quantity, neck or face velocity, noise level, pressure drop, throw, maximum and minimum drop, and diffusion range. Registers shall be provided with volume control and accessible operator. All units shall be furnished in gray shop-coat primer.

b. Grilles shall be as specified for registers hereinafter, without volume-control damper.

c. Registers shall be the air conditioning type with face-operated opposed-blade volume-control damper. Registers shall have flanged face and shall be provided with sponge-rubber gasket between flange and the wall or ceiling. The four-way directional control may be achieved by a grille core that can be inserted in the grille face in four positions or by adjustments of horizontal and vertical vanes. Removable cores shall have movable vertical vanes.

29-12. ELECTRICAL WORK: Electric motor-driven equipment specified herein shall be provided complete with motor and motor starter. Electrical

equipment and wiring shall conform to SECTION: ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as indicated. Motors shall be of sufficient capacity to drive the driven equipment at the specified capacity including an allowable service factor, without exceeding the nameplate rating on the motor. Manual or automatic control and protective of signal devices required for operation herein specified and any wiring required but not indicated on the electrical drawings shall be provided under this section of the specifications and shall conform to the applicable requirements of SECTION: ELECTRICAL WORK INTERIOR.

29-13. PAINTING AND FINISHING: Duct hangers and other specified and unprotected ferrous metal external to finished rooms shall be thoroughly cleaned and given one coat of asphalt varnish. The painting of fan units, grilles, registers, and ferrous metal work exposed within finished rooms, and fans, housings and equipment external to finished rooms is specified in SECTION: PAINTING: GENERAL. Except where provided with a protective primer at the factory, ferrous metal specified to receive finish painting shall receive a prime coat as specified in SECTION: PAINTING: PROTECTIVE, ON METAL.

29-14. OPERATION AND MAINTENANCE INSTRUCTIONS, in printed form, for each item of equipment, shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, a competent engineer shall be provided by the contractor for a period of not less than 3 days to instruct a representative of the Government in the operation and maintenance of the mechanical ventilating system.

29-15. TESTS: Each supply- and exhaust-air system shall be balanced to produce the indicated air quantities at the conditions shown. Control devices shall be set to control at the points indicated or directed. Bearings shall be lubricated, and the speed and direction of rotation of each fan shall be checked. The running current of each motor shall be checked.

a. Report of test data indicating the following in typed tabulated form shall be submitted to the Contracting Officer not less than 2 days before the final test of the system:

(1) Fans:

(a) Specified air quantity and static pressure.

(b) Installed motor horsepower.

(2) Air outlets and inlets:

(a) Specified size and air quantity.

(b) Installed size.

(c) Measured air velocity.

(d) Computed air quantity.

(3) Controls: The setting of each automatic or safety control shall be included in the test report.

b. Final tests; Upon completion, and prior to acceptance of the installation, the contractor shall subject the ventilating system to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of not less than 6 hours for each system, and all tests shall be conducted at such times as the Contracting Officer may direct. If tests do not demonstrate satisfactory operation of the ventilating system, deficiencies shall be corrected to the satisfaction of the Contracting Officer. All instruments, facilities, and labor required to properly conduct the tests shall be provided by the contractor at no additional cost to the Government. The electricity required for testing will be furnished by the Government.

29-16. GUARANTEE: The following equipment to be furnished under this section of the specifications shall be guaranteed for a period of 1 year from the date of acceptance thereof, either for beneficial use of final acceptance, whichever is earlier, against defective materials, design, and workmanship:

Centrifugal fans

Propeller fans

Roof-ventilator fans

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor.

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SECTION 30

HEATING SYSTEM, FORCED HOT WATER, GAS FIRED

30-1 GENERAL: The applicable provisions of the "General Conditions" shall govern the work under this Section.

30-2 SCOPE OF WORK: The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of all heating system work as shown on the drawings and/or as described herein.

30-3 GENERAL: The contract drawings indicate the extent and general arrangement of the heating system. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted in writing as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer. The dimensions of boiler or equipment rooms are as indicated on the drawings. Equipment and piping arrangements shall provide adequate and acceptable clearances for entry, servicing, and maintenance.

a. Standard products: The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer.

b. Approval of materials and equipment: As soon as practicable and within 30 days after the date of award of the contract, and before commencement of the installation of any materials or equipment, a plan and elevation of the boiler-room showing the proposed piping and equipment, together with a complete schedule of the materials and equipment proposed for installation, shall be submitted for approval. The schedule shall include catalogs, cuts, diagrams, drawings and such other descriptive data as may be required by the Contracting Officer. Approval of equipment under this provision shall not be construed as authorizing any deviations from the specification unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided contractor clearly states such differences and provided all essential requirements of the specification are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

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30-4. BOILER: The boiler shall be designed for hot water heating and shall be of the cast iron sectional type vertical tubes. The boiler shall be designed for a water-working pressure of 30 pounds per square inch gauge, and shall be constructed and equipped in accordance with the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code, Section I. The boiler sections shall be constructed of the best grade of gray cast iron recognized for the purpose. The boiler shall be in one unit and shall be commercial gas fired. The boiler shall be of the capacity of not less than 1,496,000 output as determined by AGA rating. The boiler shall be designed and constructed for continuous operation and so arranged as to permit the disengagement in an emergency of a section or sections in the case of the failure of a section or sections during operation, thus permitting a continuance of operation until a convenient time to make repairs. The boiler shall be furnished and fitted with all accessories and boiler trim required by the District of Columbia Code for hot water heating boilers of the capacity herein described. The boiler furnished may be jacketed with factory fabricated corrosion resisting sheet steel jacketing finished with a factory finish baked on enamel and insulated on the inside face with standard thickness glass fiber insulation or unjacketed and insulated as hereinafter specified. The boiler shall be a stock item as published in the manufacturer's current catalog. The boiler shall be guaranteed to operate at 80% efficiency being heated by natural gas of 0.66 gr., 1,050 B. T. U. @ 4 inches W. C. pressure in the manifold and burned in a burner having capacity of not less than 1,870,000 B. T. U. per hour output. The boiler shall be mounted on a concrete foundation extending 6 inches above the floor line and constructed as specified for the chiller plant under paragraph 32-6, Central Refrigeration System.

a. Gas burners: The boiler burner shall be for gas firing and shall be the atmospheric type. Its output shall be sufficient for the boiler herein specified when burning natural gas of 0.66 gr., 1,050 B. T. U. per cubic foot @ 4 inches W. C. pressure in the manifold. The heat input of the boiler specified herein is to be not less than 1,870,000 input, A. G. A. rated. The burner installed must equal this demand or any boiler input above it offered by the contractor and approved by the contracting officer. The burner heads shall be the flame retention type designed to prevent flash back or burning back in the mixing tubes from 20 per cent of capacity to full capacity. The burner control and safeguard equipment shall consist of an electronic combustion safeguard, gas pressure gauge, firing valve, diaphragm valve

with louvre operating lever, pressure-trol, low water cutoff, main cutoff valve with side pilot outlet, gas pressure regulator, pilot gas pressure regulator, solenoid valve, and aquastat to control the supply of gas fuel to the burner based on the water temperature in the boiler.

b. Barometric draft regulator: The barometric draft regulator if installed shall be of the type for installation in the boiler breaching. The barometric draft regulator shall be installed if recommended by the burner manufacturer.

30-5. SMOKE CONNECTIONS: Smoke connection from the boiler to the stack or flue shall be made by means of breeching composed of number 18 gauge tight clad type galvanized sheet steel. Joints shall be welded and made air tight. Connection to the stack or flue shall provide for expansion and contraction of the breeching. Should no barometric draft regular be used, a handhole of suitable size shall be constructed for access to the interior of the breeching. The breeching shall be insulated as described in Section 30, paragraph 13: Boiler Covering.

30-6. PRESSURE GAUGE AND THERMOMETER, in combination, having suitable pressure and temperature ranges shall be installed on each boiler.

30-7. PRESSURE RELIEF VALVES: Each boiler shall be provided with one or more relief valves, constructed and installed in strict accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section IV. The aggregate relieving capacity of the relief valves shall be not less than that required by the above mentioned code. The discharge from the valves shall be installed as directed.

30-8. DRAINS: consisting of 1 inch hose gate valves of 3/4 inch hose bibs shall be installed at the lowest point in the return main near the boiler, and wherever required by the Contracting Officer for the convenient and thorough draining of the system.

30-9. CONTROLS:

a. General:

(1) Water-temperature control: The boiler water shall be maintained at a fairly constant temperature by means of a water temperature controller which will cause the gas burner to start or

stop automatically as the boiler water temperature falls below or rises above predetermined points.

b. Safety Controls: The contractor shall submit proof that the safety controls conform to the standards of the Underwriters' Laboratories, Inc., or the Factory Mutual Laboratories. The label or listing of the above named laboratories will be accepted as evidence of conformance. In lieu of such label or listing, the contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the safety controls have been tested and conform to the standards, including methods of test, of the Underwriters' Laboratories, Inc., or the Factory Mutual Laboratories.

c. Water temperature controller for the boiler water shall be of sturdy construction and shall be protected against dust and dampness. The thermostatic element shall be inserted in a separable socket installed in the boiler. The controller shall operate on a 100°F. differential over an adjustable temperature range of approximately 100 to 220°F.

30-10. COLD-WATER CONNECTION: The heating system shall be connected by means of galvanized steel pipe and galvanized malleable-iron fittings to the capped outlet in the cold-water supply system provided for that purpose. A gate valve, strainer and float operated boiler-water feeder shall be installed in the cold-water connection in the order mentioned with the boiler-water feeder nearest the boiler.

a. Strainers, basket or Y-type shall be of the same size as the pipelines in which are installed. The strainer bodies shall be heavy and durable, of the best grade cast iron, with bottoms drilled and plugged. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The basket shall be of not less than 0.025 inch thick (22 gauge) sheet brass with small perforations of sufficient number to provide a net free area through the basket of at least 3.30 times that of the entering pipe. The flow shall be into the basket and not through the perforations.

b. Boiler-water feeder shall be float-operated and designed for

a water-working pressure of 150 pounds per square inch gauge, and shall have a strainer incorporated in the inlet connection. The feed valve shall be constructed of noncorrodible metal and shall be isolated from the float chamber by means of a packless construction, so as to prevent scaling of the valve or seat.

30-11. EXPANSION TANK shall be constructed of steel in accordance with requirements of the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII, for a working pressure of 30 pounds per square inch gauge. The tank shall be coated with a suitable rust-inhibiting paint.

30-12. PIPING FOR HEATING LINES shall be black steel, class I, weight A, or seamless copper tubing, type K or L. Connections between ferrous piping and copper piping shall be electrically isolated from each other with dielectric couplings or other approved method. Pipes shall be as specified in SECTION: AIR SUPPLY AND DISTRIBUTION SYSTEM FOR AIR conditioning system.

30-13. BOILER AND EXPANSION TANK COVERING: The boiler, if unjacketed, the smoke connections and expansion tank shall be covered with magnesia, mineral wool, calcium silicate, cellular glass, or other approved equivalent noncombustible mineral insulation at least 2 inches thick. Insulation may be either block or blanket type and shall be securely wired in place in an approved manner. Insulation applied to breechings shall be applied over $1\frac{1}{2}$ inch wire mesh, held away from the metal surfaces by metal spacers providing an air space of not less than 1 inch. Joints in the insulation shall be filled with magnesia, mineral wool, or other equally suitable cement. Insulation shall be covered with heavy galvanized hexagonal wire netting and two coats of asbestos cement each approximately $\frac{1}{4}$ inch thick. The first coat shall be left with rough surface and allowed to dry before the second coat is applied. The second coat shall consist of two parts by weight of asbestos cement and one part of Portland cement trowelled to a smooth, hard, uniform surface and neatly finished. Cleanout and access openings shall not be insulated, but the insulation and external plaster shall be neatly beveled up to the edge of such openings. In lieu of the materials specified above, consideration will be given to the use of a reinforced plastic insulating material having the following properties, substantiated by a certified laboratory report: The material shall not be adversely affected physically by soaking in cold water, boiling water, or steam, followed by drying. The materials shall further be resistant to spalling under a 10 cycle spalling test consisting of the following unit procedure; 10 minutes of heat saturation at 1,850° F., followed by a water spray for 8 minutes, and subsequent air cooling for two minutes. The U-value of the plastic insulation shall be equal to or better than the rigid or flexible materials hereinbefore specified; and the material shall be homogeneous throughout and require no external protection. The reinforcement furnished shall be approved as equal to that hereinbefore specified, and the outer surface shall be smooth and suitable for painting.

30-14. ELECTRICAL WORK: All manual or automatic control and protective or signal devices required for the operation of the heating equipment herein specified and any wiring required by not indicated on the electrical plans shall be furnished and installed under this section of the specifications. Wiring shall conform to SECTION: ELECTRICAL WORK, INTERIOR. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical-control device shall be submitted to the Contracting Officer for approval.

30-15. PAINTING AND FINISHING: All uncoated ferrous-metal work such as pipe supports and uninsulated piping in areas having unpainted adjacent surfaces shall be thoroughly cleaned and given one coat of asphalt varnish. All other uncoated ferrous-metal work shall be primed as specified in SECTION: PAINTING: PROTECTIVE, ON METAL. Finish painting shall be as specified in SECTION: PAINTING, GENERAL.

30-16. OPERATION AND MAINTENANCE INSTRUCTIONS, in printed form glass enclosed and framed, covering each item of equipment shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of a competent engineer shall be provided for a period of not less than 1 day to instruct a representative of the Government in the operation and maintenance of the heating system.

30-17. TESTS: Before any covering is installed, the entire heating system, including boiler and fittings, shall be hydrostatically tested and proved tight under a pressure of 45 pounds per square inch gauge. Upon completion and prior to acceptance of the installation, the contractor shall subject the heating system to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of 24 to 48 hours for each system. A report of the tests shall be submitted in quadruplicate to the Contracting Officer and shall include the following specific information, together with conclusions as to the adequacy of each system:

- a. Time, date and duration of test.
- b. Outside and inside dry-bulb temperatures.
- c. Water pressure at boiler.
- d. Water-supply temperature leaving boiler.
- e. Water-return temperature from system at boiler inlet.
- f. Boiler make, type, serial number, design pressure, and rated capacity.

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g. Gas burner, make, model and rated capacity, and ammeter and voltmeter readings for oil burner motor.

h. Water circulating pump make, model, and rated capacity, and ammeter and voltmeter readings for pump motor during operation.

k. Fuel-gas temperature at boiler outlet.

l. Quantity of hot water circulated.

All indicating instruments shall be read at half-hour intervals unless otherwise directed by the Contracting Officer. The contractor shall furnish all instruments, test equipment, and test personnel that are required for the tests, and the Government will furnish the necessary fuel, water and electricity.

30-18. CLEANING OF BOILERS AND PIPING: After the hydrostatic tests have been made and prior to the operating tests, the boilers and piping shall be thoroughly cleaned by filling the system with a solution consisting of either 1 pound of caustic soda or 3 pounds of trisodium phosphate per 100 gallons of water. The water shall be heated to approximately 150° F. and the solution circulated in the system for a period of 48 hours, then drained and the system thoroughly flushed out with fresh water.

30-19. OPTIONAL CONTROLS: Pneumatic controls or electronic controls may be provided in lieu of electric controls. Where pneumatic controls are furnished, an air compressor of the standard piston type complete with tank, valves, gauges, filters, and other necessary appurtenances, shall be provided. Air lines shall consist of suitable tubing with airtight fittings. The air compressor and tank shall be located as directed by the Contracting Officer. The pneumatic control system shall conform to American Standard B19.

30-20. GUARANTEE: The following equipment to be furnished under this section of the specifications shall be guaranteed for a period of 1 year from the date of acceptance thereof, either for beneficial use of final acceptance, whichever is earlier, against defective materials, design, and workmanship:

Boiler.

Gas-burning equipment.

Automatic heat regulating equipment.

Pressure-regulating and relief valves.

Boiler water feeder.

Pressure gauge and thermometer.

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Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, and the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor.

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SECTION 31

AIR-SUPPLY AND DISTRIBUTION SYSTEM (FOR AIR-CONDITIONING SYSTEM)

31-1. GENERAL: The applicable provisions of the "General Conditions" shall govern the work under this Section.

31-2. SCOPE OF WORK: The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of all air-supply and distribution systems for air-conditioning work as shown on the drawings and/or as described herein.

31-3. GENERAL: The contract drawings indicate the extent and general arrangement of air conditioning system. The central refrigeration portion of the air conditioning system is specified in SECTION: CENTRAL-REFRIGERATION SYSTEM (FOR AIR-CONDITIONING SYSTEM). Heating equipment, other than that specified herein, and heating piping are specified in SECTION: HEATING SYSTEM, FORCED HOT WATER. All items specified herein shall be properly coordinated with the central-refrigeration system and the heating system to provide a complete air conditioning system. Equipment, ductwork, and piping shall fit into the space allotted and shall allow adequate and acceptable clearances for entry, servicing, and maintenance.

a. Capacities of equipment and materials shall be not less than those indicated.

b. Conformance to agency requirements: Where materials or equipment are specified to be approved by the Underwriters' Laboratories, Inc., or constructed and/or tested in accordance with the standard of the American Society of Mechanical Engineers or the Air Moving and Conditioning Association, the contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of or listing in the Underwriters' Laboratories, Inc., Building Materials List will be acceptable as sufficient evidence that the items conform to such requirements. The ASME stamp or the AMCA label will be acceptable as sufficient evidence that the items conform to the respective requirements. In lieu of such stamp, label or listing, the contractor may submit a written certificate from any nationally recognized

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testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing of the specified agencies.

c. Nameplates: Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment.

d. Prevention of rust: Surfaces of ferrous metal shall be given a rust inhibiting coating where specified. The treatment shall withstand 200 hours in a salt-spray fog test, in accordance with method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking and no signs of rust creepage beyond 1/8 inch on either side of the scratch mark. Where rust-inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable unless a specific coating is specified except that coal tar or asphalt type coatings will not be acceptable unless so stated for a specific item. Where steel is specified to be hot dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc pigmented paint conforming to Military Specification MIL-F-26915.

e. Protection from moving parts: Belts, pulley, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.

f. Spare parts data: As soon as practicable after approval of materials and equipment and, if possible, not later than 4 months prior to the date of beneficial occupancy, the contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract, and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the contractor of any responsibilities under the guarantee specified hereinafter.

g. Standard products: Materials and equipment to be provided

shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory operation at least 2 years.

h. Verification of dimensions: The contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Contracting Officer of any discrepancy before performing any work.

31- 4. MATERIALS shall conform to the respective specifications and other requirements specified below:

a. Air vents on water mains shall be 3/4 inch quick venting float operated air valves. Each vent shall have a large port permitting the expulsion of the air without developing excessive back pressure and a noncollapsible metal float that will close the valve and prevent the loss of water from the system. The valves shall be designed for 30 p.s.i. working pressure. Air vents on water coils shall have not less than 1/8 inch tapping and shall be either float operated type as specified for mains, or hygroscopic-disc type consisting of several discs that allow release of air when dry but expand and close when water reaches the vents. The valves shall be designed for 30 p.s.i. working pressure. All air vents shall be suitable for both hot water and cold water service.

b. Asbestos connections: ASTM Standard D1571, commercial grade.

c. Expansion joints:

(1) Packless type: Military Specification MIL-E-17813, type for pipe up to and including 3 inch size pipe; type II for pipe over 3 inches; class 1 or 2 copper element.

(2) Slip tube type: Military Specification MIL-E-17814, type II or III; class 1 or 2.

d. Escutcheons in finished areas shall be chromium plated pressed or stamped brass, either one piece or split pattern held in place by internal spring tension or setscrew. Escutcheons in unfinished spaces may be 20 gauge (0.0408 inch in nominal thickness) galvanized metal disc type.

e. Flanges: Federal Specification WW-F-406, class 125.

f. Insulation: All insulating material shall be noncombustible as defined in the National Building Code, Section 200, and shall have a

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flame spread rating of not more than 25 and a smoke developed rating of not more than 50 as defined in the Method of Test of Surface Burning Characteristics in the Building Materials List of the Underwriters' Laboratories, Inc.

(1) Duct insulation: Federal Specification HH-I-542, type I where concealed, type II where exposed.

(2) Equipment insulation:

(a) Cellular glass: Federal Specification HH-I-551, types I and III, class suitable for the temperature encountered.

(b) Expanded plastic: Flexible synthetic rubber-like chemically expanded cellular tubular form insulation with a k factor of not more than 0.28.

(c) Fibrous glass: Federal Specification HH-I-542, type I, or II.

(d) Magnesia block: Federal Specification HH-I-554, type I, class A or B.

(3) Pipe insulation: Federal Specification HH-I-552, type I, class A, or a flexible synthetic rubberlike chemically expanded cellular tubular-form plastic having a k factor of 0.28.

g. Keene's cement: Federal Specification SS-C-161.

h. Pipe, steel: Federal Specification WW-P-406, weight A, class 1 or 2 as specified.

i. Pipe, fittings, steel: Federal Specification WW-P-521, threaded or welded type I or II as specified.

j. Pipe nipples: Federal Specification WW-N-351, type I or II as specified.

k. Pipe supports: Federal Specification WW-H-171.

l. Pipe threads: Federal Specification GGG-P-351.

m. Seamless copper tubing: Federal Specification WW-T-799, type K or L.

n. Sheets, metal:

(1) Aluminum sheets: Federal Specification QQ-A-359, quarter hard condition, or Military Specification MIL-A-52174. Gauge

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numbers specified hereinafter refer to Brown and Sharpe gauge.

(2) Iron and steel sheets: Gauge numbers specified herein-
after refer to United States Standard Gauge:

(a) Corrosion resistant: Federal Specification QQ-S-766, class 304, finish I.

(b) Furniture steel: Federal Specification QQ-S-698.

(c) Galvanized: Federal Specification QQ-S-775, class d.

(d) Uncoated: Federal Specification QQ-S-698, skin-passed temper, regular bright or dull finish.

o. Solder: Federal Specification QQ-S-571, compositions Sn50.

p. Strainers: Military Specification MIL-S-16293, class 125, style Y, type I or II, simplex type.

q. Thermometers: Dial type, 3-1/2 inch diameter chromium plated case remote or direct type bulb as required, plus or minus 1-degree accuracy, white face with black digits graduated in 2 degree increments.

r. Unions: Federal Specification WW-U-531, type as required to match adjacent piping.

s. Valves:

(1) Angle, check and globe valves: Federal Specification WW-V-51, type I, II, or IV, Class A.

(2) Gate Valves:

(a) Bronze gate valves: Federal Specification WW-V-54, type II, class A.

(b) Cast iron gate valves: Federal Specification WW-V-58, type I, Class A, designation OF.

31.5. MATERIALS AND EQUIPMENT LISTS: As soon as practicable, and before starting installation of any materials or equipment, the contractor shall submit to the Contracting Officer for approval a complete list, in triplicate, of materials and equipment to be incorporated in the work. This list shall include catalog numbers, cuts and such other descriptive data as may be required. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on the

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manufacturer's published data. Approval of materials and equipment will be tentative subject to submission of complete shop drawings indicating compliance with the contract documents.

31-6. SHOP DRAWINGS: After receiving tentative approval of the items on the materials and equipment lists, and before installation of any of these items, the contractor shall submit complete shop drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Shop drawings shall be submitted for the following items at one time in order to demonstrate that these items of equipment have been properly coordinated and will function properly with each other:

Air filters	Equipment supports
Air-handling units	Expansion tank
Chilled water pump	Fan coil units
Coils	Temperature control system.

Shop drawings shall be submitted also for the following items: diffusers, expansion joints, fire dampers, grilles, induction air diffusers, insulation, pipe anchors, registers, thermometers, valves and specialties, and such other items as the Contracting Officer may direct. If departures from the contract drawings are deemed necessary by the contractor, details of such departures, including changes in related portions of the project and the reasons therefor, shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

31-7. WORKMANSHIP:

a. General: All materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer, to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

b. Welding: The contractor shall be responsible for the quality of welding done. The quality of the welding procedures and the quality of the welding shall be determined by testing the welder's ability to make sound welds under standard working conditions with the equipment to be used in the work on this project, all in conformance with American Standards Association Code B31.1 and American Welding Society Standard B3.0.

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c. Qualification of welders: The determination of the qualification of welders, and the requirement for welding shall be in accordance with the applicable portions of the above referenced code and standard for pipeline and structural welding. Each welder shall be examined at the jobsite by the contractor, in the presence of the Contracting Officer, to determine his ability to meet required qualifications. Welders shall be tested for welding materials in the various positions required, including welds with the axis of the material vertical and with the axis horizontal without rolling. Each welder shall be required to identify his work with a code marking; and a listing of the names of the welders with corresponding code marks shall be furnished to the Contracting Officer. Welders making defective welds during qualifications tests and welders responsible for making defective welds after passing the test shall be given a requalification test. Welders failing a requalification test shall be discharged.

31-8. ELECTRICAL WORK: Electrical motor driven equipment specified herein shall be provided complete with motor, motor starter and control. Equipment and wiring shall be in accordance with SECTION: ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as indicated. (Motor starters shall be provided complete with properly sized thermal overload protection and other appurtenances necessary for the motor control indicated). Each motor shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation herein specified and any control wiring required for controls and devices but not shown on the electrical drawings, shall be provided, under this section of the specifications.

31-9. WATER PIPING, VALVES, AND FITTINGS: Chilled-water piping shall include all piping and connections between water chiller and air handling units.

a. Pipe and fittings: All pipe 4 inches and smaller shall be either standard weight black steel or hard drawn copper tubing, type K where buried, and type L for all other. Fittings for copper tubing shall be cast brass or wrought copper, solder joint type with solder feed holes. Unit runouts may be soft drawn copper tubing with brass flare connectors. Fittings for steel pipe shall be threaded for pipe 2 inches and smaller; for pipe larger than 2 inches, fittings shall be butt welding type; flanges shall be welding neck type. All fittings shall be suitable for 125 p.s.i. cold water service.

b. Valves:

(1) Gate valves 2 inches and smaller shall be bronze, threaded connection for black steel pipe; sweat connection for copper tubing; valves over 2 inches shall be cast iron.

(2) Globe valves over 2 inches shall be flanged end type.

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(3) Balancing cocks shall be all brass, squarehead with check, suitable for 125 p.s.i. service.

(4) Check valves 2 inches and smaller shall be bronze, threaded connection; valves over 2 inches shall be 125 p.s.i. iron body, brass trimmed, flanged connections.

c. Expansion joints:

(1) General: Expansion joints shall be suitable for water 35 to 250 degrees F., designed for 125 p.s.i. operating pressure, with traverse capacity to relieve all stress due to expansion or contraction of pipe at its operating temperature using a base temperature of 200 degrees F. Initial setting shall be made in accordance with the manufacturer recommendations to allow for ambient temperature at time of installation. Expansion joints shall be provided in all lines subject to temperature changes wherever necessary or indicated to relieve stress or strain developed in lines due to temperature increase or decrease. Pipe alignment guides shall be installed as recommended by the joint manufacturer but in any case not more than 5 feet on each side of each expansion joint, except in lines 4 inches or smaller, not over 2 feet each side of the joint.

(2) Slip-tube type joints shall be single or double slip, with or without base as indicated or required, and shall be designed to carry the weight of the expansion tubes by means of machined guides, at both ends of the tubes. End anchors shall be provided where indicated. A packing gland will not be considered as a guiding element. Each joint shall be designed for replacement or addition of packing while operating under full line pressure.

(3) Packless-type joints shall be internally guided and shall be provided with either flanged or threaded ends as required. Bases shall be provided with each joint unless indicated otherwise. Single element joints shall be provided with bases designed for use as an end anchor where indicated.

d. Anchors shall be provided wherever necessary or indicated to localize expansion or to prevent undue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed in the most effective manner to secure the desired results, using turn-buckles where required. Supports, anchors, or stays shall not be attached in places where such supports will injure the construction during installing or by the weight or expansion of the pipeline. Detailed drawings of pipe anchors shall be submitted for approval before installation.

e. Drains shall be accessible and shall consist of nipples and caps or plugged tees, unless indicated otherwise.

f. Installations:

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(1) General: Pipe shall be cut accurately to measurements established at the jobsite and worked into place without springing or forcing, properly clearing all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval. Pipes shall have burs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Changes in direction shall be made with fittings, except that bending of pipe will be permitted, provided a hydraulic or mechanical pipe bender is used and wide sweep bends are formed. Bent pipe showing kings, wrinkles, or other malformations will not be accepted. All piping shall be installed with sufficient pitch to insure adequate drainage and venting. All high points shall be provided with air vent valves, all low points with drains. Piping connections to equipment shall be provided with unions or flanges. Open ends of pipelines or equipment shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system.

(2) Joints:

(a) Copper tubing shall be cut square, ends shall be reamed, and all filings and dust wiped from interior of pipe. Joints shall be soldered with solder applied through the feed holes and drawn through the full fitting length. Excess solder shall be wiped from joint before solder hardens. Solder shall conform to Federal Specifications QQ-S-571, composition Sn50.

(b) Screw joints shall be made with tapered threads properly cut conforming to Federal Specification GGG-P-351. Joints shall be made tight with a stiff mixture of litharge and glycerin or other approved thread joint compound applied with a brush to the male threads only. Not more than three threads shall show after the joint is made up.

(c) Welded joints shall be fusion welded in accordance with American Standard B31.1, section 6, unless otherwise required. Changes in direction of piping shall be made with welding fittings only. Mitering or notching pipe to form elbows and tees or other similar construction will not be permitted. Branch connections shall be made with welding tees or forged welding branch outlets.

1. Beveling: Field and shop bevels shall be in accordance with the recognized standards and shall be done by mechanical means or flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of scale and oxidation prior to welding.

2. Alignment: Before welding, the component parts to be welded shall be aligned so that no strain is placed on the weld when finally positioned. Height shall be so aligned that no part of the pipe wall is offset by more than 20 percent of the wall thickness.

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base of the riser on a base elbow or tee with pipe stand only where shown on drawings.

h. Pipe sleeves: Pipes passing through walls, ceilings, or floors shall be provided with pipe sleeves poured or fitted in place at the time of construction. Each sleeve shall extend through the respective floor or wall, and shall be cut flush with each surface unless otherwise indicated. Unless otherwise indicated, sleeves shall be of such size to provide not less than $\frac{1}{2}$ inch clearance between uncovered pipe and sleeve or covering and sleeve. Sleeves in bearing walls shall be steel or cast iron pipe. Sleeves in other walls shall be 20 gauge (0.0408 inch in nominal thickness) galvanized steel, fiber, or other approved material. Sleeves in floors of toilets shall be cast iron or steel with integral flanges and shall extend 1 inch above the finished floor. The space between floor sleeves and passing pipes shall be caulked with graphite packing and synthetic rubber caulking compound in conformance with Military Specification MIL-C-15705.

i. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or covered, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep type escutcheons shall be used.

31 -10- EXPANSION TANK: Each expansion tank shall be constructed of steel in accordance with ASME Code for Unfired Pressure Vessels for 30 pound working pressure. The tank shall be coated with rust inhibitor outside.

31 -11. PUMPS shall be split case, enclosed impeller, non-over-loading, centrifugal type. Casing, bearing housings, and base shall be cast iron. High points in the casing shall be provided with manual air vents; low points shall be provided with drain plugs. Shaft seal shall be mechanical seal or stuffing box type. Impeller, impeller guide rings, glands, stuffing box rings, and shaft sleeve shall be bronze. Shaft shall be steel, turned and ground. Bearings shall be ball type, roller type or oil lubricated bronze steel type, and shall be efficiently sealed or isolated to prevent loss of oil or entrance of dirt or water. Each pump shall be direct connected through a flexible coupling to an electric motor operating at not over 3,600 r.p.m. except that where the pump head is less than 60 feet of water, the pump speed shall not exceed 1,750 r.p.m. Pump shall be servicable without disturbing piping connections. Pump and motor shall be mounted on a common cast iron base having lipped edges and tapped drainage openings. Pump shall be provided with shaft coupling guard and vibration isolator base with published load ratings. Each pump casing shall be designed to withstand the discharge head specified plus the static head on system plus 50 percent of the total, but not less than 125 p.s.i. Additional capacity shall be provided to accommodate extra water requirements for water cooling the compressor motor if required for the unit furnished.

Pump motors shall have ample capacity to prevent overloading with pump operating at any point on its characteristic curve, and shall have splashproof enclosure. Motor starters shall be across-the-line type with general purpose enclosure. Pumps shall be installed on suitable foundations, properly leveled, grouted in, and realigned before operation, in accordance with the manufacturer's instructions.

31-12. DRAIN LINES:

a. General: Drain lines shall be provided for each air handling unit and fan coil unit. Drain lines shall be graded in the direction of flow with a slope of $\frac{1}{4}$ inch per foot. Drains indicated to connect to sanitary sewer systems shall be connected with an indirect waste.

b. Pipe and fittings: All piping shall be standard weight galvanized steel; fittings shall be standard weight galvanized malleable iron; construction shall be threaded throughout.

c. Water seals shall be provided in the condensate drain from all units except fan coil units. The depth of each seal shall be equal to the total static pressure rating of the unit to which the seal is connected. Water seals shall be constructed of two tees and an appropriate U-bend with the open end of each tee plugged, handtight.

31-13. SHEET METAL WORK:

a. General: Ductwork shall be constructed of galvanized steel or aluminum sheets. Unless otherwise approved, ducts shall conform accurately to the dimensions indicated and shall be straight and smooth on the inside, with joints neatly finished. Ducts shall be anchored securely to the building in an approved manner and shall be so installed as to be completely free from vibration under all conditions of operation. Curved elbows shall have a centerline radius not less than $1\frac{1}{2}$ times the width of the duct. Joints shall be made substantially airtight, and no dust marks from air leaks shall show at duct joints or connections to grilles and diffusers. Laps shall be made in the direction of air flow. Edges and slips shall be hammered down to leave a smooth interior duct finish. Button or bolt connections in standing seams shall be spaced at fixed centers not greater than 6 inch spacing. Transformations shall be made with a slope ratio of 7:1, or in a specifically approved manner. Ducts shall have cross break of sufficient center height to assure rigidity in the duct section.

b. Conventional velocity ducts and stiffeners shall be constructed of galvanized steel or aluminum sheet of thickness and fabrication indicated on Table I.

c. Splitters and dampers: Dampers shall have accessible operating mechanism and where operators occur in finished portions of the

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building, operators shall be chromium plated with all exposed edges rounded. Splitter dampers shall be operated by quadrant operators or 3/16 inch rod brought through the side of the duct with a locking set screw and bushing. Two rods are required on splitters over 8 inches. Manual

Table I

Sheet metal thicknesses for rectangular duct construction¹

Aluminum Thickness (inch) and (B&S gauge)	Galv. sheet gauge	Maximum side (inches)	Type of Transverse joint connections ²	Bracing
0.0201 (24)	26	Up to 12	S, drive, pocket, or bar slips on 7-ft. 10-in. centers.	None
		13 to 24	S, drive, pocket or bar slips on 7-ft. 10-in. centers.	None
0.0253 (22)	24	25 to 30	S, drive, 1-in, pocket, or 1-in. bar slips on 7-ft. 10-in. centers. ³	1 x 1 x 1/8- in. angles 4-ft. from joint.

1. For normal pressures and velocities used in typical ventilating and air conditioning systems. Where special rigidity or stiffness is required, ducts shall be constructed of metal two gauges heavier. Cross-breaking may be omitted on uninsulated ducts if metal two gauges heavier is used.

2. Other joint connections of equivalent mechanical strength and air tightness may be used.

3. Duct sections of 3-ft. 9-in. length may be used with bracing angles omitted, instead of 7-ft. 10-in. lengths with joints indicated.

volume control dampers shall be operated by locking type quadrant operators. Dampers and splitters shall be two gauges heavier than duct in which installed. Multileaf dampers shall be opposed blade type with maximum blade width of 12 inches. Splitter dampers shall be of sufficient length to close off either branch duct.

d. Air deflectors shall be provided in all square elbows, duct-mounted supply outlets, and tap in branch takeoff connections. Air deflectors shall be factory fabricated and assembled.

31-14. DIFFUSERS, REGISTERS, GRILLES:

a. General: Diffusers, registers and grilles shall be factory fabricated of steel or aluminum and shall distribute the specified quantity of air evenly over space intended, without causing noticeable drafts, air movement faster than 50 f.p.m. in occupied zone, or dead spots anywhere in the conditioned area. The contractor shall be responsible for diffusion, spread, drop, and throw. If, according to the certified data of the manufacturer of the proposed units, the sizes indicated will not perform satisfactorily, the units shall be resubmitted to perform quietly and effectively in accordance with the manufacturer's recommendations as approved by the contracting officer. A schedule of all air inlets and outlets shall be submitted to the Contracting Officer indicating location, specified air quantity, neck or face velocity, noise level, pressure drop, throw and drop for registers, and maximum and minimum diffusion range for diffusers. Diffusers and registers shall be provided with volume control and accessible operator. After the system is in operation, if drafts, dead spots, or excessive noise are noticeable in the conditioned spaces due to improper selection of type and size of diffuser, grille or register, the unit shall be changed to the proper size and type without additional cost to the Government.

b. Diffusers shall be round, half round, square, rectangular or strip shape as indicated, and shall be of the expanding cone type, plaque type or a combination of the two types. Diffusers shall be fixed pattern unless otherwise indicated, and ceiling mounted units shall have integral antismudge rings or shall be furnished with separate antismudge rings. Ceiling mounted units shall be mounted with rims or antismudge rings tight against the ceiling. Sponge rubber gasket shall be provided between ceiling and diffuser or antismudge ring. Duct collar connecting the duct to diffuser shall fit inside of diffuser neck.

c. Registers shall be four way directionnal control type except that return and exhaust registers may be fixed pattern of design similar to supply register face. Each register shall be provided with a face operated opposed blade volume control damper. Registers shall be provided with sponge rubber gasket between flange and wall or ceiling. Return and exhaust registers shall be located 6 inches above the floor unless otherwise indicated. Free area of all registers shall be not less than 75 percent of face area. Four way directional control may be achieved by a grille core that can be inserted in the grille face in four positions or by adjustment of horizontal and vertical vanes. Removable cores shall have movable vanes.

d. Grilles shall be as specified herein for registers, without volume control damper.

31-15. COILS:

a. Water coils shall be fin and tube type constructed of seam-

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e. Fire dampers shall be provided in accordance with the National Board of Fire Underwriters Standard No.90A. Dampers shall be installed with sufficient tension to prevent rattling or vibration.

f. Duct access doors: Hinged doors shall be provided at all automatic dampers, fire dampers, heaters, thermostats, and other apparatus requiring service and inspection in the duct system. Doors shall be 15 by 18 inches unless indicated otherwise. Where size of duct will not accommodate this size, the doors shall be made as large as practical. Doors not less than 24 x 24 inches shall be provided on each side of each air handling unit. Doors shall be rigid, and shall be provided with airtight felt gaskets. Doors shall be provided with galvanized hinges with bronze pins and two approved brass fasteners. Doors 24 x 24 inches or larger shall be provided with fasteners operable from both sides. Doors in insulated ducts shall be of the insulated type. Unless otherwise indicated, doors shall so swing that fan pressure or suction holds the door closed.

g. Duct test holes: Holes with patches in ducts and plenums shall be provided where directed or necessary for using pitot tubes for taking air measurements to balance the air systems. At each of these locations where ducts or plenums are insulated, extension shall be provided with plug fittings.

h. Apparatus connections: Where sheet metal connections are made to fans or where ducts of dissimilar metal are connected, a non-combustible flexible connection of 15 ounce woven asbestos or other approved noncombustible material approximately 6 inches in width shall be installed, except in high velocity systems, 29 ounce neoprene coated fiber glass shall be used. Flexible connections shall be securely fastened by zinc coated iron clinch type draw bands.

i. Duct sleeves and flanges shall be fabricated from 22 gauge galvanized sheet steel (0.0346 inch in nominal thickness), unless otherwise indicated. Flanges not less than 4 inches wide shall be installed tight against the wall on each side, and fastened to the sleeve. Duct insulation and vapor barrier shall extend through the duct sleeve. Sleeves shall be 2 inches larger than the duct unless otherwise required by the thickness of the insulation. Framed openings shall be provided for ducts larger than 12 inches in diameter and for all square and rectangular ducts. The space between the duct or duct insulation and the opening or sleeve shall be packed with commercial grade twisted asbestos rope.

j. Duct supports shall be not less than 1 inch by 1/16 inch galvanized strap iron hangers spaced not over 4 feet on centers. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free vertical movement of the duct.

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less copper tubes and copper or aluminum fins mechanically bonded to tubes. Casing shall be 16 gauge (0.0653 inch in nominal thickness) galvanized steel with 14 gauge (0.0806 inch in nominal thickness) steel flanges and support plates. Tubes shall be full circuiting and completely drainable. Each coil shall be tested at the factory under water at 200 p.s.i. air pressure and shall be suitable for 150 p.s.i. working pressure. Coils shall be mounted for counterflow service.

31-16. AIR FILTERS shall be approved class I or 2 in accordance with Underwriter's Laboratories, Inc., Building Materials List.

a. Sectional throwaway filters shall conform to Federal Specification F-F-310, 2 inches thick and 1 inch thick and of size required to suit application. Filter face velocity shall not exceed 350 f.p.m.

b. Manometers: Inclined type manometers shall be provided for all filter stations of 2,000 c.f.m. capacity or more, including filters furnished as integral parts of air handling units as well as filters installed separately. Manometers shall be of sufficient length to read at least 1 inch of water column, shall be graduated in 1/10 inches, and shall be equipped with spirit level. Each manometer shall be equipped with over pressure safety traps to prevent loss of oil, and two three way vent valves for checking zero setting.

c. Holding frames for sectional filters shall be fabricated from not lighter than 16 gauge sheet steel with rust inhibitor coating. Each holding frame shall be equipped with suitable cell holding devices and cell seats shall be gasketed.

31-17. FACTORY FABRICATED AIR HANDLING UNITS:

a. General: Air units shall be factory fabricated single zone draw through type and shall be complete with airtight insulated casing, waterproof drain pan, cooling and heating coil, fans, motor, adjustable V-belt drive, belt guards, filters, air outlet dampers if required for stable fan operation, access doors, mixing dampers, vibration isolator bases, and any other appurtenances necessary for satisfactory operation. Each unit shall have physical dimensions suitable to fit space allotted to unit.

b. Casing shall be constructed of not lighter than 16 gauge (0.0653 inch in nominal thickness) steel treated inside with rust inhibitor. Drain pans shall be of not lighter than 12 gauge (0.1112 inch in nominal thickness) steel, waterproofed by coating with a noncombustible waterproofing material. Casing and drain pan shall be insulated at the factory, acoustically and thermally, and internally with not less than 1/2 inch thick semirigid fibrous glass insulation material. Access doors or removable panels shall be provided in each casing section.

c. Cooling and heating coils shall be water type as hereinbefore specified.

d. Filters shall be two inches thick and of the type indicated and as hereinbefore specified.

e. Fans shall be double inlet centrifugal type with each fan in a separate scroll. Fans shall be statically and dynamically balanced at the factory after fan assembly. Fans shall be mounted on steel shaft, ground and polished, and supported in ball type bearings provided with lubrication facilities outside of the unit or permanently lubricated sleeve or ball type bearings. Fans and scrolls shall be furnished with an approved rust inhibitor treatment. Fans shall be driven by a unit mounted motor connected to fans by a V-belt drive complete with belt guard. Belt drives shall be designed for not less than 150 percent of the connected motor capacity, and sheaves shall be adjustable to provide not less than 20 percent speed variation. Sheaves shall be selected to drive the fan at such speed as to produce the specified capacity when set at the approximate midpoint of fan capacity. Fan motors shall have open enclosures. Motor starters shall be across-the-line type with general purpose enclosure. Fan tip speed and outlet velocity shall not exceed the recommendations of ASHRAE guide. Fans shall be tested at the factory and rated in accordance with AMCA standards.

31-18. FAN COIL UNITS:

a. General: Fan coil units shall consist basically of a casing, water coil assembly, drain pan, air filters, fans, motor fan drive, outside air intake, pipe enclosures, and motor switch. Each unit shall be fastened securely to the building structure.

b. Enclosure: Enclosure shall be constructed of not lighter than 18 gauge (0.0530 inch nominal thickness) furniture steel, properly reinforced and braced. Entire casing shall be acoustically and thermally insulated internally with not less than $\frac{1}{2}$ inch thick glass fiber insulation fastened with waterproof adhesive. Front panel or enclosure shall be removable. Grilles shall be removable, surface mounted, or stamped into unit casing, and shall be of such design as to properly distribute air throughout the conditioned space. Plastic discharge or return grilles are not acceptable. All metal surfaces shall be either galvanized or treated with a rust inhibitor. Access doors shall be provided for all piping and control and pockets.

c. Fans shall be steel or aluminum, multiblade, centrifugal type, dynamically and statically balanced at the factory.

d. Water coils, shall be single circuiting type constructed of not less than $\frac{1}{2}$ inch outside diameter seamless copper tubing expanded into aluminum fins, provided with not less than outside diameter $\frac{1}{2}$ inch flare connectors and manual air vent. Coils shall be hydro-

statically tested at 300 p.s.i. and suitable for 200 p.s.i. working pressure.

e. Drain pans shall be sized and located properly to collect all water condensed on and dripping from any item within the unit enclosure. Drain pans shall be constructed of not lighter than 18 gauge galvanized steel thermally insulated to prevent condensation, and coated with a waterproofing material. Drain pans shall be properly pitched to insure condensate runoff. Not less than $\frac{1}{2}$ inch NPT drain connection shall be provided in drain pan.

f. Filters shall be provided for each unit and shall be glass throwaway type, 1 inch thick, class 1, in conformance with the Underwriters' Laboratories, Inc., requirements.

g. Motor shall be split capacitor or shaded pole, three speed, overload protected type, and directly connected to unit fans or belt connected through adjustable V-belt drive. Motor switch shall be Three-speed-Off, manually operated, of sufficient rating, and shall be mounted on a properly identified plate inside the unit below an access door.

h. Outside air intake boxes shall be fabricated from 18 gauge (0.0530 inch in nominal thickness) steel with rust resistant baked enamel finish, or from 16 gauge aluminum. Unit shall include stamped metal intake grille, bronze insect screen, baffle plate to prevent flow-through, and damper if not included with fan coil unit.

i. Pipe enclosure: The contractor shall furnish and install pipe enclosures of the type and size shown on the plans. These shall be installed in conjunction with the air conditioning units. Units shall be factory built rigid assemblies which are to be bolted directly together at the job site. All components shall be of not less than 18 U.S. gauge steel, phosphatized and finished with a zinc chromate base, corrosion resistant gray primer finished baked enamel. Construction shall be such that all component parts have uniform cross section to assure proper line up and fit.

31-19. THERMOMETERS shall be installed in ducts or piping where indicated or specified and shall be so installed as to be easily read from the operating floor. The thermometers shall have suitable range and shall be so installed as to be conveniently read. Thermometers for use in ducts shall have sensing elements or thermal elements with capillaries not less than 20 feet long, and for use in pipes shall have immersion type sensing elements. Thermometers shall be located specifically on, but not limited to chilled water lines entering and leaving each chiller, chilled water lines on the controlled side of each air handling unit control valve, in supply and return ducts to and from each air handling unit, and at the sensing element of each automatic temperature device where a thermometer is not an integral part thereof.

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31-20. TEMPERATURE CONTROLS:

a. General: Temperature controls shall be either pneumatic, electric, or electronic type that will provide the required sequence of operation and control. Relays, control valves, air compressors, reducing stations, switches, air piping, wiring, or other items not specified herein or shown on the control diagrams but necessary to perform the functions specified, shall be provided.

b. Dampers shall be factory fabricated with galvanized blades, oil impregnated bearings, and channel iron frames with rust inhibitor treatment, and shall be suitable for mounting in ductwork. Damper blades shall be not lighter than 16 gauge (0.0653 inch in nominal thickness) steel, not more than 10 inches wide, and shall have interlocking edges. Throttling dampers shall be opposed blade type. Two position dampers shall be parallel blade type. Connections between damper, damper motor, and damper linkage shall be made with brass or cadmium plated bolts and nuts. Nuts shall be self locking, of the interference or wedge type, or shall be castle head nuts with cotter keys.

c. Valves shall be sized by the control manufacturer to produce the required capacity and valve close-off ratings shall be equal to or in excess of the system pressures encountered. Each valve shall be equipped with self adjusting packing. Stainless steel trim and removable seats shall be provided on all valves where the pressure differential across the valve is greater than 25 p.s.i.

(1) Unit conditioner valves: Control valves for fan coil units shall be of the throttling type of three way pattern with forged brass body rated at 125 p.s.i. or more. Each valve shall be suitable for heated and chilled water service.

(2) Large control valves: Control valves for air handling units, and miscellaneous control valves shall be three way pattern of the throttling type as required for the sequence hereinafter specified. Valve bodies shall be rated at 125 p.s.i. or more for steam, hot water, or chilled water service as required for the application. Each valve shall have a contoured plug with removable discs, and each valve shall be provided with valve stem travel indicator.

d. Damper or valve operator shall be provided for each automatic damper or valve and shall be of sufficient capacity to operate the damper or valve under all conditions, and to guarantee tight close-off of valves against system pressure encountered. Each operator shall be full proportioning type unless indicated otherwise and shall be provided with spring return to fail safe as required to meet project conditions. Each operation shall operate at the rate of speed corresponding to the dictates of the controller. Where sequencing is required, the operators shall be provided with positive positioning devices and with adjustable operating range and starting point. Elec-

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tric operators shall be hydraulic or oil immersed gear train type with machine cut gears.

e. Control indicating devices: Each control except space thermostats and space humidity controllers shall be provided with a permanent indicating device at the control to indicate the exact point at which the control is operating within the modulating range.

(1) Thermostats shall be full proportioning type with adjustable throttling range unless otherwise indicated. Sensing elements shall be sensitive to temperature changes of plus or minus 1 degree F.

(a) Space thermostats shall have locking cover, adjustable differential and thermometer. Space thermostats shall be mounted 60 inches above the floor unless otherwise indicated.

(b) Remote thermostats shall be remote bulb or rigid stem insertion type. Set point and throttling range adjusting mechanism shall be mounted in a metal case outside of the duct or pipe. Sensing element shall be secured in the controlled medium flow stream to respond to overall temperature within the duct or pipe.

(c) Fan safety cutoff with manual reset shall be provided on the inlet of each fan and shall be set to stop the fan if the inlet air temperature exceeds 125 degrees F.

(d) Low limit cutoff with manual reset shall be provided after each preheat coil and shall be set to stop the fan and close the outside air damper if the air temperature leaving the coil drops below 35 degrees F.

f. Control panel shall be furnished and installed where indicated on drawings. Panel shall be not lighter than 12 gauge (0.1112 inch in nominal thickness) black steel with turned edges. Instruments shall be flush mounted or back mounted and shall be completely piped and wired to a properly identified terminal strip. Each panel shall contain starters, protective devices, gauges, and other control devices that are not normally furnished integral with the equipment.

g. Air compressor and piping: Where pneumatic controls are furnished, and air compressor of the standard piston type, complete with air tanks, valves, gauges, filters, and other appurtenances shall be provided, and the compressor and installation shall conform to American Standard B19. Air lines for pneumatic controls shall be hard drawn copper tubing except concealed air lines may be soft drawn annealed copper tubing. The air compressor and tanks shall be located where directed by the Contracting Officer. The air compressor shall be of sufficient capacity to provide continuous control air when operating on a $\frac{1}{2}$ -on $\frac{1}{2}$ -off cycle.

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h. Transformers and wiring: Transformers shall be provided for electric or electronic controls as required and shall be connected to the central power source indicated. Spare circuits in electric panels shall not be used for controls unless otherwise noted. Where controls serve an individual air handling unit, transformers may be connected to fan motor leads of the unit controlled.

i. Installation: The automatic equipment shall be installed by mechanics employed by or under subcontract to the control manufacturer, in strict accordance with the manufacturer's instructions and approved by the Contracting Officer. All control wiring or tubing shall be provided under this section of the specifications. Before the air conditioning installation is accepted, the contractor shall deliver to the Contracting Officer a statement from the manufacturer or his authorized agent, certifying that the automatic control equipment has been inspected and found to be properly installed and is functioning satisfactorily.

j. Sequence of control:

(1) Summer-winter change-over: Switch in winter position allows water supply valve V-4 and water return valve V-3 to be fully open to the boiler. Water supply valve and water return valve are fully closed to the chiller. Air valve is positioned to allow 15 pounds supply air to the control system, thereby indexing all summer-winter controls for winter operation. With switch in summer position, all of the above controls are reversed.

(2) Air handling units: When fan is started, coil of E-P is energized allowing outside air damper D-1 and return air damper D-2 to be positioned to a minimum position as determined by the minimum position relay. When the fan is stopped, coil of E-P is de-energized closing D-1 and opening D-2.

(a) Winter cycle: On a rise in temperature, room thermostat T-3 gradually positions heating coil valve V-5 such that more hot water is by-passed around the coil. On a continued rise in temperature, T-3 gradually opens outside air damper D-1 and closes return air damper D-2 to their maximum position. On a fall in temperature, this cycle is reversed. Should the unit discharge temperature fall below 55 degrees, low limit thermostat T-4 will also reverse the above cycle.

(b) Summer cycle: D-1 and D-2 are allowed to open to their minimum position only. On a rise in room temperature, thermostat T-3 gradually positions valve V-5 such that more chilled water is allowed to the coil. On a fall in temperature this cycle is reversed. Should any portion of the element of thermostat T-5 drop below 35 degrees, this thermostat will stop the fan.

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(3) Typical fan coil unit:

(a) Winter cycle: Thermostat T-2 is indexed for winter control. On a rise in return air temperature, T-2 gradually positions V-2 such that more hot water is by-passed around the coil. On a fall in temperature, this cycle is reversed.

(b) Summer cycle: Thermostat T-2 is indexed for summer control. On a rise in return air temperature, thermostat T-2 positions V-2 such that more chilled water is passed through the coil. On a fall in temperature, this cycle is reversed.

(4) Refrigeration compressor: On a rise in chilled water supply, temperature thermostat T-6 starts the refrigeration compressor through E-P-switch. When the compressor is started, coil of E-4 is energized thereby allowing the compressor to be loaded, as the load increases. On a fall in chilled water supply temperature, the compressor is unloaded. Should the power to the compressor be interrupted, the system shall be de-energized and compressor reduced to a no-load condition. When power is again restored, the compressor can again be reloaded slowly through the restrictor and solenoid air valve. Should the temperature of the water entering the chiller rise above 90 degrees, thermostat positions three way valves V-3 and V-4 such that no water would be allowed into the chiller. Flow switches shall be installed in the condenser water and chilled water so that compressor cannot start until switches indicate flow in the piping.

(5) Cooling tower control: Aquastat in tower fan shall stop tower fan on temperature fall below 75 degrees F. and start tower fan on temperature rise above 85 degrees F.

k. Space conditions: The controls shall be set to maintain conditions listed in the spaces as follows:

Winter - 70 degrees F.D.B.

Summer - 80 degrees F.D.B. and 50% R.H.

31-21. SEQUENCE OF EQUIPMENT OPERATION: Equipment shall be interlocked so that in summer the following sequence is performed when the air conditioning system is turned on:

1. Start cooling tower fan.
2. Start Cooling tower pump.
3. Start chilled water pump.
4. Start Compressor.

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In winter all above equipment shall be off except for the chilled water pump which shall also serve the heating system.

31-22. INSULATION: All insulation, vapor barrier, and duct lining materials shall be noncombustible as defined in section 200 of the National Building Code, shall have flame spread rating of not more than 25, and a smoke developed rating of not more than 50, as defined in the Method of Test of Surface Burning Characteristics in the Building Materials List of the Underwriters' Laboratories, Inc.

a. Duct insulation:

(1) General: Ducts shall be insulated to the thickness as hereinafter specified. Insulation shall be flexible type where concealed and rigid type where exposed, with factory applied fire resistant facing of 8 ounce latex coated canvas, 2- $\frac{1}{2}$ mil thick aluminum foil, laminated aluminum foil consisting of two plies of 1 mil thick aluminum foil with glass yarn reinforcing, or other approved vapor barrier material. Insulation shall be secured to rectangular ducts by impaling over metal stick clips spaced 12 inches on centers each way, by 18 gauge copperweld wire spaced not over 12 inches on centers or by a combination of the two methods if necessary to accomplish a neat finished installation. Round duct insulation shall be secured with 18 gauge copperweld wire spaced not over 12 inches on centers. In all cases where insulation joints occur, facing tabs shall be lapped not less than 2 inches and sealed with an approved adhesive recommended by the manufacturer of the facing material. All punctures in facing material shall be sealed.

(2) Thickness of material:

(a) Fresh air intake ducts, return air ducts and air conditioning supply ducts, casing and supply fans; 1 inch thick material.

b. Equipment insulation:

(1) Chilled water pumps: 2 inch thick formed cellular or fibrous glass. An approved vapor seal tape or mastic shall be applied over the insulation.

(2) Expansion tanks: 1 inch thick magnesia block or fibrous glass wired in place with 18 gauge copperweld wire.

c. Pipe insulation:

(1) General: Chilled water, combination chilled and heated water, heated water, cold water, and air conditioner drain lines, after being tested, shall be cleaned and insulated. Insulation shall be $\frac{3}{4}$ inch thick for pipe up to and including 2 $\frac{1}{2}$ inches, and 1 inch

thick for lines 3 inches and over. Insulation on heated water lines shall be jacketed with fire resistant, latex treated muslin 37½ inches wide and weighing not less than 3.5 ounces per linear yard. Insulation on chilled water, combination chilled and heated water, air conditioner drain and cold water lines shall be jacketed with fire resistant vapor barrier of 2½ mil thick aluminum foil or laminated aluminum foil consisting of two plies of 1 mil thick aluminum foil, with glass yarn reinforcing. All jacket joints shall be lapped not less than 1½ inches and sealed with an approved adhesive suitable for jacket material. Insulation shall be secured with aluminum bands not less than 0.005 inch thick, not less than ¾ inch wide, and spaced not over 18 inches on centers. Fittings and valves shall be covered with the same material of the same thickness as the pipe insulation, sealed with an approved vapor sealing tape or compound and finished with a hard smooth surface of an approved insulating cement. Covering shall be finished neatly at pipe hangers and shall be terminated neatly on the ends of the unions with insulating cement.

(2) Fan coil unit runouts shall be insulated with ½ inch thick flexible synthetic rubberlike expanded cellular tubing having a k factor of not more than 0.28 B.t.u./in./sq.ft./hr./degree temperature F. at 75 degrees and water vapor transmission coefficient of not more than 0.1 perm.

d. Plaster finish: All insulated equipment including pumps, tanks, and all ducts in equipment rooms shall be covered with chicken wire and finished with ½ inch smooth trowel coat of Keene's cement.

31-23. EQUIPMENT INSTALLATION: Necessary supports shall be provided for equipment, appurtenances, pipe, and ductwork as required; these include frames or supports for tanks, compressor, pumps, converters, valves, air units, fans, coils, dampers, and other similar type items requiring supports. Floor mounted equipment, unless otherwise indicated, shall be set on not less than 6 inch concrete pad doweled in place. Foundation drawings, bolt setting information, and foundation bolts shall be furnished for all equipment indicated or required to have concrete foundations. Concrete for all foundations shall be as specified in SECTION: CONCRETE.

31-24. ACCESS PANELS shall be provided for all concealed valves, controls, dampers, or any item requiring inspection and maintenance. Access panels shall be of sufficient size and so located that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in SECTION: MISCELLANEOUS METALWORK.

31-25. BALANCING AND TESTING:

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a. Cleaning and adjusting: Pipes shall be cleaned free of scale and thoroughly flushed of all foreign matter. Temporary bypass shall be provided for all water coils to prevent flushing water from passing through coils. All strainers and valves shall be thoroughly cleaned. Ducts, plenums, and casings shall be thoroughly cleaned of all debris and blown free of all small particles of rubbish and dust before installing outlet faces. Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided for all fans that are operated during construction, and after all construction dirt has been removed from the building, new filters shall be installed. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

b. Testing:

(1) Piping: After cleaning, all water piping shall be hydrostatically tested at a pressure equal to 150 percent of the total system operating pressure for a period of time sufficient to inspect every joint in the system and in no case less than 2 hours. No loss of pressure will be allowed. Leaks found during tests shall be repaired by rewelding or replacing pipe or fittings. Caulking of joints will not be permitted. Concealed and insulated piping shall be tested in place before covering or concealing. All tests shall be conducted in the presence of the Contracting Officer who shall be given 2 days notice before any test is to be conducted. Water and electricity required for the tests will be furnished by the Government. Any material, equipment, or instruments required for tests shall be provided by the contractor.

(2) Conventional velocity ductwork: Ducts, plenums, and casings, shall be tested and made substantially airtight at static pressure indicated for the system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through the senses of feeling or hearing.

c. Balancing:

(1) Water piping systems shall be balanced to produce water quantities as indicated with all automatic control valves open.

(2) Duct systems shall be balanced to produce air quantities within 5 percent of that indicated.

d. Performance tests: After cleaning, balancing, and testing are completed as hereinbefore specified, the system shall be

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tested as a whole to see that all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Corrections and adjustments shall be made as necessary to produce the conditions indicated.

31-26. TEST DATA:

a. General: The contractor shall provide the Contracting Officer with typewritten schedules of readings taken during the balancing and testing operations indicating the required or specified reading, the first reading taken, and the final balanced reading for the following items:

(1) Fans: Size, type, speed (r.p.m.), static pressure (H₂O), air quantity (c.f.m.), and motor load (amperes).

(2) Air balance:

(a) Air outlets and inlets: Size, velocity (f.p.m.) and air quantity (c.f.m.).

(b) Coils: Size, face velocity (f.p.m.) air condition On and Off (WB and DB degrees F.), water temperature leaving coil (degrees F.), and water temperature entering coil (degrees F.).

(c) Ducts: Size, velocity (f.p.m.) and air quantity (c.f.m.).

b. Control settings: The actual on site setting of all automatic controls including thermostats, safety controls, minimum damper settings, fire safety thermostats, pressure controls, temperature controls, and other similar items shall be provided in the form of a typed tabulated list indicating type of control, location, setting, and function.

31-27. PAINTING AND FINISHING:

a. Factory prime coats: The following items shall be cleaned and painted at the factory with type A finish without the finish coat in accordance with Military Specification MIL-T-704. Surfaces with rust inhibitor coating shall not be blasted.

Coil fan unit enclosures inside and outside.

Diffusers.

Grilles

Registers.

The color of the paint shall be the manufacturer's standard color.

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b. Factory finish coats: The following items shall be cleaned and painted at the factory in accordance with Military Specification Mil-T-704. Surfaces with rust inhibitor coating shall not be blasted.

Air handling units

Controls

Pumps

c. Field painting: All ferrous metal not specified to be painted at the factory shall be primed in accordance with SECTION: PAINTING; PROTECTIVE, ON METAL. Finish painting is specified in SECTION: PAINTING, GENERAL.

31-28. OPERATING AND MAINTENANCE INSTRUCTIONS: Complete operating and maintenance instructions for each piece of equipment, bound in book form, shall be given to the Contracting Officer. Approved wiring and control diagrams of the entire system framed underglass, shall be posted at locations designated by the Contracting Officer. Operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedure for safely starting and stopping the system shall be prepared in typed form, framed under glass, and posted beside the wiring and control diagrams. Upon completion, a competent engineer shall be provided by the contractor for a period of not less than one day to instruct a representative of the Government in the operation and maintenance of the air conditioning system.

31-29. GUARANTEE: The following equipment to be furnished under this section of the specifications shall be guaranteed for a period of one year from the date of acceptance, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design and workmanship:

Air handling units

Fan Coil units

Automatic Temperature controls

Thermometers

Chilled water pump

Valves

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor.

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SECTION 32

CENTRAL REFRIGERATION SYSTEM (FOR AIR CONDITIONING SYSTEM)

32-1. **SCOPE OF WORK:** The work required under this Section includes the provision and installation of all articles, items, materials and operation, including all labor, materials and equipment necessary for and incidental to the completion of all central refrigeration work as shown on the drawings and/or as described herein.

32-2. **GENERAL:** The applicable provisions of the "General Conditions" shall govern the work under this Section.

a. Capacities of all equipment and material shall be not less than those indicated.

b. Conformance to agency requirements: Where materials or equipment are specified to be constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Air Conditioning and the Refrigeration Institute, or the American Society of Heating, Refrigerating and Air Conditioning Engineers, the contractor shall submit proof that the items furnished under this specification conform to such requirements. The ASME stamp will be acceptable as sufficient evidence that the items conform to the requirements of the American Society of Mechanical Engineers. A certificate or published statement that the item is in conformance with the referenced ARI or ASHRAE standard by the manufacturer will be sufficient evidence that the item conforms to the requirements of ARI or ASHRAE.

c. Nameplates: Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment.

d. Prevention of rust: Surfaces of ferrous metal shall be given a rust inhibiting coating where specified. The treatment shall withstand 200 hours in salt spray fog test, in accordance with method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking and no signs of rust creepage beyond 1/8 inch on either side of the scratch mark. Where rust-inhibitor coating is specified hereinafter, any treatment method that will pass the above test is acceptable unless a specific coating is specified. Coal tar or asphalt type coatings will not be acceptable unless so stated for a specific item. Where steel is specified to be hot dip galvanized after fabrication, mill galvanized sheet steel may be used provided all raw edges are painted with a zinc dust pigmented paint conforming to Military Specification MIL-F-26915.

e. Protection from moving parts: Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded.

f. Spare-parts data: As soon as practicable after approval of materials and equipment and, if possible, not later than 4 months prior to the date of beneficial occupancy, the contractor shall furnish spare-parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract, and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation. The foregoing shall not relieve the contractor of any responsibilities under the guarantee specified hereinafter.

g. Standard products: Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least 2 years.

h. Verification of dimensions: The contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Contracting Officer of any discrepancy before performing any work.

32-3 . MATERIALS shall conform to the respective specifications and other requirements specified below:

a. Escutcheons shall be chromium plated pressed or stamped brass, either one piece or split pattern held in place by internal spring tension or setscrew, except that escutcheons in unfinished areas may be 20 guage galvanized metal disc type.

b. Flanges: Federal Specification WW-F-406, class 125.

c. Gauges: Federal Specification GG-G-76, class 2, type III, 4-1/2 inches in diameter for pressure service as required.

d. Insulation shall be noncombustible as defined in subparagraph (c) under Noncombustible, Section 200 of the National Building Code, except for insulating evaporators.

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(1) Evaporator may be insulated with combustible insulation providing it is protected with a steel jacket.

(a) Cellular glass: Federal Specification HH-I-551, type I or III.

(b) Cork: Federal Specification HH-I-525.

(c) Expanded plastic insulation shall be synthetic rubberlike chemically expanded cellular sheet form insulation with a k factor of not more than 0.28.

j. Sheets, metal:

(1) Aluminum sheets: Federal Specification QQ-A-359, quarter hard condition. Gauge numbers specified hereinafter refer to Brown and Sharpe gauge.

(2) Iron and steel sheets: Federal Specification QQ-S-775, class d, galvanized. Gauge numbers specified hereinafter refer to United States Standard gauge.

k. Solder: Federal Specification QQ-S-561, class 3.

l. Strainers:

(1) For water service: Military Specification MIL-S-16293, class 125, style Y, type I or II, simplex type.

m. Thermometers shall be dial type with 3-1/2 inch diameter chromium plated case, remote or direct type bulb as required, with an accuracy of plus or minus 1 degree, and white face with black digits, graduated in 2 degree increments.

n. Unions: Federal Specification WW-U-531, type as required to match adjacent piping.

o. Valves:

(1) For water service:

(a) Angle, check and globe valves: Federal Specification WW-V-51, type I, II or IV, class A.

(b) Gate valves:

1. Bronze gate valves: Federal Specification WW-V-54, type II, class A.

2. Cast iron gate valves: Federal Specification WW-V-58, type I, class A, designation OF.

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32-4 MATERIALS AND EQUIPMENT LISTS: As soon as practicable and before starting installation of any materials or equipment, the contractor shall submit to the Contracting Officer for approval a complete list, in triplicate, of materials and equipment to be incorporated in the work. This list shall include catalog numbers, specification sheets, cuts, capacity information, and other descriptive data as may be required. No consideration will be given to partial lists submitted from time to time. Approval of the proposed materials and equipment will be based on manufacturers' published data. Approval of materials and equipment will be tentative subject to submission of complete shop drawings indicating compliance with the contract documents.

32-5. SHOP DRAWINGS: After receiving tentative approval of the items on the materials and equipment lists, and before installation of any of these items, the contractor shall submit complete shop drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Shop drawings shall be submitted for the following items at one time in order to demonstrate that these items of equipment have been properly coordinated and will function properly with each other:

Controls	Liquid Chiller
Cooling Tower	Pumps
Equipment Supports	System Wiring Diagram.

Shop drawings shall be submitted also for the following items: Insulation, thermometers, water piping and accessories, and such other items as the Contracting Officer may direct. If departures from the contract drawings are deemed necessary by the contractor, details of such departures, including changes in related portions of the project and the reasons therefor, shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

32-6. WORKMANSHIP:

a. General: All materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

b. Welding: The contractor shall be responsible for the quality of welding done. The quality of the welding procedures and the quality of the welding shall be determined by testing the welder's ability to make sound welds, under standard working conditions with the equipment to be used in the work on this project, all in conformance with American Standards Association Code B31.1 and American Welding Society Standard B3.0.

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c. Qualification of welders: The determination of the qualification of welders, and the requirement for welding shall be in accordance with the applicable portions of the above referenced code and standard for pipeline and structural welding. Each welder shall be examined at the jobsite by the contractor, in the presence of the Contracting Officer, to determine his ability to meet required qualifications. Welders shall be tested for welding materials in the various positions required, including welds with the axis of the material vertical and with the axis horizontal without rolling. Each welder shall be required to identify his work with a code marking, a listing of the names of the welders with corresponding code marks shall be furnished the Contracting Officer. Welders making defective welds during qualifications and welders responsible for making defective welds after passing the test shall be given a requalification test. Welders failing a requalification test shall be discharged.

32-7. ELECTRICAL WORK: Electrical motor-driven equipment specified herein shall be provided complete with motors, motor starters and controls. Electrical equipment and wiring shall be in accordance with SECTION: ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as indicated. Motor starters shall be provided complete with properly sized thermal overload protection and other appurtenances necessary for the motor control indicated. Each motor shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation herein specified and any control wiring required for controls and devices but not shown on the electrical drawings, shall be provided under this section of the specifications.

32-8. LIQUID CHILLING PACKAGE, RECIPROCATING:

a. General: The chilling plant shall be one self-contained, electric motor driven unit composed of a duplex open type compressing component with individual motors, chiller, condensers, oil heaters, operating and safety controls, refrigerating piping, and instrument and control piping. The entire unit shall be a factory assembled and factory tested packaged water chiller plant completely piped and wired and ready for operation after connection to utilities and charging. The chilling plant furnished shall include a complete charge of refrigerant and oil furnished by the contractor. The refrigerant shall be Freon F-22.

b. Compressors: The compressors shall be of equal capacity, produced by the same manufacturer and of the same series of the manufacturer's production. Each compressor shall be of 50 tons refrigerating capacity, tested and rated in accordance with ASHRAE Standard No. 23 and certified as to such by the compressor manufacturer. The compressors shall be capable of operating at a partial load condition without vibration and shall be capable of continuous operation under all load conditions. The compressors shall be of monoblock design. The compressors speed shall be 1150 r.p.m. The compressors shall have light weight alloy automotive type pistons with full floating wristpins, two compression rings and one oil ring. The connector rods also to be of light weight alloy rifle-drilled to lubrication of the wristpins. The crankshaft shall run in bronze bearings of special alloy for the purpose. The bearings shall be fitted with thrustwashers throughout. The shaft seals shall be the conventional type, packless, rotary seals. Each crankcase shall be fitted with a suitable heater to prevent high concentration of refrigerant in the crankcases during shut-downs. Each compressor shall embody such features as high-to-low side spring loaded relief with an automatic reset for protection of the compressors against abnormally high discharge pressures; suction strainer with an oversized fine mesh strainer located in the suction manifold; oil gauge and sight glass with shut-off valve; pressure differential manual reset type oil failure switch to respond to pressure differential between oil pressure and suction pressure and to protect the compressor by stopping the motors on reduced oil pressure; compressor capacity control by internal discharge pressure actuated unloaders permitting no-load starts and positive capacity control; shut-off with cap seal, back seating valve.

c. Water cooled condenser: The condenser shall be two in number, two pass type constructed by straight tubes copper finned. The condensor heads shall be removable. The design shall be such that the tubes be kept free of liquid refrigerant to maintain maximum condensing surface. The condensers shall be fitted with three test-cocks for easy liquid level determination. The maximum pressure loss through the individual condensor shall not exceed 7.8 feet head. The condensers shall be A.S.M.E. constructed and bear the A.S.M.E. stamp or inspected and certified by one of the aforesaid inspection services. The condensers shall be constructed for 300 pounds working pressure on the shell side and 125 pounds on the tube side-- minimum scaling allowed is .001.

d. Chiller (evaporator): The chiller shall be two circuit expansion with tubes formed by U-bend ends and guaranteed against

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damage to the chiller in case of an occurrence of freeze-up. The chiller shall have positive oil return. The location of the anti-freeze bulb shall allow safe operation and constant flow of water as low as 34°F. The chiller shall be A. S. M. E. constructed, and bear the A. S. M. E. stamp or inspected and certified by one of the aforesaid inspection services. The chiller shall be suitable for a working pressure of 150 pounds on the tube side, and 125 pounds on the shell side. The allowable fouling factor shall be .0005. The chiller shall be of a capacity to cool 300 g. p. m. of water from 53°F. to 45°F. with 300 g. p. m. of condensor water at 85°F. to 95°F., 105°F. condensing temperature.

e. Controls, control panel and gauges: Each water chilling unit shall be provided with operating and safety controls of the electric or pneumatic type properly coordinated with the temperature control system specified in SECTION: AIR-SUPPLY AND DISTRIBUTION SYSTEM (FOR AIR CONDITIONING SYSTEM). Each unit shall be provided with a factory piped and wired control panel fitted with a discharge pressure gauge, suction pressure gauge, oil pressure gauge, high pressure cutout, low pressure cutout, oil pressure differential switch, low temperature cutout, compressor operating control, Hand-Off-Auto switch, and any other relays or appurtenances necessary for safe controlled chiller operation. High pressure cutout shall actuate a 4 inch diameter alarm bell. Transformer for bell circuit shall be provided if required. System capacity control, suction or temperature actuated, shall be provided to adjust the compressor capacity in accordance with the system load, and to automatically recycle the system on power interruption. System shall be provided with at least one step of 50 per cent automatic capacity reduction. Capacity reduction may be provided by cylinder unloading, by sequence operation of not more than two equally sized compressors, or by a combination of the two methods.

f. Electric motors: The electric motors shall be suitable for the electric power characteristics as specified in SECTION: ELECTRICAL WORK, INTERIOR. The motor shall be constant speed, 1150 r. p. m., squirrel cage induction, open enclosure, individual motor per compressor, 50 horsepower each, low starting current, normal torque type, direct connected to the compressor by flexible coupling. The motor starter shall be magnetic reduced voltage or increment starting type with general purpose enclosure.

Motors shall be thermally protected against overheating, and overload protection shall be provided on all three phases. Wiring shall be as recommended by the compressor manufacturer unless indicated otherwise to provide completely automatic operation of the refrigeration system.

g. Chilling plant foundation: The chilling plant foundation shall be mounted on a concrete base the length and width of the unit and extending 12 inches above the floor line. The foundation shall be independent of the basement floor construction and shall be poured from a suitable depth of excavation on a hand tamped sub-grade prior to the pouring of the floor. A joint for caulking with flexible material shall be left against the foundation when pouring the concrete basement floor.

h. Tools: The contractor shall provide sufficient special tools as recommended by the manufacturer for field maintenance of the chilling plant. Tools shall be mounted on a neat appearing tool board near the chilling plant or contained in a suitable tool box approved by the Contracting Officer.

i. Mount: The chilling plant shall be factory assembled on and within a set of sills and framework constructed of structural steel. The mount shall be of sufficient stiffness to arrest any tendency to vibrate unduely or weave in handling or running. The members of the mount shall be so arranged and located to permit room for the handling of tools in maintenance work. The entire plant as a unit shall be mounted on vibration isolators of sufficient and published load ratings.

j. Insulation: Insulation shall be provided for all suction piping from the evaporator to the compressor in conformance with the insulation as hereinafter specified.

k. Factory supervision: The manufacturer shall furnish without expense to the Government the services of a factory trained erection engineer for a minimum of one full working day to advise on the following:

(1) Erection: Alignment, leveling, testing, cleaning the interior, use of oil, and dehydrating.

(2) Charging: Charging the plant with refrigerant.

(3) Starting: The erection engineer is required to start the plant on its initial run and instruct a representative of the Government in the proper care and operation of the equipment.

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32-9 COOLING TOWER:

a. The contractor shall furnish and install, as shown on the plans, a Baltimore Aircoil Company, Inc., or approved equal, draw-thru type cooling tower. The cooling tower shall be of the sectional counterflow type consisting of pan, fan, and wet deck and spray sections with eliminators. The tower shall be of hot-dip galvanized steel construction throughout and all parts finished inside and outside with zinc-chromatized aluminum paint.

b. Pan section: The pan shall be constructed of not less than 1/8" gauge bottom and sides hot-dip galvanized steel. Standard accessories shall include large area lift-out strainer with closed top to prevent cavitation, waste water bled line with valve, and compound lever brass make-up valve with seamless copper float ball.

c. Casing: The casing above the pan shall be constructed of not less than 12 gauge ends and 14 gauge sides hot-dip galvanized steel.

d. Fan section: The fan section shall have forwardly-curved centrifugal fans, statically and dynamically balanced. Fans and housings shall be constructed of hot-dip galvanized steel finished with a prime coat of zinc chromate followed by a second coat of zinc-chromatized aluminum paint.

e. Fan motor and drive: A drip-proof ball-bearing fan motor shall be furnished having a "Special A" tropical insulation. The motor shall be suitable for operation on 208 volt, 60 cycle, three phase current and shall be mounted on an adjustable motor base. A multi-groove-V-belt fan drive shall be furnished, designed for not less than 120% of the motor nameplate horsepower. The drive shall be covered by a hot-dip galvanized guard.

f. Wet deck surface; The wet deck surface shall be all steel for protection against fire, fungus attack, warpage and change in weight due to water absorption. It shall be made of not less than 24 gauge hot-dip galvanized, wave-formed steel and further corrosion protected by dipping in zinc chromate paint.

g. Spray tree: The spray tree shall be made of full-weight galvanized steel pipe with removable branches and non-clog type pressure spray nozzles with removable orifices.

h. Eliminators: The eliminators shall be constructed of not less than 24 gauge hot-dip galvanized steel encased in 16 gauge hot-dip galvanized steel frames. They shall have a minimum of three breaks with hooked leaving edge and shall be removable in easily handled sections.

32-10. PUMPS shall be split case, enclosed impeller, non over-loading, centrifugal type. Casing, bearing housings, and base shall be cast iron. High points in the casing shall be provided with manual air vents; low points shall be provided with drain plugs. Shaft seal shall

be steel, burned and ground. Bearings shall be ball type, roller type, or oil lubricated bronze sleeve type, and shall be efficiently sealed or isolated to prevent loss of oil or entrance of dirt or water. Each pump shall be direct connected through a flexible coupling to an electric motor operating at not over 1750 r.p.m. Pump shall be accessible for servicing without disturbing piping connections. Pump and motor shall be mounted on a common cast iron base having lipped edges and tapped drainage openings. Pump shall be provided with a shaft coupling guard and shall be designed to withstand the discharge head specified plus the static head on system plus 50 percent of the total, but not less than 125 p.s.i. Additional capacity shall be provided to accommodate extra water requirements for water cooling the compressor motor if required for the unit furnished. Pump motors shall have ample capacity to prevent overloading with pump operating at any point on its characteristic curve, and shall have splashproof enclosure. Motor starters shall be across-the line type with general purpose enclosure. Pumps shall be installed on suitable foundations, properly leveled, grouted in, and realigned before operation, in accordance with the manufacturer's instructions.

32-11. WATER PIPING, VALVES AND ACCESSORIES:

a. Pipe and fittings:

(1) Condenser water piping shall be standard weight galvanized steel pipe, with standard weight galvanized malleable iron threaded fittings.

(2) Other water piping shall be in accordance with SECTION: AIR SUPPLY AND DISTRIBUTION SYSTEM (FOR AIR CONDITIONING SYSTEM).

b. Valves:

(1) Gate valves 2 inches and smaller shall be bronze, threaded connection; over 2 inches shall be flanged cast iron.

(2) Globe valves 2 inches and smaller shall be all brass threaded connection; over 2 inches shall be flanged bronze connections.

(3) Check valves over 2 inches shall be iron body, brass trim, flanged connection.

(4) Balancing cocks shall be all brass, squarehead with check, suitable for 125 p.s.i. service; over 2 inch cocks shall have flanged connections.

c. Installation:

(1) General: Pipe shall be cut accurately to measurements established at the jobsite and worked into place without springing or forcing, properly clearing all windows, doors and other openings.

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Cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval of the Contracting Officer. Pipes shall have burs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Changes in direction shall be made with fittings, except that bending of pipe will be permitted, provided a hydraulic or mechanical pipe bender is used and wide sweep bends are formed. Bent pipe showing kinks, wrinkles, or other malformation will not be accepted. All piping shall be installed with sufficient pitch to insure adequate drainage. All low points shall be properly flashed. Open ends of pipelines or equipment shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system.

(2) Joints:

(a) Screw joints shall be made with tapered threads properly cut conforming to the requirements of Federal Specification GGG-P-351. Joints shall be made tight with a stiff mixture of litharge and glycerin or other approved thread joint compound applied with a brush to the male threads only. Not more than three threads shall show after the joint is made up.

(b) Welded joints: Joints shall be fusion welded in accordance with American Standard B31.1, section 6, unless otherwise required. Changes in direction of piping shall be made with welding fittings or bends only. Mitering or notching pipe to form elbows or tees or other similar type construction will not be permitted. Branch connections shall be made with welding tees or forged welding branch outlets.

(c) Flanges and unions: Flanged joints shall be faced true, provided with 1/16 inch asbestos gaskets, and made square and tight. Union or flange joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as pumps, cooling tower, condensers, control valves, and other similar items.

(3) Valves in horizontal lines shall be installed with stems horizontal or above. Isolation gate valves shall be installed on each side of each piece of equipment such as pumps, condensers, cooling towers, and other similar items, and at any other points indicated or required for maintenance draining or isolation. Each valve except check valves shall be identified with not less than a 2 inch diameter brass tag correctly stamped to explain the valve function and numbered for identification. Tags shall be secured to the valve with 18 gauge copper or brass wire.

(4) Pipe supports:

(a) Suspended horizontal piping shall be supported by adjustable hangers. Chain, wire, strap, or other makeshift devices will not be permitted with roller type hangers or supports. All pipe shall have a maximum support spacing of 10 feet on centers. Where

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pipes are insulated, the size and position of the hanger shall be such as to bear on the outside of the insulation. Sleeves or saddles of not lighter than 18 gauge galvanized steel and length as recommended by the insulation manufacturer, shall be placed between hangers and insulation. Supports or hangers for uninsulated copper lines shall be copper coated, and lead sleeves shall be provided between the pipe and the support or hanger.

(b) Vertical piping shall be guided or supported in the center of the riser and not over 15 feet on centers, and shall be supported at the base of the riser on a base elbow or tee with pipe stand only where shown on the drawings.

(5) Pipe sleeves: Pipe passing through walls, ceilings, or floor shall be provided with pipe sleeves poured or fitted in place at the time of construction. Each sleeve shall extend through the respective floor or wall, and shall be cut flush with each surface unless otherwise required. Unless otherwise specified, sleeves shall be of such size to provide not less than 1/2 inch clearance between uncovered pipe and sleeve or covering and sleeve. Sleeves in bearing walls shall be made of steel or cast iron pipe. Sleeves in other walls shall be 20 gauge (0.0408 inch in nominal thickness) galvanized, steel, fiber, or other approved material.

(6) Escutcheons shall be provided at all finished surfaces where exposed piping, bare or covered, passes through floors, walls or ceilings. Escutcheon shall be fastened securely to pipe sleeves or to extension of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep type escutcheons shall be used.

32-12. THERMOMETERS shall be installed in piping and equipment where indicated or specified. The thermometers shall have operating range compatible with the temperature range of the service and shall be so installed as to be conveniently read. Thermometers shall be located specifically on, but shall not be limited to, condenser water lines entering and leaving condenser, chilled water lines entering and leaving evaporator.

32-13. CONTROLS:

a. General: Automatic controls other than condensing temperature controls for the central refrigeration equipment are specified herein before to be provided with the central equipment. These controls shall operate automatically to balance the equipment output capacity with the load on the air conditioning system, and shall be fully coordinated with and integrated into the temperature control system specified in SECTION: AIR-SUPPLY AND DISTRIBUTION SYSTEM (FOR AIR CONDITIONING SYSTEM).

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b. Condensing temperature: Control and other devices necessary shall be provided to perform the following functions:

(1) Water cooled condenser: On a decrease in water temperature leaving the condenser, the cooling tower fan shall be deenergized. Control shall be set for 105 degrees F. refrigerant condensing temperature.

32-14 INSULATION:

a. Piping shall not be insulated until after the pipes have been proved tight under the required test pressures. Chilled water lines shall be cleaned and insulated with sectional pipe insulation. Cellular glass insulation shall be provided with finish wrapping. All other insulation shall be provided with factory applied noncombustible vapor-barrier jacket of 2-½ mil thick aluminum foil or laminated 1 mil thick aluminum foil reinforced with glass yarn. Jacket or wrapping material shall be lapped not less than 1½ inches at each joint and sealed with an approved noncombustible adhesive suitable for the jacket material. Insulation shall be secured in place with aluminum bands not less than 0.005 inch thick, not less than ¾ inch wide, and spaced not over 12 inches on centers. Fittings and valves shall be covered with the same material of the same thickness as the pipe insulation and sealed with an approved vapor sealing tape and a hard smooth surface of approved insulating cement. Covering shall be finished neatly at pipe hangers and shall be terminated neatly on the ends of the unions with insulating cement.

b. Evaporators shall be insulated with a 2 inch thickness of cork, cellular glass, polystyrene, synthetic rubberlike cellular sheet, or mineral wool. If combustible insulation is used, the insulation shall be protected by not lighter than 24 gauge (0.0285 inch in nominal thickness) galvanized steel jacket. Insulation shall be secured in place with lacquered bronze, black japanned steel, or aluminum bands not less than 0.005 inch thick, not less than ¾ inch wide, and spaced not over 18 inches on centers. Noncombustible insulation pervious to moisture shall be covered with a vapor barrier jacket of not less than 2½ mil. thick aluminum foil or laminated 1 mil thick aluminum foil reinforced with glass yarn lapped and sealed with an approved noncombustible adhesive suitable for jacket material.

32-15. EQUIPMENT INSTALLATION: Necessary supports shall be provided for all equipment, appurtenances, and pipe as required; these include frames or supports for pumps, cooling towers, and other similar type items requiring supports. Chiller shall be properly isolated from the building structure by means of approved vibration absorbing foundations. Each foundation shall include an adequate number of standard isolation units which shall consist of machine and floor or foundation fastenings, together with intermediate isolation material. The isolation units shall be standard cataloged products with published load ratings. All other floor mounted equipment shall be set on not less than a 6 inch concrete pad dowelled in place. Foundation drawings, bolt setting information, and foundation bolts shall be furnished for all equipment indicated or required to have concrete

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foundations. Concrete for all foundations shall be as specified in SECTION: CONCRETE.

32-16. ACCESS PANELS shall be provided for all concealed valves, controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and so located that the concealed items may be serviced and maintained or completely removed and replaced. Access panels shall be as specified in SECTION: MISCELLANEOUS METAL WORK.

32-17. TESTING:

a. General: Upon completion of each air conditioning system, and at a time designated by the Contracting Officer, all water piping fabricated at the jobsite shall be pressure tested for leaks, and the entire system shall be performance tested as hereinafter specified. The tests shall be conducted in the presence of the Contracting Officer, or his authorized representative. The contractor shall furnish all instruments, test equipment, and personnel that are required for the tests, and the Government shall furnish the necessary water and electricity.

b. Water piping: Condenser and makeup water piping shall be tested hydrostatically and proved tight at a pressure not less than $1\frac{1}{2}$ times the maximum operating pressure of the system for a period of time sufficient to inspect every joint in the system and in no case less than 2 hours. No loss of pressure will be permitted. Leaks detected shall be repaired by tightening, rewelding joints, or replacing pipe or fittings. Caulking of joints will not be permitted. Concealed and insulated piping shall be tested in place before covering or concealing. Tests shall be conducted in the presence of the Contracting Officer who shall be given 2 days notice before any test is to be conducted. Water and electricity required for the tests will be furnished by the Government. Any material, equipment, or instruments required for tests shall be provided by the contractor.

c. Performance: After the above tests have been completed, and before each refrigeration system is accepted, capacity and general operating tests of the system shall be conducted by a competent experienced engineer. The tests shall cover a period of not less than 1 week for each system and shall demonstrate that the entire system is functioning in accordance with the specifications. Corrections and adjustments shall be made as necessary to produce specified conditions.

32-18. TEST DATA: The contractor shall provide the Contracting Officer with typed tabulated data taken during the performance tests that will indicate that the system will produce the required capacity. The information shall be generally as follows:

Date and outside weather conditions.

The load on the system:

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Water quantity and temperature On and Off of the chiller.

The position of the capacity reduction gear, machine Off one-third loaded, one-half loaded, etc.

Condensing temperature and pressure.

Running current of all motors.

The actual on-site setting of all operating and safety controls.

The refrigerant used in the system.

The above information shall be taken at least three different times at outside dry-bulb temperatures that are at least 5 degrees F apart.

32-19. PAINTING AND FINISHING:

a. Factory prime coats: The following listed items shall be cleaned, and painted at the factory with type A finish without the finish coat in accordance with Military Specification MIL-T-704. Surfaces with rust inhibitor treatment shall not be blasted.

Fan scrolls interior and exterior

Steel cooling tower casing exterior.

The color of the paint shall be the manufacturer's standard color.

b. Factory finish coats: The following items shall be cleaned and painted at the factory with type A finish in accordance with Military Specification MIL-T-704. Surfaces with rust inhibitor treatment shall not be blasted.

Control devices

Package liquid chiller

Pumps

c. Field Painting: All ferrous metal not specified to be painted at the factory shall be primed in accordance with SECTION: PAINTING; PROTECTIVE, ON METAL. Finish painting is specified in SECTION: PAINTING, GENERAL.

32-20. OPERATING AND MAINTENANCE INSTRUCTIONS complete for each piece of equipment and bound in book form, and approved wiring diagrams, refrigerant and waterflow diagrams, and control diagrams of the entire system framed under glass, shall be posted at locations designated by the Contract-

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ing Officer. Operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedure for safely starting and stopping the system, shall be prepared in typed form, framed under glass, and posted beside the wiring, flow, and control diagrams. Upon completion, a competent engineer shall be provided by the contractor for a period of not less than one day to instruct a representative of the Government in the operation and maintenance of the air conditioning system.

32-21. GUARANTEE: The following equipment to be furnished under this section of the specifications shall be guaranteed for a period of 1 year from the date of acceptance, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design, and workmanship:

Safety switches for centrifugal package water chiller.

Cooling tower

Liquid chiller

Pumps and motors

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor.

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SECTION 33

ELECTRICAL WORK

33-1. SCOPE:

The work includes the furnishing, of all labor, materials, tools, equipment and services necessary for and reasonably incidental to the execution of all electrical work as shown on the drawings and hereinafter specified. All work under this section is subject to the terms and conditions of the contract and the GENERAL and SPECIAL CONDITIONS hereinbefore written for the entire work.

It shall be the Contractor's responsibility to note other sections of the specifications to fully understand and determine the extent of additional electrical work required to be provided. Failure to do so will not relieve the contractor of responsibility for a complete and satisfactory installation of all electrical work required.

The electrical work included in the contract, in general, consists of the following list of items, which list shall not be construed as a complete list of all work included. Any items not called for in the list but which are specified and shown on the drawings, shall be included as required to provide a complete and satisfactory installation of all electrical work.

- Electric service and main service equipment, main disconnect, emergency service equipment, main distribution panel, and motor control center.

- Panelboards, lighting fixtures, devices, appliances, and all other electrical materials, and equipment required.

- Raceways, wires, cables, and electrical connections.

- Empty raceway systems, for signal and communication systems.

- Exit and emergency lighting system.

- Dimmers and dimmer control system.

- Grounding.

- Electric metering equipment.

Low voltage control wiring for the automatic temperature controls specified under HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS.

Control Interlocking Wiring furnished under the HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS.

33-2. WORKMANSHIP, MATERIALS AND EQUIPMENT:

All electrical materials furnished under these specifications shall be new and of a type approved by the Underwriters' Laboratories, Inc. Defective equipment and materials, or material damaged in the course of installation and tests, shall be replaced or repaired to the satisfaction of the Contracting Officer. All materials shall be installed in an approved manner.

Cooperate and coordinate work with other trades.

General locations of various conduit runs and equipment as shown on the drawings are diagrammatic only; their installation shall, however, conform to conditions in the building, and any necessary changes to be made are subject to approval of the Contracting Officer and form a part of this contract. Where interferences occur and work must be re-located, same shall be relocated without additional cost to the Contracting Officer.

The drawings are intended to indicate only the diagrammatic location and general character of the work included. Work indicated, but having minor details obviously omitted or not shown shall be furnished and installed complete to perform the full function intended, without extra cost to the Contracting Officer. For building details, the Architectural and Structural plans shall be followed. All conduit runs for all systems and all outlet boxes or other associated materials and devices shall be installed concealed in the floor slabs, wall, pipe chase and hung ceiling or furred areas. Where impossible to run work concealed same may be run exposed, after first obtaining approval, and must be neatly installed.

Defacement of equipment: The Contractor shall not deface the equipment installed on the project with any form of advertisement, stickers, or nameplate. However, nameplates, rating plates, and other approved identification of equipment shall be permitted, and this material shall be applied in an approved manner.

Equipment connections and material handling: The Contractor is cautioned to note carefully other sections of the specifications describing electrical equipment and apparatus to be furnished under those sections, in order that he may fully understand the wiring requirements that must be installed and connected under this section for complete and satisfactory operation.

All conduit and wiring shown on the electrical drawings or herein specified for equipment and apparatus furnished under other sections of the specifications shall be provided under the electrical section of the specification. All conduit and wiring not shown on the electrical drawings, and required for satisfactory operation of equipment furnished under other sections of the specifications will be provided under the respective section furnishing the equipment.

Lists of Materials: Within 10 days after contract has been signed, and before any purchasing, the Contractor shall submit a complete list in sextuplicate, of materials required for the project, for approval by the Contracting Officer. No consideration will be given to a partial list submitted at intervals. In the event that any item on the list fails to comply with specification requirements, such items will be rejected.

Shop drawings shall be submitted for approval prior to fabrication or actual purchase. Five copies of each shop drawing shall be submitted. Drawings shall be submitted as soon as possible. The contractor shall be responsible for any delay in construction resulting from not receiving approved shop drawings as a result of not having submitted same or for their late submission resulting in construction delays. Unless specified elsewhere or called for on the drawings, shop drawings will be required for the following:

- a. Dimmers.
- b. Dimmer control components.
- c. Main Distribution Panel.
- d. Disconnect Switches.
- e. Panelboards.
- f. Lighting Fixtures.

33-3. ELECTRIC SERVICE:

Main service equipment of the size and type shown on the drawings shall be provided. Voltage characteristics shall be 120/208v., three phase four wire. Four 4-inch concrete encased cement asbestos conduit shall be installed by the Contractor from the C.T. cabinet to a point one foot beyond the building line 36 inches below grade.

Emergency service equipment of the type shown on the drawings shall be provided.

33-4. VISIT TO SITE:

It shall be the Contractor's responsibility to visit the site of the work, compare drawings, and specifications and fully familiarize himself with the work required. Failure to do so will not relieve the Contractor from the responsibility of installing a complete and satisfactory job as herein specified.

33-5. GROUNDING:

All grounding as required by the National Electrical Code and as herein specified and shown on the drawings shall be furnished and installed.

33-6. TELEPHONE SERVICE:

The contractor shall provide a complete empty raceway system (minimum 3/4-inch conduit) to telephone outlets as located on the contract drawings. Conduits shall be run to telephone equipment space in Mechanical Equipment Room. Service conduit to C&P Telephone Co. service shall be 2-1/2-inches and shall be extended as required.

33-7. PANELBOARDS:

Main Distribution Panel shall be braced for 100,000 A. asymmetrical and shall be of the fused disconnect switch type suitable for reject type current limiting fuses. Switch Units shall be quick make, quick break, with positive pressure fuse clips. Panelboards shall be similar or equal to square D. Co. QMB Panels as revised for internal bracing.

208/120 Volt Panelboards: Branch circuit lighting panelboards shall be of the dead-front bolted breaker type, mounted in a steel cabinet, with trim and flush door. Panelboards shall have mains and lugs of rating as shown on the drawings. Bus construction shall conform to NEMA standards for 240 volt A.C. construction, with adjacent breaker poles connected to opposite phases. Panels shall be in accordance with Federal Specification WP 131a, Amendment 2.

Branch Circuit Breakers shall be single, and common trip, two, or three pole with trip calibration as scheduled on the drawings.

- a. All breakers shall be of the following type:
"E" frame breakers having interrupting
rating of 7,500 amps 120 volts A.C. sym.
and 10,000 amps. 265 volts A.C. sym.

Panelboard Cabinets shall be constructed of code gage steel. Provide necessary auxiliary bracing and supports to securely attach the panelboard to the cabinet and evenly distribute the weight on the supporting members.

- a. Trim shall be constructed with flush type door complete with flush type catches and locks. Provide two keys for each lock with all locks keyed alike.
- b. Provide directory frame card and transparent non-breakable plastic cover. Directory of circuits shall be neatly typed on the directory card to identify each circuit controlled.
- c. Cabinets and trims to have two coats of sprayed on gray enamel.

33-8. MISCELLANEOUS CABINETS, TROUGHS, AND JUNCTION BOXES:

Miscellaneous cabinets, troughs, and junction boxes shall be made of code gage steel and shall be equipped with suitable screw on cover plates. Covers shall neatly fit the associated back box.

33-9. CONDUIT SYSTEMS:

Conduit shall be the product of a reputable manufacturer. The products of Walker, General Electric, or National Electric Products Co. meet this requirement.

Conduit type: Conduit for all electric light and power feeders and telephone stubs and conduit within the floor slabs shall be rigid, heavy wall, threaded type hot dipped galvanized or sherardized type. Conduit run concealed above suspended ceilings but not concealed in slabs may be installed with electric metallic tubing (E.M.T.). Flexible metallic conduit jumpers for motor connections shall be installed weather-tight where exposed or subject to moisture.

- a. Fittings for rigid heavy wall conduit shall be of the threaded type.
- b. Fittings for electric metallic tubing shall be without screws as manufactured by Tomic Sales & Engineering Co.
- c. Fittings for flexible metallic conduit shall have insulator liners. Where moisture or water-tight raceway is used, appropriate fittings shall be used.

Minimum size: Rigid conduit, flexible conduit and EMT shall not be smaller than 1/2-inch trade size diameter, and shall be increased in size as noted or required by Code to accommodate the number of wires shown for each run. The Contractor may use multiple runs of small conduits, but in no case smaller than 1/2-inch size, to accommodate conductors where necessary. If this method is employed, then conductors shall be balanced to prevent circulating current. Where multi-conduit runs are used, each conduit shall have a neutral conductor in the run:

Conduit installation: Conduits shall be run concealed or exposed as shown on the drawings. Conduit runs shall be continuous from point of origin to all outlets, pull boxes or cabinets, and each run shall terminate at its respective outlet with two locknuts and bushing. Provide, where required, suitable approved type of bar hanger for support of conduits. Conduits run in spaces above ceiling shall be arranged and coordinated for maximum clearance between other trades. Conduits shall be rigidly attached to steel members in an approved manner. Conduit shall be run to prevent trapping of moisture. Conduits shall be swabbed in an approved manner before conductors are installed. An approved lubricant may be employed in installation of conductors where required.

Expansion fittings: Where conduit crosses building expansion joints, provide approved type of expansion fitting for each conduit.

Motor connections: Connections to motors shall be made with as short a length of flexible conduit as practicable. Rigid conduit connections to motors will not be permitted.

Empty conduits: All empty conduits shall have a minimum No. 14 A.W.G. gage galvanized steel drag wire installed therein.

Empty conduit shall be provided and installed where shown on the drawings for radio communications. Equipment for this radio communications will be furnished and installed by others. Provide and install equipment grounds and power outlets where directed for this equipment.

Underground conduits: Conduits run underground shall be rigid heavy wall steel conduit.

33-10. OUTLET BOXES:

Outlet boxes to suit the requirements of each outlet shall be provided.

Type: Outlet boxes concealed in ceiling or wall shall be of the hot-dipped galvanized steel type with standard knock-outs for conduit termination. Outlet boxes exposed on ceiling or wall shall be of the cast "Feraloy" type with tapered tapped threaded hubs for termination of threaded conduit. Outlet boxes for flush floor installation shall be of the watertight fully-adjustable type with flush cover.

Size: In general, outlet boxes shall be minimum 4-inches square, 1-1/2 inches deep. Shallow outlet boxes for switches may be used where construction prohibits the use of 1-1/2 inch deep boxes. Outlet boxes shall be increased in dimensions as required by the Code. Outlet boxes occurring in concrete slabs shall be of the concrete box type.

Special requirements:

- a. Where required, all flush wall or ceiling boxes shall be fitted with a raised device cover for mounting flush with finished ceiling or wall line.
- b. All ceiling and wall outlet boxes for lighting fixtures shall be provided with a 3/8 inch size galvanized threaded fixture stud.
- c. Flush floor outlets, unless otherwise indicated, shall be provided with a single 3-wire grounding type, 15 ampere, 125 volt, receptacle, with matching plug and sealing ring to provide absolute watertightness.

Box installation: Outlet boxes shall be installed in a rigid manner, either by wood screws on wood, expansion shields on masonry, or machine screws on steel work.

Outlet boxes occurring in cinder block, structural or glazed tile construction, shall be provided with a straight sided, square corner, raised device plate of sufficient depth to place outlet box in void space of tile or block.

33-11. PULL BOXES:

Pull boxes shall be constructed of code-gage steel of not less than minimum size required by Code.

Pull boxes shall be hot dipped galvanized after fabrication.

Unless otherwise indicated, boxes shall be provided with screw fastened covers.

33-12. WIRES AND CABLES:

All conductors shall be copper having 600 volt insulation as manufactured by General Electric, National Electric Products, General Cable, Anaconda, Rome, Crescent, or Walker. Federal Specifications J-C-103b (2).

Wire insulation: In normally dry locations, branch circuit conductors shall have type "RH" insulation.

Wire size: Branch circuit conductors shall be minimum No. 12 AWG unless otherwise noted. Feeder conductors shall be of the size shown. Branch circuit conductors shall be minimum No. 12 AWG unless otherwise noted. Feeder conductors shall be of the size shown. Branch circuit home-runs to panel-board shall be increased to minimum No. 10 AWG when the length exceeds 75 feet.

Color Coding: All wires and cables shall be color coded in accordance with the latest electrical code requirements.

Miscellaneous wire: Specific runs of the wire for low voltage signal system shall be of type and size as herein specified, or as noted on drawings. Where low voltage control system for certain equipments may be required, wiring shall be as required by the manufacturer of such equipment, and installation shall meet the requirements of the Electrical Code.

33-13. SWITCHES:

Switches shall be provided at all locations indicated on the drawings.

Tumbler switches: Flush tumbler switches shall be rated 20 amperes at 120-277 volts A.C. and shall be GE Co. 5951-1.

In general, one switch shall be installed in a single gang space.

Where switches are installed subject to weather they shall be provided with hinged-lid type weatherproof device plates.

33-14. SAFETY SWITCHES:

Safety switches shall be of the fusible or non-fusible type as noted on the drawings, and shall be as manufactured by General Electric, Westinghouse, or Bull-Dog, or approved equal. Switches exposed to the weather shall have weatherproof or raintight enclosures. All safety switches shall be NEMA type "H" heavy duty, industrial type, main switch shall be of the bolted pressure type similar or equal to Square D Bolt-Loc Pressure switch.

Motor Starters shall be of the size, type, and rating required for the equipment controlled with thermal overload elements in all three phases.

Disconnect devices where required by the Electrical Code shall be provided whether shown or not shown on the drawings.

33-15. FUSES:

Provide two complete sets of fuses for all switches and panelboards requiring same. One set shall be installed and the other set shall be delivered in their original cartons to the C.O. with proper identification for usage.

Types: Main distribution panelboard and main switch shall be fused with current limiting fuses similar or equal to Bussman Mfg. Co. Limitrons. Motor circuits in main distribution panelboard shall be dual element current limiting fuses similar or equal to Bussman Mfg. Co. Low Peak Fuses. All other fuses shall be dual element time delay.

33-16. WIRING DEVICES AND DEVICE PLATES:

At locations indicated, provide, install and connect wiring devices required. Wiring devices shall be as manufactured by G.E. Co. or equal and to conform to the type indicated.

General purpose duplex receptacles shall be grounding type, 3 pole, 2 wire, 125 volt, 15 amp, 3rd pole grounded.

Manufacturer
G.E.

Catalog No.
4065-1

Special Outlets shall be as indicated on the contract drawings.

Device plates: Each wiring device shall be provided with a flush device plate as required for the device at each outlet. Plates shall be single or gang combinations as required. Plates shall be 0.040 inches

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thick brass with satin aluminum finish, or finish as directed.

33-17. LIGHTING FIXTURES:

Unless otherwise noted, electrical contractor shall furnish and install complete with lamps, all lighting equipment as specified and as shown on the drawings. Substitute units, if any, shall be accompanied by sample unit for test by the Government at the National Bureau of Standards with the Contractor to pay all test costs and to be responsible for any and all construction delays.

In general, all lighting fixtures shall bear Underwriters' Inspection Label.

Lighting fixture types shall be as indicated on the contract drawings.

All ballasts, starters and lampholders in fluorescent lighting equipment are to be Electrical Testing Laboratories and Underwriters' Laboratories approved type H.P.F. quiet operating type (25-30 decibels), unless otherwise noted. All ballast shall be of the "Multi-Lamp, Rapid-Start" type. Fluorescent lamps shall be standard warm white unless otherwise noted on the drawings. All fluorescent fixtures shall be equipped with safety fuses furnished by the manufacturer and factory installed. Ballasts shall be equipped to operate at the voltage shown on the drawings.

Where recessed fixtures are specified for plaster or acoustical plaster ceilings, fixtures shall be installed in rolled metal frames provided by the fixture manufacturer. Cost of plaster frames and installation shall be included under this section.

All metal surfaces of fixtures and plaster frames except the non-ferrous types, shall be treated and given rust inhibiting and finish coat adherence properties before ; finish coats are applied. Finish coats of synthetic enamels are to be baked-on at approximately 320 degrees F.

Each fixture shall be supplied with the necessary guards, straps, supports, hangers, or other miscellaneous materials and devices to install them in a satisfactory manner and to conform to the desired function in areas in which they are installed.

Where incandescent fixtures are called for on the schedule which are designed for larger lamps than noted, fixture shall be equipped with required socket extensions for the smaller lamps.

33-18. EMERGENCY & EXIT LIGHTING

The contractor shall provide a complete emergency and exit lighting system as indicated on the contract drawings. Emergency source shall be a switch connected to the line side of the main switch and equipped with Bussman Mfg. Co. limitron fuses. All wiring shall be run separately in rigid conduit.

33-19. SPECIAL LIGHTING FIXTURES - TYPES A, B, E, AND R.

General: All materials shall be of the highest quality for the intended use, and only work of skilled artisans and competent mechanics will be acceptable. Corrosion resistance and maximum durability shall be essential factors in the selection of materials.

All parts shall fit accurately and shall be securely fastened in place. All castings shall be of sound structure and shall be thoroughly cleaned and chased. Cold shots, mould shifts, cracks, gas holes, mis-runs, cuts and washes, and shrinkage cavities may be causes for rejection. Supports and other major members shall be reinforced, as necessary, to assure stability and rigidity. Joints exposed to view shall be practically invisible. Where screws or bolts are used as fastenings they shall be obscured or concealed, and finished to match adjacent finished parts. Locknuts or similar devices shall be used on all screw fastenings. Assembled fixtures shall possess adequate inherent strength to resist sagging or deformation.

Canopies shall be constructed to afford easy access to electrical connections. They shall be of ample size to cover properly the outlet boxes, the electrical wires, and all attachments. Canopies shall be made of castings or spinings as indicated on drawings.

Chandeliers that cannot be packaged and shipped as complete units ready for installation shall be shop-assembled to the extent necessary to verify the accuracy of detailing and workmanship. All discrepancies, misfits, misalignments, omissions and other defects shall be corrected in a satisfactory manner before shipment. Such chandeliers and fixtures shall be factory-wired, internally, insofar as practicable to minimize work at the site. All wiring devices, fastenings and other appurtenances required for satisfactory installation and operation shall be included in each shipment, either as part of the assembly or as separate parts, for field assembly. Chandeliers disassembled for shipment will be re-assembled at the site by others under the supervision of the manufacturer.

Chandeliers that can be packaged and shipped as complete units shall be factory-wired internally, fully assembled and, as shipped, shall be ready in all respects for immediate installation.

All internal wiring and all bolts, screws and other devices required for fastening the fixtures to masonry anchorage furnished and installed by others shall be provided under this contract.

Electrical appurtenances: Sockets, shade-holders and other appurtenances shall be mounted properly and securely in their respective operating positions. Fixture wires shall be not less than No. 18 AWG stranded copper with 300-volt heat-resistant insulation. Ends of stranded wires shall be soldered. Joints in wiring shall be soldered and taped, or made up with approved mechanical connectors. Where wire nuts are used, they shall be provided with a corrosion-resistant metallic threaded insert. Wiring retainers shall be provided as necessary to support and firmly hold in place, in a neat and satisfactory manner all internal wiring.

Diligent observance of all applicable rules and recommendations of the National Electrical Code is mandatory.

Lampholders: Unless otherwise indicated on the contract drawings, incandescent lamp sockets shall be of the porcelain-body type suitable for the specific applications illustrated on the contract drawings. They shall be securely held in place by locking bushings or locknuts.

Materials and processes: Brass castings shall be made from the following copper-base alloy with composition maintained within commercial tolerances:

Copper	65 percent
Manganese	.7 percent
Lead	1.3 percent
Zinc	33 percent

Samples of other copper-base alloys may be considered upon receipt from the manufacturer of the compositions and properties of proposed substitutes.

All metal shall be new material. All castings shall be alloyed from pure metals.

Brass castings shall be a minimum of 3/16" thickness at any point and of greater thickness as required for strength, or as required as part of the design. All castings shall be made in French moulding sand; the moulds properly dried overnight to insure sharp details castings. Adequate provision shall be made for the shrinkage of metal.

Castings shall be of uniform quality, free from injurious blowholes, porosity, shrinkage cracks, and other defects. Hand chasing of a meticulous character will be required on all castings.

Turned brass fittings, 2 inches diameter or under, shall be made of free turning brass rods, either hand-turned or by screw machine with proper shaping and forming tools.

After brass castings, tubes, rod fittings, spinings, and all other parts have been chased, ground, filed, fabricated and thoroughly cleaned, they shall be polished and highlighted and shall be completely and uniformly coated with Maas and Walstein Durachem clear baking synthetic #Y-291, or equal, by spraying and then baked for a minimum of 10 minutes at 325° F. Samples of the finish shall be submitted to the architect and engineer for selection and approval.

Sections of parts shall be assembled by reasonably invisible bolting or machine threads. All joints shall fit tight, smooth and even. Where brass parts are joined to other metals, particularly steel, insulating coating or other dielectric material shall be employed to prevent electrolysis. All screw fastenings shall be non-ferrous or corrosion resistant.

Ferrous metal parts shall be "Bonderized" or given a phosphatic treatment before priming and finishing. Where light-reflection depends upon the finish this shall be pure white, glossy, baked enamel.

Maintenance: All designs shall provide for safe and easy replacement of lamps, sockets, and other expendable parts. Simplification of maintenance operations shall also be a criterion for all designs. Proper implementation of these objectives shall be given special consideration in the execution of the work specified under this section.

Models : Final finish on all castings, extrusions, spinings and other exposed metallic parts shall be of uniform color, polished or satin finish as specified on drawing.

Exterior	Frescolite B-6385 Bracket	Type R
Front of Boxes	Frescolite C-6384 Chandelier	Type A
Foot Lights	Frescolite G-6387	Type E
Around Balcony	Frescolite B-6383 Bracket	Type B

33-20. DIMMERS AND DIMMER CONTROLS

Dimmers shall be of the type indicated on the contract drawings, and shall be of the toroidal wound auto transformer type, with a carbon brush in direct contact with the exposed commutator surface of the coil. External resistances in the brush circuit will not be permitted.

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Motor driven dimmers shall be connected through the necessary gears to a two-winding synchronous, reversible motor to permit raising or lowering of the lights connected to the dimmer. Dimmers shall be provided with a raise-lower pushbutton for remote mounting. Ahead of the motor operated dimmer a remote control switch shall be provided. The switch shall be electrically operated, mechanically held with rating as indicated on the contract drawings. Switch shall be similar or equal to Bulletin 900 series in NEMA 1 Enclosure as manufactured by Automatic Switch Co.

Provide a 2 pole momentary contact, mechanically interlocked push-button similar or equal to Automatic Switch Co. Type A control station for remote mounting.

33-21. GUARANTEE OF WORK AND MATERIALS:

The Contractor shall guarantee for one year from date of final acceptance of the entire work all materials, equipment and work furnished by him. The Contractor shall correct, at his own expense, all poor, defective and inferior materials and workmanship, defects, and other faults of any kind arising therefrom, as directed by the Contracting Officer.

33-22. FINAL INSPECTION AND TESTS:

Final inspection and tests shall be made by the Contractor in the presence of the Contracting Officer or his authorized representative. Contractor shall secure and deliver to the Contracting Officer all required certificates of compliance with rules and regulations of the National Board of Fire Underwriters and Local Municipal Department issuing compliance certificates before final payment is made. The Contractor shall provide all labor, materials, instruments and miscellaneous equipment for tests as directed and required.

SIGN
"B"

SCALE
 $\frac{1}{2}" = 1'-0"$

DATA TO BE
FURNISHED BY
CONTRACTING
OFFICER.

FOR YOUR FUTURE DRIVING COMFORT

PROJECT NAME

PROJECT NAME

CONTRACTOR'S NAME

LETTERING
DIMENSIONS

2'-3"

SIGN
"C"

SCALE
 $\frac{1}{2}" = 1'-0"$

LETTERING
DIMENSIONS

PROJECT NAME

PROJECT NAME

CONTRACTOR'S NAME

PROJECT NAME

CONTRACTOR'S NAME

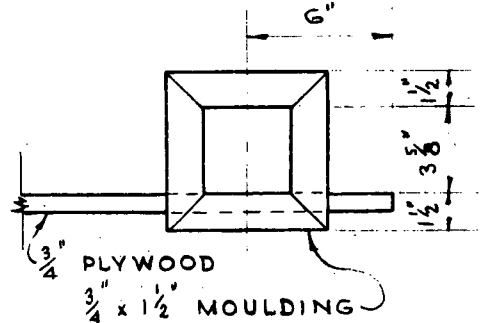
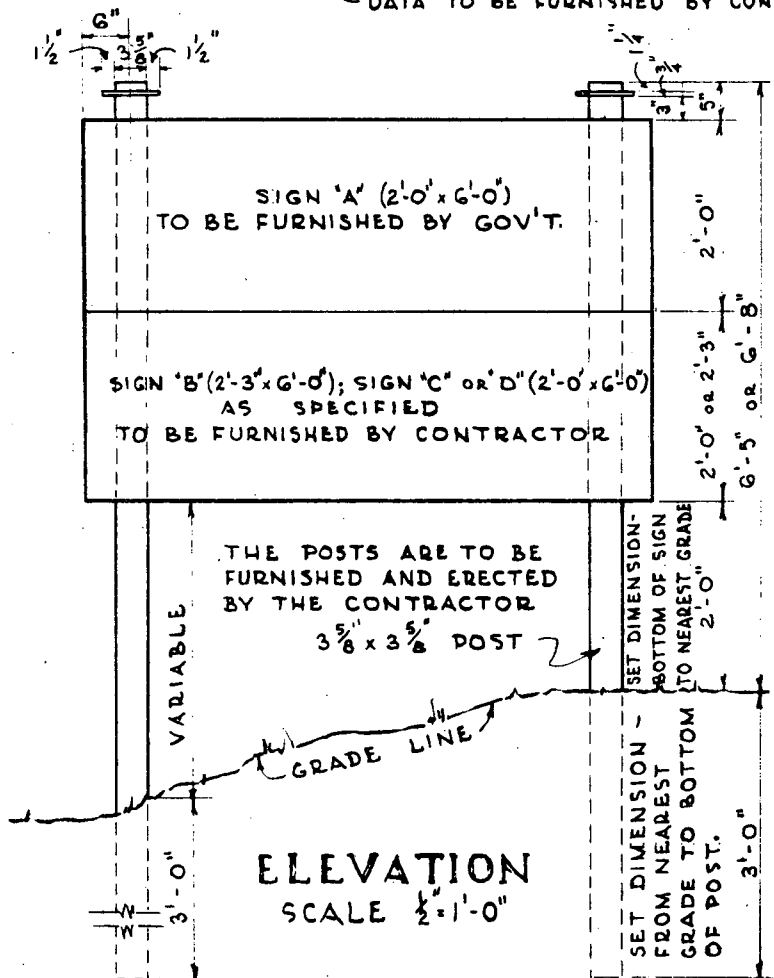
LETTERING
DIMENSIONS

2'-0"

SIGN
"D"

SCALE
 $\frac{1}{2}" = 1'-0"$

DATA TO BE FURNISHED BY CONTRACTING OFFICER



PLAN of POST
SCALE $\frac{1}{2}" = 1'-0"$

NOTES:

THE SIGNBOARDS ARE TO BE
PAINTED WHITE WITH
BLACK LETTERING.

INFORMATIONAL
CONSTRUCTION SIGN

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
NATIONAL CAPITAL PARKS

DRAWN BY: A.J.R.
CHECKED BY: RMR

Andrews
CHIEF, ENGR. BR.

4/30/57
5/1/57
DATE

SCALE
AS SHOWN

DRAWING NUMBER
N.C.R. 48-266



BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE

IFB 2849

Read the Instructions to Bidders (Standard Form 22)
This form to be submitted in **DUPLICATE**

DATE OF INVITATION

September 25, 1964

NAME AND LOCATION OF PROJECT

Restoration of Ford's Theater,
511 Tenth Street, N. W.
Washington, D. C.

NAME OF BIDDER (*Type or print*)

(Date)

TO: Chief, National Capital Office, Design and Construction
National Park Service
Department of the Interior
Washington, D. C.

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for Restoration of Ford's Theater, 511 Tenth Street, N.W., Washington, D. C.

in strict accordance with the General Provisions (Standard Form 23-A), Labor Standards Provisions Applicable to Contracts in Excess of \$2,000 (Standard Form 19-A), specifications, schedules, drawings, and conditions, for the following amount(s)

Prices to be written in both words and figures. In case of difference, words govern.

LUMP SUM BID

_____ DOLLARS (\$) _____
(Words) (Figures)

PILING (See Paragraph "J", Page 4-11):

ADD _____ Per linear foot of 14" piles over design aggregate length.

ADD _____ Per linear foot of 10 3/4" piles over design aggregate length.

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within calendar days (60 calendar days unless a different period be inserted by the bidder) after the date of opening of bids, he will within 10 calendar days (unless a longer period is allowed) after receipt of the prescribed forms, execute Standard Form 23, Construction Contract, and give performance and payment bonds on Government standard forms with good and sufficient surety.

The undersigned agrees, if awarded the contract, to commence the work within ten (10) calendar days after the date of receipt of notice to proceed, and to complete the work within Five hundred forty (540) calendar days after the date of receipt of notice to proceed.

Receipt of Amendments: The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. (Give number and date of each):

The bidder represents (Check appropriate boxes):

(1) That he ☐ is, ☐ is not, a small business concern. (For this purpose, a small business concern is a business concern, including its affiliates, which (a) is independently owned and operated, (b) is not dominant in its field of operation, and (c) had average annual receipts for the preceding three fiscal years not exceeding ~~\$8,000,000~~. For additional information see governing regulations of the Small Business Administration.) \$7,500,000.

(2) (a) That he ☐ has, ☐ has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and (b) that he ☐ has, ☐ has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer.

(For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Subpart 1-1.5.)

(3) That he operates as an ☐ individual, ☐ partnership, ☐ joint venture, ☐ corporation, incorporated in State of _____

Enclosed is bid guarantee, consisting of

in the amount of

NAME OF BIDDER (Type or print)

FULL NAME OF ALL PARTNERS (Type or print)

BUSINESS ADDRESS (Type or print)

BY (Signature in ink. Type or print name under signature)

TITLE (Type or print)

DIRECTIONS FOR SUBMITTING BIDS

Envelopes containing bids, guarantee, etc., must be sealed, marked, and addressed as follows:

MARK IN LOWER LEFT-HAND CORNER:

"Bid for Restoration of Ford's Theater,
511 Tenth Street, N.W., Washington, D. C.,
IFB 2849."

ADDRESS:

National Capital Office
Design and Construction
Room 224
1100 Ohio Drive, SW.
Washington, D. C. 20242

CAUTION: Bids should not be qualified by exceptions to the bidding conditions.

ATTACHMENT TO BID FORM

Bidders shall check the appropriate blocks in the following representation in accordance with Federal Procurement Regulation Notice No. 7 dated February 4, 1964:

The bidder (or offeror) represents that he () has, () has not, participated in a previous contract or subcontract subject to either the Equal Opportunity Clause herein or the clause originally contained in Section 301 of Executive Order No. 10925; that he () has, () has not, filed all required compliance reports; and that representations indicating submissions of required compliance reports, signed by proposed subcontractors, will be obtained prior to subcontract awards.



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