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- 2nd Floor & Ceiling Plans, Section - Mezzanine- - L. U. S. 7
INSTRUCTIONS TO BIDDERS

1. Before submitting a proposal, all contractors and sub-contractors bidding on the work shall carefully examine the drawings and specifications, visit the site to fully inform themselves as to all existing conditions and limitations, and shall include in their proposal a sum sufficient to cover all items to be included in the contract.

2. Proposals shall cover the furnishing of all labor, material, tools, and equipment required for the complete construction of the building in accordance with drawings and specifications prepared by the Engineering Department of Bethlehem Steel Company, James A. Bell, Chief Engineer, West Office Building, Third and Fillmore Streets, Bethlehem, Pa.

3. Proposals shall be submitted in triplicate in sealed envelopes, marked on the outside, "Proposal for Extension to Fritz Laboratory, Lehigh University, Bethlehem, Pennsylvania", and addressed to Mr. C. E. Walsh, Jr., Assistant Purchasing Agent, Bethlehem Steel Company, East Office Building, Bethlehem, Pa. Date on which bids will be due will be specified on written invitations to bidders.

4. General Contractors shall state in their proposals the number of calendar days from the date of the award of the contract in which he will complete the contract.

5. The Owner reserves the right to reject any or all bids or to waive any formality as his interest may advise.

6. Proposals shall be submitted covering the entire general construction contract, including heating, ventilating, air conditioning, plumbing, electric wiring, both power and lighting including lighting fixtures, one passenger elevator, venetian blinds, and draw curtains, all as shown and specified.

7. The owner shall furnish and erect structural steel, 20 ton electric traveling crane and 5,000,000 lb. vertical testing machine. Miscellaneous work in connection with the above, such as painting, electric wiring, etc., shall be done by the Contractor, as shown and specified.

8. The Contractor shall submit with his proposal on his letterhead a list of the sub-contractors used in making up his bid.
UNIT PRICES

For additions to or deductions from the contract, the following Unit Prices shall prevail if accepted in the award of the contract:

A - Price per cu. yd. for earth excavation,  
GENERAL CONDITIONS OF THE CONTRACT

1. SCOPE:

These General Conditions apply to all contracts, or sub-contracts for any work covered by these specifications.

2. DEFINITIONS:

Whenever in these contract documents the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

(a) Contract Documents: The contract documents consist of the agreement, the general conditions of the contract, the drawings and specifications and modifications thereof incorporated in the documents before their execution.

(b) Owner: Lehigh University, Bethlehem, Pennsylvania.

(c) Contractor: The Contractor for the entire contract including all work covered by the drawings and specifications.

(d) Sub-Contractor: A Sub-Contractor shall mean a person, firm, or corporation supplying to the Contractor labor or materials, or both, for work to be done under the Contract.

(e) Work: The term "work" of the Contractor or Sub-Contractor includes labor or materials, or both.


3. EXECUTION OF DOCUMENTS:

The contract shall be signed, in duplicate, by the Owner and the Contractor in the form and with terms and conditions approved by the Owner.

4. SUPERVISION AND PREROGATIVES OF THE ENGINEERS:

(a) The work is to be carried out under the supervision of the Engineers and to their entire satisfaction. The work and materials shall be strictly of the best quality of the kinds herein specified, and should any work or materials other than those specified or shown be introduced into the construction of the work, the Engineers or their authorized representative shall have full power to reject them and they shall be removed from the premises within twenty-four (24) hours by the Contractor after being notified to do so.
(b) To prevent disputes and litigations, the Engineer shall in all cases determine the amount of quantity, quality, and acceptability of the work and materials which are to be paid for under this contract; shall decide all questions and disputes in relation to said work and the performance thereof; and shall, in all cases, decide every question which may arise relative to the fulfillment of the contract or to the obligations of the Contractor or thereunder. His determination, decision, and estimate shall be final and conclusive upon the Contractor, and in case any question shall arise between the Contractor and the Owner touching the contract, such determination, decision, and estimate shall be a condition precedent to the right of the Contractor to receive any moneys under the contract.

(c) The Engineer shall have full power to order the removal of any employee for incompetency. The Contractor shall adjust all strikes, as no allowance will be made for such delays in the time limit herein named. All sub-contractors and workmen, as well as their Superintendents and Foremen, are under the jurisdiction and control of the Engineer.

5. INDEMNIFICATION OF THE OWNER:

(a) The Contractor shall pay, indemnify, and save harmless the Owner, its agents and employees, from all suits, actions, claims, demands, damages, losses, expenses, and/or costs of every kind and description to which the Owner may be subjected or put by reason of injury (including death) to persons or property, resulting from the manner or method employed by the Contractor, his agents and employees, or sub-contractors, in the performance of this contract, or any part thereof, or from, by or on account of any act or omissions of the Contractor, his agents and employees or sub-contractors, and whatever such suits, actions, claims, demands, damages, losses, expenses, and/or costs be against, suffered or sustained by the Owner, its agents, and employees may become liable therefor, and the whole, or so much of the moneys due or to become due the Contractor under the contract as may be considered necessary by the Engineer may be retained by the Owner until such suits or claims for damages shall have been settled or otherwise disposed of, and satisfactory evidence to that effect furnished to the Engineer.

(b) The Contractor shall maintain adequate insurance against all liabilities comprehended by this Article 5. Certificates of such insurance shall be filed with the Owner at or before commencement of the work and shall be subject to the Owner’s approval for adequacy of protection at all times.
6. PERMISSIONS:

All permits of every kind shall be procured by the Contractor without cost to the Owner.

7. LAWS TO BE OBSERVED:

The Contractor at all times shall observe and comply with all Federal, State, Municipal, and Local Laws, Ordinances, rules and regulations in any manner affecting the conduct of the work, and all such orders or decrees as exist at present and those which may be enacted later, of bodies or tribunals having any jurisdiction or authority over the work, and shall indemnify and save harmless the Owner and all of its officers, agents and servants against any claim or liability arising from or based on the violation of any such law, ordinance, rules or regulation, order or decree, whether such violations be by the Contractor, or any sub-contractor, or any of their agents and/or employees.

8. RESPONSIBILITY:

(a) The Contractor shall give to the proper authorities all required notices relating to the work in his charge.

(b) Whenever herein mention is made of any article, material, or workmanship to be in accordance with laws, ordinances, building code, underwriters' code, A.S.M.E. regulations, or similar expressions, the requirements of these Laws, Ordinances, etc., shall be construed as the minimum requirements of these specifications.

(c) Where the requirements of the specifications call for a higher grade and are not in conflict with the Laws, Ordinances, etc., the specifications shall govern.

(d) Where the requirements of the Laws, Ordinances, etc., are mandatory, they shall govern.

(d) In case of any apparent conflict between the specifications and such Laws, Ordinances, etc., the Contractor shall call the attention of the Engineer to such conflict for a decision before proceeding with any work which may involve any conflict.

9. PROTECTION:

(a) All work or materials of every description which may possibly be injured, during the construction or before final acceptance of the work, shall be fully protected from damages by the Contractor, from any source, but in any event should any work or material under this contract become damaged in any way or
manner, the Contractor shall repair and perfect the same at his own expense, no matter by whom caused, as when the entire contract is completed, the building, premises, and equipment shall be delivered to the Owner without defects.

(b) The Contractor shall provide and maintain all lights, guards, etc., for the proper protection of the public and shall comply with all municipal rules, regulations, ordinances, and laws.

(c) The Contractor shall provide sufficient, safe and proper facilities, at all times, for the inspection of all work.

10. OTHER CONTRACTORS:

The Owner reserves the right to have other contractors at work on the building or premises at any time.

11. TEMPORARY WATER SUPPLY:

The Contractor shall provide and maintain, at his own expense, a temporary water supply for building purposes, extending branches to convenient points and terminating same with a proper stop and hose connection. No undue waste of water shall be permitted. Before any new paving is laid, the temporary supply shall be removed and the tap in the main supply properly capped.

12. TEMPORARY ELECTRICAL SERVICE:

Any temporary electric service required either for power or lighting by the sub-contractors shall be furnished by the Contractor at his own expense.

13. APPROACHES:

The Contractor shall provide all necessary approaches and exits required to properly execute the work.

14. WORK AND MATERIALS:

The Contractor shall furnish all materials of the best quality of the kinds shown or specified, and perform the work in a perfect and workmanlike manner, entirely to the satisfaction of the Engineer. No visit of the Engineer or his representatives to the building, or payment thereon, shall be construed as passing any work or materials entering into the construction, but the Contractor and his bond shall be held to make good the defects arising from improper work or materials for a period of one (1) year after final completion and acceptance of the work. The
Contractor shall provide all tools, implements, tackle, machinery, etc. to properly do the work, and no sub-contractor is to be engaged upon any branch of the work who is not thoroughly practical and responsible and at the time of the making of this contract, conducting business in the particular branch for which he is employed. The workmen in any branch shall be practical and skilled. The hours of labor referred to shall normally occur between 7:30 A.M. and 4:30 P.M., and shall apply to laborers, workmen, and mechanics alike to the end that all work shall begin at the same hour and be conducted so that all work will stop at the same hour (except in the special cases hereinbefore mentioned), said time of beginning to be approved by the Engineer.

15. PAYMENTS TO THE CONTRACTOR:

(a) Payments under this contract shall be made monthly. At the first of each month the Contractor shall submit to the Engineer an application for payment in the form of an itemized statement of the cost of all work and materials furnished, installed, erected, and incorporated in the building, and if required, a certified statement signed by all sub-contractors or persons furnishing work or materials that they have been paid the amount drawn from the Owner by the Contractor on the previous month's statement. The calling for such a certified statement shall be optional with the Engineer and may apply to each, any, or all of the monthly payments. The Contractor may make application for the payment, and the Owner will pay, for any materials and/or equipment delivered at the site of the work but not actually erected, installed, and incorporated complete in the structure. The Contractor shall, before the first application for payment, submit to the Engineer a schedule of values of the various parts of the work aggregating the total sum of the contract, divided so as to facilitate payments made out in such form as the Engineer and the Contractor may agree upon, and if required, supported by such evidence as to its correctness as the Engineer may direct. This schedule, when approved by the Engineer, shall be used as a basis for warrants for payment unless it be found to be in error. In applying for payments, the Contractor shall submit a statement based upon this schedule and, if required, itemized in such form and supported by such evidence as the Engineer may direct, showing his right to the payment claimed.

(b) After the Engineer has approved the statement and such releases as called for, he shall deduct ten percent (10%) therefrom and cause to be issued a warrant for payment, which shall be made within ten (10) days following his approval. This ten percent (10%) shall be deducted from each and every itemized statement and shall be retained until final completion and acceptance of all work covered by this contract, notwithstanding any provisions to the contrary that may appear elsewhere in these contract documents.
(c) Should any expense be caused by which the Owner shall be compelled to pay out money on account of the neglect or fault of the Contractor or any sub-contractor, or for any other reason, such amount or amounts shall be deducted previous to payment being made. Before final payment is made by the Owner to the Contractor for the execution of this work, all drawings and specifications shall be returned to the Engineer.

(d) At the time of completion and before final voucher for settlement is passed, the Engineer shall require the Contractor to deliver to them certificates of payments for all materials and work furnished under this contract.

(e) Final payment will be made within thirty (30) days after the completion and final acceptance of the entire contract.

(f) When written notice is given to the Engineer before or within ten (10) days after the completion and acceptance of the entire work under this contract, by persons having done work or furnished materials for said contract, that there is money due and unpaid for such work and materials, the Contractor shall furnish the Engineer with satisfactory evidence that said money has been fully paid or satisfactorily secured by him. In case said evidence is not furnished as aforesaid, such amount or amounts as may be necessary to meet the claims of persons aforesaid may be retained from any moneys due the Contractor under the contract until these liabilities shall be fully discharged or such notices withdrawn. The Engineer may, with the written consent of the Contractor, use any money retained, due, or to become due under the contract for the purpose of paying for both labor and material for the work for which claims have been filed in the office of the Engineer.

(g) Should any sub-contractor refuse or neglect to furnish proper work or materials, or refuse or neglect to comply with the interpretations or rulings made by the Engineer, in accordance with the specifications, the Engineer may on any of the monthly estimates or on final estimate, retain all or any part of the payment which may be due or claimed to be due by the Contractor to the sub-contractor so in default, and the Engineer will not make any payments of funds so retained until the cause for such refusal or neglect shall have been remedied.

(h) No warrant issued or payment made to the Contractor nor partial or entire use or occupancy of the work by the Owner shall be construed as acceptance of any work or materials not in accordance with the contract, drawings and specifications.
16. **SUPERINTENDENT:**

The Contractor shall keep on the work a competent superintendent, acceptable to the Engineer, at all times during the working hours. The superintendent shall represent the Contractor in his absence, and all directions given to him shall be as binding as if given to the Contractor directly.

17. **NO ESTOPPEL OR WAIVER OF LEGAL RIGHTS:**

The Owner or the Engineer shall not be precluded or estopped by any measurement, estimate or certificate, made or given by them, or by any agent, or employee of the Owner, under any provisions or provisions of the contract, at any time, either before or after the completion and acceptance of the work and payment thereof pursuant to any measurement, estimate or certificate, from showing the true and correct amount and character of the work performed and materials furnished by the Contractor, or from showing at any time, that any such measurement, estimate or certificate is untrue or incorrectly made in any particular, or that the work or materials or any part thereof do not conform in fact to specifications and contract, and the Engineer shall have the right to reject the whole or any part of the aforesaid work or materials, should the said measurement, estimate, certificate or payment be found or be known to be inconsistent with the terms of the contract, or otherwise improperly given; and the Owner shall not be precluded and estopped, notwithstanding any such measurement, estimate, certificate, and payment in accordance therewith from demanding and recovering from the Contractor and his Surety such damages as it may sustain by reason of his failure to comply with the terms of the specifications and contract. Neither the acceptance of the Owner, the Engineer, or any agent or employee of the Owner, nor any certificate by the Owner nor payment of money, nor any payment for, nor acceptance of the whole or any part of the work by the Engineer, nor any extension of time, nor any possession taken by the Owner or its employees, shall operate as a waiver of any portion of the contract or of any power herein reserved by the Owner, or any right to damages herein provided, nor shall any waiver of any breach of the contract be held to be a waiver of any other or subsequent breach.

18. **EXPLANATION OF DRAWINGS AND SPECIFICATIONS:**

(a) The drawings and specifications are to augment each other, and are to be considered as one and not as a part. Anything mentioned in one and not in the other, or vice versa, is to be furnished and done. The general character of the detail work is shown on the drawings, and the Contractor shall not get out any part of the work until the details of the same have been approved, where such are not presented herewith.
(b) Parts not shown in the drawings are to be in accordance with corresponding parts which are shown.

(c) The Contractor shall carefully study and compare all drawings, specifications, and other instructions, and shall report at once to the Engineer any error, inconsistency, or omission which he may discover.

(d) Figures in all cases are to be followed in preference to direct measurements from the drawings.

(e) Figures given on future scale drawings and full size details are to take precedence over those on general drawings.

(f) The Contractor shall abide by and comply with the true intent of the drawings and specifications and not take advantage of any unintentional error or omission, but shall fully complete every part as to the true intent and meaning of the drawings and specifications, as decided by the Engineer, and as described hereinafter.

19. **SAMPLES:**

(a) Samples of materials and devices entering into the construction shall be submitted to the Engineer for approval, all charges prepaid for all material necessary to carry out the work, and all samples shall be clearly marked with the Contractor's name and identified for this installation. No materials shall be used on the work until approved in writing by the Engineer.

(b) In submitting to the Engineer for approval, the use of any material or device as the equal of some other material or device specified by name, the Contractor shall submit samples of the material specified and also a sample of the material proposed to be substituted as the equal thereof, together with any supporting data in the form of catalogues, papers, etc.

(c) In case of devices, samples of which cannot readily be submitted, catalogues and other data, both of the material specified and that proposed to be substituted as the equal thereof, shall be submitted.

(d) Any material or device proposed to be substituted shall not be approved, except by written communication from the office of the Engineer.

20. **CLEANING:**

The Contractor shall keep the premises as clean as the progress of the work will permit, and on completion shall remove all
surplus materials and rubbish from the premises, leave the building broom clean and wash all windows, glazed doors, etc.

21. INSURANCE:

(a) The Contractor shall insure all work incorporated in the building and all materials for the same in or about the premises against loss or damage by fire, windstorm, hail, and tornado, in an insurance company or companies acceptable and approved by the Owner. The amount of the insurance at all times to be equal to the amount paid on account of work and material and plus the value of work or materials furnished, or delivered, but not yet paid for by the Owner. The policies shall be made payable to the Owner and the Contractor, as their interests may appear, and the policies shall be left in possession of the Owner before payments are made.

(b) The Contractor shall make and maintain all payments, contributions, taxes, or premiums which may be payable or required under the Federal Social Security Act, or under the Unemployment Compensation Insurance Laws of Pennsylvania, or any other State, as to the employees of the Contractor engaged in the performance of work under the contract. Certificates of such insurance and payments shall be filed with the Owner if and when required by it.

(c) The requiring of any and all insurance as set forth in these specifications, or elsewhere, shall be in addition to, and not in any way in substitution for, all the other protection provided under the contract and bonds of the Contractor hereunder.

(d) No acceptance and/or approval of any insurance by the Owner shall be construed as relieving or excusing the Contractor from furnishing any or all of the insurance required by the contract documents to be furnished by him.

22. BONDS:

(a) At or prior to the signing of the contract, the Contractor shall furnish, at the option of the Owner, bond or bonds covering the faithful performance of the contract and the payment of all obligations arising thereunder for labor and materials, or otherwise howsoever, in such form and amount as the Owner may prescribe and with such surety or sureties as the Owner may approve. The premium for such bond shall be paid by the Owner.

(b) Prior to the beginning of any work on, or furnishing of any materials to the site of the proposed building, the Contractor, for itself, its sub-contractors, and all parties acting through or under it, shall execute and deliver to the Owner for proper recording in the public records of Northampton County, Penna., a
stipulation against liens, waiving all rights to file or maintain any mechanics' claims or liens against the proposed building and/or the land upon which the same is to be constructed or appurtenant thereto, in such form as shall be approved by the Owner.

23. **SUB-CONTRACTOR:**

(a) The Contractor shall give his personal attention constantly to the faithful performance of the work, shall keep the same under his own control, and shall not assign the contract by power of attorney or otherwise; not sublet the work of any part thereof, without the previous written consent of the Engineer. He shall state to the Engineer in writing the name of such sub-contractor as he intends employing; the portion of work which he is to do; or the material which he is to furnish; his place of business; and such other information as the Engineer may require in order to know whether the sub-contractor is reputable and reliable and able to perform the work to furnish the material called for in the specifications. Only such sub-contractors as are acceptable to the Engineer will be allowed upon the work. The Contractor or sub-contractors shall not, either legally or equitably, assign any of the moneys payable under this contract, or any claims thereto, unless by and with the consent of the Engineer.

(b) The Contractor shall not be released from any part of his liabilities or obligations under his contract should any sub-contractor fail to perform in a satisfactory manner the work undertaken by him.

24. **DEVATIONS:**

The Contractor shall abide by and comply with the true intent of the specifications, and in no way deviate from them without the written order from the Engineer, and should any error or conflict occur in the specifications, he shall immediately make same known to the Engineer before signing the contract, as after the contract has been executed he will be held strictly to complete the work as decided by the Engineer (who is to interpret these specifications and whose decision shall be final and conclusive). The Contractor shall verify all dimensions and be responsible for the accurate fitting of all work at the building.

25. **AS TO EXISTING AND CONNECTING WORK:**

In all cases each sub-contractor whose work depends upon the quality of existing or connecting work, furnished and installed by other, shall thoroughly examine all such existing and connecting work before starting the work under his own contract, and
shall report to the Engineer, in writing, any defects which would impair the excellence of the work that is to follow. In absence of any such written report, each sub-contractor on beginning his work, will be considered as having accepted all preceding work as being in suitable condition for receiving his own work, and as having waived all claims to the contrary.

26. "OR EQUAL CLAUSES":

Wherever in these Contract Documents a particular brand, make of material, device, or equipment is shown or specified, such a brand, make of material, device, or equipment should be regarded as a standard, and other brands, make, or materials which in the opinion of the Engineer are equal, may be offered for the Engineer's approval.

27. SPECIAL PROVISIONS:

The Owner will furnish, fabricate and deliver on trucks at the building site, free of charge to the Contractor, but will not unload or erect:

Item a. Anchor bolts and other structural steel for embedment in building foundations.

Item b. Structural steel for temporary quarters in north aisle of old building.

Item c. Anchor bolts, grillages and pipe sleeves for embedment in testing machine pit walls.

Item d. Anchor bolts, surface plates and other structural steel for embedment in dynamic test bed.

Item e. Structural steel for curb and cover of housing for centrifuge.

Item f. All pipe anchors for embedment in flexure slabs and laboratory floor.

All of the foregoing items the Contractor will unload, install and/or erect.

The owner will furnish, fabricate, deliver, unload, erect, field rivet and/or bolt, but not field paint, free of charge to the Contractor, on foundations provided by the Contractor, the structural steel frame for new building and alterations to the south aisle of old building. Contractor will field paint as specified elsewhere in these specifications.
The Owner will furnish and erect a 20 ton electric traveling crane ready for connection of electric power. Contractor will install power line and render the crane ready for service as soon as practicable after its erection, as specified under electrical work.

Baldwin-Lima-Hamilton Corporation will furnish, erect and test a 5,000,000 lb. vertical testing machine in and over the testing machine pit constructed by the Contractor. Contractor shall so arrange his operations as not to impede the work of Baldwin-Lima-Hamilton Corporation.

The Owner will thereafter deliver and erect but not field paint, without cost to the Contractor, the loading aprons, idle pit aprons, ladders and their appurtenances in the testing machine pit. Contractor will field paint such portions of same as are accessible for painting in the completed building, as specified under painting.

Plans and specifications for the structural steel to be furnished and/or erected by Owner will be included with building plans for use of the Contractor and are binding upon the contractor insofar as they affect the work under this Contract.

28. SEQUENCE OF OPERATIONS:

The following general sequence of operations will be observed.

1. Cleaning and grading site, foundations for new building; centrifuge housing; by Building Contractor.

2. Provision of temporary quarters in north aisle of old building; by Building Contractor.

3. Construction of machine pit foundation; by Building Contractor.

4. Vacation of south aisle and construction of new column foundations therein; by Building Contractor.

5. Erection of structural steel framework for new and old buildings; by Owner.

6. Enclosure (walls and roof) of new and old buildings, electric line to overhead crane; by Contractor.

7. Erection and testing of Testing Machine; by B-L-H.

8. (Simultaneously with 7). Completion of new and old office aisles; by Contractor.
9. Construction of dynamic test bed; by Contractor.

10. Erection of pit aprons, stairs, etc.; by Owner.

11. Installation of pipe anchors and completion of first floor; by Contractor.

12. Finish of pavements, exterior grading, landscaping, clean-up; by Contractor.

The several contractors will agree among themselves and with Owner, as to further detailing of the schedule, with the common objective of completing the entire project at the earliest practical date.

29. **ALTERNATE FOR CHANGE IN SEQUENCE OF OPERATIONS:**

The scheduled delivery for the 5,000,000 lb. testing machine is February 1, 1955, and complete erection of machine not later than May 1, 1955.

In view of the above the Contractor shall furnish an alternate price for the installation of the following items possibly six (6) months after the completion of building:

- Dynamic test bed.
- Flexure slabs and adjacent concrete floors of Main Laboratory with the exception of first floor concrete slab under 7 story office section.
1. **GENERAL NOTE:**

   The General Conditions apply to and form a part of the specifications under this heading.

2. **OFFICE:**

   (a) The Contractor shall erect a temporary office on the site convenient to building operations.

   (b) In addition to the usual field office and toilet conveniences, it shall contain a room of sufficient size to hold Progress Meetings.

   (c) Offices shall be heated and equipped with electric lights.

3. **SIGN:**

   (a) The Contractor may erect a sign where directed on the property containing the name of the Building, the Contractor, and Heating, Plumbing and Electrical sub-contractors.

   (b) Size of sign, lettering, spacing, etc., to be approved by the Engineer.

4. **WATER AND ELECTRICITY:**

   (a) The Contractor shall make a temporary water connection for use during construction. The Owner shall furnish water, but if same is wasted this privilege may be withdrawn.

   (b) The Contractor shall provide all temporary electric service.

5. **PROGRESS MEETINGS:**

   (a) There shall be weekly progress meetings held during the entire course of the construction.

   (b) These meetings shall be attended by the Engineer or his representative, Contractor or his representatives, and all sub-contractors as may be required.

   (c) The minutes of these meetings shall be kept by the Contractor and copies of same sent to all interested parties.

6. **CLEANING UP:**

   On completion of the contract, or when directed, all offices, etc., shall be removed from the site.
EXCAVATION AND BACKFILL

1. **GENERAL NOTE:**

   The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   (a) The work included under this heading shall include the staking out of the building and establishing bench marks and grades.

   (b) The removal of top soil from areas disturbed.

   (c) Excavation for walls and foundations.

   (d) Backfill.

   (e) The forming of rough grades.

   (f) Removal of excess or unsuitable excavated material.

   (g) Excavation and backfill for the mechanical trades shall be done by the trade affected and is specified under that particular heading.

   (h) Removal and protection of trees where required.

3. **STAKING OUT THE BUILDING:**

   (a) The Contractor shall stake out the building employing a qualified surveyor for the purpose.

   (b) All grades and levels shall be established and monuments set up.

4. **REMOVAL OF TOP SOIL:**

   (a) All top soil and sub-soil shall remain the property of the owner and shall be disposed as hereinafter specified.

   (b) All suitable top soil shall be removed from the site of the building area and where grades are changed.

   (c) Top soil required for finished grading shall be stored on site where it shall be kept free from building debris.
(d) Top soil shall be completely stripped and picked before any grading or excavation is started.

(e) The stripped top soil shall be without admixture of sub-soil, and shall be free from large stones, hard clods, construction or demolition debris or other deleterious material.

5. EXCAVATION:

(a) The Contractor shall excavate for all walls, foundations, basement areas, etc., to the depths shown on the drawings. Excavation shall be sufficiently wide to allow the installation of all waterproofing, tile drains, etc.

(b) The site shall be excavated to the lines and levels shown on the drawings. The bottoms of all excavations for footings shall be true and level.

(c) Should the excavation be carried lower than necessary or called for on the drawings, the Contractor shall fill to the proper level with concrete at his own expense.

(d) The Contractor shall provide and erect all timber work, shoring, bracing, etc., necessary to retain the earth banks, if the ground is not sufficiently firm to stand by itself. The size of excavations shall be increased accordingly at no additional cost to the Owner.

(e) Should soft or unsuitable earth be encountered at footing, machine foundation or floor slab levels, the Engineer shall be notified immediately, and the Contractor shall follow instructions pertaining thereto.

(f) If underground springs are encountered, the Contractor shall pipe same to the nearest storm water drain without additional compensation.

(g) Should pumps be required, the same shall be furnished and operated at the Contractor's expense. The Contractor shall keep the excavations free from water at all times.

(h) Should rock be encountered under Buildings, the Contractor shall bare same and notify the Engineer who shall determine the credit for earth excavation omitted, and the addition for rock excavation.

(i) Material which cannot be removed by pick or shovel and boulders in excess of 15 cu. ft. shall be considered rock excavation.
(j) All excavations for footings shall be inspected and approved by the Engineer or his representative before footings are poured.

(k) The excavation for the machine pit foundation shall be carried out within a braced sheet piling enclosure, using sheet piling not less in section than shown on Plan LUBI. Construction in open pit with plumb or sloping earth faces will not be permitted.

Sheeting shall remain permanently in place.

Contractor shall flame-cut holes in sheeting for installation of pipe sleeves leading to machine control cabinet.

(l) Excavation for the dynamic test bed shall preferably not be commenced until after the testing machine shall have been erected and tested.

(m) Excavation under south aisle of old building shall be so conducted as to cause no damage to the existing pipe tunnel. Any damage to this tunnel shall be repaired at Contractor's expense.

6. BACKFILL:

(a) After walls are above grade and all waterproofing, drain tile, etc., is in place, the Contractor shall backfill against same and maintain a grade away from the building at all times.

(b) Backfill shall be done in layers not over 8" in depth and well tamped.

(c) All backfill shall be done with clean earth or sand and no debris or large stones shall be used.

(d) Before making backfill under floor slabs, all debris, silt, soft or spongy earth shall be removed. Backfill shall be sufficiently compact to sustain loads to be placed thereon.

7. ROUGH GRADING:

(a) The Contractor shall form all grades as shown on the drawings.

(b) Remove all obstructions to a depth of 12 inches below sub-grades. The sub-grade shall be uniform and smooth.
(c) Where embankments or fills are to be made over pits or other depressions, the fill shall be made in 8" layers and thoroughly compacted.

(d) Top 18" of fill shall be made of clay or loam entirely free from large clods or debris.

(e) Rough grading shall be carried to a point 4" below finished grade, making due allowance for settlement.

8. REMOVAL OF EXCESS MATERIAL:

All excess excavated material or material not suitable or required for grading or backfill shall be removed from the site and trucked to east side of Phi Delta Theta Fraternity, Sayre Park, Lehigh Campus.

9. REMOVAL AND PROTECTION OF TREES:

(a) Trees on actual site of new building and those at points where the grade changes in excess of 4'-0" shall be taken down and stumps, etc., completely removed.

(b) Remaining trees near building operations shall be carefully protected, and those located at points where grade changes shall be enclosed with a dry wall.

(c) Plant material to be saved shall be heeled in at a point to be designated for later transplanting by the Owner.
CONCRETE AND CEMENT WORK

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) Provide all labor, materials, equipment, and services necessary for and incidental to the completion of all concrete work, both plain and reinforced, as shown on the drawings and as herein specified.

(b) This sub-division of the work includes all plain and reinforced concrete footings, walls, piers, beams, slabs, floors, stairs, and steps, and all necessary forming for same, etc., all as shown on the drawings and herein specified.

3. GENERAL SYSTEM:

(a) In general, the structural system is designed as a steel skeleton frame with concrete floor arches.

(b) Footings shall be plain or reinforced concrete as shown.

(c) Basement floors (at bins) except where framing occurs, shall rest on ground with waterproof course (see WATERPROOFING, ETC.) and protective concrete slab.

(d) All other floor and roof slabs where shown shall be self-supporting reinforced concrete.

(e) All floor slabs throughout building shall have stone or gravel aggregate.

4. CEMENT:

(a) All cement shall be Portland cement of the best quality and shall be tested after it has been delivered at the building. In order to allow sufficient time for testing, the cement shall be delivered at the building at least ten (10) days before it is to be used in the work.

(b) The cement shall be stored in a watertight building having the floor properly blocked and raised from the ground. The cement shall be stored in such manner as to permit easy access for proper inspection and identification of each shipment.
(c) The cement shall be delivered in the original packages with the brand and name of the manufacturer plainly marked thereon. A bag of cement shall contain 94 lbs. of cement net, and each barrel shall contain four (4) bags. One bag of cement shall be considered as one (1) cubic foot.

(d) The cement shall meet all the requirements of the Standard Specifications and Tests for Portland cement of the American Society for Testing Materials, and sampled and tested in accordance with the A.S.T.M. Standards, with the additional test of neat cement, and the twenty-eight (28) day test. Any cement rejected shall be removed from the site within twenty-four (24) hours after such rejection.

(e) Lehigh Portland cement shall be used throughout, or an approved equal.

(f) Any cement used under other headings must also conform to the above specifications.

5. **SAND**

(a) Sand used for concrete, both plain and reinforced, shall be clean and sharp, free from injurious amounts of alkali, organic matter of a humus nature, loam, or other deleterious matter. The sand shall be washed if necessary.

(b) The sand shall be of such sizes that it shall all pass a 1/4" sieve and shall be graded from coarse to fine within the following limits. Retained on a #4 sieve, not more than 15% by weight; retained on a #100 sieve, not less than 95% by weight; weight removed by decantation, not more than 3%.

(c) The source of supply shall be designated and free access thereto be granted the Engineer or his representative for the purpose of obtaining samples or other information.

(d) Samples of the sand shall be submitted to the Engineer for approval at least one (1) week previous to the time it is desired to start use of same. All samples must be marked for identification and dated, and be not less in quantity than one (1) quart dry measure. The Contractor shall not submit any sample of sand for approval that is not a representative sample of an adequate supply for the proposed work.
6. BROKEN STONE OR GRAVEL:

(a) Broken stone for concrete shall be clean, hard, sharp, quarried stone, free from foreign matter, of sizes that will pass in any way through a 3/4" diameter ring and be retained on a one-quarter inch (1/4") mesh screen.

(b) Clean, washed and screened gravel, free from alkali, loam, organic matter of a humus nature, or other deleterious matter, of the sizes specified above, may be substituted for the broken stone.

(c) Samples of the broken stone or gravel shall be submitted to the Engineer for approval, at least one (1) week previous to the time it is desired to start use of same. Uniformly graded gravel, all of one size, will not be acceptable.

7. WOOD FORMS:

(a) Wood forms, properly braced and tied, shall be used on both sides of all foundation and basement walls, at bins, unless otherwise indicated, and on all sides of piers and footings. In no case shall the vertical surfaces of the concrete be placed directly against the soil, except as hereinafter noted.

(b) If the soil on the sides of the footings is stiff enough to stand up without bracing, the wood forms may be omitted and the sides of the excavations lined with Sisalkraft paper, or with saturated waterproof building paper.

(c) All forms shall be set in the exact positions shown on the drawings, plumb and straight, and they shall be securely held in exact position without deflection or settlement and of ample strength to carry the full load.

(d) The wood for the forms shall be 7/8" thick, dressed, tongued and grooved, for all exposed surfaces and square edged, fitted close to prevent leakage for all unexposed surfaces. Lumber shall be well seasoned and free from loose knots or other defects.

(e) Forms shall be put together in an approved manner, secured, against warping or displacement and kept wet when necessary to prevent shrinking. All material for forms shall be thoroughly cleaned before reusing.
8. **PLYWOOD OR STEEL FORMS:**

(a) The underside surfaces of floor slabs and concrete encasement of steel beams, where no suspended ceiling or plastering is called for in finish schedule will remain exposed.

(b) It is the intention that the above surfaces be cast as smooth as possible and prepared for painting. All forms required for this area shall be made with plywood or smooth steel sheets.

9. **REINFORCING STEEL:**

(a) The reinforcing material for concrete shall be Bethlehem deformed bars made from new billet stock and shall conform in all particulars to the Standard Specifications for Billet Steel Concrete Reinforcement Bars of the American Society for Testing Materials, Serial Designation A-15, as amended to date. Deformed bars shall be used throughout. Bars of rerolled steel or rail steel shall not be used in any part of the work.

(b) The steel shall be delivered at the building free from scale and injurious rust. Before the steel is placed in the forms it shall be cleaned of all rust, scale, dirt, paint, grease, and foreign matter of any kind. Any bars having rust scale or thin coating of rust shall be rejected if they cannot be cleaned to the satisfaction of the Engineer. A thin coating of red rust resulting from short exposure will not be considered objectionable.

(c) Steel reinforcement shall be accurately placed in accordance with approved drawings and securely fastened in position with appropriate clips, chairs, and spacers, so as to prevent any displacement of steel while concrete is being poured. The spacing rods in the slabs shall be supported at intervals of not over 3'-0" on wire chairs holding the bottom of the rods 3/4" clear above the forms. The reinforcing rods shall be wired to the spacing rods and at each chair, secured to the forms with staples.

10. **CONCRETE PROPORTIONS:**

(a) All measurements of fine and coarse aggregates shall be made separately by weight or volume. Weighing equipment shall be arranged to permit making compensation for changes in weight of moisture contained in the aggregate.

(b) The proportioning of materials for plain and reinforced concrete shall be based on the requirements for a plastic and workable mix with the use of not less than six (6) sacks of cement per cubic yard and not more than seven (7) gallons of water per
sack of cement, including surface water carried by the aggregates. Mix shall be so designed as to produce a concrete testing minimum of 2,500 lbs. per square inch at twenty-eight (28) days on a 6" x 12" cylinder.

(c) The proportions of aggregate to cement shall produce concrete that can be thorougly compacted. The slump shall not exceed 4" when vibration equipment is used and in no case shall exceed 6". The fine aggregate shall not be less than one-third nor more than one-half the total combined weights of aggregates.

11. MEASURING:

(a) The method of measurements of water and aggregates shall be such as to secure the specified proportion in each batch and in such manner that the proportion of water to cement can be closely controlled and easily checked at any time by the Engineer.

(b) To insure uniformity in the consistency or degree of workability, some method or device whereby the aggregates may be measured separately by weight or by volume before they enter the mixing hopper shall be provided. Such method or device shall provide for readily changing the amount of either or both aggregates as may be required to meet the changing requirements as to workability.

12. WATER CONTENT RATIO:

(a) Clean water shall be used. The total amount of mixing water including the moisture content of the aggregates, per bag of cement, shall not exceed the following amounts:

- Plain concrete - 7 gallons per sack of cement
- Reinforced concrete - 7 gallons per sack of cement

(b) In the absence of field determination of moisture content the following shall be assumed. Fine aggregate effective moisture content, 1/2 gallon per cubic foot. Coarse aggregate, 1/8 gallon per cubic foot. This moisture shall be subtracted from the above figures to get the net amount to be added at the mixer.

13. MIXING CONCRETE:

(a) All concrete throughout shall be mixed in an approved type of power operated batch mixer which will insure a uniform distribution of the materials throughout the mass, and the contractor shall install and operate a sufficient number of mixers to rapidly carry on the work.
(b) Materials shall remain in the mixers for periods of time and be rotated and mixed at rates approved by the Engineer.

14. PRE-MIXED CONCRETE:

(a) The use of pre-mixed concrete will be permitted under the following conditions:

(b) That the concrete and the materials of which it is made, together with the installation of same, shall meet in all respects the requirements of the specifications, and that the formulas used shall produce, in the opinion of the Engineer concrete which is the equivalent of the concrete specified.

(c) That the concrete shall be furnished by a manufacturer acceptable to the Engineer and approved by him.

(d) That the plant and equipment, including delivery equipment, to be used in making and delivering the concrete, shall be subject to the approval of the Engineer.

(e) That an inspection and testing service satisfactory to the Engineer shall be employed to inspect and test all concrete as to mix, strength, and as to any other matters as directed by the Engineer. Reports, properly certified, of such inspection and tests, shall be filed with the Engineer in the manner and at the times prescribed by the Engineer, and copies of such reports shall be filed on the job. Such inspection service shall be paid for by the Contractor at no additional cost to the Owner.

15. CONSISTENCY OF CONCRETE:

The materials shall be mixed to such a consistency that it will work readily in the angles and corners of the forms and completely envelop the reinforcing steel without permitting the materials to segregate or free water to collect on the surfaces, so that when the forms are removed the faces and corners of the members shall be smooth and sound throughout.

16. CLEANING FORMS:

Before placing the concrete, all debris, wood chips, ice, etc., shall be removed from the forms, and the forms shall be washed with clean water. No concrete shall be placed until the forms and reinforcing steel in them shall have been inspected and approved by the Engineer. In hot weather the forms shall be thoroughly wet before pouring begins.
17. **PLACING CONCRETE:**

(a) The concrete after it is mixed shall be placed in wheelbarrows or other conveyors in such a manner that there shall be no separation of the various ingredients, and raised or lowered by lifts or runways to the various levels it is being used.

(b) Towers and chutes requiring a liquid mixture of the concrete to flow down the chutes shall not be used.

(c) The concrete shall be mixed only as required for immediate use, and no concrete shall be used that has been mixed beyond fifteen minutes of the time of initial set of the cement as determined by the cement tests. Any concrete that has not been used before that time shall be wasted and not used for any purpose.

(d) The concrete shall be spaded, worked, and vibrated as it is being poured to secure its maximum density, free from voids and completely filling the forms. Concrete shall be thoroughly worked to secure the complete envelopment of all parts of the reinforcing steel, and into the corners of the forms. In order to prevent ragged edges and honeycombed surfaces, strict attention shall be given to this requirement.

(e) The Contractor shall keep all exposed surfaces of concrete well sprinkled with water as long as conditions require.

18. **NOTICE TO OTHER CONTRACTORS:**

The Contractor for concrete work shall notify all other contractors such as steam fitters, plumbers and electricians, and in ample time for them to install any portion of their work which is to be concealed in the concrete before any concrete is poured.

19. **DEPOSITING CONCRETE IN COLD WEATHER:**

When depositing concrete at or near freezing temperatures, the concrete shall have a temperature of at least 50 degrees F., but not more than 120 degrees F. The concrete shall be maintained at a temperature of at least 50 degrees F., for not less than 72 hours after placing or until the concrete has thoroughly hardened. When necessary, concrete materials shall be heated before mixing. Dependence shall not be placed on salt or other chemicals for the prevention of freezing. No frozen materials or materials containing ice shall be used.
20. STRIPPING FORMS:

(a) Special care shall be taken not to break concrete edges in taking down forms. Any portion of concrete damaged while stripping forms may be ordered torn down and recast at the discretion of the Engineer. Upon removal of forms the Engineer shall be notified by the Contractor. The Engineer, after inspecting the surfaces newly stripped, will designate what honeycombed parts may be pointed up and how the slightly damaged portions of concrete may be repaired, or replaced. No freshly stripped surface shall be pointed up or touched in any manner before having been inspected by the Engineer.

(b) In all cases, the Contractor shall assume all responsibility arising from the removal of forms, and shall assure himself that the concrete is properly cured to sustain loads before forms are removed.

21. SHOP DRAWINGS:

(a) The Contractor shall furnish the Engineer with four (4) complete sets of shop drawings for all reinforcing steel, showing the exact locations, the lengths, splicing, and the laps of the rods.

(b) Unless otherwise noted on the drawings, the rules of the Concrete Reinforcing Steel Institute shall apply in determining the length of all laps, splices, etc.

(c) The shop drawings shall be approved by the Engineer before proceeding with the work.

22. PROTECTING CEMENT FLOORS:

(a) All finished cement floors throughout shall be covered at once with dampproof kraft paper, applied over the entire area, lapping joints 4"; the laps sealed with waterproof glue.

(b) No materials, such as mortar, plaster, paint, etc., shall be mixed on any finished cement floors.

23. CONCRETE FOR 5,000,000 LB. TESTING MACHINE FOUNDATION:

Concrete in the lowermost 17 ft. 9 in. of the testing machine pit shall be 3,000 psi quality. Upon this, after completion of side and end walls, there shall be placed 3 in. of 1 - 1-1/2 - 3 granolithic sidewalk mixture, troweled smooth and graded to a sump where directed.
Prior to pouring of any concrete, the two groups of 6 in. anchor bolts shall be placed in position. They shall be surveyed with the utmost care for horizontal and vertical position, and shall then be so secured that it shall be impossible for their positions to be altered during the concreting.

Prior to placing these anchor bolts they shall each be wrapped between points indicated on the plans, with a spiral wrapping of 15 lb. building paper, lapped one inch and mopped with roofing pitch.

Concrete shall be cast against the cleaned surface of the sheet piling.

Concreting may terminate at the top of the 17 ft. 9 in. block, for placing of inside forms for side and end walls. Provision satisfactory to the Owner shall be made for securing bond between the concrete in the block and that in the walls.

Concrete in side and end walls shall be of 3,000 psi quality.

All reinforcement and pipe sleeves shall be in place, and anchor bolt positions carefully re-surveyed and secured, before this concreting is commenced.

Concrete of side and end walls shall be placed in one continuous operation, except that the upper 3 in. at the main table seats and at first floor level shall be placed between 36 and 60 hours after the pour is otherwise completed.

Main table seats shall be finished approximately level, free from projecting coarse aggregate but not troweled, at approximately 3/4 in. below the planned elevation of bottom of steel table.

Top of side and end walls shall be troweled to carefully established elevation as indicated on the plans for first floor level.

Contractor shall protect side and end walls, for their full length, with a wooden angle guard consisting of not less than 12 x 1-1/2 flat and 8 x 1-1/2 vertical, the latter nailed to the overhang of the former.

24. CONCRETE FOR DYNAMIC TESTING BED:

Concrete in the dynamic testing bed shall be of 5,000 psi quality throughout.
Contractor shall first place a layer 6 in. thick over the entire bottom, with surface as rough as practicable for the intended purpose. After this shall have sufficiently hardened the anchor bolts and lower reinforcing bars shall be installed and secured.

The accurate positioning, and the true verticality, of the bolts is of the utmost importance to the operation of this bed. It is contemplated that the following sequence of operations, or an alternative sequence to be approved by the Owner, will be required.

When the anchor bolts, the bottom reinforcing bars, and the stirrups are in accurate position, install four frames about 13 ft. long and about 4 ft. high, for the support of the four longitudinal I-beams called for by the plan. Wedge the I-beams to an elevation not above, and possibly one-fourth to one-half inch below, their final elevation by plan.

Then place the upper transverse reinforcing bars grouped in twos next to the stirrups nearest the bolts, and place in an approximate position the upper longitudinal #8 reinforcing bars; after that place the sleeves on the bolts. Then place the upper longitudinal #11 reinforcing bars, bunched near the bolt sleeves, to avoid encroachment on the openings for concreting. Finally, bolt the 22 in. transverse surface plates to the I-beams, and check that the sleeves of the bolts enter about one-half inch into these plates. Check that bolts and sleeves are completely coated to prevent bonding with concrete.

Concrete must be passed in small batches through the openings in the steel surface, through trunks so supported that they cannot contact or disturb the steelwork. Concrete shall be carefully shoveled around the anchor bolts and vibrated for maximum density. This second pour shall be placed as one uninterrupted operation.

This second pour will terminate under the I-beams, at about 2 ft. below floor level, where a pause will be made to allow for shrinkage of the mass.

After that place the I-beams in their final position, using, between the beams and the top surface of the preceding pour, steel wedges, adequate in number and position to adjust the surfaces of all 22 in. plates as closely as possible to a common plane at floor level. Place all top reinforcing bars in their final position and bring the bolt sleeves to their proper elevations. The entire work shall be re-checked and if necessary re-adjusted, and the welding of the 22 in. plates to the I-beam performed, in a sequence to minimize distortion.
Concreting of the uppermost layer will be executed slowly and with constant check upon the positions of the surface plates and their relation to the upper ends of the bolt sleeves, and with especial care to make contact with the under sides of surface plates.

The concrete at top of block, for the full depth of the surface plates shall be 1 - 1-1/2 - 3 granolithic sidewalk mixture. Its placing shall be delayed from 12 to 18 hours after the pour reaches the under side of the surface plates, and it shall be troweled smooth to the level of the top surface of these plates. The ends of these strips shall be poured against smooth vertical forms.

Contractor shall from time to time touch up any abrasions of the shop coat of paint on the upper surface of the surface plates. Immediately prior to completion of the building he shall give them two coats of approved paint.

Concrete floor slab between south wall of dynamic test bed and north wall of machine pit shall be of 3,000 psi quality. It shall be poured on a 12 in. of crushed stone fill at 6 in. below floor level and shall have the finish of the first floor in general.

Concrete for the housing for centrifuge shall be 3,000 psi quality.

Except for a portion under, and about 3 in. outside of, the testing machine control cabinet, the placing of the first floor slabs shall be postponed until after all work on the testing machine shall have been completed, the loading aprons and the idle aprons erected, and all construction operations and trucking on the first floor are discontinued.

Floor slabs containing pipe anchorages shall be of 3,000 psi quality. The upper one inch (minimum) shall be of 1 - 1-1/2 - 3 granolithic sidewalk mixture, troweled with steel trowels to a non-dusting surface.

Pipe anchorages shall be placed at the spacing on the plans with a tolerance in position not over 1/4 inch in any direction. They shall be so secured as to remain truly vertical. Contractor shall furnish temporary plugs to exclude mortar during the operations of concreting and finishing, and shall place the permanent plugs furnished by the Owner when the surface is hard.

All floor slabs shall be of the full depth of concrete shown on the plans, below which there shall be placed not less than 12 in. of crushed stone heavily rammed.
1. RELATED CONTRACTS

The structural steel will be furnished under separate contract by the Owner.

Another contract will be awarded by the Owner for the manufacture and erection of a testing machine, in and over the testing machine pit; the contractor under which, the Baldwin-Lima-Hamilton Corporation, will be referred to hereinafter as "B-L-H".

2. OBLIGATIONS UNDER CONTRACTS:

Owner, under separate contract, will furnish, fabricate and deliver to the building site, but not erect:

Item a. Anchor bolts and other structural steel for embedment in building foundations.

Item b. Structural steel for temporary quarters in north side of old building.

Item c. Anchor bolts, grillages and pipe sleeves for embedment in testing machine pit walls.

Item d. Anchor bolts, surface plates and other structural steel for embedment in dynamic test bed.

Item e. Structural steel for curb and cover of housing for centrifuge.

Item f. All pipe anchors for embedment in flexure slabs and laboratory floor.

Item g. Spreader beams, bolsters, test frames for the dynamic test bed and specimens for the acceptance tests.

Item h. Bed-plate pre-stressing columns and their structural appurtenances.

Owner, under separate contract, will furnish, fabricate, deliver, erect, field rivet and/or bolt, but not field paint:

Item k. Structural steel frame for new building and alterations to south aisle of old building.

Item l. Loading aprons, idle pit aprons, ladders and their appurtenances in testing machine pit.
Owner, under separate contract, will erect, but not field paint:

Item m. A 20 ton electric traveling crane, ready for connection of electric power. (The crane will be furnished and delivered under a separate contract).

Owner, under separate contract, will deliver and lend to B-L-H, and later haul away, such jacks, pumps and hydraulic accessories as are required for prestressing columns in pit.

The welded steel main table (bed plate) will be furnished and installed under the B-L-H contract.

All bar and/or mesh reinforcement will be furnished by Contractor.

3. **INTER-RELATION OF CONTRACTS:**

   Under the separate contracts referred to in Article 1 it is intended that:

   a. Contractor will unload, install and/or erect all steel in Items a to f inclusive.

   b. Owner will unload and store all steel in Item g.

   c. B-L-H will unload and install pre-stressing columns and appurtenances in Item h.

   d. Contractor will field paint exposed structural steel of Items b, d, e, h, k, l, and m, as specified under "Painting".

4. **DESIGN PLANS:**

   Design plans governing all structural steel to be furnished under separate contract are:

   Plan No. LUL1 : Layout of First Floor. (Quadrille Sheet)
   LUB1 : Pit and Flexure Slabs.
   LUB2 : Dynamic Test Bed.
   LUB3 : Pit Aprons and Bed Plate Columns.
   LUB4 : Housing for Centrifuge; Bolster and Spreader Beams; Pipe Anchors.
   LUB5 : Test Frames for Dynamic Test Bed.
   LUS1 to LUS7 inclusive : Structural Steel for New Building and for Alterations to Old Building.
5. **SPECIFICATIONS - GENERAL:**

Structural steel shall conform to A.S.T.M. Specification A7 and rivet steel to A.S.T.M. Specification A141; unless and except as otherwise indicated on the plans.

Design and details shall conform to the A.I.S.C. Specifications for Structural Steel in Buildings.

Calculation of weights for administrative purposes shall conform to the A.I.S.C. Code of Standard Practice.

6. **SPECIFICATIONS - SPECIAL:**

a. Metal templates are to be provided for each of the two groups of six anchor bolts of the pit walls to ensure their exact spacing and to permit their correct placing. These templates are to be removed after the completion of the concreting.

b. The pairs of holes in the surface plates of the dynamic test bed correspond to pairs of collars projecting below the bases of the dynamic test frames. It is of the utmost importance that the collars pertaining to the test frames shall fit with close clearances into any holes in the surface plates.

Therefore these pairs of holes shall be drilled and/or reamed through metal templates, by methods which will ensure like accuracy in the relative positions in the collars of the test frames.

The diameter of the holes in the surface plates shall be 5.260" ± .004".

The diameter of the collars in the test frames shall be 5.240" ± .004".

The distance between the centers of holes of a pair in the surface plates and in test frames shall be 12.000" ± .006".

The distance between pairs of holes in the surface and their placing in general, shall be as accurate as possible.

The surface plates shall be flattened to the least practical variation and then rough planed on the upper surface. Only the upper surface shall receive shop paint.

c. The bolsters and spreader beams shall be of carefully selected material for concentricity of web, and the tolerance on out of squareness shall after fabrication not exceed one-third of A.I.S.C. Manual tolerance.
d. All steelwork not to be embedded in concrete shall be thoroughly cleaned by hand wire-brushing and given one shop coat of paint to specification 75-25 FSC.

Steelwork for embedment in concrete shall be delivered to the site free of loose scale, heavy rust, dirt, grease or paint.
1. **GENERAL NOTE:**

The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   (a) The scope of the brickwork is clearly indicated on the drawings.

   (b) In general, it is as follows:

   1. Face brickwork of entire building shall start at top of granite base at approximately the second floor level for main building and about 2'-0" above basement and first floor levels of north extension. The facing as shown below second floor line will be of granite and backed with hollow Waylite block and brick as required.

   2. Interior walls and partitions as shown on drawings and called for in Schedule of Finishes shall be hollow Waylite block or Clear Glazed tile.

3. **MATERIALS:**

   (a) **Cement:** All cement shall be Lehigh Portland cement, or an approved equal. Cement shall conform to the latest Standard Specification and Tests for Portland Cement of the A.S.T.M.

   (b) **Sand:** All sand shall be clean, washed sand, free from impurities and as approved by the Engineer from samples submitted.

   (c) **Hydrated Lime:** Shall be a standard brand as approved by the Engineer.

   (d) **Mortar:** Mortar for brickwork below grade shall consist of one (1) part cement, one-quarter (1/4) part cold lime paste, and three to three and one-half (3 to 3-1/2) parts sand by volume.

   Mortar for brickwork above grade shall consist of one (1) part cement, one (1) part cold lime paste, and five to six and one-half (5 to 6-1/2) parts sand. Color of mortar shall be as directed.
Lime paste shall be made by using either lump or hydrated lime, slaked and allowed to cool before using.

All mortar shall be mixed in a batch mixer, and none shall be used after it has begun to show evidence of setting.

Where brickwork abuts granite work, the joint between same shall be non-staining mortar (see GRANITE WORK)

(e) Common Brick: All common brick shall be hard burned, standard size, as made by Glen-Gery Brick Corp., or an approved equal.

(f) Exterior Face Brick: All face brick for exterior use shall be "Belden Graystone A", manufactured by Belden Brick Co., Canton, Ohio, or an approved equal.

(g) Interior Clear Glazed Brick and Tile: All interior clear glazed brick or tile shall be of sizes shown on drawings or called for in Schedule of Finishes. Clean glazed material shall be of "Standard" quality as manufactured by Claycraft Company, or approved equal. Color will be selected from samples submitted.

All Clear Glazed Brick and tile shall be "Standard" quality stretchers, size as shown, packed in paper cartons with separators. These units shall conform to the requirements of Column 2 of Tables 1 to 4, inclusive, of the Grading Rules of the Facing Tile Institute as to 80% thereof and the requirements of Column 3 of Tables 1 to 4, inclusive, of the Grading Rules of the same institute as to the remainder.

The glaze of the "Standard" quality clear glazed brick shall be free from chips, crazes, blisters, crawling, or other imperfections detracting from the appearance of the finished wall when viewed at a distance of not over 5'-0", except that not more than 20% of the units may have slight mechanical or glaze imperfections and small chips.

Provide sanitary cove base at the floor in all glazed brickwork, using proper cove starters, right and left at door openings; cove bull-nose corners at external angles and cove square corner special shapes at internal angles.

Window jambs and external angles to be bull-nose; internal angles and heads square.
(h) Masonry Anchors: Masonry anchors for anchoring brick walls to concrete walls shall be 14 gauge galvanized "Dovetail Anchors", as manufactured by the Universal Form Clamp Company, Chicago, Illinois, or an approved equal (see CONCRETE WORK).

Anchors and ties for brick and granite veneer shall be copper of size as required.

4. SAMPLES:

(a) The Contractor shall furnish samples of the above specified material, properly labeled for the Engineer's approval.

5. SAMPLES OF BRICKWORK:

(a) Before commencing face brick work the Contractor shall erect at the site sample panel of bond specified approximately 5'-0" long and 4'-0" high for the Engineer's approval.

(b) These samples shall remain in place until all brickwork is completed as a standard of workmanship.

6. LAYING BRICK:

(a) All vertical joints for the entire height and breadth of the brick shall be full. To obtain this, the mortar shall be spread on the ends of the brick before they are laid in the wall. The spreading shall cover the entire end of the brick. Slushing to fill end joints after the bricks are laid will not be permitted. Joints between courses shall be sufficiently wide to permit full slushing.

(b) Every sixth course in common brick shall be a full header course, bricks shall be carefully laid, each course breaking joints with course below.

(c) Build in chases in walls for all mechanical trades as called for on the drawings or as may be directed.

(d) All bricks, except face and glazed brick shall be wet before they are laid; except in cold weather near the freezing point when they shall be laid dry.

(e) No brickwork shall be laid in freezing weather, unless especially authorized and supervised by the Engineer. Should such work be authorized, the Contractor shall provide proper protection to all such work not thoroughly dry.
(f) The Contractor for brickwork shall set all steel and iron plates, lintels, anchors, etc., and all grounds, etc., for the securing of wood trim, etc. He shall also set all sleeves, conduits, etc., for the mechanical trades. The locations of all such work shall be given by the several trades.

(g) All exposed common brick walls or block partitions shall have neatly struck and pointed flush joints and be cleaned on completion. The above prepared for paint finish.

(h) Brick and block backing for granite facing shall be carefully bonded and shall be anchored with the granite.

(i) All brick backing shall be laid with a shoe joint on a full bed of mortar with all interstices solidly filled.

7. FACE BRICK:

(a) Face brick shall be laid in straight running bond as indicated on the drawings, unless specifically noted otherwise.

(b) All face brick shall be laid 2 - 5/8" brick and joint. Joints shall be struck smooth flush with brick both horizontal and vertical.

(c) Care shall be taken to make vertical joints uniform, and where necessary, brick shall be clipped to obtain the proper jointing.

8. INTERIOR CLEAR GLAZED BRICK & TILE WORK:

(a) All interior glazed brick wainscots and partitions where called for on Finish Schedule shall be carried to heights shown on drawings, or to work out with joint nearest to that height. No cap is to be used; glazed brick or tile to be laid flush with face of finished plaster or Waylite block wall surfaces above without the use of any cap. At window openings wainscoting shall return back to window frame.

(b) All interior glazed brick or tile shall be laid in straight running bond with uniform horizontal and vertical joints not over 1/4" wide.

(c) Use scored back glazed units for plastering on the back in 4" partitions that are to be glazed on one side and plastered on the reverse side.

(d) All cutting of glazed units shall be done by an electrically driven saw as no cutting by hand on the job will be permitted.
(e) All glazed brick when delivered at the building site shall be piled on wooden platforms and a watertight shed erected over the pile in order to protect the brick and keep dry until actual laying in the wall. Work laid in wall shall be protected from moisture getting into the wall.

(f) All wheelbarrows are to be filled with straw in the handling of all interior glazed brick, and shall be placed in the wheelbarrows and not thrown in. Every care shall be exercised in the handling to eliminate chipped units.

9. PROTECTION:

(a) All brickwork shall be carefully protected after laying. Open tops of walls shall be covered at the end of each day's work and kept covered unless work is being done.

(b) Interior brickwork or block work shall be carefully protected. No work shall be done in freezing weather unless building is enclosed and all exterior angles shall be carefully protected.

10. CLEANING:

(a) On completion, all exposed brickwork shall be carefully cleaned down with fibre brushes and clear water. The use of acids is prohibited.

(b) All pointing shall be gone over carefully.

(c) Interior clear glazed brick or tile shall be cleaned with the greatest care using soap powder boiled in clear water and a fibre brush.

11. GLASS BLOCK:

Glass block where shown shall be 7-3/4" x 7-3/4" in size as manufactured by Pittsburgh Corning, or approved equal. The design shall be as selected.

This Contractor shall furnish and install expansion strips, reinforcing wall ties, etc., all in accordance with glass block manufacturer's specifications.
GRANITE WORK

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) The scope of Granite Work is clearly indicated on the drawings.

(b) In general, it shall include the following:

Veneer facing from grade to second floor for main building and base at north extension.

Door trim and trim for large windows at east and west sides.

Spandrel panels and trim for windows having vertical treatment on south, east, and west sides.

Window and door sills throughout, also all wall coping.

An inscription reading "Fritz Engineering Laboratory" shall be made at top portion of architrave over large door opening at west side of building.

3. MATERIALS:

(a) Cement: All granite shall be set in an approved brand of stainless cement, Medusa or equal.

(b) Sand: Same as specified for Masonry. A selected white sand shall be used for pointing.

(c) Lime: Same as specified for Masonry.

(d) Mortar: All granite shall be set in a carefully prepared mortar consisting of one (1) part stainless cement, one-half (1/2) part lime and three (3) parts sand, making as stiff a mixture as can be worked.

Mortar for pointing shall be the same, except that selected sand shall be used.
(e) Granite: All granite shall be as quarried by H. E. Fletcher Co., West Chelmsford, Mass., or an approved equal. The random rectangular ashlar as shown on drawing shall be natural split face with color range in grays and browns as selected. Granite for base, watertable, trim, spandrels, sills, and copings shall have sawn and sandblasted finish gray in color as selected by Engineer.

4. SAMPLES:

The Contractor shall submit two (2) typical extreme samples of each grade of stone clearly marked with name of Contractor furnishing same, grade of stone and name of this project. Samples shall show one side finished as specified below.

5. SHOP DRAWINGS:

(a) The Contractor shall prepare and submit in triplicate to the Engineer complete cutting and setting drawings for his approval.

(b) These drawings shall be based on scale details as prepared by the Engineer, and shall show in detail, sizes, sections, and dimensions of stone, the arrangement of joints, bonding, anchoring, and all other necessary details in keeping with standard practice.

(c) Each stone indicated on these drawings shall bear the corresponding number on back or bed, marked with non-staining paint.

(d) Lintels and architrave or other members spanning openings of Main Entrance Doorway, etc., shall be of the proportion and sectional area that will provide an ample factor of safety, based on the average strength of stone.

6. CUTTING AND FINISH:

(a) All stone shall be accurately cut to shape and dimensions, full to the square with all faces, and uniform jointing as shown on approved shop drawings.

Beds and all joints shall be dressed straight and unless otherwise shown, at right angles to the face.

(b) All moulded work shall be cut to full size details and must match perfectly at joints. All arrises shall be sharp and true.
(c) Unless otherwise noted on details, all joints shall have a uniform thickness of one quarter (1/4) inch.

(d) Patching or hiding of defects shall not be permitted, and Lewis holes shall not be made on exposed surfaces.

(e) Washes, drips and reglets for flashing, etc., shall be cut where shown or required. All projecting members shall have drips.

(f) All rust marks and stains from saw blades shall be removed before stone is shipped. Stone arriving on site with such marks will be rejected.

7. DELIVERY AND STORAGE:

(a) All granite shall be carefully car-blocked and protected from smoke and grime during transit. It shall be delivered promptly as ordered and in the sequence in which it is to be set.

(b) All granite shall be carefully unloaded, transported to site and shall be handled throughout by competent men using such methods as will insure against any damage or injury to the material.

(c) The stone shall be stored at the site on planking set entirely clear of the ground and shall be protected by proper means from damage to projecting members. Care shall be taken to protect stone from staining or other disfiguring elements. During extended periods of storage the stone shall be covered with tarpaulins or boards.

8. ANCHORS AND DOWELS:

(a) All projecting stone members shall be securely anchored to adjoining construction with 1/4" x 1-1/2" proper length wrought iron anchors. These anchors shall be heavily galvanized.

(b) All stone shall be anchored to adjoining structural steel wherever possible by anchors as specified in paragraph (a).

(c) All coping stone shall be set on crimped flashing (See Roofing and Sheet Metal).

9. FIELD CUTTING:

Should it be necessary to do any cutting of granite in the field to overcome inaccuracies or make material conform to conditions in building, the same shall be done by skilled mechanics.
10. **SETTING:**

(a) All setting shall be done by competent stone setters in accordance with the approved granite shop drawings.

Each granite stone shall be clean and dry before being set. Each piece shall be carefully bedded in a full bed of mortar and tapped home with a rawhide mallet to a full and solid bearing. All vertical joints shall be completely filled.

Particular care shall be exercised when setting the granite to equalize the bed and joint openings and to eliminate the necessity of redressing or jobbing of exposed surfaces.

The face of the granite shall be kept free from mortar at all times.

Granite facing shall not in any case be built up more than two courses ahead of the backing and no stone having a greater width of bed than the one below it shall be set until the lower course is backed up.

All joints and beds shall be raked out to a depth of at least 3/4 inch and every precaution taken to prevent stones bearing upon the edges.

Sills, etc., subject to uneven pressure, shall be bedded only at the ends.

(b) The stone shall be set accurately, true to line and level with full flush joints filling all anchor holes. The use of wedges in setting stone will not be permitted.

(c) The entire backs of all cut stone shall be plastered with a coat of setting mortar not less than 1/2" thick before backing up same.

(d) The first course of brickwork or masonry shall be laid in the same kind of mortar as is used for setting granite.

11. **CLEANING AND POINTING:**

(a) The face of all granite under this contract shall be thoroughly cleaned upon completion with clean water and stiff fibre brushes, and then drenched with clear clean water.

(b) The use of wire brushes or acids of any kind will not be permitted.
(c) All face joints shall be brushed out clean to a depth of 3/4" and after a thorough wetting of the stone, be pointed flush with mortar as specified above for pointing.

12. PROTECTION OF WORK IN PLACE:

As soon as granite work is in place it shall be immediately protected by boards or other means. This protection shall remain in place until completion.

13. CAULKING:

(a) All vertical joints in coping and other projecting members shall be carefully caulked as follows:

(b) The joints shall be raked to a depth of 1-1/2 inches and caulked with "Standard Pecora Compound" as manufactured by the Pecora Paint Company of Philadelphia, Pa., or approved equal. This caulking shall be applied with a gun under 130 lbs. pneumatic pressure by a licensed applier. The caulking compound shall match as nearly as possible the color of the pointing.

(c) The joint under all window sills shall be similarly caulked. (See Dampproofing and Caulking).
WATERPROOFING, DAMPPROOFING AND CAULKING

1. GENERAL NOTE:

   The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

   (a) Waterproofing: The exterior surface of all concrete grade beams and piers shall be waterproofed from footings to grade, also the walls and floors of centrifuge and elevator pit. The first floor slab between Column line C and the expansion joint north of Column line B for the entire length of building shall be waterproofed.

   (b) Spandrel Waterproofing: All spandrel beams at floor lines shall be waterproofed.

   (c) Dampproofing: All exterior walls from first floor to roof shall be dampproofed.

   (d) Caulking: All exterior door and window frames in masonry openings shall be caulked.

3. WATERPROOFING:

   (a) The Contractor applying waterproofing shall inspect all surfaces to be covered and report to the Engineering in writing any defects therein, for in commencing his work he will be considered as accepting all work in place and waiving all claims to the contrary.

   (b) Surfaces to be waterproofed shall be dry and free from sharp projections, loose matter, and dust.

   (c) Apply primer at the rate of one (1) gallon per 10 square feet of surface and allow to dry. Follow with a mopping of waterproof asphalt into which shall be imbedded 15 lbs. asphalt saturated rag felt. The first strip of fabric shall be half width; the second shall be full width, lapped the full width of the first sheet; and each succeeding strip shall be full width lapped so that there shall be two layers of fabric at all points with head laps not less than two (2) inches wide. All end laps shall be at least 12 inches. The entire surface shall then be given a final mopping of hot asphalt.

   (d) The completed waterproofing shall be firmly bonded membrane, composed of two (2) layers of fabric and three (3) asphalt. Under no circumstances shall one layer of fabric touch another layer at any point, or touch the surface, as there shall be at least three moppings of asphalt.
(e) Waterproofing shall completely cover the exterior surface of the walls below grade. It shall extend over footings and between concrete floors. All elevator and sump pits and pipe trenches where required shall be carefully waterproofed. Where areas occur the waterproofing shall be turned back through the wall.

(f) Waterproofing shall be so applied that all surfaces of the building including floor below grade shall be completely sealed.

(g) Materials for waterproofing shall be Johns-Manville, Barrett, Flint Kote, or approved equal.

4. SPANDREL WATERPROOFING:

(a) The outside face and top of all exposed spandrel beams which are faced with brick or cut stone shall be waterproofed.

(b) Waterproofing shall consist of one (1) trowel coat of mastic cement applied directly to the beam; one (1) ply of #15 asphalt saturated felt with joints lapping at least 3" and embedded in the above specified cement. Over this shall be applied an additional trowel coat of mastic cement.

(c) The waterproofing shall extend out on continuous angle lintel for entire length of spandrel, up over beam, through the wall and turn-up at least 2" above the floor slab. The turn-up shall be secured to the interior face of the wall with mastic cement.

(d) Joints in felt shall lap at least 3" and shall be well buttered with mastic above and below.

5. DAMPPROOFING:

(a) The interior surface of all exterior walls of building, including Pent House, shall be dampproofed from first floor to underside of structural roof slab.

(b) All dampproofing shall be done by a continuous spray coat application.

(c) All dampproofing shall cover the entire wall and shall extend into jambs, heads, and chases.
6. **CAULKING**

   (a) All exterior window and door openings in masonry walls shall be carefully caulked on all sides with Toch Bros. Elastic Caulking Compound, Pecora, or approved equal.

   (b) Caulking shall be applied with a gun under pressure in accordance with manufacturer's directions.

   (c) For wood door frames, the staff bead shall be removed and caulkling applied back of same. Bead to be replaced after inspection. For steel sub-frames, caulking shall be applied along joint and cut to an even edge.

   (d) Wood and brick coming in contact with caulking shall first be shellaced.

   (e) For caulking of joints in cut stone, under sills, etc., see CUT STONE WORK.

7. **GUARANTEE:**

    (a) The Contractor shall guarantee that above specified waterproofing, spandrel waterproofing, dampproofing, and caulking shall render the walls proof against the penetration of water or dampness for a period of two (2) years from the date of the acceptance of the building.

    (b) The above guarantee shall also apply to the caulking of cut stone work as specified under CUT STONE WORK.

8. **ROOF INSULATION:**

    Entire roof surface shall be covered with two layers of Johns-Manville (or approved equal) roof insulating board, applied in accordance with manufacturer's specification covering the application of this type of insulation on concrete slab construction and steel deck roof.
ROOFING AND SHEET METAL WORK

1. GENERAL NOTE:

   The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

   (a) This division of the work shall include the covering of all roofs and the flashing and counterflashing of the same.

   (b) Flashing under all parapet copings.

   (c) Flashing around all plumbing vents or ventilators.

   (d) Flashing around pent houses.

   (e) Flashing and covering of trap covers on main roof of laboratory.

   (f) Flashing and gutters between new and present building.

3. PREPARATION OF ROOF SURFACE:

   The Roofing Contractor shall carefully examine all surfaces to be covered and report in writing to the General Contractor any defects therein, as on commencing his work he will be considered as having accepted all work in place, and waived any claims to the contrary.

4. GENERAL:

   (a) The Contractor shall consult the Mechanical Drawings to see locations of all vents, etc.

   (b) This Contractor shall work in conjunction with the Heating, Ventilating, and Plumbing Contractors to see that the parts of the roof where their two works join are made watertight.

5. BUILT-UP SLAG ROOFS:

   (a) Roofs of entire building and pent house shall be covered with 4 ply felt pitch and slag roofing.

   (b) The felt and pitch shall have class "A" Underwriters Laboratories, Inc., inspected roofing material labels. The slag shall be dry, free from dirt and shall be thoroughly imbedded in the pitch.
(c) Main roof of building and pent house are reinforced concrete slabs and steel deck.

(d) All felt laps shall be mopped their full width so felt does not touch felt. Wearing surface shall consist of a heavy flowed on application of pitch and slag, heated if applied in cold weather. After work on roof is complete, all bare spots shall be re-slagged.

(e) Where downspouts spill on slag roofs, there shall be set a two foot square by one inch slate splash plate, well bedded in slag.

(f) In general, it is the intention that the specification for roofing cover the equivalent of a twenty year bonded roof; however, no twenty year bond will have to be furnished.

6. FLASHING:

(a) Where roofs abut vertical surfaces, vents, etc., they shall be carefully flashed and counterflashed.

(b) Flashing for main roof of building and pent house where same abuts vertical brick walls shall be made as follows:

1. Roofing felt (see above) shall be carried over cant strip and up wall two inches.

2. Mop on over this roofing felt with steep pitch, a tarred strip of roofing felt which shall extend two inches out on roof and up vertical surface as specified below. On top of this apply a second strip extending the felt one inch beyond preceding one, and a third strip on top of the second.

3. Strips shall be approximately 10' - 3" long and ends shall overlap at least 3 inches. All plies of felt shall be firmly pressed into moppings so that there will be no wrinkles.

4. Felt shall be secured to walls by 1-1/2" barbed roofing nails through metal discs 10" o.c.

5. At parapet walls felt flashing shall extend up the wall to within 1 inch of granite coping, at walls of pent house felt flashing shall extend at least four (4) brick courses above roof.
(c) Counterflashing for all parapet walls shall be 3-way type through wall flashing of 16 oz. soft rolled copper. Same shall start 1/2" from outside face of wall, through wall and be turned down four (4) inches over flashing.

(d) Counterflashing at walls shall be 25 lb. lead coated copper and shall be built in and turned over first course of brick at back 1/2 inch and be turned down 4" over flashing.

(e) Flashing at plumbing vents shall be done with 4 lb. sheet lead. Same shall extend 6 inches out on roof up pipe and be caulked into hub. Open vertical side to be soldered tight.

(f) Flashing at trap opening curb and entire top surface of trap cover shall be 16 oz. copper properly seamed and soldered to insure watertight job. The above covers two trap openings in roof over Testing Laboratory.

(g) Built up gutter between new and existing building shall be 16 oz. cold rolled copper with expansion joints, locks, cap flashing, etc., to insure watertight job.

7. **PAINTING:**

All metal other than copper and lead coated copper shall receive a heavy coat of an approved metallic paint on all sides by this Contractor.
LUMBER AND CARPENTRY

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) All rough carpentry, all temporary and preparatory work such as enclosures, runways, scaffolding, ladders, all wood framing, sheathing, bucks, grounds, centers, all wood blocking or furring, and the laying out of the work, establishing lines, and all other miscellaneous carpentry work required to complete the project.

(b) The setting of all exterior and interior millwork, frames, doors, and installation of all hardware and, in general, the finishing carpentry necessary for the completion of the project. Refer to room finish schedule and door schedule for this work.

3. GRADES AND MATERIALS:

(a) All framing lumber shall be Douglas Fir Structural grade with 1800# fiber stress.

(b) All other lumber shall be Douglas Fir Commercial Grade.

4. GROUNDS:

(a) Grounds shall be set for all wood trim, metal cabinets, etc., and as detailed and shall be straight and plumb. There shall be two (2) grounds set for all wood base.

(b) All grounds shall be Fir or Cypress, 3/4" x 1-1/2", or as detailed.

5. TEMPORARY FOREMAN'S OFFICE

Construct a temporary office of wood frame construction at first floor level of present Fritz Laboratory as shown and specified on drawing #LU-7.
INTERIOR NON-BEARING PARTITIONS AND FURRING

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

All partitions between corridors and rooms shall be Waylite block, steel partition, and glazed tile. See SCHEDULE OF FINISHES.

3. MATERIALS:

(a) Cement, sand, and mortar same as specified for BRICKWORK.

(b) Waylite Block: All Waylite Block shall be 4" x 8" x 16", of first quality local manufacture, subject to approval of Engineer.

4. ERECTION:

(a) All Waylite block shall be laid in cement mortar with full flush joints to a line, and with horizontal beds uniformly level on each course.

(b) All joints, between tile and other work shall be filled with mortar, well slushed in, joints in alternate courses shall be broken.

(c) All partitions shall start on structural concrete slab and extend to slab above. All blocks shall be set plumg and true and well wedged at slab above.

(d) Tile at corners and re-entrant angles shall be laid interlocking and be bonded.

(e) The Contractor shall furnish and set all necessary reinforcing clips, etc., to insure a rigid partition, especially where pipes, conduits, etc., are in partitions.
5. **LINTELS:**
   (a) Lintels for Waylite block walls shall be pre-cast with reinforcing bars well grouted in cells.

6. **EXTERIOR WALL FURRING:**
   (a) Cross partitions shall contact wall on alternate courses and shall be bonded with furring.

7. **GENERAL:**
   (a) Build in all furring blocks, anchors, etc., necessary to secure finish or the work of other trades.
   
   (b) Care shall be exercised to see that all pipes, conduits, etc., are within the line of partition or furring, and nothing shall project beyond the finished plaster line.
   
   (c) Tile shall be carried well into hollow metal door and window jambs, and the metal ties of jambs shall be carefully and securely built into partition. All space around same shall be filled with mortar.
STEEL PARTITIONS

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE OF WORK:

Furnish and erect complete movable steel partitions as shown on drawings and specified hereunder as manufactured by E. F. Hauserman Company, or approved equal.

3. SHOP DRAWINGS:

(a) The Contractor shall furnish shop drawings showing partition layout, typical elevations, hardware schedule, finish, and any special conditions.

(b) Drawings shall be submitted in triplicate for the Engineer's approval.

4. TYPE:

Partition shell shall be flush, 3" thick, insulated with rock wool. Doors shall be 1-3/4" thick complete with hardware consisting of lockset, check, and ball bearing butt. Partitions shall be provided with standard cutouts for electrical switches, outlets, and other fittings at locations shown on plans. All the above shall be in accordance with manufacturer's specifications. Each door shall have 1-1/2 pr. of butts.
ALUMINUM WINDOWS

1. GENERAL NOTE:
   The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:
   The following work is to be included:
   (a) All exterior windows for entire building.
   (b) All sub-frames for aluminum sash.
   (c) Glazing clips.
   (d) The erection of all aluminum sash in the sub-frames.

   The following work is not included:
   (e) Erection of sub-frames, glass, glazing, caulking of sub frames.

3. SHOP DRAWINGS:
   (a) The Contractor shall furnish shop drawings showing dimensions, operation and all structural details.
   (b) Drawings shall be submitted in triplicate for the Engineer's approval.

4. TYPES:
   (a) Double Hung Windows: Exterior double hung windows shall be Ceco-Sterling Aluminum Series 150-B, sash S.
       All frames shall be equipped with necessary hardware to complete installation, including window cleaners bolts.
       The above windows to be as manufactured by Sterling Windows, 1132 S. 14th St., New Castle, Ind., or an approved equal.
   (b) Stationary Window: The large glazed openings at east and west ends of main testing laboratory shall have channel iron frames completely covered with extruded aluminum sections including glass beads to receive 1/4" P.P. Solex glass. The above shall be Pittco metal aluminate finish as manufactured by Pittsburgh Plate Glass Co. or an approved equal.
1. **GENERAL NOTE:**

   The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   This sub division of the work shall include all exterior and interior millwork necessary to complete the building.

   **A. Interior Millwork:**

   (a) All interior doors except those indicated as of other material, excluding toilet stall doors, see door schedule.

   (b) Shelving in all closets and Janitors' Room, as listed in "Schedule of Finishes" shall be "B" select or better grade.

3. **WORKMANSHIP:**

   (a) All workmanship shall be of the highest grade in all respects, and all finished work shall be properly protected from damage after installation until the entire building is completed.

   (b) All millwork shall be sandpapered at the mill; all moulded members shall be thoroughly smoothed and sanded by hand. No sanding marks shall show in the finished product.

   (c) Backs of all interior millwork coming in contact with plaster shall be primed with a damp resisting paint before leaving mill. No millwork shall be put in place until, in the opinion of the Engineer, the plaster is dry.

   (d) All millwork shall be in accordance with details to be furnished by the Engineer.

4. **INTERIOR MILLWORK:**

   **A. Interior Doors:**

   (a) All interior doors shall be as shown and of sizes as specified in Door Schedule.

   (b) All interior doors in temporary quarter shall be manufactured by Curtis or Morgan, or an approved equal.
(c) Interior door and window openings shall have no wood trim; a quarter round metal plaster stop is to be used as a plaster finish. (Refer to "Lathing and Plastering")

(d) Interior door jambs shall be 1-1/8" thick and made to suit the different thicknesses of partitions.

B. Miscellaneous:

(a) All shelving in closets shall be white pine on 3/4" x 3-3/4" cleats.
ORNAMENTAL AND MISCELLANEOUS METAL WORK

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) Under this heading shall be included all ornamental and miscellaneous metal work as hereinafter specified or as may be required.

(b) This shall include bolts, anchors, stairs, etc.

3. SHOP DRAWINGS:

(a) The Contractor shall furnish shop drawings of all the hereinafter specified items which shall show all construction details, limestone, etc.

(b) Three (3) copies shall be furnished for the Engineer's approval.

4. MATERIALS:

(a) All steel shall be as specified for Structural Steel.

(b) All cast iron shall be of the best quality of tough gray iron, smooth and straight, of uniform thickness, true to pattern and entirely free from blow holes, honeycomb, or other defects.

(c) Brass or aluminum shall be commercial composition. Aluminum shall have alumilite finish.

5. PAINTING:

All iron and steel work not galvanized shall receive a heavy shop coat of red lead and linseed oil paint. In subsequent painting, see "Painting".

6. STAIRS:

(a) Stairways #1, #2, #3 and #4, two open stairs at first floor present building, also stair to basement of present building shall be included.

(b) Risers and treads shall be integral pressed steel bolted together and secured to stringers by angles.
(c) Treads and platforms of Stairway #1 shall be of pre-cast terrazzo with metal risers exposed. Metal work shall be arranged to receive this finish. (Refer to "Marble, Tile and Terrazzo Work").

(d) Stairways #2, 3, 4, and stair to basement of present building shall have pan type cement treads and platforms. Stairways from first floor to mezzanine of present building shall have checkered plate treads and platforms with iron pipe handrail.

(e) Stairways shall be built up of 3/16" steel plate outside and wall stringers. Railing for Stairways #1, #2, #3, and #4 to be aluminum pipe. Brackets supporting rail shall be cast aluminum. Rails shall be continuous.

(f) The Contractor shall furnish all necessary bolts, screws, anchors, etc., to secure the above specified stairs to adjoining construction.

7. LADDERS:

Ladders from main roof to pent house roofs shall have 3/8" x 2" bars with rungs not over 14" o.c. Ladder shall be set 6" from wall to center of rung. Ladder shall extend 3'-0" above landing.

8. INTERIOR RAILINGS

Railings for all balconies and first floor shall be aluminum pipe installed in pipe sleeves as shown on drawings; also include aluminum screws on working balconies.

9. EXTERIOR RAILINGS:

Railings for exterior steps at southwest and southeast corners of building shall be stock type extruded aluminum, as made by the Aluminum Company of America, or approved equal. Brackets supporting rail shall be cast aluminum. Newel posts shall be tubular with cast aluminum caps. Finish shall be aluminite.

10. ALUMINUM THRESHOLDS:

All exterior doors shall have aluminum thresholds. Same shall be of same width as jamb and 1/2" high, fluted and full width of opening.
11. MISCELLANEOUS:

Furnish checkered plate cover and frame for trap pits, etc., where shown or called for on drawings. Also metal anchors for wood door jamb in temporary office section of present building.

Furnish cast iron gratings and frame for catch basins where shown on drawings.

Furnish aggregate chutes complete for basement bins also angle iron guides to receive wood planks at interior of bins, all as shown on drawings.

12. ENCLOSURE FENCE:

This Contractor shall furnish and erect chain link steel wire fence 6'-0" high complete with steel posts and gates, as shown on drawing #LU7 and as manufactured by Anchor Post Fence Company or approved equal. The purpose of this fence is to limit Contractor's activities and restrict students and the public from building area.
HOLLOW METAL

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) All exterior and interior door frames and doors of Stairways #1, #2, #3 and #4, and as shown on door schedule, shall be metal.

(b) Access doors and frames, wherever shown or required.

(c) Elevator doors, frames and tracks are not in this contract.

3. SHOP DRAWINGS:

The Contractor shall submit shop drawings in triplicate showing all construction details and dimensions for the Engineer's approval.

4. MATERIALS:

(a) All exposed members of hollow metal work shall be of cold rolled furniture stock steel that has been properly annealed and processed, levelled, and has smooth clean surfaces.

(b) Concealed structural or reinforcing members shall be well finished sheet or rolled steel shapes.

(c) Gauges specified shall be U. S. Standard sheet steel and shall be the minimum acceptable under the contract.

5. WORKMANSHIP:

(a) The finished work shall be strong and rigid, neat in appearance, and free from defects. Plain surfaces shall be smooth and free from warping or buckle. Mitres shall be well formed and true in alignment. Fastenings shall be concealed where practicable. Exposed screws shall have oval heads.

(b) Construction joints of steel shall be welded their full length and cleaned off flush on exposed surfaces. Spot welding shall be used where practicable in preference to the use of rivets, screws, or bolts.
(c) Suitable sinkages shall be provided for all mortised or countersunk hardware. Steel reinforcement shall be inserted for all hardware and shall be of ample size to stiffen the jamb against the strain of the service required. All keepers shall be of the "box" type.

(d) Suitable sinkage shall be provided in doors, frames, etc., for all mortised or countersunk hardware. Steel reinforcement shall be inserted for all hardware and shall be of ample size to stiffen the sheet metal against the strain of the services required.

(e) A box reinforcement of not less than #16 gauge steel shall be placed within the doors where required to support locks and escutcheons. All keepers shall be "box" type.

(f) Reinforcement for butts shall be at least 10" long. Reinforcement in frames for butts and lock keepers shall have metal guards on back. All doors shall be reinforced at top for door checks.

(g) Fitting for hardware shall be done at the factory, either to templates or to the hardware as may be required.

(h) All hollow metal work shall be of the Art Metal Construction Company manufacture, or an approved equal.

(i) The typical details shown on the drawings are to be followed, except that this Contractor shall check all openings and other conditions in connection with the same and make such modifications of the details as are necessary to meet conditions to the full satisfaction of the Engineer.

(j) All bucks shall be of the proper depth to fit the partitions in which they are set and shall finish flush with plaster work as shown.

(k) All jambs shall be provided with #16 gauge corrugated galvanized anchors attached to frame with sliding adjustment. There shall be three (3) such anchors on each jamb.

6. ERECTION:

(a) The bucks and frames shall be set plumb and true in exact positions shown or detailed on the drawings, and securely braced until partitions are built.

(b) Bucks and frames shall be secured to concrete floor slab by expansions screws drawn up tight.
(c) Distance between finished floor and structural concrete slab is 1/2".

7. **HOLLOW METAL DOORS:**

   (a) All hollow metal doors, except access doors, shall be 1-3/4" thick. Stiles and rails shall be constructed of #16 gauge steel with moulded members. Rails shall be neatly fitted to stiles with joints reinforced and welded. Compressed cork shall be placed within stiles and rails.

   (b) Muntins shall be neatly mitred and moulded and glass held in place with removable cold drawn moulding.

8. **ACCESS DOORS:**

   (a) Access doors and frames shall be fabricated of #12 gauge steel. Doors shall be of flush type and may be single thickness plate construction. Frames shall have anchors to secure same to wall. Doors shall be provided with pin tumbler master keyed cylinder locks.

   (b) Doors shall be 18" x 24" unless shown otherwise. Refer to floor plans for location and number of access doors required.

9. **FINISH:**

   (a) All surfaces shall be clean and dry when paint of finish is applied.

   (b) All hollow metal work, except bucks, shall have a five (5) coat baked-on finish, consisting of one (1) dip coat of rust-resisting paint, one (1) filler coat, and three (3) additional coats of paint on exposed surfaces. Each coat shall be baked in and rubbed smooth.

   (c) Bucks shall have primer finish for painting. (See "Painting")
1. **GENERAL NOTE:**

   The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   (a) The work under this heading shall include all lathing and metal furring. The Contractor shall refer to the "Schedule of Finishes" for the scope of the work. In general it shall include:

   1. All ceilings as called for in finish schedule.
   2. Soffits of stair and platforms for Stairway #1.
   3. All exterior window and door heads and jambs.
   4. All incidental lathing to cover chases and covering pipes, conduits, etc., in partitions where same is cut.
   5. Metal corner beads for all outside angles.

   (b) There is no lathing and furring in main testing laboratory.

3. **SUSPENDED CEILINGS:**

   (a) All ceiling areas as called for in finish schedule shall have suspended ceilings throughout.

   (b) Runner channels shall be 1-1/2" x 7/16" cold rolled channels and shall be placed not over 4'-0" on centers at right angles to structural steel floor beams and secured by #10 galvanized wire looped on reinforcing in concrete slab above and turned around the channel. In special cases where spaces exceed 4'-0", the runner channels shall be doubled or placed back to back and hangers increased accordingly.

   (c) Furring channels shall be 3/4" x 7/16" cold rolled and shall be erected at right angles to the runner channels at 12-3/4" centers and shall be securely wired to channels with #16 galvanized wire.
(d) Metal lath for ceilings and soffits shall be Stay-Rib \#2 Milcor copper alloy steel, painted and weighing 3.40 lbs. per square yard. Lath shall be lapped at least 1-1/2" and wired to channels at intervals of 10" with \#16 galvanized wire. Ends of wire shall be twisted tight and turned back against lath. The ceiling lath shall be turned down on the side walls 4". All interior angles of plastered walls shall be covered with strips of expanded metal at least 8" wide, secured with galvanized staples and bent to form 4" legs.

(e) Where concrete beams come out to face of block walls, as in stairway, they shall be covered with metal lath before plastering. Apply metal lath at all other points needed to form a plaster base or to prevent cracking of plaster at joints.

(f) Metal corner beads for all other external angles, unless otherwise specified, shall be Milcor Super-Ex-corner beads.

(g) Cold rolled channels and expanded metal lath shall be as manufactured by the Bethlehem Steel Company, or subsidiary companies, or an approved equal.

(h) Milcor metal lath, corner beads, and miscellaneous fittings and fasteners shall be as made by the Milcor Steel Company, or an approved equal.

(i) All suspended ceilings, which are to receive acoustical tile finish as called for in room finish schedule shall be lathed with rock lath wired to furring channels in an approved manner.

4. STAIR SOFFITS:

(a) The soffits and platforms of Stairway \#1 shall be lathed.

(b) Lath shall be secured to steel frames of stair by \#18 wire, as specified above.

5. MISCELLANEOUS:

(a) All pipes, etc., in walls or partitions, which are not covered by wall furring or partition material, shall be covered with wire lath.

(b) When wall or partition material changes, the joint shall be covered with wire lath. Lath shall extend at least 4" on each side.
PLASTER WORK

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) The Contractor shall refer to the "Schedule of Finishes" for the scope of plaster work.

(b) In general the following surfaces shall receive plaster finishes:

1. All exterior office walls, office block partitions, ceiling, and soffits of stair #1, and locker and toilet room ceiling, shall have plaster finish except as noted in the following paragraph.

2. There shall be no plaster work in the Main Testing Laboratory, pent houses, or seventh floor storage and machine room area. All plaster work shall also be omitted where clear glazed tile walls are called for. Where acoustical tile ceilings are called for, same shall be applied directly to rock lath and no plaster shall be applied.

3. MATERIALS:

(a) Sand: Clean, sharp sand, free from impurities, and screened, 100% passing through #16 screen.

(b) Plaster: All plaster shall be standard brand, as National Gypsum Co., United States, Gypsum Co., or approved equal.

(c) White Finish: All white finish shall be a standard brand, as specified above.

4. WORKMANSHIP:

(a) All plaster shall come from the manufacturers dry and ready for application after the addition of the necessary water and sand as required by the manufacturer's directions.

(b) All plaster work on metal lath shall be three (3) coat work; scratch, brown, and finished coats.

(c) All plaster work on block or brick shall be two (2) coat work; brown and finished coats.
(d) The scratch coat shall be well trowelled on to form a perfect key and scratched; the second or brown coat shall be floated up true and plumb; and the final coat shall be applied thereon with all surface and angles absolutely true.

(e) Plastering shall be carried into all window and door jambs and heads where same is shown or required. Note that window heads are lathed.

(f) Plaster finish shall be carried behind all trim and up to and between all grounds.

(g) Where plaster finish is applied on block surfaces, same shall be thoroughly wetted before applying the scratch coat.

(h) No plaster work shall be applied directly on concrete unless wire lath or plaster bond, as approved by the Engineer, is first applied to the concrete surface.

(i) If plaster work is done in cold or freezing weather, temporary heating shall be provided.

(j) Before finished coat of plaster is applied, all exterior openings shall be closed.

5. PATCHING AND PROTECTION:

After all trim, etc., is in place, the plaster work shall be gone over carefully and all breaks, cracks, or other imperfections shall be cut out and replaced in a neat and workmanlike manner.
ACOUSTICAL TILE

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

The work under this specification shall include the installation of acoustical tile for all areas where acoustical tile is called for in the "Schedule of Finishes".

3. MATERIAL:

All acoustical tile shall be 12" x 12" x 13/16" thick Acoustone "F", as made by the United States Gypsum Company, or an approved equal.

4. INSTALLATION:

Surfaces where acoustical tile is to be applied shall be clean and free from dirt, dust, grease, loose paint, or plaster, or any other condition which would prevent proper adhesions. Rock lath shall be firm and securely fastened.
1. **GENERAL NOTE:**

The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   (a) The Contractor shall refer to the "Schedule of Finishes" for the extent of this type of work.

   (b) **Slate:** Window sills except as noted otherwise on finish schedule.

   (c) **Marble:** Saddles.

   (d) **Ceramic Tile & Terrazzo:** The Contractor shall refer to the "Schedule of Finishes" for scope of ceramic tile floors, base, and wainscots.

3. **MATERIALS:**

   (a) **Slate:** All slate shall be first quality Bangor Black Ribbon slate, or approved equal.

   (b) **Marble:** All marble shall be selected Grey Tennessee.

   (c) **Tile:** Ceramic floor tile shall be 1" x 2" x 3/16" in two shades for field and darker shade for border.

       Shower floors shall be non-slip tile.

       Wall tile shall be 4-1/4" x 4-1/4" with cap and base with cove. Bull-nose and cove corners. Color as selected.

       All of the above tile shall be products of the United States Quarry Tile Co., Canton, Ohio, or an approved equal.

   (d) All necessary setting materials, such as sand, cement, plaster of Paris, etc., shall be furnished.

4. **SAMPLES:**

   The Contractor shall submit samples of all the above specified materials, properly labeled, for the Engineer's approval.

5. **SHOP DRAWINGS:**

   The Contractor shall furnish shop drawings of all marble and slate work for the Engineer's approval.
6. **MARBLE WORK:**

All marble saddles shall have a polished finish as approved from samples to be furnished.

7. **SLATE WORK:**

(a) Window stools where called for in Room Finish Schedule, shall be 1-1/4" thick, in one piece, and with rounded or chamfered edges.

(b) All slate work shall have a rubbed finish, and shall be oiled on completion.

8. **TILE WORK:**

(a) All tile work shall be laid in accordance with the standard specifications of the Associated Tile Manufacturers.

(b) All tile floors shall extend under all movable equipment.

(c) Care shall be exercised in laying out all tile work to avoid small closures, etc., and to show uniform spacing.

(d) All tile wainscots shall be set to height shown on drawings. Where no height is given, it shall be 4'-8" from finished floor, including cap and base.

(e) Wherever tile floors are called for, there shall be a tile base.

(f) All outside angles shall be bull-nose and inside angles coved.

(g) Ceramic tile 1" x 2" x 3/16" shall be laid in two (2) inch squares with tiles in adjoining squares run in opposite directions. Squares shall be in two tones, making a checkerboard pattern.

(h) The soldier course border of same size tile in darker shade.

(i) Provide tile wainscot wall finish around all lavatories located in offices as shown and noted.

(j) Where tile shower compartments are shown, tile shall be set in lead pan, furnished and set by Plumber. Lead shall extend up exposed side 6", and be covered by tile base.
9. **TERRAZZO WORK:**

(a) Floor in entrance platform shall be of Terrazzo laid on concrete slab. Dividing strips shall be of white metal, #12 gauge, and shall be placed to form approximately 3'-0" squares. Provide 1/2" recess for floor mat.

(b) Stairway #1 shall have precast reinforced Terrazzo treads, no risers, steel riser of stair to remain exposed.

(c) Stairway #1 shall have Terrazzo intermediate landings laid in steel platform pan.

(d) All Terrazzo treads shall have three lines of abrasive strips near front edge of tread.

(e) Contractor shall submit samples of Terrazzo and dividing strips for approval of the Engineer before material is ordered or work started.

(f) All Terrazzo work shall be guaranteed for a period of one (1) year against defects.

10. **BUILT-IN ACCESSORIES:**

(a) The Contractor shall furnish and set built-in matching tile, soap, and grab in shower compartments, one for each shower head.

11. **CLEANING AND PROTECTION:**

(a) Immediately after setting, the Contractor shall carefully protect all work.

(b) On completion all broken, scratched, or otherwise damaged work shall be replaced.

(c) All tile, marble, and slate work shall be thoroughly cleaned and left in perfect condition.
1. **GENERAL NOTE:**

The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

(a) The Contractor shall refer to the "Schedule of Finishes" for the extent of asphalt and rubber tile floor finish.

(b) Finish floors of office sections in north bay of present Fritz Laboratory shall receive asphalt tile floor finish. Finish floors of seven and four story office sections shall be rubber tile. See "Schedule of Finishes".

3. **EXAMINATION OF BASE:**

(a) The General Contractor shall furnish a base suitable for receiving asphalt tile finish.

(b) The Contractor shall carefully examine the base before laying his tile and report in writing any defects therein, as on commencing his work he will be considered as having accepted all work in place and waived all claims to the contrary.

(c) The Contractor laying asphalt and rubber tile shall assume full responsibility that the base is in proper condition to receive tile.

4. **HEAT AND VENTILATION:**

The General Contractor shall provide good ventilation and a constant temperature of at least 70 degrees Fahrenheit while the tile is being laid and thereafter if required. The General Contractor shall also furnish hoisting service, adequate lighting, and power for scrubbing and polishing.

5. **PROTECTION:**

(a) The Contractor shall carefully protect all asphalt and rubber tile floors as soon as same are laid with heavy paper, renewing same where torn or worn.

(b) The Contractor shall assume full responsibility for the tile and replace any damaged work to the satisfaction of the Engineer.
6. MATERIALS AND WORKMANSHIP:

   (a) All asphalt and rubber tile shall be Armstrong Cork Company, or an approved equal.

   (b) All tile shall be laid in accordance with the manufacturer's specifications for concrete base.

   (c) All tile shall be 9" x 9" x 3/16" thick with colors selected from color groups B and C.

   (d) Small fillers shall be avoided when possible, the difference being taken up in base or by cutting several tiles to avoid same.

   (e) Asphalt and rubber tile cove base shall be black in 36" lengths with returns and mitres at all corners.

7. SAMPLES:

   (a) The Contractor shall submit samples of all tile for the Engineer's approval.

   (b) Samples shall be properly labeled.

8. CLEANING:

   (a) On completion the Contractor shall clean all tile floors in accordance with the manufacturer's specifications.

   (b) Floors shall be waxed and left with a hard, durable, and lustrous finish.

9. GUARANTEE:

   On completion and acceptance of the building the Contractor laying asphalt and rubber tile floors shall furnish the Owner with a written guarantee warranting that all workmanship and materials are free from defects and he shall promptly replace or repair any and all defects which evidence themselves within one (1) year after the above date.
1. **GENERAL NOTE:**

   The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   **A. Exterior Painting:**

   (a) The following specification shall cover the complete painting and finishing in the building, including iron work, sheet metal (except copper, lead, or lead coated copper), wood trim, and all wood doors, not including aluminum windows. This shall also include all sheet metal work in connection with vents, louvres, ducts, etc.

   **B. Interior Painting:**

   (a) For interior painting the Contractor shall refer to the "Schedule of Finishes".

   (b) In addition shall be included the painting or finishing of all interior wood work and metal work, including pipes, pipe coverings, convector grilles, etc.

   (c) The painting of all interior brick and Waylite block walls, concrete ceilings, and exposed metal work including pipes and coverings in the basement.

   (d) The Contractor shall apply two (2) field coats of paint to the following exposed metal and structural steel:

       Structural steel for temporary quarters in north aisle of old building.

       Anchor bolts, surface plates, and other structural steel for embedment in dynamic test bed.

       Structural steel for curb and covers of housing for centrifuge.

       Bed plate pre-stressing columns and their structural appurtenances.

       Structural steel frame for new building and alterations to south aisle of old building.
Loading aprons, idle pit aprons, ladders, and their appurtenances in testing machine pit.

A 20 ton electric traveling crane in new testing laboratory.

(e) The painting of all metal cabinets, hollow metal doors, and elevator doors and enclosures is not included.

3. MATERIALS:

(a) All exterior painting shall be done with Devoe & Reynolds Co., Inc., or Allentown Paint Mfg. Co. paint, or an approved equal.

(b) All interior wood, metal, concrete, brick, and plaster work shall be finished with Devoe & Reynolds, or Allentown Paint Mfg. Co. paint, or an approved equal.

(c) All stains and varnish shall be Berry Bros., Pratt & Lambert, or an approved equal.

(d) Paint for brick and Waylite block shall be Devoe Masonrite, or approved equal.

(e) All linseed oil shall be pure raw linseed oil.

(f) All turpentine shall be pure spirits of Turpentine.

(g) All putty shall be same as specified for glazing.

(h) No material shall be changed or thinned in any way except as may be indicated by the manufacturer's directions.

(i) All materials used in painting or finishing where a special make is called for shall be delivered in unbroken original packages, bearing the brand or maker's name; and where mixing is called for, shall be mixed on the premises. They shall be subject to inspection, and any materials rejected by the Engineer shall be at once removed from the premises.

(j) All varnishes shall be of the best grade made by the manufacturer for the particular class of work for which they are to be used.

(k) Tinting piments used shall be of the best quality conforming to the specifications of the A.S.T.M.
4. **SAMPLES:**

(a) Samples of all the above specified materials, properly labelled, shall be submitted to the Engineer for approval.

(b) All colors shall be as selected and approved by the Engineer.

(c) The Contractor shall make samples of all colors on boards 2' x 3' and submit them for approval. Samples of the approved color shall be furnished in sufficient number for proper distribution.

5. **WORKMANSHIP:**

(a) This Contractor shall examine all surfaces to be painted and report to the General Contractor in writing any defects therein, as on commencing his work he will be assumed to have accepted all work in place and waived all claims to the contrary.

(b) All nail holes shall be puttied after the first coat, with putty mixed with pigment to match finish.

(c) All wood or metal surfaces calling for enamel finish shall be sanded between coats with fine sandpaper to produce an even and smooth finish.

(d) All coats of every description shall be bone dry before the application of succeeding coats.

(e) Each coat shall be inspected and approved by the Engineer before the next is applied, and the Engineer shall have the right to change the shade of paints between coats.

(f) The tops and edges of all doors shall be finished same as balance of doors after they have been fitted. Bottom of all doors shall be painted.

(g) No exterior painting shall be done if surface is wet or during freezing in inclement weather.

(h) The number of coats specified shall mean the number of separate and distinct applications in addition to priming or shop coats.

(i) All metal surfaces shall first be washed with benzine to remove any dirt or grease before applying finish. Where rust appears, it shall be well brushed or sandpapered clean before painting.
(j) All knots and sappy spots shall first be touched with pure shellac when finish calls for paint or enamel.

(k) Interior wood trim shall be back-primed with a damp-resisting paint before installation.

(l) All "hot spots" in plaster or cement which are noticeable after the first coat shall be touched up before applying the second coat, to produce an even result in the finished coat.

6. **EXTERIOR PAINTING:**

All exterior sheet metal (except aluminum windows), and ironwork shall receive in addition to priming or shop coats three (3) heavy coats of lead and linseed oil paint.

7. **INTERIOR PAINTING AND FINISHING:**

Interior painting shall be as follows:

1. **Interior Metal Work:**

   a. All interior metal work, such as metal door frames, stairs, hangers, exposed ducts, grilles, etc., shall receive in addition to the priming coat:
      
      - One (1) coat of enamel undercoat.
      - One (1) coat mixture in equal parts of enamel undercoat and enamel.
      - One (1) coat of eggshell enamel.

   b. All surfaces of structural steel, etc., accessible after erection, except those to be encased in concrete, shall receive after all work has been completely erected, bolted with permanent bolts, two (2) coats of paint differing in color. If the scale has not fallen off, or if rust has formed, it must be removed, if necessary with wire brushes. Painting must always be done on dry surfaces. Mud, grease, and dirt of any kind must be removed before painting. The paint for all structural work, exposed after erection, shall be Detroit Superior Graphite #30, black for first coat and color as selected for second coat, or an approved equal. The paint must be delivered at the shop and at the building in unbroken packages.

   c. All interior metal work in pent houses shall receive in addition to the priming coat:
      
      - Two (2) coats in the gloss.
2. Interior Woodwork:
   a. All doors and jambs in present laboratory mezzanine toilet rooms shall receive three (3) coats of paint. Finish coat eggshell enamel.

3. Plaster Work:
   a. All plaster walls and ceilings in Stairways #1, toilets, and closets shall be finished as follows:
      One (1) coat of enamel undercoat.
      One (1) coat of a mixture in equal parts of enamel undercoat and enamel.
      One (1) coat of enamel.

4. Brick, Concrete, or Waylite Block Work:
   a. All brick, Waylite block, and concrete walls and ceilings in building to be painted shall receive the following:
      One (1) coat of pigmented primer.
      Two (2) coats of flat paint.
      Interior concrete walls of main testing pit and centrifuge housing shall be painted with two (2) coats of "Bondex" or approved equal.

5. Painting of Pipes and Covering:
   a. All mechanical pipes and canvas pipe covering shall be painted two (2) coats of gloss enamel.

   b. In addition there shall be painted 6" wide bands on canvas covering at 20'-0" intervals. Colors shall be in accordance with standards established by the American Society of Mechanical Engineers to indicate service.

8. PROTECTION OF WORK:
   The Contractor shall not only protect his work at all times, but he shall also protect all adjoining work by drop cloths or other methods. Upon completion he shall remove all paint spots from adjoining work. This shall apply in particular to tops of tile wainscot caps and bases where paint shall be cleaned back to plaster line.
9. **SIGN PAINTING AND DIRECTORY:**

This Contractor shall include the painting of room numbers, names and directions on all doors, glass, or walls as directed.

This Contractor shall include the furnishing and erection of directory to be located in Entry #101. Directory shall be changeable strip stype with aluminum frame and hinged glass door as manufactured by Acme Bulletin & Directory Board Corp., New York City, or approved equal.
GLAZING

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) Under this heading shall be included all labor, materials, and equipment necessary for the complete installation of glass throughout the building.

(b) This shall include all windows, doors and sidelights, and mirrors.

(c) Glass in all cabinets is not included.

3. MATERIALS:

(a) Double strength glass shall be Grade A "Penvernon" as manufactured by the Pittsburgh Plate Glass Co., or approved equal.

(b) Solex Heat-Absorbing Plate Glass shall be 1/4" thick as manufactured by Pittsburgh Plate Glass Co., or approved equal.

(c) Safety Glass laminated type shall be 1/4" thick as manufactured by Libbey-Owens-Ford Co., or approved equal.

(d) Wire glass shall be "Misco", or approved equal, polished plate glass as manufactured by the Mississippi Wire Glass Co., 1/4" thick as specified. (Clear glass.)

(e) Mirrors shall be of 1/4" thick polished plate glass as manufactured by the Pittsburgh Plate Glass Co., or approved equal.

(f) Putty shall be Pittsburgh Plate Glass Co. (white lead), or approved equal.

(g) All glass shall bear manufacturers' labels.

(h) Glass shall be set in aluminum sash. Glazing clips as required shall be furnished by manufacturer of aluminum sash.

(i) Glass shall be set in accordance with specifications of the glass manufacturer.
4. **DOUBLE STRENGTH GLASS:**

   (a) All exterior glass in aluminum double hung windows of building.

   (b) All glass shall be bedded in putty; glass in aluminum shall be set in accordance with window manufacturer's specifications.

   (c) All glass in wood shall be secured by tins, two (2) on each side. Doors shall be secured by wood beads, bedded in putty.

5. **SOLEX GLASS:**

   (a) Large aluminum windows at east and west ends of Main Testing Laboratory.

   (b) Glass to be bedded in putty or some other approved method.

6. **SAFETY GLASS:**

   (a) Metal windows between office, office corridors and Main Testing Laboratory on north and south side of Laboratory as shown on drawings.

7. **WIRE GLASS:**

   (a) All exterior and interior doors to Stairways #1, #2, #3, and #4.

8. **MIRRORS:**

   (a) Furnish and install 1/4" plate glass copper backed mirrors in all toilet rooms in accordance with drawings.

   (b) In general, provide one mirror for each lavatory, but where lavatories are grouped, a single mirror equaling the required length shall be provided and mounted in a single frame.

   (c) Mirrors shall have narrow chromium plated steel frames with dividing strips as required and shall be securely mounted on wall.

9. **GENERAL:**

   (a) All glass shall be set by qualified glaziers.
(b) All putty shall be cut to an even and uniform line.

10. COMPLETION:

   (a) On completion all broken, cracked, or scratched glass shall be removed and replaced.

   (b) All glass shall be thoroughly cleaned to the satisfaction of the Engineer.
FINISHING HARDWARE

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) It is the intention of this specification, together with the drawings, to make a complete contract covering all units. Material must be furnished by the Contractor with this end in view, and for any unit not specifically mentioned in the specification, material must be furnished, same to be of character consistent with that specified for similar or same units, or as required to suit those units to the purpose intended, as no excuse will be accepted for not furnishing all hardware, except as noted to be furnished under other divisions.

(b) Where hardware is required in connection with the following items, it is to be furnished with these items (see other divisions), unless specifically noted otherwise.

   Aluminum sash, ornamental iron or bronze work, grilles, standards, and fittings for water closet partitions, metal or wood factory built furniture or cabinets, metal access panels, and elevator doors, also steel office partitions.

(c) The following items are to be furnished under Carpentry Division:

   All rough and structural hardware, such as nails, screws, anchors, brackets, and the installation of all hardware.

(d) All material specified in this section must be furnished by the (one) hardware sub-contractor.

3. DETAILS:

(a) The Contractor shall consult the accompanying drawings and details, all scale and full size details and relevant shop drawings, and schedules which are prepared during the progress of the work, and otherwise thoroughly familiarize himself with the work to the end that all hardware furnished shall conform to the details and requirements of the materials and units to which it is to be applied and, in the opinion of the Engineer, be suitable for the purpose intended.
(b) All templates and schedules of finishing hardware shall be furnished to all parties requiring same.

4. CHANGE OF MATERIAL:

The types and numbers of the hardware as specified herein are as nearly correct as can be determined in advance of final detail drawings. The Hardware Contractor shall, however, check all hardware specified against the approved detail drawings previously referred to and any conflicts or inconsistencies between these specifications and the approved drawings shall be immediately brought to the attention of the Engineer in writing before the hardware in question has been manufactured or otherwise procured. The Contractor shall then furnish appropriate and suitable hardware in accordance with the directions and subject to the approval of the Engineer. All changes in material which may be required to suit the work and materials installed which are not reported to the Engineer as above specified shall be made without additional cost to the Owner.

5. DELIVERY OF MATERIAL:

The material must be furnished in such quantities and at such times as will not delay progress of the building. All material must be labelled or tagged for its intended units in such a manner as to assist the applying of same. A working schedule of all hardware shall be furnished.

6. ASSEMBLING OF MATERIALS:

The General Contractor must arrange open shelving for the assembling of materials before application, so that same can be checked and also to enable all parties concerned in investigating discrepancies pertaining to quantity and character of material. All materials must be kept in a room under lock and key until ready for final application.

7. PROTECTION:

The General Contractor shall see that all finishing hardware shall be adequately protected from damage during the progress of the work. At the completion of the building all hardware shall be cleaned and any damaged or broken parts replaced. All hardware shall be left in perfect working order at the completion of the building.
8. **SAMPLES:**

(a) If hardware other than that scheduled and described is used, samples of every item must be submitted to the Engineer for approval, plainly tagged, stating article and type. A complete schedule of hardware must also be submitted for the Engineer's approval.

(b) All material shall be of perfect manufacture and of first class workmanship, free from flaws and defects. All material is to have proper quantity and size of screws or bolts to apply in a satisfactory manner and must conform in character and finish to material.

9. **MAKE OF HARDWARE:**

(a) Numbers specified in the following schedule of hardware are taken from the catalogues of the following manufacturers:

- P. & F. Corbin, Schlage Lock Co., Stanley Works, Glynn-Johnson, and Oscar C. Rixson Co.

Exterior doors shall be equipped with P. & F. Corbin cylinder locks for proper mastering with other University Buildings.

(b) Finish on all hardware shall be of Alumalite where furnished in aluminum, and dull chrome or bronze metal on balance. Interior butts shall be steel, finished as specified.

(c) **Keys:**

Furnish two (2) keys for locks on all doors throughout building.
Furnish three (3) Master keys.

(d) **Exterior Entrance Doors & Stairway Doors (Hollow Metal)**

- 3 pair Butts BB-192, 4-1/2" x 4-1/2" double doors.
- 1-1/2 pair Butts BB-193, 4-1/2" x 4-1/2" single doors.
- 1 set Exit Fixtures 42986 for double doors 42885 for single doors - dull chrome finish.
- Door Closers 104 and Brackets 26-4.
- Coordinating Device 2359 for double doors, dull chrome finish.
- Kick plates 10" high - dull chrome finish.
(e) Doors to Stairways and Entries (Hollow Metal)
3 Pair Butts BB-146-N5 - 4-1/2" x 4-1/2" F.B.T. double doors.
1-1/2 pair Butts BB-146-N5 - 4-1/2" x 4-1/2" F.B.T. single doors
Push Plates 02325-1/2 - 16 x 4 dull chrome finish
Pulls 02210-1/4 - dull chrome finish
Door Closers - #3.

(f) Hollow Metal Office Doors in Block or Tile Partitions
1-1/2 pair Butts 146 - N5, 4-1/2" x 4-1/2" FBT
Lockset D-52-PD Novo X 26D
Door Closers - #3 - Stops FB-13-X
(g) Doors to Closets, Janitor's Closets

1-1/2 pair Butts 146-N5, 4-1/2" x 4-1/2" FBT
Lockset D-52-PD Novo X 26-D
Stop - FB-13-X

(h) Toilet and Locker Room

1-1/2 pair Butts 146-N5, 4-1/2" x 4-1/2" F.B.T.
Push Plate 02325-1/2 - 16x 4 dull chrome finish.
Pulls 02210-1/4 - dull chrome finish.
Door closers #3
Stops - FB-13-X
SITE IMPROVEMENTS

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) The work to be included under this division shall comprise the furnishing of all labor, material, tools, and equipment required for the completion of the site improvements after building construction is completed or has reached the stage when it will be possible to start grading around the building.

(b) Rough grading, backfilling, and the salvage of top soil needed for finished grading; also disposal of excess material from excavation, are specified under "Excavation, Backfill, and Rough Grading".

(c) Fine grading, plain concrete for base of granite retaining walls and steps, Bethrock walks, and driveway; all in accordance with First Floor Plan.

3. FORMS:

Forms for placing concrete shall be of wood or steel properly placed and staked so as to eliminate the necessity of lining up after concrete has been placed.

4. PLAIN CONCRETE:

(a) Concrete foundation walls for granite retaining walls and steps shall consist of one (1) part Portland cement, two (2) parts sand, and four (4) parts crushed stone. The bottom of foundation wall shall be a minimum depth of 3'-0" below lowest grade, walk, or driveway.

5. STORM WATER DRAINAGE:

(a) Work under this heading shall include the installation of storm water drains to properly drain the ground area around new building.

(b) Construct reinforced concrete catch basin in driveway and walk as shown and located on First Floor Plan. From this point lay first quality glazed terra cotta bell and spigot pipe to drain surface water from this area to a point where indicated on drawings.
6. **STONE WALLS AND STEPS:**

   (a) Stone retaining walls, steps, and cheek pieces shall be Granite as specified for building. Walls and cheek pieces shall be random rectangular ashlar and steps sawn and sandblasted to match building trim.

   (b) Granite shall be laid as specified under Granite.

   (c) Shop drawings of Granite and paved areas must be submitted for approval.

7. **BETHROCK PAVING:**

   (a) Entrance area at west end of building and walks south of building, as shown and specified on First Floor Plan, shall be Bethrock.

   (b) Driveway shall be accurately laid out and excavated to the proper depths to receive 6" slag base with 3" of two course premixed wearing surface.

   (c) Walks shall be accurately laid out to the proper depths to receive a 4" slag base with 2" course of fine premixed wearing surface.

   Each course for the above driveway and walks shall be properly rolled. Finished surface shall be smooth and true and graded as shown or directed.
ALUMINUM ROLL-UP DOOR

1. GENERAL NOTE:

   The general conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

   These specifications shall include all labor, material, tools, delivery, erection, protection, and superintendence necessary to furnish and completely install electrically operated Aluminum Roll-Up Door as manufactured by R. H. Mahon Company, Detroit, Mich., Kinnear Mfg. Company, Columbus, Ohio, or approved equal as hereinafter specified and shown on drawing at west end of Main Testing Laboratory.

3. SHOP DRAWINGS:

   (a) The Contractor shall submit shop drawings showing dimensions and all construction details, including wiring diagrams for the Engineer's approval.

   (b) This Contractor shall take all dimensions at the building and be responsible for same.

4. WORK NOT INCLUDED:

   Field Painting; Preparation of openings to receive Roll-Up-Door; Structural or miscellaneous iron work; Electric wiring and conduit.

5. CONSTRUCTION:

   Curtain, guides, and hood shall be built of aluminum; roller shaft and brackets - steel; in accordance with manufacturer's standard specifications for size and type of door.

6. OPERATION:

   (a) Doors to be operated by means of an electric motor. The control circuit shall be closed by means of push buttons and automatic limit switches that will break the circuit at termination of travel. Door to be stopped at intermediate points by stop button from where it can then be operated in either direction.

   (b) Motor to be high starting torque elevator or hoist motor, raising or lowering curtain at approximately 67 ft. per second. Electric current characteristics 220/440 volt, 3 phase, 60 cycle.

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(c) Reduction gears of the power unit shall be machine-cut gear completely housed and running in oil bath.

(d) Emergency Operation - A control for automatically engaging a sprocket and chain and releasing the brake, shall be operable from the floor. A device which will automatically prevent the motor from operating until emergency sprocket is disengaged shall be provided. Emergency operation shall not affect timing of limit switch.

(e) Control Switches - Shall consist of three (3) button push button switch "Open" "Close" and "Stop" remote control magnetic enclosed switch panel with overload protection for reversing motors and automatic limit switch.

7. ERECTION:

All doors shall be erected by the manufacturer or his authorized representative, and shall be guaranteed for a period of one (1) year from the date of completion of erection, that any part defective in material or workmanship will be replaced without charge to the Owner.
VENETIAN BLINDS & LIGHT PROOF SHADE

1. GENERAL NOTE:

   The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

   It is the intention of this specification to cover the furnishing and installation of Venetian Blinds for all exterior double hung windows and one (1) light proof shade for Dark Room, as manufactured by The Columbia Mills, Inc., 428 South Warren Street, Syracuse 2, N. Y., or an approved equal. Only first quality materials shall be used, assembled in a workmanlike manner throughout as hereinafter specified.

3. VENETIAN BLINDS:

   (a) The general construction shall consist of headbox installation brackets, tilt device, automatic stop, tape and pulley brackets, tape anchorage brackets, tape clip grips and bottom rails. All the above shall be cold rolled steel properly plated to prevent rust.

   (b) Slats shall be 2" wide and .008" thick steel. Slats shall be flexible and specially treated electro-galvanized and bonderized. Slats shall be concave shape to insure stability. There shall be no sharp edges, and corners shall be well rounded. All cord holes shall be clean cut and smooth.

   (c) Tapes shall be of first quality with cross straps interwoven and free from defects in weaving. Tape shall be in Duplex Color combination, street side color to be neutral, roomside color to match as selected. Regular operating blinds, end tapes shall be spaced not less than 3-1/2" or over 6-7/8" from ends of slats, intermediate tapes spaced not more than 27-3/4" on centers.

   (d) Operating cords shall be of first quality No. 4-1/2 braided cord and glazed to minimize wear. Pull cords on roller and mechanical lift blinds shall be first quality No. 6.

   (e) Headbox, bottom rail and installation brackets shall be finished with high grade enamel to produce a semi-gloss velvet finish. Steel slats shall be finished with a high grade enamel baked on at high temperature.

   (f) Installation to be made in a thoroughly workmanlike manner in accordance with the manufacturer's standards, and to be subject to the approval of the Engineer.
4. **LIGHT PROOF SHADE:**

   (a) Shade material shall be permanently light proof, fire resisting, washable, waterproof, and color fast.

   (b) Roller shall be approved type wound and tested at the factory before shade is installed.

   (c) Side channels and roller housing shall be extruded aluminum.
RUBBER MATS

1. GENERAL NOTE:

   The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

   These specifications shall include the furnishing of rubber floor mats at entrances of size as shown on First Floor Plan and as manufactured by Akron Rubber Company, 55 Warren Street, New York 7, N. Y., or approved equal.

3. RUBBER MATS:

   Rubber mats shall be 1/2" thick, corrugated and perforated. All mats shall have square edges to fit floor recess. Color shall be brown and white combination as selected by Engineer.
1. **GENERAL NOTE:**

   The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   These specifications shall include the furnishing and installation of aluminum framed chalkboards and cork bulletin boards of sizes as shown on plans and as manufactured by New York Standard Blackboard Co., Inc., New York City; Weber Costello Company, Chicago Heights, Ill., or an approved equal.

3. **SHOP DRAWINGS:**

   The Contractor shall submit shop drawings of cutting diagrams and cutting schedules showing disposition of joints and chalkboard sizes for the various rooms accurately allocated.

4. **MATERIALS:**

   (a) Clips and clamps shall be steel cadmium plated.

   (b) Chalkboard trim and chalk rail shall be stock aluminum patterns as selected by the Engineer. Finish shall be "Dull Alumilite".

   (c) Chalkboards shall be solid plastic, green in color, and set in accordance to manufacturer's specifications. Chalkboards shall be 4'-0" high and in lengths as shown on plans.

   (d) Bulletin boards shall be cork, green in color, and set in accordance to manufacturer's specifications.

5. **CLEANING AND BREAKING-IN CHALKBOARD SURFACES:**

   Upon completion the Contractor shall clean and properly break-in all chalkboard surfaces and leave these surfaces in perfect, ready-to-use condition.
METAL CABINETS

1. **GENERAL NOTE:**

   The General Conditions apply to and form a part of the specifications under this heading.

2. **SCOPE:**

   These specifications shall include all labor, material, tools, delivery, erection, protection, and superintendence necessary to furnish and completely install all metal laboratory and dark room cabinets, sinks and hood as shown on the drawings or hereinafter specified, also all other cabinets shown or hereinafter specified.

3. **SHOP DRAWINGS:**

   (a) The Contractor shall submit shop drawings showing dimensions and all construction details for the Engineer's approval.

   (b) This Contractor shall take all dimensions at the building and be responsible for same.

4. **LABORATORY AND DARK ROOM CABINETS:**

   (a) All steel cabinets required to equip Laboratory and Dark Room as shown on drawings shall be as manufactured by Fisher Scientific Co. (Eimer and Amend) or an approved equal. Alberene tops, shelves and sinks shall be as quarried by Alberene Stone Corporation of Virginia.

   (b) Tables and base cabinets shall have drawers and cupboards as shown with Alberene tops and sinks. The island tables shall be provided with 12" Soapstone shelf.

   (c) Wall cabinets shall have clear glass doors.

   (d) All steel cabinets shall have reagent resistant finish.

   (e) Drain piping shall be of Duriron Material.

   (f) The exterior of fume hood shall be steel with sliding glass panel. Interior shall be Alberene or approved equal acid resisting material. Hood vent thru roof shall be "Transite" with fan and enclosed motor.
5. **FIRE HOSE CABINETS:**

(a) Furnish and install fire hose cabinets at locations marked "R.R." on floor plans. These cabinets shall be recessed Alenco Steel Cabinets, Plate #1, Page 14, Cat. 146, of W. D. Allen Mfg. Co., or an approved equal.

(b) Hose for each unit shall be in lengths as indicated on drawings, size 1-1/2". Cabinets to be equipped with one 2-1/2" Fire Line Angle Hose Valve for attachment of fire department hose. Local Fire Dept. thread to be checked and valves supplied to suit. Extinguishing equipment furnished by Owner. Nozzles, fittings, and extinguisher to be polished chromium finish. (Refer to Standpipe System, page 117)
METAL TOILET ROOM PARTITIONS

1. GENERAL NOTE:

   The General Conditions apply to and form a part of the specifications under this heading.

2. METAL TOILET ROOM PARTITIONS: (WATER CLOSETS)

   (a) All stall partitions in toilet rooms throughout shall be Sanymetal "Normandie", flush type porcelain enamelled finish, as manufactured by the Sanymetal Products Co., Inc., or an approved equal.

   (b) All sizes, workmanship, and finish shall be in accordance with the manufacturer's specifications for the above type of partitions.

   (c) Partitions shall be 60" high, set 12" above floor. All water closet stalls, vestibule entrances in toilet rooms, where required, and wing partitions shall be of a matching design and finish.

   (d) Contractor shall submit shop drawings showing dimensions and all construction details to Engineer for approval. Color shall match samples to be supplied by the Engineer.
ELEVATOR WORK

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

The specifications shall include all labor, material, tools, delivery, erection, protection and superintendence necessary to furnish and completely install one electric passenger elevator as shown on drawings or hereinafter specified.

3. DRAWINGS:

(a) The contractor shall submit detailed drawings of shaft, machine room, cab, etc. for the engineer's approval.

(b) This contractor shall take all dimensions at the building and be responsible for same.

4. WORKMANSHIP:

(a) All labor and materials are to conform to the requirements set forth in these specifications and shall be of the best of any grade or make specified. Any work not specially described shall be built in accordance with the best practice for this class of work.

(b) The specifications are to be supplemented by all regulations governing the installation of elevators in the Commonwealth of Pennsylvania.

5. INSPECTION FEE AND PERMIT:

This contractor shall obtain and pay for necessary Municipal or State elevator inspection and permits as required, also make such tests as called for by the regulations of such authorities and as required by the Engineer.

6. WORK INCLUDED:

(a) This contractor shall include all labor, material, scaffolding required to furnish and install one overhead, gearless, unit multivoltage or variable voltage traction, full automatic, push button, self leveling elevator. This shall include machines,
cabs, doors, door openers, shaft doors, wiring and complete installation to place the machine in operation.

(b) Manufacture of elevator equipment shall be Otis or an approved equal.

(c) The following work is not included in Elevator Contract:

Elevator hoistway, including an elevator pit. Machine room, including all machine room floors, and floors under elevator equipment.

Supports for guide rail brackets and for overhead or machine beams.

Electric feeder wires to signal and elevator control panels with fused switches and an electric light outlet at center of hoistway, electric power for testing and adjusting the elevator equipment.

(d) Power supply for the elevator apparatus will be 220/440 volt, 3 phase, 60 cycle, alternating current. The lighting supply will be 110 volt, 60 cycles, alternating current. All power supplies must be confirmed by the elevator contractor.

(e) Duty of elevator - 3500 lbs. load; 400 F.P.M.

(f) Platform size - about 5' 6" x 7'-0".

(g) Travel of elevator shall be from first floor to seventh floor with 7 stops and 7 openings a distance of approximately 64'-4".

(h) The car platform shall consist of structural steel frame covered with two layers of wood flooring. The top wood flooring will consist of T. & G. yellow pine, not less than 25/32" thick. The underside of the car platform will be covered with sheet steel. The platform shall be equipped with a white bronze threshold plate. Rubber tile floor covering of a design, color and quality selected by the Engineer shall be furnished.

The elevator car shall be of metal or wood, of design and finish as approved by the Engineer. The value of the car shall not exceed $2,000 including center-opening car doors but exclusive of field labor for erection, car door hangers and ventilation. Car shall be equipped with complete ventilation system.
7. **GUARANTEE:**

Any defects which may develop in any part of the equipment with a period of one year from date of acceptance shall be replaced by the contractor without cost to the Owner.

8. **MAINTENANCE:**

After completion of the installation, maintenance and call back service for the equipment furnished under this specification shall be provided for a period of three months. This service shall include regular examinations of the installation during regular working hours by trained employees, and shall include all necessary adjustments, greasing, oiling, cleaning, supplies and parts to keep the equipment in proper operation, except any parts made necessary by misuses, accidents, or neglect caused by others.
DRAW CURTAINS

1. GENERAL CONDITIONS:

   The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

   The large windows at east and west end of Main Testing Laboratory and windows of fourth floor, Seminar Room, shall be equipped with fireproof draw curtains for the purpose of excluding light for photographic purposes.

3. MATERIAL:

   Curtain material shall be glass fiber or other fireproof material meeting the approval of Engineer.

4. TRACK:

   Track for curtains shall be as manufactured by Kirsch Company, Sturgis, Michigan, or an approved equal. Track for large windows in Main Testing Laboratory shall be heavy duty installation with ball-bearing pulleys.
STEEL ROOF DECK

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

The specifications shall include all labor, material, tools, delivery, erection, etc. necessary to furnish and completely erect steel roof deck over Main Testing Laboratory and south office bay including Pent House roof as shown on drawings. Steel roof deck shall be as manufactured by Detroit Steel Products Co., or approved equal.

3. ROOF SUMP RECESS:

A 1/4 gauge steel sump recess with sufficient bearing surface to overlap steel deck not less than 6" all around shall be furnished and installed at each point where rain water conductors are shown on drawings and welded to roof deck. Opening in sump recesses shall be circular of size to fit roof drain specified.

4. ACCESSORIES:

Metal cant strips etc. must be attached directly to steel deck plates, in order to provide a finished surface for the application of insulation and roofing, shall be furnished by the steel deck manufacturer.

5. PAINTING:

All steel deck, sump recesses, etc., shall receive one shop coat of oven-baked on enamel before shipment.

6. ERECTION:

Roof deck shall be erected in accordance with manufacturer's specifications and shop drawings. The deck plates shall be fastened to the Structural Steel by welding the ribs directly to steel roof beams.
HEATING, AIR CONDITIONING, AND VENTILATING

1. GENERAL CONDITIONS:

All work included under this heading shall be subject to the General Conditions of the entire operation. The sub-contractor for this portion of the work is required to refer especially thereto.

2. WORK INCLUDED:

(a) This sub-contract shall include all labor, material, and equipment to furnish and install complete heating and air conditioning systems; also ventilation required for Main Testing Laboratory, toilet rooms, etc.

(b) The drawings show the general arrangement of pumps, heaters, steam and hot water mains, convectors, ventilating and air conditioning, and, with the specifications, are intended to provide for all equipment, labor, work and material necessary to install a complete Carrier Weathermaster Air Conditioning System for seven story south office bay with separate steam circuit for convectors as shown and unit heaters in Main Testing Laboratory. The four story office bay shall be provided with a conventional air conditioning system and separate steam circuit for convectors. The ventilating shall be provided as shown.

3. NOT INCLUDED:

(a) All electrical connections will be installed by the Electrical Contractor.

(b) Water outlets will be provided by others for connecting by the Heating Contractor.

(c) The combination hot water heaters and storage tanks will be installed by the Plumbing Contractor, but the Heating Contractor shall provide steam and return connections and set the control valves.

4. EXECUTION OF THE WORK:

(a) The work of this contract shall be executed by skilled mechanics, working under the supervision of a competent foreman or superintendent, who shall represent the Contractor on the job at all times during the prosecution of the work.
(b) The work shall be laid out and executed in such a way and in such order as may be directed by the Engineer, so that all parts will be complete by the time that other contracts are finished and so that no other contractor will be put to unforeseen expense or delay on account of the work of this contract.

(c) This Contractor shall pay all freight, cartage and cost of transportation of material and workmen, required in connection with this work and shall furnish all scaffolding, tools and instruments required to properly execute, test and fully complete the work.

5. **CODE RULES:**

   (a) All material shall be furnished and all work shall be done in strict accordance with the rules and regulations of the National Board of Fire Underwriters, State Industrial Board, State Boiler Codes and all other boards and departments having legally constituted jurisdiction.

   (b) The Contractor shall prepare and submit plans as required by the State Departments, procure all certificates for work to be installed under his contract and shall pay all fees and charges in connection therewith. He shall deliver the same to the Engineer before his work is finally accepted.

6. **APPROVAL OF DETAILS:**

   (a) The method of construction and all details of workmanship which are not specifically described in the specification or shown on the plans shall be furnished and done in a manner satisfactory to the Engineer whose approval or disapproval of any detail of the work of this contract shall be considered final.

   (b) The Contractor shall furnish and submit to the Engineer for approval, detailed drawings showing the construction and arrangement of any part or accessory, as required by the Engineer, and whose approval or disapproval shall be considered final and binding.

   (c) Detail drawings in quadruplicate shall be furnished by the Contractor showing in detail: pumps, heat exchanger, etc.

7. **MANUFACTURERS:**

   Within thirty days after the award of the contract, the Contractor shall submit to the Engineer a list of all material and equipment which he proposed to install giving the name of the manufacturer, type and size for each time.
8. **STEAM SUPPLY:**

   (a) Heating Contractor before submitting his proposal shall investigate existing conditions on the site with reference to existing steam supply at Power House.

   (b) Contractor shall include in his proposal the cost for furnishing of all labor, material, and equipment necessary to connect to present steam supply at Power House and install required reducing valves at this location. Also the running of new steam supply and return piping from Power House to new building. Contractor shall also include the relocation of present underground high pressure steam line and return at south side of present building to the south side of new building. This line to be run underground in conduit system as hereinafter specified.

   (c) Steam pressure available in Power House is 135# per sq. inch.

   (d) New steam supply line from Power House to new building and relocated high pressure steam line shall be run underground and be installed in Type "F" Ric-wil standard tile conduit system or approved equal.

9. **PRESSURE REDUCING VALVES:**

   Furnish and install Boigt Hill, Mason, or approved equal pressure reducing valves with stainless steel seats, discs and stems. Diaphragms shall be of seven-ply rubber and canvas. For each reducing valve, furnish and install a 3-valve by-pass strainer, two pressure gauges and pressure relief valve.

10. **ELECTRIC CURRENT:**

    Current available for the operation of fractional horsepower motors is 120 V, 60 cycle A.C. For motors larger than 1/2 HP is 3 phase, 60 cycle, 220/440 volts.

11. **VALVES:**

    (a) All valves on the high pressure steam and hot water flow and return lines shall be of "medium weight", the medium pressure steam (40#) for 175# steam working pressure with bronze spindles, bronze removable seats, bronze gates and glands.

    (b) Valves 2-1/2" and larger shall be of the O.S. & Y. type with iron bodies flanged; any smaller valves required shall have bronze bodies screwed. The disc faces and seat rings shall
be removable and shall be arranged for seating when open for pacing under pressure. Valves shall be Lunkenheimer or Jenkins, or equal manufacture designed for the service, globe or gate valves as required and approved.

(c) Valves required on the low pressure steam piping and on the steam returns shall be of the same type for a working pressure of 125 pounds.

12. **PIPING:**

(a) All steam and hot water heating pipes shall be standard weight black steel pipe.

(b) Steam returns and drips shall be of extra heavy steel pipe.

(c) Steel pipe, 2" in size and larger shall be welded with Tube Turns and weldulet fittings.

(d) Valves, equipment and branch mains 2-1/2" and larger shall be connected with Vanstone type flanges.

(e) All cold water, hot water, and circulating water lines throughout shall be of Chase type L copper water tube (or an approved equal) soft and hard temper tubing as required for the different type of work.

(f) All piping shall be suspended by adjustable malleable iron hangers not more than 10' apart.

(g) All steel piping shall be as manufactured by Bethlehem Steel Company. Copper tubing shall be of Chase (or approved equal) manufacture.

13. **DRIPS AND DRAIN CONNECTIONS:**

(a) All drips, as required, shall be installed and connected with traps to relieve the steam system of water. The drips shall be taken out of the bottom of the steam mains with water pockets not less than 2" in diameter and 18" deep. No drip piping shall be less than 3/4" in diameter. All drips shall be connected through inverted bucket type traps to the return tank.

(b) All traps shall be of the inverted bucket, cast iron type, with stainless steel seats, discs and bearing parts. All floats shall be of copper or stainless steel. The traps shall be designed for the pressure required by the connections.
(c) All traps shall be connected with three-valve by-passes. The traps shall be of the Master "K", Armstrong, Anderson Super Silver-top, or equal, of sizes approved by the Engineer, but not less than one (1) pipe size smaller than the pipe on which they are indicated.

(d) Each section of the hot water heating system including each valved main and riser shall have a valved drainout with 1/2" hose connection.

14. MATERIALS AND APPARATUS:

(a) All materials and apparatus furnished by the various sub-contractors shall be of the same manufacture where possible; that is, all motors, switches, valves, and specialties shall be furnished by one concern manufacturing this particular type of equipment.

(b) Before placing orders for material and equipment, the Contractor shall submit the name of manufacturers for approval of the Engineer.

15. CONVECTOR RADIATORS:

(a) All radiators throughout shall be of the recessed or exposed cabinet type as shown and shall be as made by the Trane Company, or an approved equal.

(b) Cabinets shall be constructed of first quality steel. Fronts shall be of 16 ga. and backs and ends of 20 ga. metal.

(c) Grilles shall be standard Freeflo type equipped with a knob type damper.

(d) Cabinets and frames shall be painted inside and outside with one coat of gray primer.

(e) Convectors shall be of copper tubes mechanically expanded into non-ferrous fins.

(f) Complete cabinets and convectors shall be manufactured by the same company.

(g) Each convector shall be equipped with steam type flow control valve and air chamber with air valve complete.

16. UNIT HEATERS:

(a) Floor and wall mounted unit heaters of size and location
as shown on plans shall be furnished and completely installed including steam connections, valves, electric switches and controls, thermostats, etc.

(b) Unit heaters shall be as manufactured by Carrier or approved equal.

17. RADIATOR CONNECTIONS:

Convecto connections shall be installed in furred ceilings below the radiators with vertical branches to the convectors. They shall drain to the risers.

18. PLATES AND TUBES:

(a) Wherever pipes pass through floors, furring, walls, partitions, or woodwork, they shall be surrounded by 20 ga. galvanized iron tubes, arranged to leave air spaces around the pipes. Each riser shall have a separate sleeve.

(b) Provide iron pipe size tubes with plates screwed on where exposed pipes pass through floors.

19. EXPANSION TANK:

(a) On the ceiling of the pent house the Contractor shall install one (1) 24" x 5'-0" expansion tank with 1-1/2" expansion line from the supply main. Tanks shall be supported by 2" x 3/8" strap iron.

(b) The tanks shall be constructed of 1/4" sheet steel riveted tight and tested to 50 lbs. pressure. They shall be provided with valved gauge glass and a 1-1/2" overflow line to roof. Vents shall be extended to funnel at floor line.

20. TESTING AND OPERATION:

(a) The Contractor shall test all concealed pipe work before it is built in and should any work prove defective, it shall be removed before it is concealed. Such tests in concealed pipe work shall be made with cold water pressure of at least 150 lbs., under which condition it shall be proved tight. Before the water test is made, 10-pound steam pressure shall be applied to all mains, risers, and radiator branches.

(b) After the system is complete in all details, it shall be filled with cold water and subjected to a pressure of 100 lbs. This pressure shall remain on the system until all parts
are inspected. If any leaks occur, they shall be repaired and the pressure repeated. Any damage caused by leaks or cutting required to repair leaks shall be paid for by this Contractor.

(c) When the apparatus is complete, the Contractor shall provide all necessary labor, but no fuel, and shall run the plant at his own cost for seven consecutive days and nights to test it to the Engineer's satisfaction. He shall demonstrate by this test a uniform circulation in all parts of the apparatus, a freedom from leaks, and perfect functioning of all parts. During this period the Chief Engineer of Lehigh University shall be instructed by the Heating Contractor in the operation of the controls and all parts of the system.

21. STEAM CONNECTIONS:

   (a) For each piece of equipment requiring steam the Contractor shall provide and install control valves of the Globe type on the supply and return connections. The valves shall have mushroom insulating handles, clearly marked to indicate: "Steam" and "Return". In each return connection the Contractor shall install a swing check valve of the Jenkins manufacture with composition disc.

   (b) The hot water tank and converter shall be connected with a pressure reducing valve to maintain a pressure of 5 pounds in the coils.

22. RETURN TRAPS:

   On each piece of heating equipment, etc., requiring steam, the Contractor shall furnish and install a Master "K", or Armstrong, Supersilvertop, or approved equal, trap with approved self-cleaning strainer. The traps and strainers shall be nickel plated. The hot water heater and converter shall have low pressure float type traps with air vents of the same make.

23. THERMOSTATIC CONTROL:

   Each convector shall be provided with individual thermostatic control valve as part of the convector equipment.

24. STRAINERS:

   All pressure reducing valves, control valves, drip traps, and return traps where required shall be furnished with cast iron strainers which have removable brass screens.
25. **TEMPORARY HEAT:**

(a) The Heating Contractor shall furnish and install radiators and piping for temporary heat and maintain the temporary system when required during construction. This shall include 50% of the number of radiators and radiation indicated on the plans which shall be set and connected for temporary heat. These radiators shall be moved and reconnected as required for plastering and painting. All risers and dead ends which are not circulated by the radiators installed shall be connected with 1/2" circulating lines to prevent freezing. The Contractor will have the option of connecting the mains for operation with steam or water, but shall assume all responsibility for damage to the system, piping, and radiation during construction. All radiators used for temporary heat shall be cleaned, tested, and primed before they are hung and connected permanently.

(b) Steam for temporary heat will be furnished by the Owner.

26. **VENTILATING SYSTEMS:**

(a) This contractor shall furnish all labor, material, and equipment required for a complete installation of exhaust fans as shown on plans for toilet room, laboratory, and roof of Main Testing Laboratory.

(b) Exhaust fans shall be as manufactured by Trane Co., or approved equal, complete with switches, controllers, starters, automatic louvres, protection screens, etc.

(c) Electric current available for the operation of fan motors is for fractional horsepower 110 Volt, 60 cycle A.C. for motors larger than 1/2 HP is 3 phase, 60 cycle, 220/440 volts.

27. **CONDUIT WEATHERMASTER SYSTEM:**

(a) **General Description**

The system shall provide complete year 'round air conditioning for areas indicated, with winter heating (and humidification) and summer cooling and dehumidification. It shall consist of refrigeration equipment, hot and cold water circulating systems, central air conditioning apparatus, individual room Weathermaster units and other necessary equipment and appurtenances hereinafter specified.
(b) **Weathermaster Units**

Shall be furnished and installed where indicated on drawings. Units shall be properly connected to primary air and water risers in accordance with the specifications herein contained.

The unit shall consist of plenum box, nozzles, water coil, emergency condensate collector, and stack.

The water coil shall be located so as to permit cooling or heating of the secondary air stream and shall be of the plate fin type with 1/2" O.D. copper tubes and aluminum fins.

The mixture of primary and secondary air shall be discharged vertically through a grille equipped with lateral deflection vanes to provide rapid diffusion of the air stream.

(c) **Cabinet Units**

A sheet steel cabinet constructed of 18 gauge furniture steel and internally braced for strength shall be furnished and installed for each Weathermaster unit. Cabinet shall have recirculating grille and discharge grille with deflecting vanes and shall be easily removable for access to the unit. It shall also have a small hinge type access door in the top. All grilles shall be of a type manufactured by Carrier Corporation.

(d) **Automatic Weathermaster Control System**

Furnish and install a two pipe system of pneumatic temperature control as manufactured by the Johnson Service Co.

Provide a solenoid air valve to be wired to the fan motor starter circuit which, when the fan starter circuit is energized, passes main air to open the outside air damper. When the damper opens a lever type switch is closed to energize the fan motor circuit.

(e) **Summer-Winter Switch Indexed to the "Summer-Cycle"**

A three-way air valve is positioned to pass 19# main air to the unit thermostats. The converter steam valve is closed, and the three-way valve in the secondary water supply line is positioned to pass chilled water under this cycle of operation.

Provide a master thermostat with its sensing element in the outside air and a capillary thermometer mounted adjacent to same to reset the operating point of a submaster type thermostat.
located in the fan discharge. On a rising fan discharge temperature the submaster thermostat gradually closes the reheat coil steam valve. The reverse operation occurs on a falling fan discharge temperature.

Provide a capillary thermostat and capillary thermometer with sensing elements in the chiller discharge to maintain a constant chiller discharge. On a falling chiller discharge temperature the thermostat shall reduce the refrigeration capacity through the cylinder unloader. The reverse operation occurs on a rising chiller discharge temperature.

Provide at each room unit, a capillary thermostat with its sensing element properly located behind the unit return air grille, to control a water valve on the unit water coil. On a rising unit return air temperature the return air thermostat gradually opens the unit water valve, the reverse operation occurs on a falling unit return air temperature.

(f) Summer-Winter Switch indexed to the "Winter Cycle"

The three-way air valve is positioned to pass 15 main air to the unit thermostats.

The convertor steam valve is under control of its submaster thermostat, and the three-way valve in the secondary water supply is positioned to pass return water to the secondary system.

Provide a capillary thermostat with capillary thermometer mounted adjacent to same with sensing elements in the dehumidifier discharge to control the preheat coil steam valve. On a rising dehumidifier coil discharge temperature, the capillary thermostat shall gradually close the preheat coil steam valve, the reverse operation occurs on a falling temperature.

The reheat steam valve will be closed during this cycle of operation.

The master thermostat described above shall serve to reset the operating point of a submaster thermostat with its sensing element located in the secondary supply. On a rising secondary supply temperature, the submaster thermostat gradually closes the convertor steam valve. The reverse operation occurs on a falling secondary water temperature.

On a rising return air temperature at the room units, the unit thermostat gradually closes the unit coil water valve. The reverse operation occurs on a falling return air temperature.
Provide one electric driven 1/2 HP air compressor complete with 30 gal. air tank, air reducing valve and air filter assembly located as shown on the plans.

(g) **Header and Riser Conduit (Air Distribution System)**

Shall be furnished and installed as indicated on drawings connecting the fan discharges with room Weathermaster units. All conduits shall be of sizes indicated, properly supported and hung from building structure by strap hangers from inserts.

All header conduits shall be constructed of 20 gauge zinc coated steel of grooved seam or welded construction. All joints on header conduits are to be welded.

All riser conduit shall be of Carrier manufacture 24 gauge "zinc grip" steel of spiral lock-seam construction furnished in 12 foot lengths and in 3"-4-3/4"-6-1/2" and 8" inside diameters. Conduit shall be cut to length on the job and assembled with fittings of Carrier manufacture.

All fittings shall be of Carrier design made from 20 gauge "zinc grip" steel or of a material listed in ASTM specification A93-27 Class E.

Connections of riser conduit to fittings shall be made with a synthetic rubber sealing compound and mechanically fastened with drive screws or twist screws.

Connection between Riser Conduit and Weathermaster unit shall be made with 3" I.D. flexible metal hose, unless the distance from riser to unit is greater than 10 feet in which case, a 2 foot length of flexible metal hose shall be used to take care of expansion and contraction of the riser and the balance of the run-out shall be 3" I.D. spiral conduit. Run-out connections shall be assembled in the same manner as riser conduit and fittings.

(h) **Central Air Conditioning Apparatus (PRIMARY AIR SYSTEM)**

Shall consist of outside air intake with louvers, screen and automatic damper, Aerofin type preheat and reheat coils, air filter, Carrier type 29R spray coil air conditioner, fans with motor, starter, V-belts and drives. This system is to be capable of supplying 3200 CFM of outside air to the Weathermaster units as indicated on the drawings. This equipment shall be interconnected with sheet metal casing and sound deadening material.
(i) **Outside Air Intake**

Consisting of rain louvers and removable screens to be furnished and installed in openings provided by general contractor. Rain louvers shall be constructed of 18 gauge galvanized steel securely fastened in structural steel frame. Screen shall be 1/2" mesh 14 gauge copper or galvanized wire designed so that it can be easily removed.

(j) **Automatic Outside Air Damper**

Shall be furnished and installed in outside air intake opening. Damper shall be constructed of heavy gauge iron; shall be of the multi-blade tight-closing type; and shall be interlocked with fan starters in such a manner that damper will close when fan is stopped, and unless pressure relief is provided, shall be in 1/3 open position before starting fan.

(k) **Air Filters**

Will consist of one set of cleanable type standard wire mesh filters and a set of electrostatic filters suitable for 85% efficiency.

(l) **Dehumidifier**

Shall be Carrier Type 29R complete with sprays, eliminators, cooling coils and drip pan, all enclosed in sheet metal casing and including recirculating water pump, pump motor and motor starter, make-up float valve and all interconnecting piping, and other necessary appurtenances.

(m) **Preheaters**

Shall be of Aerofin type manufacture, non-freeze type of all copper construction thoroughly tinned after fabrication.

(n) **Reheaters**

Shall be of Aerofin type manufacture, flexitube type of all copper construction thoroughly tinned after fabrication.

(o) **Apparatus Casing**

All necessary sheet metal casing shall be furnished and installed between outside air intakes and fan inlets to make the central air conditioning apparatus complete and operative.
Casings shall be constructed of 18 gauge galvanized sheet metal with structural iron stiffeners and that portion between dehumidifier and fan shall be of welded construction. Insulated access doors shall be installed in the section before dehumidifier and special insulated air tight doors with gaskets and locking devices shall be installed for access between dehumidifier and fan. Casings shall terminate at floor line with angle iron grouted in floor.

(p) **Canvas Connections**

Shall be provided at inlet and outlet of the fan consisting of not less than a 4" length of 16 ounce canvas, flame-proofed and waterproofed and properly secured in an airtight manner.

(q) **Fans**

Shall be Sirocco single inlet single width type approximately 13" wheel diameter to supply 3200 CFM at static pressure 7" W.G.

(r) **Fan Motors**

Motors shall be of the 400 C type designed for continuous operation without overheating and shall be furnished with approved combination type starters with overload and low voltage protection and with start-stop push button in cover, also necessary V-belt drives with vari-pitch pulleys shall be furnished.

A guard will be furnished consisting of 22 gauge galvanized steel frame with side of 22 gauge perforated metal supported and securely bolted in place for drive.

(s) **Fan bases**

Will be designed to minimize transmission of noise and vibration to building structure.

(t) **Sound Absorbers**

Shall be installed on the discharge side of the supply fan to absorb the noise developed in fans and central air conditioning apparatus, and shall provide an attenuation of at least 30 decibels for noise of a frequency of 128 cycles per second.

(u) **Refrigeration Cycle**

A refrigeration cycle including 5H60 Carrier compressor
with drive, 9E7 evaporative condenser, 10 row coil, and evaporator and refrigeration piping. For all interconnecting water and brine piping, valves and starters, see section under "Work by Others".

Compressor rated to supply 441,000 BTU/hour at 40°F saturated suction and 105°F condensing temperatures and have unloading steps designed for 100%, 83%, 67%, 50% and 33%. Auxiliaries to be supplied with compressor are dual pressure-stat, oil safety switch, muffler and vibration isolators. Compressor to be driven by a 40 HP motor, 40°F C rise operating on 220/3/60 or 550/3/60.

(v) Water Piping System

A complete circulating system of the reverse return using warm and/or chilled water shall be installed as per manufacturers design and to connect to all Weathermaster units primary air preheat and reheat coils and heat exchangers, together with all water and air relief piping, valves, fittings, pumps, tanks, controls as required to make the system complete (see work by others).

All piping shall be installed so as to provide allowance for expansion and contraction. Dirt pockets and shut off valves shall be installed in order to isolate, drain and clean any section of the system. The water piping system pertaining to the air conditioning will be installed as recommended by the manufacturers.

(w) Air Venting

The top of each water supply riser, and other points indicated on plans where necessary for removal of air from system, shall be automatically vented in an approved manner.

(x) Cleaning Equipment

A portable cleaning kit shall be furnished for the cleaning of the coils and nozzles of the Weathermaster units. This kit shall consist of a portable blower with dust bag, flexible hose, special cleaning attachments.

(y) Testing and Adjustment

After installation of all Conduit risers and before installation of Weathermaster units, risers shall be tested individually for air leakage. Tests shall be made at 8" static pressure and the leakage per riser shall not exceed 10 CFM.
After completion of header conduit and primary air apparatus and before insulation of the header conduit, all joints shall be inspected for leakage.

Before the final connection of Weathermaster Units, all water piping shall be tested under a hydraulic pressure of 100 lbs. After completion of this test, the system shall be drained and final connections made to Weathermaster units.

During initial operation, the supply and return water to and from each unit shall be closed off and cross connected by means of the bypass around the Weathermaster Unit. (If so, specified) the system shall be operated in this manner for a 48 hour period with hot water to remove construction dirt.

After clean-out period valves shall be positioned to assure required flow of water through all portions of the system.

After all equipment is installed and ready for operation, adjustment of primary air shall be made and room distribution checked.

All necessary adjustments to manual temperature control system shall be made and controls shall be left in first-class operating condition.

All necessary temporary equipment, gauges, etc. required for the above testing and adjusting shall be furnished.

(z) Water Treatment

Before initial filling of piping system, contractor shall retain a water treatment consultant and shall provide for periodic service by such consultant for a period of one year.

(aa) Instruction

After completion of the installation, a complete set of operating instructions shall be furnished, and the Owner's representative shall be instructed in the proper operation and maintenance of the equipment for a period of two weeks.

(bb) Guarantee

All equipment furnished and installed shall be guaranteed against all inherent defects of workmanship and material for a period of one year from date of final acceptance and Contractor shall repair or replace F.O.B. factory and at such time as may
be designated by owner all such parts found defective within that period. This guarantee covers all defects caused by faulty manufacture and not by improper operation or maintenance.

28. **CONVENTIONAL AIR CONDITIONING SYSTEM**

This conventional system is designed to air condition the first to the fourth floors exclusive of the addition to the Fritz Engineering Laboratory as illustrated on the drawings. Heating coils will be located in the ductwork to provide capacity for winter heating. The air handling unit will be a #43B-7 Carrier Weathermaker coupled with a #5H-40 Carrier Compressor with rated capacity of 294,000 BTU/hr. @ 40° suction and 105° condensing, and a #9E-5 Carrier Evaporative Condenser. The supply and return duct runs will be designed as recommended by the manufacturer, and as shown on drawings.

(a) **Automatic Temperature Control for Conventional System**

Furnish and install a two pipe system of pneumatic temperature control as manufactured by the Johnson Service Company.

Provide a Solenoid air valve to be wired into the fan starter circuit which is energized when the fan motor is started and passes main air to open the minimum outside air damper.

(b) **Summer-Winter Switch Indexed to the "Summer Cycle"**

The maximum outside air and relief air dampers are closed and the return air damper is open under this cycle of operations.

Provide a capillary type dewpoint thermostat with a capillary type thermometer mounted adjacent to same, with sensing elements located in the leaving side of the dehumidifier coil, to operate the unloader mechanism on the refrigeration machine through a pressure regulator. On a rising dewpoint temperature the thermostat shall operate the unloader to increase the refrigeration capacity. The reverse operation occurs on a falling dewpoint temperature.

Provide a room type thermostat as shown in each floor controlling a booster coil.

Steam valve in the supply air duct to that floor. On a rising space temperature the room thermostat will gradually close the booster coil steam valve. The reverse operation will occur in a falling space temperature.
Provide a pressure regulator with its sensing line in the compressor discharge to maintain a constant head pressure in the refrigerant compressor by operating a damper in the supply air connection to the evaporative condenser. On a rising head pressure the pressure regulator shall gradually open the damper in the supply air connection, the reverse operation occurs on a falling head pressure.

(c) Summer-Winter Switch Indexed to the "Winter Cycle"

On a rising dewpoint temperature, the dewpoint thermostat shall first gradually close the preheat coil steam valve and on a further rise in dewpoint temperature shall gradually open the maximum outside air and relief air dampers simultaneously closing the return air damper. The reverse operation occurs on a falling dewpoint temperature.

The booster coil control is the same under this cycle of operation as described above.

Provide a fire protection thermostat in the fan discharge to stop the fan motor if the discharge temperature exceeds its predetermined setting.

Provide one electric driven 1/2 HP air compressor complete with 30 gal. air tank, air reducing valve and air filter assembly located as shown on the plans.

29. COVERING:

(a) All steam, supply piping, return, and water piping installed as a part of this contract shall be covered, except where omitted by notes on plans.

(b) All steam and return piping, including risers and connections to hot water heater, shall be covered with standard sectional 85% magnesia.

(c) All hot water piping, including that in the heater room, in the furred ceilings, and all risers shall be covered with 85% magnesia of standard thickness.

(d) Radiator branches shall not be covered.

(e) All cold water piping shall be covered with 1" wool felt with an approved waterproof lining and canvas.
(f) All valves and flanges on the steam piping shall be covered with molded removable coverings of the same material as is specified for the pipe covering.

(g) Expansion tank, and return tank shall be covered with blocks of 1" 85% magnesia applied over expanded metal lath. It shall be held in place with wire netting and finished with a 1/2" coat of plastic asbestos.

(h) All fittings not otherwise insulated shall be covered with plastic insulation to a thickness equal to that of the pipe covering. The insulation on pipe fittings shall be finished with canvas pasted on.

(i) All pipe covering where exposed shall be wrapped with building paper and finished with 8 oz. duck sewed on with concealed seams. All other covering shall be finished with canvas pasted on and banded 30" on centers.

(j) CENTRAL AIR CONDITIONING APPARATUS. The apparatus from and including the dehumidifier to fan inlet connection shall be covered with 2 inches of cork insulation or equivalent properly applied and finished with a troweled finish of asbestos cement.

(k) FANS. All air conditioning supply fans shall be covered in same manner as apparatus casing.

(l) HEADER CONDUIT. All header conduit in unconditioned areas except sound absorbing sections shall be covered with a total of 1" wool felt insulation applied in two 1/2 inch layers with both circumferential and longitudinal seams broken, and finished with canvas jacket securely pasted on.

(m) RISER CONDUIT. All riser conduit located outside of conditioned areas shall be covered in same manner as header conduit. Furred-in-risers are considered as being within a conditioned area.

(n) SHELL AND TUBE COOLER. Shell of cooler shall be covered with 2" thickness of vegetable cork lagging applied with hot pitch or adhesive, securely wired in place and finished with a troweled coat of asbestos cement. Heads and including flanges shall be covered with 2 inches of cork applied in a manner so as to permit easy removal for cleaning and inspection of tubes.

(o) WATER HEATER. Shall be covered with 2" thickness of 85% magnesia covering securely wired in place and finished with two layers of asbestos cement. Heads and including flanges shall
be insulated in a manner so as to permit easy removal.

(p) WATER PIPING. All chilled water piping except as stated below shall be covered with not less than an equivalent of 1" thickness of wool felt insulation with sealed canvas covering and an adequate vapor seal to present condensation on the pipe. Heads and including flanges or strainers, filters, etc. shall be insulated in a manner to permit easy removal.

30. PAINTING:

(a) All exposed iron work installed by this Contractor shall be painted. Any exposed iron work and piping in the heater room shall be painted with red lead and approved metal enamel.

(b) All sheet iron which is visible back of registers and grilles shall be painted with two coats of lead and oil.

(c) The motors, pumps, and all other equipment furnished as a part of this contract shall be primed, painted two coats of approved machinery enamel.

(d) All exposed pipe covering shall be primed and painted two coats of oil and lead. All pipes shall be given distinctive markings to indicate the system to which they belong.

(e) All convectors shall be primed at the factory. After the convectors have been set and connected, all exposed parts, grilles, etc. shall be painted by others.

31. GUARANTEE:

(a) All work installed as a part of this contract shall be guaranteed to be free from defects in material and workmanship for a period of one year and any defects which may develop in this period shall be repaired by the Contractor without cost to the Owner.

(b) The Contractor shall guarantee all piping and convectors to circulate uniformly without noise or water hammer and failure of any part of the system to function properly shall be considered a defect as covered by this guarantee.
PLUMBING, DRAINAGE, STANDPIPE SYSTEMS, ETC.

1. GENERAL CONDITIONS:

All work included under this heading shall be subject to the General Conditions of the entire operation. The Sub-contractor for this portion of the work is required to refer especially thereto.

2. SCOPE:

(a) This contract shall include all plumbing, drainage, gas piping, compressed air, standpipe and water supply systems as required for the building and as described in these specifications and shown on the plans.

(b) This contract shall include all plumbing and drainage work in the air conditioning rooms and all connections to the air conditioning equipment, as specified under "Heating, Ventilating, and Air Conditioning."

(c) All plumbing and drainage work, material and fixtures specified and not shown on the drawings or shown on the drawings and not specified, shall be furnished and performed by the Contractor same as if fully hereinafter described and shown on the drawings, with exceptions only where so specifically hereinafter mentioned and provided.

(d) Dimensions shown on the architectural drawings and by details shall be taken by the Contractor, as the required dimensions without reference to what they may measure according to the given scale. Drawings shall not be scaled.

(e) In no case shall plumbing and drainage material and work, plumbing fixtures, apparatus or equipment, shown on drawings, be construed as omitted or furnished by others, unless so specifically hereinafter specified.

3. PROCEDURE:

The work of this contract shall proceed in such order and at such times as required by the progress of the general construction so as not to delay or interfere with the other trades.

4. MEASUREMENTS AT THE BUILDING:

(a) Before proceeding with any part of this work the Contractor shall lay out all work, make and take all levels and measurements necessary for the perfect and complete assembling,
building, and installing of the work for which he has contracted, and will be held responsible for the accuracy of all measurements, levels, etc. taken, made or established by him.

(b) This Contractor shall study the plans of other trades and consult with other contractors to determine the location of their piping, finishes, etc., and avoid interferences.

(c) Should it appear that any of the plumbing and drainage work as described in these specifications, or as shown by the drawings, is not sufficiently detailed or explained, the Contractor shall apply to the Engineer for such further plans, details, or information as may be necessary for a full understanding and interpretation of the work in question and shall conform to such additional details and explanations as far as same is consistent with the drawings.

5. MATERIAL AND WORKMANSHIP:

(a) All plumbing and drainage work described in these specifications or shown by the accompanying drawings, and all work necessary to complete the finishing of any work so described or shown, shall be executed in a thorough, substantial, and workmanlike manner. All materials shall be new and shall be of the highest grade or quality of the several kinds herein specified or shown by drawings, and all plumbing and drainage work of every kind shall be delivered upon the completion of the building in a clean, perfect and undamaged condition, free of flaws or defects. The best grade and design of any manufacturer mentioned shall be provided.

(b) The Contractor shall close all pipe openings, etc. with proper caps and fittings to prevent obstruction in same or damage to same of any kind while the building is in course of construction. He shall also make all necessary provisions to prevent obstructions from entering traps of fixtures.

(c) All damages of each and every kind resulting from the failure of the Contractor to properly protect his work, material, fixtures, apparatus, machinery, etc., or that of other contractors, or the building, at all times during the erection, construction, and completion of the building, shall be made good by him.

6. APPROVAL OF DETAILS:

(a) The method of construction and all details of workmanship which are not specifically described in this specification or shown on drawings shall be done in a manner satisfactory to the Engineer and the local and State departments having
jurisdiction, whose approval or disapproval of any detail of the work of this contract shall be considered final.

    (b) The Contractor shall furnish and submit to the Engineer for approval details and cuts of all plumbing fixtures, tanks, and special equipment. Samples of all types of valves, escutcheons, faucets, stops, and traps shall be submitted for approval, if requested by the Engineer.

    (c) No orders shall be placed and no work requiring such items shall be done until such cuts or prints are approved by the Engineer.

7. PERMITS AND FEES:

This Contractor shall obtain and pay for all State and local approvals of plans, permits, tests, fees, charges, deposits, etc., that may be necessary for the proper carrying on, completion, and approval of his work.

8. TEMPORARY WORK:

    (a) The Contractor shall furnish, install, and connect and maintain in good condition and cleanly order, two temporary water closets with flush tanks and seats for use by all trades during the construction of the building.

    (b) For supplying water for use of other contractors, furnish and install and connect up with the water supply two 1-1/4" galvanized iron risers located at points directed by the Engineer and continue the risers up to the top story of the building as the work of construction progresses, and provide and fit the risers with loose key brass gate valves. Outside of the building, furnish and install two water supply outlets for construction purposes.

    (c) Also provide and fit risers up to each story with a 3/4" short branch and a 3/4" brass loose key hose bibb. Furnish and install temporary water meter, as required.

9. CHASES, DRILLING, CUTTING, ETC.:

    (a) The Contractor shall lay out his work to conform to space conditions and to pipe chases, shafts and channels in walls and to openings in floors, shown on drawings, as far as possible or practical in the opinion of the Engineer. The locations given for horizontal runs may be changed by direction at building or by drawings which will be issued, as required, to conform to building construction.
(b) The Contractor shall personally, or through his representative, watch and see that all chases and channels required for his work are correctly located and built, and that all holes and openings in floor and other slabs are left at the required locations during the concrete pouring. For all such floor openings, the plumbing contractor shall provide and secure in place to the form work, before the concrete is poured, approved iron pipe size sleeves of required size and dimensions.

(c) Should the Plumbing Contractor fail or neglect to see that all said chases and channels are of required sizes and correctly located for this piping work, he shall in all such cases pay the General Contractor for the necessary cutting and framing of openings and rebuilding of chases and channels that may be required through his oversight or neglect. The Plumbing Contractor will not be permitted to do any cutting.

(d) The construction and all floors and ceilings of the building will be of fireproof construction, with ceilings furred; all pipes shall be concealed above furred ceilings except in basement, which will not have any suspended ceilings.

(e) Where necessary to cross beams to reach stacks, the piping shall be installed at points directed, and all piping shall be run and installed back of furrings, and in chases, channels and above furred ceilings.

10. PIPE AND FITTINGS:

(a) All piping 2" and larger for sanitary sewers, drainage lines, vents, soil pipes, drains, and for waste pipes not otherwise specified, including all risers, branches, and extensions of said piping, shall be of standard weight hub and spigot pattern cast iron, tarred in and out, and installed complete with cast iron "Y's", elbows, bends, and other drainage fittings of each and every type and pattern required. Sewers which occur below basement floor or underground shall be extra heavy cast iron.

(b) All joints of cast iron pipe and fittings shall be oakum and lead caulked.

(c) All piping for vent lines and waste pipes smaller than 2" shall be of extra heavy galvanized copper bearing steel pipe.
(d) All nipples shall be of extra heavy weight galvanized of same type as the pipe.

(e) Pipe for gas supply shall be of standated weight steel of same make or makes as the foregoing, complete to fitting of requirements above specified, except not galvanized.

(f) The standpipe system shall be installed with galvanized standard steel pipe and extra heavy galvanized pipe fittings.

(g) All pipes shall be reamed after threading.

(h) All steel of Arco cast iron pipe shall be threaded to fit the threads of the fitting true, full and accurate.

(i) All exposed threads of galvanized iron pipe shall be painted with a good heavy coat of red lead paint after the pipe has been screwed in place.

(j) All piping for the cold water, drinking water, hot water supply, and for hot water circulating, including all supply lines, branches, risers, extensions and descending lines of said piping, shall be of type "L" Chase copper tubing, or an approved equal.

(k) Fittings for copper tubing or brass pipe shall be of the walseal type with high temperature solder of Walworth or Crane manufacture. All joints shall be brazed under the direction of the manufacturer.

(l) All piping, traps, etc., for acid wastes shall be of acidproof Duriron pipe.

(m) All joints of Duriron pipe and fittings shall be pure asbestos and lead caulked.

11. **EXCAVATING AND BACK FILLING:**

All excavating required to install plumbing work and back filling after same is installed and tested shall be done by the Plumbing Contractor. Submit unit price for removal of rock.

12. **SEWERS AND DRAINS:**

(a) The rain water leaders and drains shall be galvanized steel pipe and extended outside the building and connected into the new storm sewers at the points indicated.
(b) The sanitary house drains shall be extended to the new sanitary sewer at the points indicated.

(c) At the points indicated the Contractor shall construct brick or concrete manholes or catchbasins. Manholes shall be not less than 36" in diameter and have walls not less than 8" thick. If brick is used, joints shall be made with Portland cement mortar. The bottom of the manhole shall be of 6" stone concrete finished with 1" of 1-2 concrete. Provide steps from top to bottom of 3/4" iron bars anchored through walls. The manhole shall be provided with 21" cast iron frames and removable covers. The manhole shall be provided with double cast iron manhole covers and frames. The lower cover shall be gasketed and bolted in place. Catchbasins shall have cast iron gratings.

(d) The exact grade and routing of sewers will be determined at the site by the Engineer.

(e) New storm and sanitary sewers shall be vitrified Bell and Spigot pipe or cast iron pipe with joints calked with oakum and lead as shown on drawings. Alter, remove or abandon present storm and sanitary sewers as required.

13. SOIL, WASTE AND VENT PIPING:

(a) The Contractor shall furnish and install all necessary soil, waste, and vent piping for all plumbing fixtures of each and every kind and type shown on drawings, as well as for all fixtures specified, complete and ready for the installing and connecting up of the fixtures, including the connecting of the soil pipes to sanitary sewer, waste pipes to soil pipes or said sewers, and connecting of vent pipes to vent stacks.

(b) Where small vents or waste pipes are buried in soil, concrete, or floor fill below the basement floor, same shall be of extra heavy cast iron, installed with extra heavy cast iron fittings, in place of galvanized iron pipe.

(c) All water closets throughout the building shall be connected up to soil pipe stacks, branches or extensions, as the case may be, with 12 pound lead bends.

(d) All soil pipes and waste pipes 2" or larger shall be of standard weight cast iron hub and spigot pattern pipe with maker's names, size and weight on every hub. All fittings shall be of the best close grain gray standard cast iron, hub and spigot type. The fittings of the waste and drain systems shall be of a long sweep pattern and connections shall be made with "Y" fittings. Smaller waste and vent pipes shall be of galvanized extra heavy copper bearing steel pipe or screwed cast iron, as specified above.
(e) All leader soil and vent pipes shall be connected below the roof to Holt or Josam roof connections and a 2'-0" length of cast iron pipe extended above the roof caulked into the connections.

14. COLD WATER SERVICE:

(a) From the high pressure water service main, Contractor shall furnish and install a 4" water service.

(b) In Boiler House furnish and install two (2) pressure reducing valves of Mason, or an approved equal, manufacture, with 3-valve by-pass and water gauges.

(c) From the pressure reducing valves, extend cold water supplies to hot water heaters and a separate 4" supply to serve standpipe system. Each main, branch, and connection shall be valved.

15. DOMESTIC HOT WATER SERVICE:

(a) Furnish and install two (2) Patterson-Kelley Co. or approved equal instantaneous hot water service heaters, lined throughout with copper weighing 3# per square foot, and built in accordance with the A.S.M.E. Code for 125# working pressure.

(b) Heater shall be 12" indiameter x 4'-6" long with a capacity to heat 500 G.P.H. of water from an initial temperature of 40°F to a final temperature of 180°F when supplied with steam at atmospheric pressure.

16. DOMESTIC HOT WATER CIRCULATING PUMPS:

Furnish and install two hot water circulating pumps in air conditioning rooms for the domestic hot water systems. The steam and water connections shall be made by the plumbing contractor. The pumps shall be of the centrifugal type each with a capacity of 25 gallons per minute and shall be as made by the Bell & Gossett Company or an approved equal.

17. WATER TEMPERATURE REGULATOR:

In the steam supply lines to domestic hot water heaters furnish and install water actuated thermostatic control valves of the Powers or Boigt Hill manufacture. The regulators shall be adjusted to maintain a temperature of 150°F.
18. **PRESSURE REDUCING VALVES:**

For the domestic hot water heaters furnish and install Boigt Hill, Mason, or an approved equal pressure reducing valves with stainless steel seats, discs and stems. Diaphragms shall be of seven-ply rubber and canvas. For each reducing valve, furnish and install a 3-valve by-pass strainer, two pressure gauges and pressure relief valve.

19. **COLD, HOT WATER AND CIRCULATING PIPING:**

(a) All cold water and hot water supply piping and hot water circulating piping throughout the building shall be of "B" type copper tubing installed and connected up with Wal-seal type fittings brazed at all joints as specified above.

(b) The Contractor shall furnish, install, and connect up all cold and hot water supply mains and hot water circulating risers shown on the drawings or specified complete to all branches, risers, and extensions.

(c) From all said cold water risers, take off all necessary branches, extensions, and connections for all fixtures and equipment indicated on the drawings.

(d) All water closets throughout the building shall be connected up with the cold water supply only. All other plumbing fixtures and equipment of each and every kind shall have both cold and hot water supply unless specifically excepted.

(e) Install hot water supply risers in plumb and paralleled lines. All hot water mains, hot water branches, hot water risers, and circulating mains shall be connected with expansion loops of "B" soft copper tubing to permit free expansion.

20. **PIPE SIZES:**

(a) The sizes of all pipes shall be as indicated on the drawings or specified herein, and shall be adequate for the condition as specified. The sizes of connections to groups of fixtures, when not indicated on the drawings and not specified, shall not be smaller than one-half the combined area of all branches of the group. All branches from fixtures and all offsets shall be made in furred ceilings or pipe spaces.

(b) Connections from soil, waste, supply pipes, etc., to individual fixtures shall be of the following sizes:
<table>
<thead>
<tr>
<th>Fixture</th>
<th>Soil or Waste</th>
<th>Vent</th>
<th>Hot Water</th>
<th>Cold Water</th>
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<tbody>
<tr>
<td>Drinking Fountains</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>1/2&quot;</td>
<td>3/8&quot;</td>
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<td>Lavatories</td>
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<tr>
<td>Slop Sinks</td>
<td>3&quot;</td>
<td>1-1/2&quot;</td>
<td>3/4&quot;</td>
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<tr>
<td>Water Closets</td>
<td>4&quot;</td>
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<tr>
<td>Floor Drains</td>
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<td>Sinks</td>
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<tr>
<td>Showers</td>
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<td>1-1/2&quot;</td>
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<td>Urinals</td>
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(c) The above shall be construed as minimum sizes and shall be increased where so indicated on drawings or required by special fixtures.

21. GAS PIPING:

Furnish and install pipe from present gas meter to all equipment requiring gas supply. Relocate present gas water heater.

22. VENT PIPING:

Each and every trap and each and every plumbing fixture shown on drawings, without exceptions, and each and every trap and fixture specified or mentioned throughout these specifications, including all fixtures, apparatus, and equipment specified or noted on drawings as furnished by this contractor or by others shall be vented by loop or back venting to prevent syphonage.

23. FLOOR DRAINS:

(a) Furnish and set in floor at all points shown, accessible, water sealed, galvanized cast iron drains with removable perforated covers. These shall be Brayman or Josam locking type, flashed into waterproofing with 4 lb. lead 24" x 24". Gratings and rims shall be of cast brass with chromium finish.

(b) Each drain shall have a galvanized cast iron trap of a special water seal design.

24. HOSE BIBBS:

Provide and install at points indicated 3/4" brass hose bibbs with integral bases of approved pattern, properly threaded for hose connections. Outside bibbs shall be valved and provided with drips inside of building, and connected up complete to water supplies and drains.
25. **VALVES:**

   (a) Each main, branch main, cross connection, riser, and group of fixtures shall be valved.

   (b) The valves throughout shall be of Jenkins, Lunkenheimer, or equal, as approved by the Engineer. All valves 3" and smaller shall be of brass. All larger valves shall be of standard weight cast iron bronze fitted with removable seats, bronze stems and gates. All valves shall have stuffing boxes with bronze glands and followers. Valves shall be designed for a working pressure of 125 pounds, except the high pressure water service main and branches shall have 150 pound valves.

   (c) Control and shut off valves of the chromium plated globe type shall be provided for all fixtures and equipment where exposed. For concealed branches to fixtures provide shut-off valves of the built-in high seat type in addition to faucets.

26. **VALVE TAGS AND FINAL PLANS:**

   (a) At the completion of the plumbing work the Contractor shall provide on each main operating valve a heavy brass tag, plainly numbered with black recessed numerals and secured to valve by a neat brass chain or ring.

   (b) The Contractor shall deliver to the Owner a duplicate typewritten list indicating the function of every main valve furnished by him in the building and two 1/8" scale plans on white paper and one on cloth showing the location of these valves and all waste, drain, and water piping. The schedule shall be framed under glass. During construction the Contractor shall note on plans the exact location of pipes as installed, as a guide in the preparation of final plans.

27. **PIPE SUPPORTS:**

   (a) All pipe installed under this contract shall be supported in an approved, substantial manner. Horizontal runs of all pipe shall be supported from the floor construction of the building or from beams by adjustable expansion hangers, spaced not more than 10'-0" apart along the runs. These hangers shall be fitted with approved extra heavy eye bolts, extending through the floor construction with cross pieces not less than 18" in length and 1" in diameter, or approved inserts set in the floor slab or anchored to steel construction with beam clamps. The risers and stacks shall have wrought iron bolted clamps.
bolted to building construction. Soil, waste and vent stacks shall be supported at each floor. Each section of horizontal cast iron pipe shall be independently supported.

(b) All cold water and drinking water pipes shall be supported by hangers with clamps around the covering. The covering at hangers shall be protected by 14 ga. sheet iron collars.

(c) Each pipe shall be separately hung and no pipe shall be suspended from any other pipe or by chain or strap hangers.

(d) Pipes on walls shall be supported on extra heavy cast iron wall brackets with rollers of an approved design.

(e) Pipe hangers shall be of "Clip Bar" or Grinnell manufacture.

28. SLEEVES AND ESCUTCHEONS:

(a) Where cold water, hot water, circulating, or drinking water pipes pass through concrete construction, partitions, walls, furrings, or slabs, provide and install galvanized standard weight iron pipe steel sleeves. Where exposed, solid chromium plated cast brass escutcheons or collars shall be provided. Sleeves shall be of proper size to receive covering.

(b) Sleeves shall be set before concrete is poured.

(c) All exposed water pipes passing through finished floors shall be provided with iron pipe size sleeves, flashed watertight and provided with cast brass high cupped nickel plated escutcheons screwed on.

29. EXPANSION AND CONTRACTION:

(a) In executing the work the Contractor shall make provision for expansion and contraction with variations in temperature. Mains and risers shall have bends or offsets of type "B" soft copper tubing to take up expansion and contraction.

(b) The branches shall be taken from all lines in a manner to allow for free expansion and proper venting so that all pipes throughout the building shall be absolutely tight under all temperatures.

(c) The water supplies to every fixture and the end of each cold water riser shall have 18" air chambers of the same kind of pipe to which they are connected and of the same size as the supply branch. Caps shall be brazed onto the air chambers.
30. **FLASHINGS:**

(a) All pipes which pass through outside walls, waterproof wall, floors, or retaining walls shall be flashed watertight with 24" x 24", 6 pound lead.

(b) Under showers the Contractor shall furnish and install 6 pound lead pans turned up 6" at sides and ends. Provide and solder in place, Josam 3" brass adjustable drains with chromium strainers.

31. **CLEANOUTS:**

Cleanout openings shall be provided and set in all waste, soil, sewer and drain pipes, at all ends and changes in direction. All cleanout plugs shall be of brass screw pattern of full size of pipes in which they occur. All cleanouts which occur below basement floors shall be extended up to floor levels with long radius bends, or into accessible locations, and fitted with chromium plated cast brass rims and covers set flush with the floor.

32. **STANDPIPE SYSTEMS:**

(a) Furnish all material and equipment required for the installation of a complete standpipe system with galvanized steel standpipes installed and connected as indicated. Hose, racks, nozzles, and 1-1/2" and 2-1/2" valves shall be of the Allen Mfg. Co., or approved equal, manufacture, in recessed cabinet. Cabinets will be furnished by General Contractor. Hose shall be 1-1/2", of the lengths indicated, with C.P. brass nozzles and reducing fittings. Equipment and hose shall be approved and stamped by the National Board of Fire Underwriters. In each cabinet, furnish and install a 2-1/2 gallon fire extinguisher with rack as approved by the National Board and to conform with standards now in use.

(b) The standpipe system shall be connected to the 4" cold water supply and to brass Siamese on the east and west walls of the building. The Siamese and hose connections shall have threads to fit those of the City Fire Department.

33. **PIPE COVERING, ETC.:**

(a) All cold and hot water supply mains, supply branches and risers, hot water circulating pipes, supply pipes, and all other cold and hot water piping of each and every kind throughout the building shall be covered with canvas jacketed sectional pipe covering, including all fittings and valves. Standpipe
will not be covered.

(b) The pipe covering for all cold water piping shall be one inch thick and of a positive sweatproof type and construction consisting of two distinct sections, each 1/2" thick and applied so as to break all joints, and said covering shall be made up tar felt and wool and shall be equal to the double section sweatproof cold water pipe covering manufactured by the Johns-Manville, anti-sweat covering, or equal to other approved make acceptable to the Engineer.

(c) The covering for all hot water piping, including all hot water circulating piping, shall be 1" thick similar to "Asbestocell" type and construction, having four rings of approximately 1/4" thick corrugated asbestos air cells, and shall be make and other requirements acceptable to the Engineer.

(d) The foregoing cold and hot water piping covering shall be canvas jacketed and banded at all points. Where exposed, as in the basement, it shall be finished with 8 oz. duck sewed on.

(e) Where cold water pipes are buried in outside wall construction, they shall be covered and wrapped with three separate thicknesses of heavy approved tarred waterproof paper, banded securely with copper wire.

(f) All canvas jacketing, except where sewed on, shall be secured in place every 30" or closer with lacquered metal bands.

(g) Leader pipes and connections in furred ceilings shall be covered with two thicknesses of 1" hair felt and waterproof building paper wired on with copper wire. Soil and waste lines in furred ceilings shall be covered in the same manner.

(h) Covering shall be of Johns-Manville, Keasby & Mattison, or Ehrets manufacture.

(i) The hot water heaters shall be covered with 2" magnesia to leave a 1/2" air space between covering and metal. The magnesia shall be finished with 1/2" asbestos cement applied in two coats trowelled hard and smooth. Covering shall be finished with 8 oz. duck pasted on.

34. **PAINTING:**

(a) Underground pipes and all lead bends and connections shall be painted with hot tar or black asphaltum.
(b) All other painting shall be done by the General Contractor.

35. TESTS:

(a) All water pipes installed under this contract shall be tested and proved tight in accordance with the State Codes and to the satisfaction of the Engineer before the covering is applied. All concealed lines shall be tested in sections as they are installed to a cold water pressure equal to 150 pounds. All systems of piping shall be retested at the completion of the work to a water pressure of 125 pounds.

(b) At the completion of the roughing in, all open ends, except those at the roof, shall be plugged or capped. All soil, wastes, vents, and drains shall be filled to the roof and allowed to stand for at least one day without loss of head. This shall be done in the presence of the Engineer's representative.

(c) Any defects disclosed by tests must be made good by the Contractor and tests repeated until satisfactory.

36. GUARANTEE:

The Contractor shall guarantee his work for a period of one year from the date of completion, as witnessed by a certificate of completion signed by the Engineer. He shall promptly repair and make good any damage done to his work or other work during that period that may be caused by defective material or workmanship. He shall deliver in writing a written guarantee to the Owner upon receipt of final payment, without the Owner's request.

37. DAMAGES:

The Plumbing Contractor shall be responsible for any and all damages caused by his employees, equipment leaks, tools, etc., to work of other contractors. Such damages shall be paid by the Contractor in an amount commensurate with the damages as determined by the Engineer. The Contractor shall drain all water used for testing to a point outside the building to avoid damaging material for construction.

38. FINISHES:

All exposed pipes, trimmings, and fittings at fixtures, including faucets, shut-off valves, plates, escutcheons, traps, wates, water and vent pipes, etc., shall be finished with dull chromium plate.
39. **PLUMBING FIXTURES:**

(a) For exact location of fixtures and equipment, the Contractor shall refer to the scale drawings and the manufacturers' roughing drawings. Refer to Fixtrue Schedule on floor plans for type of fixtures to be furnished and installed.

(b) All sink and lavatory faucets, hose bibbs, chains, stop cocks, exposed wastes, supplies and traps, pop-up drains, exposed stops on supplies, and all other exposed metal fittings and trimmings of fixtures, not otherwise specified, shall be polished of satin chromium finish.

(c) The flush valves for all water closets, stops and escutcheons shall be of brass of said chromium finish. All chromium plating shall be applied over copper plating.

(d) The handles for all bibbs and cocks shall be of a heavy four arm pattern, all brass.

(e) Sink bibbs and hose cocks, shall not be less than 5/8", lavatory bibbs not less than 1/2".

(f) Stops shall be provided on all supplies to sinks, lavatories, showers, etc. They shall be of the lockshield shut-off type, full size of the supplies, none less than 1/2".

(g) All bibbs, cocks and stops, not otherwise specified or directed, shall be of compression type.

(h) Each sink, each lavatory, and each fixture not otherwise specified shall be provided and fitted with two bibbs; one for cold and one for hot water supply; and the cold and hot water supplies below each of said fixtures shall be provided and fitted with stops.

(i) All exposed wastes, traps, and supplies of fixtures shall be brass, of finish before specified. All traps shall have brass cleanout screws.

(j) The supply connection to each water closet valve shall be provided and fitted with a brass regulation stop of said finish and full size of the said connection.

(k) Where supplies, wastes, etc. enter walls or floors below fixtures, same shall be provided with approved cast brass wall plates of said finish.
(1) The Contractor shall submit cuts with manufacturer's name of all plumbing fixtures to the Engineer for approval, and no fixtures shall be shipped from the place of manufacture until the Engineer's approval has been received.

(m) None but selected Class "A" fixtures shall be used in the work, and any fixtures of faulty shape, and any stained, dented or cracked fixture which becomes apparent before the final acceptance of the work shall be removed and replaced by the Contractor as a part of this contract. Any damage to floors or walls caused by said removal shall be paid for by the Contractor.

(n) All cleats, supporting bolts, brackets, etc., required in connection with the fixtures, shall be furnished and placed by the Contractor at accurate locations. They shall be approved by the Engineer before installation.

(o) Fixtures shall be of Standard Sanitary, or Crane manufacture except where other manufacturers are specified, similar and equal in all respects to fixtures listed on drawings.

(p) All faucets, stops, flush valves, wastes, shower heads, and brass work in connection with fixtures shall be of the Standard, Crane, or Speakman Company manufacture of their "heavy line". All faucets including all sink faucets shall have removable barrels and seats. No cast stems or spindles will be permitted.

40. WATER COOLING SYSTEM:

(a) Plumbing Contractor shall furnish and install all work and equipment required to install two complete cold water circulating systems for drinking water purposes, each consisting of: Insulated storage water cooling tank, refrigerating machine, circulating water pumps, necessary electric controls, valves for automatic operation, all housed in substantial angle iron frame with perforated panels around machine compartment.

(b) Pumps shall be installed as part of system, of turbine type, bronze fitted, direct connected to motor.

(c) Cooling tanks constructed of steel plate, welded, hot dipped galvanized after fabrication, tested for 125 lbs. w.p. having storage capacity of 40 gals., and capacity to cool not less than 100 g.p.h. from 80° to 50°.

(d) Evaporators constructed of extra heavy steel pipe, hot dipped galvanized after fabrication.
(e) Cooling tank to be housed in 22 ga. galvanized container with removable cover and insulated with 2" pure cork board and 1" granulated cork all around with 6" of rock wool on top. All the above to be in detail accord with Model M-40-R as manufactured by Filterine Mfg. Co., Brooklyn, N. Y.

41. SUMP PUMP:

(a) Furnish and install one (1) Pemberthy Model 1M, or approved equal, automatic electric sump pump.

(b) Pump shall be constructed of copper and bronze throughout and shall be equipped with 1/3 HP capacitor type vertical motor and mercury switch controlled by extra heavy copper ball float. Overload protection shall be built into the motor.

(c) Pump shall be of top suction, submerged type, with double shroud impeller and shaft of Tobin bronze.

(d) Provide steel sump cover with proper working clearance for automatic control mechanism.
ELECTRIC WIRING

1. GENERAL CONDITIONS:

All work included under this heading shall be subject to the General Conditions of the entire operation. The sub-contractor for this portion of the work is required to refer especially thereto.

2. SCOPE OF THE WORK:

(a) This specification and accompanying drawings shall be interpreted according to their full intent, whether taken separately or together. Taken together, they shall be deemed to mutually explain each other and to be descriptive of the materials to be furnished and of the work to be performed under the contract.

(b) The building will be of fireproof construction. The floor slabs will be of reinforced concrete construction with steel beams, as shown on the structural drawings. The ceilings will be furred throughout, except Main Testing Lab. and seventh floor, as shown on drawings.

(c) All electric work and material specified and not shown by the drawings, or shown by the drawings and not specified, shall be furnished and performed by the Contractor the same as if fully hereinafter described and shown by the drawings.

(d) Should any error or discrepancy appear in either the drawings or specifications, or in both, the same shall be immediately submitted to the Engineer for correction before proceeding with the work in question.

(e) The symbol lists and standard indications, together with the specifications and written descriptions contained on drawings, shall be the standing guide as to the kind of materials and equipment contemplated. The particular grade or quality of the equipment and materials of the several kinds shall be as hereinafter specified, and in all cases shall be of the best grade of make and manufacture mentioned. Materials or work not directly or indirectly specified and not shown by the drawings but necessary for the complete carrying out of the intentions of both drawings and specifications, or either thereof, shall be understood as implied and shall be furnished and performed by the Contractor, notwithstanding such omission.

(f) The Electrical Contractor shall disconnect machines in the present Materials Testing Laboratory at South Bay of
present Fritz Laboratory. Electrical Contractor shall then carefully dismantle buss bars and store where directed. The above shall be done in accordance with the "Sequence of Operations" as given in the General Conditions. When 4 story addition is ready for electrical work buss bars shall be reinstalled and machines connected as relocated on second floor.

In connection with the demolition of South Bay of present Fritz Laboratory Electrical Contractor shall disconnect, remove or reroute all electrical work.

3. **INSPECTION OF WORK IN PLACE:**

Before submitting a proposal, each bidder shall visit the site and examine the work in the present Fritz Laboratory building and conditions between buildings and on the site, and acquaint himself with the conditions under which the work will have to be performed, and include the cost of all such items in his proposal.

4. **PROCEDURE:**

(a) The work of this contract shall proceed in such order and at such times as required by the progress of the general construction so as not to delay or interfere with the other trades.

(b) The new service transformer and feeders to new building shall be installed in such a manner as not to interfere with the operation of the present Fritz Laboratory.

5. **WORK NOT INCLUDED:**

(a) Public telephone instruments, services, and wiring shall be installed by the Telephone Company, but Electrical Contractor must furnish and install the telephone conduit system and plates and boxes for outlets.

(b) Elevator machine and controller will be furnished, installed, and connected by others under separate contract, but the Electrical Contractor shall provide feeders to controllers, lights, and controls.

(c) The 5,000,000 lb. testing machine motors, controllers, etc. will be furnished, installed and connected by others under separate contract, but Electrical Contractor shall provide feeders to terminate in a junction box just below floor level near the southwest corner of pit. Feeders shall be ample to provide for the following power and light load:
Pump Motor - 50 HP 220 volt -- 3 phase
Crosshead motor - 100 HP 220 volt -- 3 phase
Movable platform - 15 HP 220 volt -- 3 phase

There will be several small motors of 1 HP or less used in conjunction with this machine, but they will operate from 110 V.- A.C.

The Electrical Contractor shall provide conduit and 4 light outlets as directed in testing pit with switch at pit entrance.

(d) The 20 ton Traveling Crane will be furnished and erected by others under separate contract, but Electrical Contractor shall furnish material and do work in connection with Crane as follows:

The trolley will be completely wired, but 3 collector staffs will be removed for shipment. Electrical Contractor shall connect 22 wires to the collector shoes on the 3 staffs.

A junction box is mounted on the end of bridge walkway nearest the runway collectors. A conduit with 3 power wires from junction box to the main collector staff will be furnished for crane by crane manufacturer, but same is removed for shipment. Electrical Contractor shall install conduit and make 6 electrical connections. Another conduit will be furnished with 8 wires from the above junction box to the collector wires for main hoist motor and limit switch. This shall be put in place by Electrical Contractor and 16 connections made.

On opposite end of bridge platform another junction box will be installed and a conduit runs to the 14 collector wires for auxiliary hoist motor, limit switch and trolley wire. Electrical Contractor shall make 28 electrical connections.

The Electrical Contractor shall furnish and install the 3 wire collector system complete with bracket insulators and end ties for the entire length of Main Testing Laboratory, and also the 220 V. - 3 phase power feeders to the system. Feeder shall be 00 type RH wire. A suitable 3 pole 225 ampere frame circuit breaker with 150 amp. thermal trip shall be installed to disconnect the power from collectors. Size of motors for crane will be: Crane travel 7-1/2 HP, trolley travel 5 HP, Main Hoist 25 HP, auxiliary hoist 15 HP.
6. **APPROVAL OF DETAILS:**

   (a) The method of construction and all details of workmanship which are specifically described in the specification or shown on plans shall be done in a manner satisfactory to the Engineer, whose approval or disapproval of any detail of the work of the contract shall be considered final.

   (b) The Contractor shall furnish and submit to the Engineer for approval detailed drawings of all switchboards, distribution boxes, public telephones and low tension system, and fire alarm wiring.

   (c) The Engineer reserves the right to make reasonable changes when drawings are submitted for approval without affecting the contract in any manner. Upon approval, sufficient copies of these drawings shall be issued by the Electrical Contractor for distribution. The approval of such drawings does not waive the provisions of this contract.

7. **MEASUREMENTS AT THE BUILDING:**

   (a) Before proceeding with any part of his work, the Contractor shall layout all work, make and take all levels and measurements necessary for the perfect and complete assembling, building, and installing of the work for which he has contracted, and shall be held responsible for the accuracy of all measurements, levels, etc., taken or made by him.

   (b) The Contractor shall take all necessary measurements, levels, etc., at and in the building to insure the perfect fitting of his work where same joins or connects with the work of other contractors. This Contractor shall study the drawing of all other trades, confer with contractors for other trades, and so arrange his work that there will be no interference.

   (c) Should it appear that any of the work as described in the specifications or as shown by the drawings are not sufficiently detailed or explained, the Contractor shall apply to the Engineer for such further drawings, details, or information as may be necessary for a full understanding and interpretation of the work in question, and shall conform to such additional detail explanation as far as same is consistent with the original drawings.

8. **MATERIAL AND WORKMANSHIP:**

   (a) All work described in these specifications or shown by the accompanying drawings and all work necessary to complete
the finishing of any work so described or shown shall be executed in a thorough, substantial, and workmanlike manner. All materials shall be of the highest grade or quality of the several kinds and makes herein specified or shown by drawings, and all work of every kind shall be delivered upon the completion of the building in a perfect and undamaged condition, free of flaws or defects.

(b) The Contractor shall also close all pipe openings, etc. with the proper caps and fittings to prevent obstructions in same or damage to same of any kind while the building is in course of construction.

(c) All damages of each and every kind resulting from the neglect or refusal of the Contractor to properly protect his work, material, fixtures, apparatus, machinery, etc., at all times during the erection, construction, and completion of the building shall be made good by him.

9. CUTTING, PATCHING AND EXCAVATION:

(a) The Contractor shall so lay out his work to conform to structural and architectural drawings to avoid unnecessary cutting. Conduit for feeders, circuits, and controls shall be installed before slabs are poured.

(b) The Contractor shall carefully watch the progress of mason and concrete work and shall be responsible for the proper location and dimensions of all openings required for his use.

(c) Where special chases, holes, or other provisions are necessary for electrical work, the Contractor must so indicate and arrange for same during the construction of building before slabs are poured or walls and partitions are built.

(d) Any cutting of slabs, fireproofing, walls, or partitions required for the installation of electrical work will be done by the General Contractor at the expense of the Electrical Contractor.

(e) All excavation and backfilling shall be done by the Electrical Contractor. Roads and openings in street shall be repaired as a part of this contract. All sod shall be carefully removed and replaced.

10. INSPECTION, CERTIFICATES, ETC.:

(a) All state and local rules and regulations, and require-
ments of National Board of Fire Underwriters and National Electric
Code, applicable to the installation of this equipment, shall be followed as a part of this contract. The Contractor shall obtain all permits and give notice to the various national and state departments having jurisdiction when ready for inspections, and all certificates of approval issued by the departments or other bodies must be delivered to the Engineer before final payment on the contract is made.

(b) Any approvals or temporary certificates required on temporary work, or during the process of construction, shall be procured and paid for by the Contractor.

11. DISTRIBUTING SYSTEM:

(a) The switchboard shall be connected to the secondaries of the transformers through fused safety switches.

(b) From the main switchboard run three or four wire, three phase, 60 cycle, 120/208 and 220 volt feeders, as required, for power and light to the main light and power distribution boxes in the building.

(c) From the light and power distribution boxes, feeder and circuits shall be run as indicated on the drawings to all light and power outlets and apparatus shown on the drawings and described hereinafter.

12. MAIN SWITCHBOARD:

(a) Contractor shall furnish, install, and completely wire the main switchboard with switches and breakers.

(b) The switchboard shall be of the dead front, totally enclosed steel type.

(c) Switchboard shall consist of the necessary number of #10 gauge stretcher-leveled steel panels, formed in dies with round corners to as to give an effective thickness of 1" and of sufficient size to accommodate without crowding all the equipment required.

(d) At the rear of the board, provide the necessary number of steel doors to permit easy access to back of switchboard.

(e) Switchboard shall be complete with a rigidly constructed angle iron frame, and the entire switchboard shall rest on a 6" channel sill at both front and rear, set in floor properly leveled for mounting of the frame work.
(f) Lighting feeders shall be provided with Safety-Fuse unit switches and power feeders shall be controlled and protected by 3-pole circuit breakers.

(g) Each safety-fuse unit shall be enclosed in a steel housing, with hinged door having an indicator showing "on" and "Off" positions. In each housing there shall be mounted a molded base on which the shielded contacts and lugs shall be mounted, ready for connection to bus bars and circuit wires. On the door likewise shall be mounted a molded base on which shall be mounted rigid double break contact blades and N.E.C. fuse clips. The door of each steel housing shall be so designed that when same is opened the switch unit shall automatically fall to the "Off" position, disconnecting the fuses both from the line and load. To close the switch unit it will be necessary to raise the molded switch unit by the handle attached to same, which extends through the cover of the door, to the "On" position, which pushes the door closed. Means shall be provided in door so that the fuses can be tested without opening the door. Hinges shall be of the heavy piano type. Provide Economy, or equal, renewable cartridge fuses.

(h) Switch units shall be mounted to the switchboard frame work and not to the steel face plates.

(i) The circuit breakers shall be of Westinghouse, or equal, dead front type with overload, coil in each phase, time limit and non-closable features. Circuit breakers shall have extended control handles for operating from front of board and to be covered by steel face plates, set for capacity of feeder.

(j) The design of the switchboard connections and the construction of the wiring system at the switchboard shall be such as to make the least complications of crossings, and present a neat, workmanlike appearance. The bus bars shall run in as open, straight, and simple manner as possible and be independently supported from the switchboard frame upon insulators resting on heavy wrought iron braces.

(k) The feeders shall be carried in conduit to a pull box above the switchboard and extended to their proper locations for connection to bars and busses.

(l) The connections to the busses by the cables shall be in heavy milled copper lugs. The contact portion of the joints shall be thoroughly tinned, and all exposed parts of the busses, rods, and lugs cleaned.
(m) Extend copper connection bars from the switch and circuit breaker studs to the feeder cable lugs under transfer box at the top of the board, and to within 12" of finished floor for cables entering from below, full height of board. All connection bars shall be fastened to fibre or composition insulating bars for support and electric clearance.

(n) Cover any parts of bus bars, rods, or other connections with heavy cord as directed.

(o) Furnish, erect, and connect up complete, over the entire length of switchboard, a pull box of ample capacity to provide for the introduction of all light and power feeder cables. The cable shall have asbestos tape covering over the specified insulation and be mounted on porcelain insulators and supports to permit the transfer of cables therein to their proper busses and connection bars on the board below. Box shall be heavy black iron, not less than #10 ga., securely held together and braced. Bottom of box shall be 1" slate drilled for cables passing through same. There shall be ample access doors on front, and rear bottom of box so that any portion of this box can be reached quickly.

(p) All steel work shall have a dull black finish.

(q) A bakelite nameplate, properly engraved, shall be furnished for each piece of apparatus on the switchboard.

(r) Switchboard shall be manufactured by Westinghouse, or approved equal.

13. SWITCHBOARD CONNECTIONS:

The power and light feeders shall be brought through the main pull box above the switchboard and connected to lugs on the straps from the switchboard. All feeders in pull boxes shall be neatly arranged and independently supported on insulators, mounted on steel angle iron or bars. All connections to lugs shall be soldered, wiped, and neatly arranged.

14. DISTRIBUTION SYSTEM:

Secondary feeders from the transformers to the switchboard shall be run in rigid galvanized conduit as indicated.

15. PANEL BOARDS:

(a) Panel boards shall be furnished and installed in panel board closets on each floor at the points shown on the floor plans.
(b) The branch circuits, except as hereinafter specifically mentioned or shown on plans, shall be connected to panel board busses through single pole, no fuse, automatic thermal overload switches, of Westinghouse, or approved equal, manufacture. The lighting breakers shall have 30 ampere capacity with overload release set for 15 amperes, except where high capacities are required for motor circuits. Two pole switches of the same type shall be provided where 3-wire circuits are required.

(c) Each branch circuit connection in all panels shall have a number recessed in the breaker cover and filled with black enamel.

(d) Forged or cast copper tube lugs shall be furnished for each conductor in each leg of each feeder or main connecting to panel. All lugs shall be finished to match the bus bars and shall be secured to the bus by stud bolts; two bolts shall be used for all lugs for conductors 2/0 and above in size.

(e) Panel boards and boxes shall be as made by Westinghouse, or an approved equal.

16. DIRECTORIES:

In each power and light panel, furnish and install small scale drawings of the floors served with numerals to indicate the number of each circuit to which a light outlet or motor is connected. Numerals shall correspond to the numbers on the switches. Drawings shall be mounted in frames under glass.

17. CONDUIT:

All feeders, sub-feeders, circuits, telephone wires, and low potential wiring shall be run in conduits not smaller than the sizes indicated or specified by the N.E.C. All conduit shall be made of the new standard weight galvanized mild steel pipe, gas pipe size, and shall be of Walker "Sheraduct", or approved equal, make. All fittings shall be of the same make as conduit.

18. INSTALLATION OF CONDUIT:

(a) All circuiting in the new building, except where specifically omitted, shall be installed with rigid conduit.

(b) No conduit shall be smaller than the size specified or indicated, but all conduit shall be of such size and so installed that the required conductors may be drawn in and withdrawn without injury or excessive strain. No more than
three #14 or two #12 Bts conductors shall be installed in a 1/2" conduit; five #14 or four #12 B. & S. conductors in a 3/4" conduit. No conduit shall be less than 5/8" inside diameter. Branch circuits and home runs shall be installed on forms and poured into the slabs.

(c) All conduits shall be held in place by galvanized E-Z, insulated bushings and lock nuts where they enter panel boxes, pull boxes, support boxes, or outlet boxes.

(d) All conduit ends shall be carefully reamed after threading and kept corked and dry during construction, using approved conduit plugs. All conduit lines shall be kept dry and clean and shall be swabbed out before wires are pulled into them.

(e) Approved pipe bending devices shall be used in making bends in conduit, and any conduit which is crushed, deformed, or otherwise injured shall not be installed.

(f) All unions in conduit shall be made with R and L couplings or Erickson joints, and in no case shall running threads be used. All joints shall be made with red lead placed or male thread.

(g) The Contractor shall use particular care in erecting all exposed conduit. All conduit shall be concealed except in ceilings of seventh floor, pent houses, and Main Testing Laboratory. All exposed pipes and iron work connected therewith shall be run parallel and square with the building walls and present a neat and workmanlike appearance. Where several pipes occur together, they shall be run parallel and shall be equally spaced and connected with coundulet fittings.

(h) All conduit runs shall be installed to avoid proximity to steam and hot water pipes, heaters, etc. No conduit shall be run within 3" of such pipes or heaters, except where crossings are unavoidable. Where such crossings are necessary, the conduit shall run at least 1" from the covering of the pipe or heater.

(i) A spare conduit shall be installed parallel to the telephone conduit for later installation of an inter-office communication system. Outlet boxes shall be adjacent to telephone outlets and covered with a blank plate. This conduit shall connect both office sections and should have outlets on the walls near the large testing machine and Amsler equipment. There shall be outlet boxes for a call-signal system or loud speaker system about 20 ft. above the floor in both test areas. These boxes shall be common to this additional conduit system. The conduit shall be of sufficient size to allow later installation of buzzer system also.
19. PULL BOXES:

(a) Pull boxes shall be installed at the points shown and at other points where required to facilitate the pulling of cables or wires. These boxes shall be constructed with \#14 gauge sheet iron, riveted and braced with angle irons. Each box shall be provided with a removable cover, stiffened with angle irons and secured with brass machine screws. Feeders shall not be pulled through more than one 90 degree bend without a pull box. Conduit bushings shall be insulated.

(b) Cables in all pull boxes shall be independently supported on insulated hangers to remove all stain from conduit bushings.

20. OUTLET BOXES:

(a) At each electric outlet shown, specified, or required, the Contractor shall install an outlet box. These outlet boxes shall be hot dipped galvanized iron.

(b) All outlet boxes for ceiling fixtures shall be 4" in size and 3" deep with flanged covers, set to come flush with the plaster on the hung ceilings, unless otherwise specified.

(c) All outlet boxes for wall brackets shall be 31/4" square and 11/4" deep with French cover for bracket outlets. Bracket and ceiling outlets shall be furnished with approved four-bolt malleable iron fixture studs, except where lamp receptacles are indicated.

(d) All outlets, boxes, and fittings under ducts, at motors, or unfinished walls and elsewhere, as directed, shall be Crouse-Hinds conduit, W&V fittings or Veco fittings. Boxes which occur in furred ceilings shall be anchored to the slab above or to the ceiling angles and supported independently of the conduits. Ceilings in the Main Testing Laboratory and seventh floor will not be furred.

(e) No exposed wires will be permitted between conduits and motors, starters, switch boxes, or other equipment. Connections at motors shall be made thru Greenfield from conduit to motor terminals to prevent transmission of sound and the movement of the motor.

21. LOCATION OF OUTLET BOXES:

(a) The drawings furnished herewith shall not be used to determine the exact location of outlets in finished halls, rooms, etc. The Contractor shall obtain these locations from the Engineer or from scale drawings of interior details and finish. When the interior finish, paneling, or woodwork is erected, the Contractor shall make any necessary adjustment of his work so that the outlets shall be properly centered. All local switches near doors shall be located at strike side of doors as finally hung, whether so indicated on the contract plans or not.
(b) In centering outlets, the Contractor is cautioned to allow for overhead pipes, ducts, etc., and for variation in arrangement and thickness of fireproofing, furred ceilings, lathing, and plastering; also for window trim, paneling, etc., and any unsatisfactory locations resulting from failure to do this shall be corrected by the Contractor without expense to the Owner or other Contractors.

22. INSTALLATION OF OUTLET BOXES:

(a) All outlet boxes shall be anchored securely to the building construction.

(b) All outlets shall be erected in advance of furring and fireproofing and shall be substantially secured to the wall or slab.

23. WIRES AND CABLES:

All wires or strands of feeders and circuits shall be of soft drawn commercially pure annealed copper, round and free from flaws or surface imperfections. They shall be equal in all particulars to the General Cable Cambric insulated wire with a relative conductivity of 98% with coded fire and moisture resisting braid, of Habirshaw, General Cable, Okanite, or approved equal, manufacture. Service feeders shall be insulated with varnish cambric for 6,000 volts.

24. LEAD SHEATHING:

Outside feeders and all wires and cables which extend to outlets located on the outside surface of building, where run under basement floor, and where run in floor or slab in roof construction, shall be sheathed with a standard thickness of commercially pure lead.

25. BRANCH CIRCUITS:

(a) Branch circuits shall be run as shown on the plans. In general these branch circuits in the new building shall be run as indicated on the drawings to panels on each floor. All circuits, unless otherwise shown or specified, shall be #12 B. & S. single conductors with all legs of each circuit in one conduit.

(b) Circuits to special outlets shall be of the proper size for the outlet capacity required.
26. INSTALLATION OF WIRES AND CABLES:

(a) Feeders, sub-feeders, circuits, and conduits shall be installed of the sizes shown on plans or specified.

(b) No wire shall be drawn into conduit until all work of a nature which may cause injury is completed. Powdered soapstone only may be used as a lubricant where necessary. Except where otherwise indicated on the plans or specified, no more than the conductors constituting a single circuit or branch shall be drawn in one conduit.

(c) Where two or more circuits run to or through a single outlet box, each circuit shall be tagged with linen tags as a guide to the fixture contractor in marking fixture connections. All feeders and mains shall be tagged in all pull boxes and in the gutter of all panels to which they connect. Such tags shall be of linen with the feeder stamped thereon. All branches and circuit ends in outlet boxes shall be soldered.

(d) All wire above #8 shall be stranded. All stranded feeders shall have a double braid and shall have coded colors.

27. MOTOR CONNECTIONS:

(a) The power wiring to the motors shall be as indicated, all motors being connected complete with proper direction of rotation. The starting devices for all motors, will be furnished and set by others, but the Contractor shall connect complete all starting devices and all motors excepting those for the elevator and 5,000,000 lb. testing machine. Where remote or automatic controls and special controls are indicated, this Contractor shall provide the necessary control wires to starters, controllers, and remote control switches.

(b) Approved fittings shall be used at all motors and controllers, so arranged that no wire will be exposed and to present a neat, workmanlike appearance.

(c) Motor switches of the recessed automatic breaker type shall be furnished and installed at all motors by the Electrical Contractor.

28. SWITCHES:

Wall switches for all rooms as shown on the floor plans shall be of a flush enclosed specification grade, toggle type with face plates of brown Bakelite finish. The operating levers shall be of bakelite or other approved composition. Minimum rating for switches shall be 20 amperes.
29. **RECEPTACLES:**

(a) All wall receptacles, unless otherwise indicated, shall be of the 10 ampere capacity, of a composition top connected type, set in steel boxes with plates flush with the plaster. They shall be of the heaviest 10 ampere pin plug type manufactured by Bryant, Hubbell, General Electric, or equal.

(b) All receptacles shall be furnished with composition plugs with as small a projection as possible. All plates shall be of .06 brass with dull chromium finish.

(c) Heavy duty receptacles, where required, shall be of the same manufacture of heavy construction with special plugs as approved for the duty required.

(d) Receptacle outlets shown on plans shall be connected to circuits separate from circuits serving ceiling outlets.

30. **ELEVATOR LIGHTS:**

(a) An outlet for the elevator lights shall be installed at the center of elevator shaft, with #12 B. & S. wire. It shall be set at the center of the shaft at a point approved by the Elevator Contractor and left with bushed junction box for connection to the elevator travelling cables.

(b) Two circuits shall also be provided in the pent house as required by the Elevator Contractor for signals, pushes and annunciator.

(c) All wiring to these boxes shall be pulled in under this contract, but connection to the car will be made by the Elevator Contractor.

31. **CLOCKS:**

Contractor shall furnish and install 110 volt, Standard time clocks. The clocks shall be of the Standard Time Company manufacture, set flush with boxes for 12" dials, and brushed aluminum finish frames. Clocks shall be located as shown on drawings.

32. **FIRE ALARM SYSTEM:**

(a) At each of the points indicated, the Contractor shall furnish and install a Code ringing pull lever flush type fire alarm station to operate two 8" gongs.
(b) The fire alarm system shall be of the closed circuit, A.C. type, complete with control board, test lamps and bells, etc.

(c) All wires shall be run in galvanized iron conduit as specified for feeders.

(d) All equipment shall be of the Standard Time Company manufacture, or approved equal of design approved by the Engineer.

(e) All equipment and wiring shall be approved by the Engineer before it is installed. Submit plans showing all wiring for approval.

33. PUBLIC TELEPHONE SYSTEM:

(a) Furnish and install steel cabinet, boxes and wall outlets, conduits, box cover, etc., as required for public telephone and shop drawings for same, which must be approved by the Telephone Company before any work is begun. Conduits shall be provided for station indicated in the building.

(b) For desk telephones, locate the outlets just above the baseboards and finish with chromium plated brass plate. Floor outlets shall be approved type projecting above floor.

(c) For wall telephones, locate the bottom of the outlet approximately 56" above the level of the floor.

34. TESTS:

All electric wiring shall be tested by the Contractor in the presence of the Engineer's representative.

35. PAINTING:

(a) All conduit, hangers, switchboard braces, boxes, connection boxes, and all exposed work which is furnished and installed under this specification shall be cleaned and primed by the Contractor.

(b) The final coats of paint will be applied by the General Contractor.

36. TEMPORARY WORK:

(a) Temporary connections will be provided from the present power and light company service as required to provide
temporary service to the site.

(b) For temporary light and power in the Contractor's construction office and in the building the Contractor shall furnish and install temporary meter in a suitable shelter. Furnish and install a temporary three-wire lighting riser in conduit in the stairways with switch and fuse at each landing.

(c) From these fuses, install temporary wiring along all corridors with lamp receptacles located 20'-0" on centers. Provide temporary lights in each room which does not have an outside window.

(d) Furnish and install two 50' trailers with composition receptacles for temporary light, as directed.

(e) All temporary wiring shall be maintained by the Electrical Contractor during the life of the job. Light bulbs shall be provided by the General Contractor or Contractor requiring light.

37. **LIGHTING FIXTURES:**

The Electrical Contractor shall furnish, hang and connect all lighting fixtures. The fixtures shall be furnished as scheduled on plans including all fluorescent tubes and lamps.

38. **UNIT PRICES:**

Electrical Contractor shall name in his proposal one price for any additions to or deductions from the original layout for the respective materials and labor named below for installing and wiring:

- Price for wall plug receptacle and box complete.
- Price for single pole, flush wall switch, with outlet box.
- Price for Three-way, flush wall switch, with outlet box.
- Price for ceiling or wall outlet box.
- Price for switch outlet box.
- Price for floor box with receptacle.
- Price for floor box without receptacle.
39. **ELECTRICAL SERVICE:**

The present three (3) 75 KVA power and three (3) 15 KVA lighting transformers in the Transformer Building on the north side of the present Laboratory shall be removed and replaced with three (3) new 100 KVA transformers for power and three (3) new 37-1/2 KVA transformers for lighting. Removed transformers shall remain the property of Lehigh University and shall be stored at the Campus Warehouse.

Transformers shall be three (3) single phase 2400/4160 volt primary voltage, and secondary voltage for power shall be 240 volt, 60 cycle. Power transformers shall be equipped with four (4) 2-1/2% taps.

Lighting transformers shall be three (3) 37-1/2 KVA single phase, primary voltage 2400/4160; secondary voltage 120/240 volt.

The incoming underground primary cable is connected to a 100 amp, 5 KV; General Electric Co. oil fuse cutout with fuse links. Four (4) #4, 7500 volt conductors shall be connected thru above oil fuse cutout, thence to form the primary bus of the two (2) transformer banks. The secondary three phase power run size or capacity shall be determined by the electrical contractor and shall be extended thruout the new addition, as indicated on the drawings to the new switchboard.

All wiring, fittings, and primary fuses shall be checked to conform to the transformer capacity.

All necessary rewiring, such as connecting existing three (3) phase power and lighting bus duct and conduit for lighting shall be connected to the new secondary bus. Do all other necessary rewiring where required to complete the new installation.

Contractor shall leave intact the existing bus duct which supplies power and lighting to the existing Fritz Laboratory.

A new 3 phase, 240 volt, 3 wire secondary at the transformers shall be provided and extended in conduit to the new switchboard in the Laboratory Extension. Provide a 3 wire 120/240 volt secondary for the lighting installation terminating at the switchboard.

From the main switchboard power and lighting shall be distributed thruout the entire building.

All equipment for electrical services shall be subject to the approval of the Engineer, and in accordance with the National Board of Fire Underwriters.
AUXILIARY STEAM SUPPLY

1. SCOPE:

Contractor shall furnish and completely install the following auxiliary steam supply for domestic hot water and air conditioning equipment to be used for the three months summer period when main Power House is shut down. The equipment is to be located in the southwest corner of present old power house adjacent to steam tunnel entrance.

2. STEAM BOILER:

Steam boiler shall be 5000 sq. ft. steam capacity - Spencer Type 4M50 steel boiler for oil burner installation complete with #11 induced draft fan and 12" diameter steel stack carried above roof.

3. OIL BURNER:

Contractor shall furnish and install Petro, Electrol, or approved equal oil burner complete with all controls, and two (2) 275 gallon fuel oil tanks located as directed in present building.

4. STEAM AND RETURN RISERS:

Contractor shall run two (2) direct 3" risers and 2" returns from boiler to Patterson-Kelley hot water units located in Pent House of four story bay and air conditioning room of seven story bay. Piping shall be properly valved to supplement main steam system. Pipe, pipe covering, and painting shall be as specified under Heating, Air Conditioning, and Ventilating.
DEMOLITION, ALTERATIONS AND SALVAGE

1. GENERAL NOTE:

The General Conditions apply to and form a part of the specifications under this heading.

2. SCOPE:

(a) The Contractor shall demolish south bay of present Fritz Laboratory including wall, partitions, concrete floors, structural steel, roof, electrical work, plumbing, etc. Electrical Contractor shall remove or relocate all electrical work as required. Plumbing Contractor shall remove or reroute all piping as required. The above work shall be done in strict accordance with "Sequence of Operations" as called for in General Conditions and shall in no way interfere with the operation of present Fritz Laboratory.

(b) The Contractor shall salvage usable material as directed by the Engineer and store where directed for Owner's future use.

(c) The Contractor shall remove or reroute piping, etc. required for the construction of mezzanine for temporary quarters at north bay of present Fritz Laboratory.

It is intended that present buss bar arrangement supplying machines in this bay remain intact with the exception of support brackets which shall be rearranged by Contractor as required. Lighting fixtures in present Machine Shop shall be rehung from new mezzanine floor construction and conduit rearranged as required.

The construction of this mezzanine shall be planned for a minimum shutdown of Machine Shop facilities and in accordance with drawing #LU 11.