

## SECTION 15801 - GENERAL SPECIFICATIONS FOR AIR CONDITIONING WORK

### A. GENERAL

#### 1. RELATED DOCUMENTS

- 1.1 Drawings and general provisions of the Contract, including the General Conditions, the Supplementary General Conditions, the Special Conditions, the Supplementary Special Conditions and all Division -1 Specifications sections, apply to the Work of this Section, and the other sections of Division 15.

#### 2. DEFINITIONS

- 2.1 “The Contractor” means specifically the Sub-contractor working under his respective section of these specifications.
- 2.2 “Provide” means to supply, erect, install and connect up in complete readiness for regular operation the particular work referred to.
- 2.3 “Piping” includes, in addition to pipe, all fittings, valves, hangers and other accessories related to such piping.
- 2.4 “Concealed” means hidden from sight as in chases, furred spaces, shafts, hung ceiling or embedded construction.
- 2.5 “Exposed” means concealed as define above. Work in trenches, crawl spaces and tunnels shall be considered “exposed” unless otherwise specifically noted.
- 2.6 “Law and Ordinances”, as used herein shall mean local codes, laws, ordinance, standards, rule or regulations of any nature which are in any way pertinent to or regulatory over the work covered by this section of the specifications.

#### 3. SUMMARY AND INTENT

- 3.1 It is the intention of the work specifications and drawings to call for finished work, tested and ready for operation all materials, equipment and apparatus shall be new and first class quality.
- 3.2 Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications or vice-versa, or any accessories or minor details not shown but necessary to make the work complete and perfect in all respect and ready for operation, even if not particularly specified, shall be provided by the Contractor without additional expense to the Owner.
- 3.3 With submission of bid, the Contractor shall give written notice to the Architect and/or Engineer of any materials, apparatus or omissions believed to be in violation of laws, ordinance, rules or regulations to authorities having jurisdiction.

In the absence of such written notice, it is mutually agreed that the Contractor shall include the cost of providing all systems in accordance with applicable regulations without extra compensation.

- 3.4 The plans and specifications are complementary to each other, so that material and workmanship indicated for or implied by one and not by the other, shall be supplied and installed as through specifically called necessarily showing in detail or to scale all of the minor items. It shall be the responsibility of the bidders to review and make themselves completely familiar with all architectural, structural, electrical and mechanical drawings and to adjust his work to conform to all conditions indicated on them. Failure of the bidder to fully inform themselves of all conditions and to include in their proposal a sum to cover the same sufficiently, shall not entitle them to an extra.
- 3.5 All items not specifically mentioned in the specification or in the drawings, but which are necessary to make a complete working installation shall be include in the bidder proposal. Failure of the bidders to do so will not entitle them to an extra.

#### 4. INTERPRETATIONS OF DRAWINGS AND SPECIFICATIONS

- 4.1 Any questions or disagreements arising as to the true intent of these specifications or the drawings or the kind or quality of work required, thereby shall be decided by the Architect and/or Engineer, whose interpretation thereof shall be final but subject to appeal as prescribed by the General Conditions.
- 4.2 The specifications and the drawings are intended to be in agreement with each other and to be mutually explanatory. However, they are also intended to be complementary and any work or material called for by either, shall be performed and/or provide as faithfully as if called for by both.
- 4.3 In cases of disagreement between the drawings and the specifications or within either document itself or between one trade and another, the better quality, greater quantity or more costly work shall be include in the contract price, and the matter referred to the Architect's and/or Engineer's attention for decision and/or adjustment.

#### 5. CONTRACTOR'S PROPOSAL

- 5.1 The Contractor's proposal must cover all items on the drawings and in the specifications exactly as drawn and specified based only on the manufacturers listed.
- 5.2 If the Contractor proposes substitution of the equipment of other manufacturers than those specified, he shall attach to his base bid an itemized list of substitutions. Directly opposite of each item, he shall indicate the amount to be added to or deducted from his base bid, if his proposal is accepted. In all instances, such request shall be accompanied by all complete descriptive theory literature and performance data. Failure to furnish that the Contractor agrees to provide all items

exactly as drawing and specified. The information given by each Contractor in the above itemized list will in no way affect the determination of low bidder.

## 6. QUALIFICATIONS FOR BIDDERS

- 6.1 Examine drawings relating to work of all trades and become fully informed as to extent and character of required and its relation to all other work in project.
- 6.2 Before submitting bid, Contractor shall visit the site and examined all spaces conditions. He shall report to the Architect any condition which might prevent him from installing his equipment in the manner intended.
- 6.3 No consideration or allowance will be granted for failure to visit site or for any alleged misunderstanding of materials to be furnished or work to be done; it being agreed that tender of proposals carriers with it agreement to items and conditions referred to herein or indicated on aforementioned drawings.

## 7. SUBMITTALS

### 7.1 SHOP DRAWINGS AND SAMPLES

- 7.1.1 Prior to delivery to job site, but sufficiently in advance to allow Architect and/or Engineer ample time for review, Contract shall submit for approval five (5) copies each of shop drawings of all equipment, materials, piping, ductwork, and wiring, and further obtain written approval for same before installing any of these items.
- 7.1.2 Shop drawings shall consist of manufacturer's certified scale drawings, cut or catalogs, including descriptive literature and complete certified characteristic of equipment, showing dimensions, capacity, code requirements, motor and drive testing, as indicated on the drawings or specifications.
- 7.1.3 Certified performance curves for all fans and water pumping equipment shall be submitted for approval.
- 7.1.4 A sample of materials or equipment, when requested by the Architect and/or Engineer shall be submitted for approval.
- 7.1.5 Samples, drawings, specifications, catalogs, etc., submitted for approval, shall be properly labeled, indicating specific service for which material or equipment is to be used, section and article number of specifications governing, Contractor's name and the name of the job.
- 7.1.6 Catalogs, pamphlets or other documents to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc., of item submitted will be clearly made in ink. Data of a general nature will not be accepted.

- 7.1.7 Approval rendered on shop not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that the drawings have been checked in detail. Said approval does not, in any way, relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.
- 7.1.8 Failure by the Contractor to submit shop drawings in ample time for checking, shall not entitle him to an extension of contract time and no claim for extension by reason of such default will be allowed.
- 7.1.9 Approval rendered on shop drawings for any material, apparatus, devices, and layouts, shall not relieve the Contractor from the responsibility of furnishing same of proper dimension, size, quantity, quality, and all performance characteristics to efficiently perform the requirements and intent of the contract drawings. Such approval shall not relieve the Contractor from responsibility for errors of any sort on the shop drawings. The Contractor shall notify including the reason for the deviation.
- 7.1.10 Shop drawing scale 1/4"=1'-0" minimum shall be submitted for approval for all ductwork, pipe runs, inserts, sleeves, etc., before work is performed.

## B. PRODUCTS

### 1. EQUIPMENT AND MATERIAL

- 1.1 Furnish and install were indicated on the drawings of all equipment hereinafter specified or shown on the drawings or specifications.
- 1.2 Capacities of equipment shall be as specified on the drawings or specifications.
- 1.3 Equipment construction standard shall be as follows: Pressure vessels shall be constructed in accordance with ASME Code; all electrical equipment shall be listed and approved and conform to be latest edition of the NEC; piping, materials, fittings, valves and accessories shall be constructed in accordance with the latest ASTM and ASME Standards for class of work involved. All the equipment and materials shall be new.
- 1.4 All component parts of each item of equipment or device shall bear the manufacturer's nameplate, giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Sub-Contractor or distributor will not be acceptable.
- 1.5 All materials and apparatus required for the work shall be new, or first-class quality and shall be furnished, delivered erected, connected and finished inn every detail and shall be so selected and arranged as to fit properly into the building

spaces. Where no specific kind or quality material is given, a first-class standard article as approved by Architect and/or Engineer shall be furnished.

1.6 All item of the same type shall be of the same manufacturer.

## 2. SUBSTITUTIONS

2.1 Substitutions of material and equipment of brands other than specifically named on the drawings and in the specifications and as provided for in the above paragraph will be approved by the Architect and/or Engineer for the following reasons only:

2.1.1 That the material or equipment proposed for substitution is equal or superior to that specified and that the material or equipment called for on the drawings or in the specifications cannot be delivered to the job in time complete the work in proper sequence to the work or other Contractors, due to conditions beyond control of the Contractor.

2.1.2 To receive consideration, request for substitutions must be accompanied by documentary proof of equality difference in price and delivery, if any, in the form of certified quotations from suppliers of both supplied and proposed equipment. In case of a difference in price, the Owner shall receive, in the form of a credit, all benefit of the difference in cost involved in any substitution.

2.1.3 Should a substitution be approved under the foregoing provisions and should the same subsequently prove to be defective or otherwise unsatisfactory for the service for which it was intended, the Contractor shall, without cost to the Owner and without obligations on the part of the Architect and/or Engineer, replaced the same with the material originally specified.

2.2 Where a Contractor's proposal is accepted to used an item of equipment other than that specified or detailed on the drawings and which required any redesign of structure, partitions, foundations, piping, wiring or of any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and details required thereof shall, with the approval of the Architect and Engineer, be prepared by the Contractor at his own expense.

2.3 Where such approved deviation requires a different quantity and arrangement of duct work, piping, wiring, conduit and equipment from that specified or indicated on the drawings, subject to approval of the Architect, the Contractor shall provide any such duct work, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional equipment required by the system at no additional cost to the Owner.

## C. EXECUTION

### 1. SYSTEM INSTALLATION

- 1.1 The installation of systems described in these specifications and plans will be performed by experienced personnel in this type of work, under the supervision of competent foremen and in accordance with the recommended practices of the ASHRAE and those of the manufacturer of the equipment and the materials involved, to obtain not only a functional installation but a neat installation.
- 1.2 Architect shall have privilege of stopping any work or use of material that in his opinion is not being properly installed and Contractor shall remove all materials delivered, or work erected, which does not comply with contract drawings as directed by the Architect at no additional cost to the Owner.
- 1.3 Before installing ductwork and/or piping, check plumbing, electrical, architectural and structural drawings against the drawings of the contract and make accurate layouts of ductwork and/or piping.
- 1.4 Where interference may appear and departures from indicated arrangement are required, this Contractor shall consult with the other trades involved and come to an agreement as to change locations and elevations for the ductwork and/or piping and shall obtain approval from the Architect and/or Engineer for the proposed changes.
- 1.5 Foundations and supports for all equipment in this Contract shall be furnished by this Contractor, unless otherwise noted on the plans, as required or as recommended by the manufacturer of each piece apparatus.
- 1.6 The Contractor shall locate, layout and install all holes and sleeves in walls, ceilings, floors, etc., necessary for the installation of his work. The Contractor shall cooperate with the Contractors of the other divisions, giving due and proper notifications regarding all such work.

### 2. EQUIPMENT INSTALLATION

- 2.1 Equipment shall be installed as indicated and in accordance with the manufacturer's installation recommendations. Equipment shall fit into spaces assigned.
- 2.2 Installation which will cause maintenance or operation problems shall be avoided. Items that may require removal for servicing shall be installed with adequate clearance, so as not to require the removal or damaging or other items or their insulation to permit their own removal. Equipment requiring inspection or service shall be accessible. Access doors shall be installed in mechanical equipment as required and as indicated.

- 2.3 Piping and specialties which are required for the proper completion of work, but which are not indicated, shall be provided as required or as recommended by the manufacturer of the equipment served. Offsets, connections and take-off in piping shall be made within fittings.
- 2.4 This Contractor shall investigate each space through which equipment must move. Where necessary, equipment shall be shipped from the manufacturer in crated sections of a size suitable for moving through the restricted available spaces. This shall apply to all equipment whether specified or indicated to be provided "knocked down" or not.

### 3. LAWS, ORDINANCES, PERMITS AND FEES

- 3.1 The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawings and documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on drawings and/or specified.
- 3.2 All materials furnished and all work installed shall comply with the rules and recommendations of the National Board of Fire Underwriters, with all requirements of local utility companies, with the recommendations of the Fire Insurance Rating Organization having jurisdiction and with the requirements of all governmental departments having jurisdiction. Cases of discrepancy between the respective requirements shall be referred to the Architect for decision.

### 4. COORDINATION OF TRADES

- 4.1 The Contractors shall give full cooperation to the other trades and shall furnish (in writing, with copies to Architect and/or Engineer) information necessary to permit the work of all trades to be installed satisfactorily and with the least possible delay.
- 4.2 Where the work of the Contractor is to be installed in close proximity to work of the other trades, or where there is evidence that the work of the Contractor is to interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. The Contractor shall prepare composite working drawings and sections at a suitable scale not less than 1/4"-0" clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordinating with other trades, he shall make necessary changes in his work to correct the condition without extra care.

### 5. PROTECTION OF WORK AND PROPERTY

- 5.1 The Contractor shall be responsible for the maintenance and the protection of all equipment, materials and tools, supplied by him stored or installed on the job site, from loss or damage of all causes until final acceptance by the Architect and /or Engineer.

5.2 The Contractor shall be responsible for the protection of any finished work of other trades from damage or defacement by his operations and must remedy any such damage at his own expense.

## 6. TEMPORARY OPENINGS

6.1 The Contractor shall ascertain, from his examination of the architectural drawings, whether any special temporary openings in the building will be required for the admission of apparatus provided under his contract and he shall notify the Architect accordingly. In the event of failure of the Contractor to give sufficient notice to the Architect in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

## 7. ACCESSIBILITY

7.1 The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions and the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with the General Contractor and all other Contractors whose work in the same space and shall advise the General Contractor of his requirements. Such spaces and clearances shall, however, be kept to minimum size required.

7.2 The contractor shall install all work so that all parts required are readily accessible for inspection, operation, maintenance and repair, minor deviations from the drawings may be made to accomplish this, but changes of magnitude shall not be made without prior written approval from the Architect and/or Engineer.

7.3 Wherever mechanism requiring access for the operation are concealed in the structure and wherever else indicated on the drawings, the Contractor shall supply access doors of size necessary to provide ready access to the concealed item.

7.4 Where access doors are called for and/or required to maintain, balance or operate the mechanical equipment, this Contractor must furnish an access door. In white plaster ceilings, provide access doors Milcor Style "K" as manufactured by the Inland Steel Products Company. Provide Milcoir Style "M" access doors for unfinished walls. Access doors shall be turned over to the General Contractor for installation.

7.5 Access doors shall be installed in building structure by General Contractor.

## 8. PIPE EXPANSION

8.1 All pipe connections shall be installed to allow for freedom of movement of the piping during expansions and contraction without springing. Swing joints, expansions loops and expansion joints with proper anchors and guides shall be provided by the Contractor where necessary, and/or when shown on the drawings. Anchors and guides shall be subject to the approval of the Architect.



## 9. SLEEVES, INSERTS AND ANCHOR BOLTS

- 9.1 The Contractor shall provide and will be held responsible for the location of any maintaining in proper position all sleeves, inserts and anchor bolts shall be set before concrete is poured and before masonry construction is finished. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.
- 9.2 All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves having an internal diameter of 1" larger than the outside diameter of pipe, conduit or insulation enclosing pipe or conduit.
- 9.3 Sleeves through foundation walls shall be James B. Clow & Sons No. F-1430 cast iron sleeve with intermediate integral flange. Sleeves shall be set with ends flush with each face of wall. The space between 2" of each face of wall. The remainder space shall be packed and made watertight with a waterproof compound.
- 9.4 Sleeves through masonry floors or interior masonry walls shall be schedule 40 black steel pipe, set flush with finished wall or ceiling surfaces but extending 1/2" above finished floors.
- 9.5 Sleeves through interior partitions shall be 22 gauge galvanized sheet steel, set flush with finished surfaces of partitions.
- 9.6 Inserts shall be individual or strip type of pressed steel or malleable iron construction with accommodation for removable nuts and threaded rods up to 3/4" diameter, permitting lateral adjustment. Individual inserts shall be from Mason Manufacturing Company, Fig.190 with attached rods having hooked ends to allow fastening to reinforce rods.

## 10. COVERING OF WORK

- 10.1 No pipe, fitting or other of any kind shall be covered up or hidden from view, before it has been examined by the Architect or from other authority having jurisdiction over the same. Any faithful or imperfect work or materials which may be discovered shall be removed and corrected immediately after being condemned and other work and material shall be furnished which shall be satisfactory to the Architect and/or Engineer.

## 11. MACHINERY GUARDS

- 11.1 Moving parts of machinery exposed to contact by personnel shall be guarded as required by authorities having jurisdiction by barrier of a type as approved by the Architect and/or Engineer.
- 11.2 Exposed moving parts such as belts and couplings shall have 3/4" No. 16 gauge expanded metal mesh guards with all edges rounded. Guards shall have a 1-1/4" X 1/8" angle frame properly supported.

11.3 All machinery guards covering the ends of motor or equipment shafts shall have openings for the insertion of a tachometer.

12. TOOLS

12.1 All special tools required for operation and maintenance of equipment shall be furnished and delivered to Owner's Representatives and a receipt obtained.

13. TESTS

13.1 All piping, ductwork, and equipment shall be tested as specified under the various section of the work and additional tests shall be provided, as may be required for approval by all agencies having jurisdiction. Labor, materials, instruments and power required for testing shall be furnished by the contractor unless otherwise indicated under the particular section of the specification.

13.2 Test shall be performed in the presence and to the satisfaction of the Architect and such other parties as may have legal jurisdiction.

13.3 All defective work shall be promptly repaired or replaced and the test shall be repeated until the particular system and component parts thereof receive the approval of the Architect and/or Engineer.

13.4 Any damages resulting from tests shall be repaired and damaged materials replaced, all to the satisfactions of the Architect.

14. NOISE AND VIBRATION ELIMINATION

14.1 All equipment and material installed by the Contractor shall operate under all conditions of load without any sound or vibration which in the opinion of the Architect is objectionable by the Architect and/or Engineer, the Contractor shall eliminate same in the manner approved by the Architect and/or Engineer, at no additional cost to the Owner.

14.2 The particular attention of this Contractor shall be directed to the problem of preventing noise and vibration transmission from mechanical equipment and fan rooms to adjacent emanating from equipment in these rooms be perceptible in adjacent areas. The Contractor shall incorporate in his installation all devices and accessories to accomplish this result. Such devices shall include vibration isolator bases and sound absorber pads, sound insulation, all as may be required. The above also applies to equipment suspended in ceilings or mounted on roof.

14.3 Vibration isolators exposed to the weather shall be equipped with limit stops to resist wind velocity. Steel parts other than springs shall be galvanized; springs shall be cadmium plated or suitable coated to resist corrosion.

- 14.4 Rubber-in-shear isolators shall be properly housed and provided with adequate facilities for bolting. Single rubber-in-shear shall be molded mound shaped element designed for 1/4" deflection under the imposed load. Double rubber-in-shear shall be two elements described above, assembled in series to provide 1/2" deflection under the imposed load.
- 14.5 All vibration isolation system shall be guaranteed to have the static deflections as specified and indicated on the drawings. The vibration isolation system shall be installed in accordance with the manufacturer's instructions.

15. RUBBISH

- 15.1 Work shall be done in such a manner as to maintain a clean construction area and reduce fire hazards to a minimum. The Contractor shall remove his own debris from the site and no accumulation of inflammable combustible will be permitted.

16. CLEANING PIPING, DUCTS AND EQUIPMENT

- 16.1 The Contractor shall thoroughly clean all piping, ducts and equipment of all foreign substances inside and out before being placed in operation. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstruction material.
- 16.2 If any part of a system should be stopped by a foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected whether necessary to locate and removed obstruction. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

17. FINAL INSPECTION

- 17.1 The Contractor should arrange and schedule final inspection of the mechanical work and shall notify the Architect and/or Engineer in writing that the Contractor has thoroughly checked his work and in the opinion of the Contractor is ready for final inspection. This check will include a record of air quantities to each space, balancing of systems, proper function of each place of electrical equipment and individual system.
- 17.2 During the entire period scheduled for these inspections, the General Contractor, the Sub-Contractor involved and representative of each manufacturer of equipment involved will be present. All of these organizations will have sufficient and competent personnel present so that adjustment can be made to all systems without delay.
- 17.3 Only after all systems and equipment are inspected and approved in writing and lists of instructions, etc., are submitted, will final payment be made.

18. GUARANTEES

- 18.1 The Contractor shall guarantee that all work installed will be free from any and all defects and that all apparatus will be develop capacities and characteristics specified and that if during a period of one (1) year from the date of acceptance of work any such defect in workmanship, material or performance appear, he shall immediately replace, repair or otherwise correct the defect or deficiency without cost to the Owner.
- 18.2 The Contractor shall also replaced or repair to the satisfaction of the Owner any and all damage done to the building or its contents or work of other trades in consequence of work performed in fulfilling guarantee.
- 18.3 In the event of default on this guarantee by the Contractor, the Owner may have such work done as required and charge the cost to the Contractor.

19. INSURANCE

- 19.1 The Contractor shall carry and pay for liability and workmen compensation insurance for the duration of this contract and shall protect the Owner against all claims that may arise. All premiums are to be paid by the Contractor and the policies are to cover any and all persons and contingencies in connection with the installation of the work included in this contract. Also a 100% payment and 100% performance bond will be required.

20. SURVEYS AND MEASUREMENTS

- 20.1 Contractor shall base all measurements, both horizontal and vertical, from established marks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.
- 20.2 Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevent following good practice or the intent of the drawings and specifications, he shall notify the Architect and/or Engineer and shall not proceed with his work until he has received instructions from them.

21. SCAFFOLDING, RIGGINGS AND HOISTING

- 21.1 Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. Remove same from the premises when no longer required.

22. WATERPROOFING

- 22.1 Where any work pierces waterproofing, including waterproof concrete, the method of installation shall be approved by Architect before work is done. Contractor shall furnish all necessary caulking and flashing required to make openings absolutely watertight.

23. TESTING AND BALANCING

- 23.1 Work shall consist of testing, balancing and adjusting of all air and water systems and components called for on the drawings and/or other Contract Documents. This shall be accomplished as follows:

23.1.1 Obtain the required air quantities at various operating conditions of the system to demonstrate compliance with the design. This will require simulation of maximum pressure drops due to dirty filters and wetted cooling coils, and, in the case of variable air volume systems, variation of air volume through the range from minimum to maximum.

23.1.2 Obtain the hot and/or chilled water quantities required by the various components, equipment and devices.

- 23.2 All work shall be performed by an independent test and balance agency under direct supervision of a qualified air conditioning and ventilating engineer approved by the consulting engineer and Owner. All instruments used shall have been accurately calibrated within the last six months and maintained in good working order. (Affidavits attesting to the date, method (s) of calibration, and by whom calibrated shall be furnished to the Owner's Engineer and/or his Representative. Test And Balance (TAB) Contractor and Owner Representative shall meet at least two (2) weeks prior to the anticipated start of testing to finalize procedures and assure complete understanding of the methods used.

- 23.3 Testing and balancing shall not begin until systems have been completed and are in full working order. The ventilating and air conditioning Contractor shall put all ventilating and air conditioning equipment into full operation and shall continue the operation of same during each working day of testing and balancing.

- 23.4 TAB Contractors shall include an extended warranty of ninety (90) days after completion of test and balance work and submission of the report, during which time the Owner's Representative at his direction may request a recheck or resetting of any outlet, supply air fan, exhaust fan, control valves or balance valves to adjust technicians to assist the Engineer in making any tests he may require during this period.

- 23.5 Upon the completion of the system, the TAB Contractor shall submit seven (7) copies of the balancing report. In addition, one marked-up set of mechanical drawings indicating and identifying test point locations shall be furnished. Balancing reports shall be done in SMACNA'S, NBB or AABC Forms, as specified on drawings.
- 23.6 The TAB Contractor shall check all controls for proper calibration and furnish a list of all controls needing adjustment. Any controls needing adjustment shall be attended to by the controls Contractor, and this Contractor shall validate and verify the adjustment repeating the process until satisfactory operation is achieved.

#### 24. RECORD DRAWINGS AND DOCUMENTS

- 24.1 The Contractor shall keep concurrently with the progress or the installation, a set of "as built" record drawings, consisting of a reproducible marked set of Engineer's drawing with additional sketches as required, denoting and dimensioning accurately all changes in elevation, location and size of material deviating from Engineer's drawing. In addition, all offsets and valves shall be recorded. Upon completion of the work, the Contractor shall deliver to the Architect an up-to-date set of these "as built" record drawings. "As built" drawings must be presented on transparent cloth.
- 24.2 Before final payment is made, the Contractor shall deliver to the Architect for approval the following items:
- 24.2.1 Five (5) books with approved equipment submittal data, operation instructions and maintenance instructions.
- 24.2.2 The following "as built" record drawings and "as built" shop drawings.
- a. Original "as built" set (translucent bond or mylar).
  - b. Five (5) blue or black print sets.

END OF SECTION 15801