
USACE / NAVFAC / AFCEA / NASA UFGS-23 08 00.00 20 (August 2008)

Preparing Activity: NAVFAC Superseding
UFGS-23 08 00.00 20 (October 2007)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2008

Latest change is extensive and therefore not indicated by CHG tags

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SECTION 23 08 00.00 20

HVAC TESTING/ADJUSTING/BALANCING

08/08

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SECTION 23 08 00.00 20

HVAC TESTING/ADJUSTING/BALANCING 08/08

NOTE: This guide specification covers the requirements for testing, adjusting, and balancing (TAB) of heating, ventilating, and air conditioning (HVAC) air and water distribution systems.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

NOTE: Following information shall be shown on project drawings:

1. A unique number or mark for each piece of equipment or terminal.
2. Air quantities at air terminals.
3. Air quantities and temperatures in air handling unit schedules.
4. Water quantities and temperatures in thermal energy transfer equipment schedules.

5. Water quantities and heads in pump schedules.

6. Water flow measurement fittings and balancing fittings.

7. Ductwork Construction and Leakage Testing Table that defines the DALT test requirements, including each applicable HVAC duct system ID or mark, duct pressure class, duct seal class, and duct leakage test pressure. This table is included in the file for Graphics for Unified Facilities Guide Specifications:

http://www.wbdg.org/ccb/browse_org.php?o=70

8. When applicable, provide notes on the drawings specifying and completely describing any special or out of the ordinary TAB work to be performed. If required, provide special coordinating paragraphs in this section to compliment the special TAB notes on the design drawings.

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S1.11 (2004; Errata 2005) Specification for Octave- Band and Fractional-Octave-Band Analog and Digital Filters (ASA 65)

ASA S1.4 (1983; R 2006) Specification for Sound Level Meters (ASA 47)

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 203 (1990) Field Performance Measurements of Fan Systems

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE FUN IP (2005) Fundamentals Handbook, I-P Edition

ASHRAE FUN SI (2005) Fundamentals Handbook, SI Edition

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1 (2002) National Standards for Total System Balance

AABC MN-4 (1996) Test and Balance Procedures

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB MASV (2006) Procedural Standards for Measurements and Assessment of Sound and Vibration

NEBB PROCEDURAL STANDARDS (2005) Procedural Standards for TAB (Testing, Adjusting and Balancing) Environmental Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA HVACTAB (2002, 3rd Ed) HVAC Systems - Testing, Adjusting and Balancing

SMACNA Leakage Test Mnl (1985, 1st Ed) HVAC Air Duct Leakage Test Manual

1.2 MODIFICATIONS TO REFERENCES

Accomplish work in accordance with referenced publications of AABC or NEBB or TABB except as supplemented or modified by this section. In the references referred to herein, consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may" wherever they appear. Interpret reference to the "authority having jurisdiction," the "Administrative Authority," the "Owner," or the "Design Engineer" to mean the "Contracting Officer."

1.3 DEFINITIONS

- a. AABC: Associated Air Balance Council.
- b. COTR: Contracting Officer's Technical Representative.
- c. DALT: Duct air leakage test or testing.
- d. DALT'd: Duct air leakage testing performed.

- e. HVAC: Heating, ventilating, and air conditioning; or heating, ventilating, and cooling.
- f. HVAC field check group: As related to the TAB Field Checks, an HVAC field check group is a group of HVAC system components of the same basic type, as determined by the Contracting Officer. For example, a field check group could be all of the VAV boxes for an air handling unit, or all of the fan coil units on a building floor, or all of the ceiling supply diffusers in a large office.
- g. NEBB: National Environmental Balancing Bureau.
- h. Out-of-tolerance data: This term relates to the field checking of data provided in the submitted DALT Report and the submitted TAB report. With regard to DALT, this phrase means a leakage rate measured during DALT field checking which exceeds the allowable leakage rate. With regard to TAB, this phrase means a measurement taken during TAB field checking which falls outside the range of plus or minus 5 percent of the original measurement reported."
- i. Season of maximum heating load: The time of year when the outdoor temperature at the project site remains within **plus or minus 17.5 degrees Celsius plus or minus 30 degrees Fahrenheit** of the project site's winter outdoor design temperature, throughout the period of TAB data recording.
- j. Season of maximum cooling load: The time of year when the outdoor temperature at the project site remains within **plus or minus 3 degrees Celsius plus or minus 5 degrees Fahrenheit** of the project site's summer outdoor design temperature, throughout the period of TAB data recording.
- k. Season 1, Season 2: Depending upon when the project HVAC is completed and ready for TAB, Season 1 is defined, thereby defining Season 2. Season 1 could be the season of maximum heating load, or the season of maximum cooling load.

 NOTE: Where the summer and winter outdoor design dry bulb temperatures are within **20 degrees C 35 degrees F** of each other, the two seasons of TAB work are reduced to one TAB season. When there is only one TAB season, replace the phrase "the Season 1" with "the" and delete requirements for "Season 2."

- [l. Sound measurements terminology: Defined in AABC , NEBB or TABB standard sound measurement procedures.]
- m. TAB: Testing, adjusting, and balancing (of hvac systems).
- n. TAB'd: Testing, adjusting, and balancing procedures performed.
- o. TAB Agency: TAB Firm
- o. TAB supervisor: TAB engineer
- p. TAB technician: TAB assistant

q. TAB team field leader: TAB technician that is in charge of the TAB team in the field when the TAB supervisor is not at the project site.

r. TABB: Testing Adjusting and Balancing Bureau.

1.4 DESCRIPTION OF WORK

The work includes duct air leakage testing (DALT) and test, adjust, and balance (TAB) of [new and existing] heating, ventilating, and cooling (HVAC) air and water distribution systems including equipment, ducts, and piping which are located within, on, under, between, and adjacent to buildings.

1.4.1 Air Distribution Systems

Systems shall be tested, adjusted, and balanced (TAB'd) in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to exterior of air distribution systems under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

1.4.2 Water Distribution Systems

Systems shall be TAB'd in compliance with this section. Obtain Contracting Officer's written approval before applying insulation to water distribution systems under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEM. At Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are TAB'd.

Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. The ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After completion of work under this section, the flow control valves and devices shall be insulated under Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

[1.4.3 Projects with Phased Construction

NOTE: Ensure all aspects of the HVAC work, including DALT work and TAB work, are incorporated in the contract's construction phases and fully covered in the contract documents. Revise this paragraph accordingly based on your specific project.

This specification section is structured as though the HVAC construction, and thereby the TAB work, will be completed in a single phase. When the construction is completed in phases, the DALT work and TAB work must be planned, completed, and accepted for each construction phase.]

NOTE: When the measurement of existing conditions is desired, clearly indicate and/or specify all requirements.

[1.4.4 [DALT and]TAB Services to Obtain Existing Conditions

Conduct [DALT and]TAB of the indicated existing systems and equipment and submit the specified [DALT and]TAB reports for approval. Conduct this [DALT and]TAB work in accordance with the requirements of this section.]

1.5 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

For LANTNAVFACENGCOM jobs, keep "G" for submittals.

NOTE: Refer to the paragraph above entitled "Phasing of Work". If this paragraph applies to the construction contract, modify the entire "SUBMITTALS" paragraph by phasing (maybe by repeating the various submittals for each phase) to

facilitate the submittal process.

SD-06 Test Reports

DALT and TAB Work Execution Schedule; G

DALT and TAB Procedures Summary; G

Design review report; G

Pre-Final DALT report; G

Final DALT report; G

TAB report for Season 1; G

TAB report for Season 2; G

SD-07 Certificates

Independent TAB agency and personnel qualifications; G

Advance notice of Pre-Final DALT field work; G

Completed Pre-Final DALT Work Checklist; G

Advance Notice of [Season 1]TAB Field Work; G

Completed [Season 1]Pre-TAB Work Checklist

[Advance Notice of Season 2 TAB Field Work; G]

[Completed Season 2 Pre-TAB Work Checklist]

1.6 DALT AND TAB SUBMITTAL AND WORK SCHEDULE

Comply with additional requirements specified in UFGS-23 08 00.00 20
Appendix C DALT AND TAB SUBMITTAL AND WORK SCHEDULE

1.7 RELATED REQUIREMENTS

Requirements for price breakdown of HVAC TAB work are specified in Section
01 20 00.00 20 PRICE AND PAYMENT PROCEDURES.

Requirements for construction scheduling related to HVAC TAB work are
specified in Section 01 32 17.00 20 NETWORK ANALYSIS SCHEDULES.

1.8 SUBCONTRACTOR SPECIAL REQUIREMENTS

Perform all work in this section in accordance with the paragraph entitled
"Subcontractor Special Requirements" in Section 01 30 00 ADMINISTRATIVE
REQUIREMENTS. The paragraph specifies that all contract requirements of
this section shall be accomplished directly by a first tier subcontractor.
No work required shall be accomplished by a second tier subcontractor.

1.9 INDEPENDENT TAB AGENCY AND PERSONNEL QUALIFICATIONS

For agency proposed for approval, submit information certifying that the

TAB agency is a first tier subcontractor who is not affiliated with any other company participating in work on this contract, including design, furnishing equipment, or construction. Further, submit the following, for the agency, to Contracting Officer for approval:

a. Independent AABC or NEBB or TABB certified TAB agency:

TAB agency: AABC registration number and expiration date of current certification; or NEBB certification number and expiration date of current certification; or TABB certification number and expiration date of current certification.

TAB team supervisor: Name and copy of AABC or NEBB or TABB TAB supervisor certificate and expiration date of current certification.

TAB team field leader: Name and documented evidence that the team field leader shall have satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract's bid opening date.

TAB team field technicians: Names and documented evidence that each field technician shall have satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract's bid opening date.

Current certificates: Registrations and certifications shall be current, and valid for the duration of this contract. Certifications which expire prior to completion of the TAB work, shall be renewed in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification shall not perform TAB work on this contract.

b. TAB Team Members: TAB team approved to accomplish work on this contract shall be full-time employees of the TAB agency. No other personnel shall do TAB work on this contract.

c. Replacement of TAB team members: Replacement of members may occur if each new member complies with the applicable personnel qualifications and each is approved by the Contracting Officer.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 WORK DESCRIPTIONS OF PARTICIPANTS

Comply with requirements specified in UFGS-23 08 00.00 20 Appendix A WORK DESCRIPTIONS OF PARTICIPANTS

3.2 PRE-DALT/TAB MEETING

NOTE: Inclusion of this meeting requirement in the specification shall be based on the complexity of

the HVAC systems and the location of the contract site.

Meet with the Contracting Officer's technical representative (COTR) [and the designing engineer of the HVAC systems] to develop a mutual understanding relative to the details of the DALT work and TAB work requirements. Ensure that the TAB supervisor is present at this meeting. Requirements to be discussed include required submittals, work schedule, and field quality control.

3.3 DALT PROCEDURES

NOTE: Require duct air leakage testing for duct systems except very simple duct systems on small projects. The designer shall indicate on the drawings the Ductwork Construction and Leakage Testing Table referenced on this specification section's title page.

3.3.1 Instruments, Consumables and Personnel

Provide instruments, consumables and personnel required to accomplish the DALT field work. Follow the same basic procedures specified below for TAB work for instruments and consumables, including maintenance of and calibration of instruments, accuracy of measurements, preliminary procedures, field work, workmanship and treatment of deficiencies. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

3.3.2 Advance Notice of Pre-Final DALT Field Work

On completion of the installation of each duct system indicated to be DALT'd, the Contractor shall notify the Contracting Officer in writing prior COTR's duct selection field visit.

3.3.3 Ductwork To Be DALT'd

From each duct system indicated as subject to DALT, the COTR shall randomly select sections of each completed duct system for testing by the Contractor. The sections selected shall not exceed 20 percent of the total measured linear footage of the duct systems indicated as subject to DALT. Sections of duct systems to be tested may include main ducts, branch-main ducts, branch ducts, or plenums serving supply, return, exhaust, or outside air intake ductwork.

It will be acceptable for an entire duct system to be DALT'd instead of disassembling that system in order to DALT only the 20 percent portion specified above.

3.3.4 DALT Testing

Perform DALT on the duct sections selected by the COTR. Using the duct class, seal class, leakage class, and leak test pressure data indicated on the drawings, comply with the procedures specified in **SMACNA Leakage Test Mnl.** Testing shall be in accordance with the procedures specified in **SMACNA Leakage Test Mnl**, except as supplemented and

modified by this section.

In spite of specifications of **SMACNA Leakage Test Mnl** to the contrary, ductwork of construction class of **746 Pa3-inch** water gauge static pressure and below shall be DALT'd if indicated to be DALT'd. Complete DALT work on the COTR selected ductwork within 48 hours after the particular ductwork was selected for DALT. DALT work shall be conducted separately for large duct systems to enable the DALT work to be completed in 48 hours.

3.3.5 Pre-Final DALT Report

After completion of the DALT work, prepare a Pre-final DALT Report meeting the additional requirements specified in UFGS-23 08 00.00 20 Appendix B REPORTS - DALT and TAB. Data required by those data report forms shall be furnished by the TAB team. Prepare the report neatly and legibly; the Pre-final DALT report shall provide the basis for the Final DALT Report.

TAB supervisor shall review, approve and sign the Pre-Final DALT Report and submit this report within one day of completion of DALT field work. Verbally notify the Contracting Officer's TAB representative that the field check of the Pre-Final DALT Report data can commence.

3.3.6 Quality Assurance - COTR DALT Field Checks

Field check for accuracy selected Pre-Final DALT Report data in the presence of the Contracting Officer's TAB representative (COTR). For each duct system, conduct field checks on 50 percent of the duct sections DALT'd. The TAB team field leader shall be present full-time when DALT field checking is conducted.

3.3.7 Additional COTR Field Checks

If any of the duct sections checked for a given system are determined to be out-of-tolerance, data checking for that section shall be terminated and the associated Pre-final DALT Report data for the given system shall be disapproved. The Contractor shall make the necessary corrections and prepare a revised Pre-Final DALT Report. A field check of the revised report data shall then be rescheduled with the Contracting Officer's TAB representative.

Further, if any data on the Pre-Final DALT report form for a given duct section is out-of-tolerance, then data for one additional duct section, preferably in the same duct system, shall be field checked as specified herein. The DALT'd duct section to be field checked shall be in addition to the original 50 percent of duct sections to be field checked.

3.3.8 Final DALT Report

On successful completion of all field checks of the Pre-Final DALT Report data for all systems, the TAB Supervisor shall assemble, review, approve, sign and submit the Final DALT Report in compliance with UFGS-23 08 00.00 20 Appendix B REPORTS - DALT and TAB to the Contracting Officer for approval.

3.3.9 Prerequisite for TAB Field Work

No TAB field work shall commence prior to the completion and approval, for all systems, of the Final DALT Report.

3.4 TAB PROCEDURES

3.4.1 TAB Field Work

Perform TAB in accordance with the requirements of the TAB procedural standard recommended by the TAB trade association that approved the TAB Firm's qualifications. That is, comply with requirements of **AABC MN-1**, **NEBB PROCEDURAL STANDARDS**, or **SMACNA HVACTAB** (used by TABB) as supplemented and modified by this specification section. All recommendations and suggested practices contained in the TAB procedural standards are considered mandatory.

Test, adjust, and balance the listed HVAC systems to the state of operation indicated on and specified in the contract design documents. Conduct TAB work, including measurement accuracy, and sound measurement work in conformance with the **AABC MN-1** and **AABC MN-4**, or **NEBB PROCEDURAL STANDARDS**, and **NEBB MASV**, or **SMACNA HVACTAB** (used by TABB) and TABB sound measurement procedures, except as supplemented and modified by this section. Provide instruments and consumables required to accomplish the TAB work. Calibrate and maintain instruments in accordance with manufacturer's written procedures.

NOTE: For those projects having only a single TAB report, delete the last sentence of the following paragraph.

Air systems and water systems shall be proportionately balanced and reported in the [Season 1]TAB report. [The only water flow and air flow reporting which can be deferred until the Season 2 will be that data which would be affected in terms of accuracy due to outside ambient conditions].

3.4.2 Preliminary Procedures

Use the approved pre-field engineering report as instructions and procedures for accomplishing TAB field work. Test ports required for testing by the TAB engineer shall be located in the field by the TAB engineer during TAB field work. It shall be the responsibility of the sheet metal contractor to provide and install test ports as required by the TAB engineer.

[3.4.3 TAB Air Distribution Systems

NOTE: Specifier shall edit, delete, and add to the paragraphs below to ensure that air distribution systems indicated on project drawings are listed for TAB work. Specifier shall explicitly identify new and existing systems and components which are to be TAB'd. Particular care should be exercised in defining existing systems and components. Specify the systems identically to labeling and terminology used on project drawings.

3.4.3.1 Units With Coils

Heating and cooling performance capacity tests shall be reported for hot

water, chilled water, DX and steam coils for the purpose of verifying that the coils meet the indicated design capacity. Submit the following data and calculations with the coil test reports:

- a. For air handlers with capacities greater than 26,370 Watts7.5 tons (90,000 Btu) cooling, such as factory manufactured units, central built-up units and rooftop units, capacity tests shall be conducted in accordance with AABC MN-4, procedure 3.5, "Coil Capacity Testing."

Entering and leaving wet and dry bulb temperatures shall not be determined by single point measurement, but shall be the average of multiple readings in compliance with paragraph 3.5-5, "Procedures", (in subparagraph d.) of AABC MN-4, Procedure 3.5, "Coil Capacity Testing."

Submit part-load coil performance data from the coil manufacturer converting test conditions to design conditions; the data shall be used for the purpose of verifying that the coils meet the indicated design capacity in compliance with AABC MN-4, Procedure 3.5, "Coil Capacity Testing," paragraph 3.5.7, "Actual Capacity Vs. Design Capacity" (in subparagraph c.).

- b. For units with capacities of 26370 Watts7.5 tons (90,000 Btu) or less, such as fan coil units, duct mounted reheat coils associated with VAV terminal units, and unitary units, such as through-the-wall heat pumps:

The apparent coil capacity shall be determined by calculations using single point measurement of entering and leaving wet and dry bulb temperatures; the calculations shall be submitted with the coil reports.

3.4.3.2 Air Handling Units

Air handling unit systems including fans (air handling unit fans, exhaust fans and winter ventilation fans), coils, ducts, plenums, mixing boxes, terminal units, variable air volume boxes, and air distribution devices for supply air, return air, outside air, mixed air relief air, and makeup air.

3.4.3.3 Rooftop Air Conditioning

Rooftop air conditioning systems including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.

For refrigeration compressors/condensers/condensing units/evaporators, report data as required by NEBB, AABC, and TABB standard procedures, including refrigeration operational data.

3.4.3.4 Heating and Ventilating Units

Heating and ventilating unit systems including fans, coils, ducts, plenums, roof vents, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.

3.4.3.5 Makeup Air Units

Makeup air unit systems including fans, coils, ducts, plenums, registers, diffusers, grilles, and louvers for supply air, return air, outside air,

and mixed air.

3.4.3.6 Return Air Fans

Return air fan system including fan ducts, plenums, registers, diffusers, grilles, and louvers for supply air, return air, outside air, and mixed air.

3.4.3.7 Fan Coils

Fan coil unit systems including fans, coils, ducts, plenums, and air distribution devices for supply air, return air, and outside air.

3.4.3.8 Exhaust Fans

Exhaust fan systems including fans, ducts, plenums, grilles, and hoods for exhaust air.]

[3.4.4 TAB Water Distribution Systems

NOTE: Specifier shall edit, delete, and add to the paragraphs below to ensure that water distribution systems indicated on project drawings are listed for TAB work. Specifier shall explicitly identify new and existing systems and components which are to be TAB'd. Particular care should be exercised in defining existing systems and components. Specify the systems identically to labeling and terminology used on project drawings.

3.4.4.1 Chilled Water

Chilled water systems including chillers, condensers, cooling towers, pumps, coils, system balance valves and flow measuring devices.

For water chillers, report data as required by NEBB, AABC, and TABB standard procedures, including refrigeration operational data.

3.4.4.2 Heating Hot Water

Heating hot water systems including boilers, hot water converters (e.g., heat exchangers), pumps, coils, heater coils, system balancing valves and flow measuring devices.

3.4.4.3 Dual Temperature Water

Dual temperature water systems including boilers, converters, chillers, condensers, cooling towers, pumps, coils, and system balancing valves, and flow measuring devices.]

[3.4.5 Sound Measurement Work

3.4.5.1 Areas To Be Sound Measured

In the following spaces, measure and record the sound power level for each octave band listed in **ASHRAE FUN SI ASHRAE FUN IP** Noise Criteria:

- a. All HVAC mechanical rooms, including machinery spaces and other

spaces containing HVAC power drivers and power driven equipment.

- b. All spaces sharing a common barrier with each mechanical room, including rooms overhead, rooms on the other side of side walls, and rooms beneath the mechanical room floor.

NOTE: The designer/specifier shall select representative non-mechanical rooms which are occupied by any personnel and are served by each type of primary HVAC air moving system and HVAC water moving systems. Include rooms served by like primary systems which have significantly different sound affecting configurations. List, in the subparagraphs below, the rooms to be sound measured that will accomplish the aforementioned sound assessment philosophy. List the rooms by terminology identical to labeling indicated on drawings.

[c. AHU No. 1 System: Rooms: [____]]

[d. [____] System: Rooms: [____]]

[e. [____] System: Rooms: [____]]

3.4.5.2 Procedure

At the time the sound level is measured, each room shall be unoccupied, except for TAB team, and all HVAC systems that would cause noise in the room shall be operating in their noisiest mode. Record the sound level (dB) in each octave band. Attempt to mitigate the sound level and bring the level to within the specified **ASHRAE FUN SI ASHRAE FUN IP** noise criteria goals, if such mitigation is within the TAB team's control. State in the report the **ASHRAE FUN SI ASHRAE FUN IP** noise criteria goals. If sound level cannot be brought into compliance, provide written notice of the deficiency to the Contractor for resolution or correction.

3.4.5.3 Timing

Sound levels shall be measured at times prescribed by AABC or NEBB or TABB.

3.4.5.4 Meters

Measure sound levels with a sound meter complying with **ASA S1.4**, Type 1 or 2, and an octave band filter set complying with **ASA S1.11**. Measurement methods for overall sound levels and for octave band sound levels shall be as prescribed by AABC or NEBB or TABB.

3.4.5.5 Calibration

Sound levels shall be calibrated as prescribed by AABC or NEBB or TABB except that calibrators emitting a sound pressure level tone of 94 dB at 1000 hertz (Hz) are also acceptable.

3.4.5.6 Background Noise Correction

Determine background noise component of room sound (noise) levels for each

(of eight) octave bands as prescribed by AABC or NEBB or TABB.]

NOTE: Choose the text immediately below or the text below entitled "TAB Work On Performance Tests Within Seasonal Limitations." Use the text immediately below in the case where the winter outdoor design dry bulb temperature and the summer outdoor design dry bulb temperature are within 19.4 degrees C 35 degrees F of each other. This will reduce the number of trips to the contract site from two (one per season) to one for performance testing by the TAB field team. Use the second option, in the other cases.

[3.4.6 TAB Work on Performance Tests Without Seasonal Limitations

3.4.6.1 Performance Tests

In addition to the TAB proportionate balancing work on the air distribution systems and the water distribution systems, accomplish TAB work on the HVAC systems which directly transfer thermal energy. TAB the operational performance of the [heating systems] [and] [cooling systems].

3.4.6.2 Ambient Temperatures

On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. That is, record these temperatures at beginning and at the end of data taking.

[3.4.6.3 Sound Measurements

Comply with paragraph entitled "Sound Measurement Work," specifically, the requirement that a room must be operating in its noisiest mode at the time of sound measurements in the room. The maximum noise level measurements could depend on seasonally related heat or cooling transfer equipment.]]

NOTE: Choose the text immediately below, or the text above entitled "TAB Work On Performance Tests Without Seasonal Limitations." Refer to technical note immediately above. The text immediately below requires one trip each for Seasons 1 and 2.

[3.4.7 TAB Work on Performance Tests With Seasonal Limitations

3.4.7.1 Performance Tests

Accomplish proportionate balancing TAB work on the air distribution systems and water distribution systems, in other words, accomplish adjusting and balancing of the air flows and water flows, any time during the duration of this contract, subject to the limitations specified elsewhere in this section. However, accomplish, within the following seasonal limitations, TAB work on HVAC systems which directly transfer thermal energy.

3.4.7.2 Season Of Maximum Load

Visit the contract site for at least two TAB work sessions for TAB field measurements. [Visit the contract site during the season of maximum heating load] [and] [visit the contract site during the season of maximum cooling load], the goal being to TAB the operational performance of the [heating systems] [and] [cooling systems] under their respective maximum outdoor environment-caused loading. During the seasonal limitations, TAB the operational performance of the [heating systems] [and] [cooling systems].

3.4.7.3 Ambient Temperatures

On each tab report form used for recording data, record the outdoor and indoor ambient dry bulb temperature range and the outdoor and indoor ambient wet bulb temperature range within which the report form's data was recorded. That is, record these temperatures at beginning and at the end of data taking.

[3.4.7.4 Sound Measurements

On each seasonal TAB work session, comply with paragraph entitled "Sound Measurement Work," specifically, the requirement that a room must be operating in its noisiest mode at the time of sound measurements in the room. The maximum noise level measurements could depend on seasonally related heat or cooling transfer equipment.]]

3.4.8 Workmanship

Conduct TAB work on specified HVAC systems until measured parameters are within plus 10 percent and minus 5 percent of the design values, that is, the values specified or indicated on the contract documents.

3.4.9 Deficiencies

Strive to meet the intent of this section to maximize the performance of the equipment as designed and installed. However, if deficiencies in equipment design or installation prevent TAB work from being accomplished within the range of design values specified in the paragraph entitled "Workmanship", TAB Supervisor shall provide written notice as soon as possible, at most within three working days, to the Contractor describing the deficiency and recommended correction.

Responsibility for correction of installation deficiencies is the Contractor's. If a deficiency is in equipment design, call the TAB team supervisor for technical assistance. Responsibility for reporting design deficiencies to Contractor is the TAB Supervisor's.

3.4.10 TAB Reports

Additional requirements for TAB Reports are specified in
23 08 00.00 20 Appendix B REPORTS - DALT and TAB

3.4.11 Quality Assurance - COTR TAB Field Checks

3.4.11.1 Initial TAB Field Check

During initial field check, the Contractor shall check, in the presence of the Contracting Officer's TAB representative, random selections of data

(water, air quantities, air motion, sound level readings) recorded in the TAB Report. Points and areas of field checks shall be selected by the Contracting Officer's TAB representative. Measurement and test procedures shall be the same as approved for TAB work for the TAB Report. Selections for recheck will not exceed 25 percent of the total number of reported data entries tabulated in the report.

3.4.11.2 Additional TAB Field Checks

If any of the data checked for a given HVAC field check group are determined to be out-of-tolerance, data checking for all affected data for that group shall be terminated and the affected TAB report data for the given group shall be disapproved. The Contractor shall make the necessary corrections and prepare a revised TAB Report. A field check of the revised report data shall then be rescheduled with the Contracting Officer's TAB representative.

Further, if any data on the TAB Report for a given field check group is out-of-tolerance, then data for one additional field check group shall be field checked as specified herein. This increase field check work shall continue until out-of-tolerance data ceases to be found. This additional field checking is up and above the original 25 percent of the of reported data entries to be field checked.

If there are no more of the similar field check group, additional field checking from another, but different, type of field check group shall be checked.

3.4.11.3 Prerequisite for Approval

Compliance with the field checking requirements of this section is a prerequisite for the final Contracting Officer approval of the TAB report submitted.

3.5 MARKING OF SETTINGS

Upon the final TAB work approval, permanently mark the settings of HVAC adjustment devices including valves, splitters, and dampers so that adjustment can be restored if disturbed at any time. The permanent markings shall indicate the settings on the adjustment devices which result in the data reported on the submitted TAB report.

3.6 MARKING OF TEST PORTS

The TAB team shall permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. The location of test ports shall be shown on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

3.7 APPENDICES

UFGS-23 08 00.00 20 Appendix A WORK DESCRIPTIONS OF PARTICIPANTS
UFGS-23 08 00.00 20 Appendix B REPORTS - DALT and TAB
UFGS-23 08 00.00 20 Appendix C DALT AND TAB SUBMITTAL AND WORK SCHEDULE

WORK DESCRIPTIONS OF PARTICIPANTS

The Contractor shall be responsible for ensuring compliance with all requirements of this specification section. However, the following delineation of specific work items is provided to facilitate and co-ordinate execution of the various work efforts by personnel from separate organizations.

1. Contractor

a. HVAC documentation: Provide pertinent contract documentation to the TAB Firm, to include the following: the contract drawings and specifications; copies of the approved submittal data for all HVAC equipment, air distribution devices, and air/water measuring/balancing devices; the construction work schedule; and other applicable documents requested by the TAB Firm. Provide the TAB Firm copies of contract revisions and modifications as they occur.

b. Schedules: Ensure the requirements specified under the paragraph "DALT and TAB Schedule" are met.

c. Pre-DALT and TAB meeting: Arrange and conduct the Pre-DALT and TAB meeting. Ensure that a representative is present for the sheet metal contractor, the mechanical contractor, the electrical contractor, and the automatic temperature controls contractor.

d. Coordinate Support: Provide and coordinate support personnel required by the TAB Firm in order to accomplish the DALT and TAB field work. Support personnel may include factory representatives, HVAC controls installers, HVAC equipment mechanics, sheet metal workers, pipe fitters, and insulators. Ensure support personnel are present at the work site at the times required.

e. Correct Deficiencies: Ensure the notifications of Construction Deficiencies are provided as specified herein. Refer to the paragraph entitled "Construction Deficiencies." Correct each deficiency as soon as practical with the Contracting Officer, and submit revised schedules and other required documentation.

f. Pre-TAB Work Checklists: Complete check out and debugging of HVAC equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC system installations, and verifying all adjustable devices are functioning as designed. Include as pre-TAB work checklist items, the deficiencies pointed out by the TAB team supervisor in the design review report.

Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's DALT and TAB Work Procedures Summary. Do not allow the TAB team to commence TAB field work until all of the following are completed.

g. Give Notice of Testing: Submit advance notice of TAB field work accompanied by completed prerequisite HVAC Work List

h. Insulation work: Ensure that no insulation is shall not be installed on ducts to be DALT'd until DALT work on the subject ducts is complete.

Ensure the duct and piping systems are properly insulated and vapor sealed upon the successful completion and acceptance of the DALT and TAB work.

2. TAB Team Supervisor

a. Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical DALT and TAB procedures and TAB team field work.

b. Schedule: Ensure the requirements specified under the paragraph "DALT and TAB Schedule" are met.

Submittals: Provide the submittals specified herein.

Pre-DALT/TAB meeting: Attend meeting with Contractor. Ensure TAB personnel that will be involved in the TAB work under this contract attend the meeting.

Design Review Report: Submit typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the duct leakage testing work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. State that no deficiencies are evident if that is the case.

Support required: Specify the technical support personnel required from the Contractor other than the TAB agency; such as factory representatives for temperature controls or for complex equipment. Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish the notice as soon as the need is anticipated, either with the design review report, or the DALT and TAB Procedures Summary, the during the DALT or TAB field work.

Ensure the Contractor is properly notified and aware of all support personnel needed to perform the TAB work. Maintain communication with the Contractor regarding support personnel throughout the duration of the TAB field work, including the TAB field checking.

Ensure all inspections and verifications for the Pre-Final DALT and Pre-TAB Checklists are completely and successfully conducted before DALT and TAB field work is performed.

[Monitor the completion of the duct system installations and provide the Advance Notice for Pre-Final DALT field work as specified herein.]

Provide technical assistance to the DALT and TAB field work.

Ensure the notifications of Construction Deficiencies are provided as specified herein. Comply with requirements of the paragraph

entitled "Construction Deficiencies." Resolve each deficiency as soon as practical and submit revised schedules and other required documentation.

Develop the required TAB procedures for systems or system components not covered in the TAB Standard.

4. TAB Team Field Leader

a. Field manager: Manage, in the field, the accomplishment of the work specified in Part 3, "Execution."

b. Full time: Be present at the contract site when DALT field work or TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.

c. Prerequisite HVAC work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC work list, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

REPORTS - DALT and TAB

All submitted documentation must be typed, neat, and organized. All reports must have a waterproof front and back cover, a title page, a certification page, sequentially numbered pages throughout, and a table of contents. Tables, lists, and diagrams must be titled. Generate and submit for approval the following documentation:

1. [DALT and TAB Work Execution Schedule](#)

Submit a detailed schedule indicating the anticipated calendar date for each submittal and each portion of work required under this section. For each work entry, indicate the support personnel (such as controls provider, HVAC mechanic, etc.) that are needed to accomplish the work. Arrange schedule entries chronologically.

2. [DALT and TAB Procedures Summary](#)

Submit a detailed narrative describing all aspects of the DALT and TAB field work to be performed. Clearly distinguish between DALT information and TAB information. Include the following:

- a. A list of the intended procedural steps for the DALT and TAB field work from start to finish. Indicate how each type of data measurement will be obtained. Include what Contractor support personnel are required for each step, and the tasks they need to perform.
- b. A list of the project's submittals that are needed by the TAB Firm in order to meet this Contract's requirements.
- c. The schematic drawings to be used in the required reports, which may include building floor plans, mechanical room plans, duct system plans, and equipment elevations. Indicate intended TAB measurement locations, including where test ports need to be provided by the Contractor.
- d. The data presentation forms to be used in the report, with the preliminary information and initial design values filled in.
- e. A list of DALT and TAB instruments to be used, edited for this project, to include the instrument name and description, manufacturer, model number, scale range, published accuracy, most recent calibration date, and what the instrument will be used for on this project.
- f. A thorough checklist of the work items and inspections that need to be accomplished before DALT field work can be performed. The Contractor must complete, submit, and receive approval of the [Completed Pre-Final DALT Work Checklist](#) before DALT field work can be accomplished.
- g. A thorough checklist of the work items and inspections that need to be accomplished before the [Season 1]TAB field work can be performed. The Contractor must complete, submit, and receive approval of the [Completed \[Season 1 \]Pre-TAB Work Checklist](#) before the [Season 1]TAB field work can be accomplished.

[h. A thorough checklist of the work items and inspections that need to be accomplished before the Season 2 TAB field work can be performed. The Contractor must complete, submit, and receive approval of the [Completed Season 2 Pre-TAB Work Checklist](#) before the Season 2 TAB field work can be accomplished.]

i. The checklists specified above shall be individually developed and tailored specifically for the work under this contract. Refer to [NEBB PROCEDURAL STANDARDS](#), Section III, "Preliminary TAB Procedures" under the paragraphs titled, "Air Distribution System Inspection" and "Hydronic Distribution System Inspection" for examples of items to include in the checklists.

3. [Design Review Report](#)

Submit report containing the following information:

a. Review the contract specifications and drawings to verify that the TAB work can be successfully accomplished in compliance with the requirements of this section. Verify the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, circuit setters, balancing valves, and manual volume dampers.

b. Submit a typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team from accomplishing the DALT work and the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the design deficiency. If no deficiencies are evident, state so in the report.

2. [Pre-Final DALT Report](#) for COTR DALT Field Checks

Report the data for the Pre-Final DALT Report meeting the following requirements:

a. A copy of the approved DALT and TAB Procedures Summary. Provide notations describing how actual field procedures differed from the procedures listed.

b. Report format: Submit a comprehensive report for the DALT field work data using data presentation forms equivalent to the "Air Duct Leakage Test Summary Report Forms" located in the [SMACNA Leakage Test Mnl.](#) In addition, submit in the report, a marked duct shop drawing which identifies each section of duct tested with assigned node numbers for each section. Node numbers shall be included in the completed report forms to identify each duct section.

c. Include a copy of all calculations prepared in determining the duct surface area of each duct test section. In addition, the DALT reports shall contain copy(s) of the calibration curve for each of the DALT test orifices used for testing.

d. Instruments: List the types of instruments actually used to measure the data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date. Instruments shall have been calibrated within one year of the date of use in the field. Instrument calibration shall be traceable to

the measuring standards of the National Institute of Standards and Technology.

d. TAB Supervisor Approval: Include on the submitted report the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

3. Final DALT Report

On successful completion of all COTR field checks of the Pre-final DALT Report data for all systems, the TABS Supervisor shall assemble, review, sign and submit the Final DALT Report to the Contracting Officer for approval.

4. Submit TAB Report for Season 1 and TAB Report for Season 2 in the following manner:

a. A copy of the approved DALT and TAB Procedures Summary. When applicable, provide notations describing how actual field procedures differed from the procedures listed.

b. Report format: Submit the completed data forms approved in the pre-field TAB Engineering Report completed by TAB field team, reviewed, approved and signed by the TAB supervisor. Bind the report with a waterproof front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten. Handwritten report forms or report data are not acceptable.

c. Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within which the TAB data was recorded. Include in the TAB report continuous time versus temperature recording data of wet and dry bulb temperatures for the rooms, or zones, as designated in the following list:

NOTE: The design engineer shall list, in the paragraph below, those rooms, or zones, for which indoor dry bulb and wet bulb temperatures shall be compiled for the specified time duration. Include a sufficient number of rooms, or zones, in the listing to ensure correct evaluation of performance for the installed HVAC systems.

[_____]

(1) Data shall be measured and compiled on a continuous basis for the period in which TAB work affecting those rooms is being done.

(2) Data shall be measured/recorded only after the HVAC systems installations are complete, the systems fully balanced and the HVAC systems controls operating in fully automatic mode. Provide a detailed explanation wherever a final measurement did not achieve the required value.

(3) Data may be compiled using direct digital controls trend

logging where available. Otherwise, the Contractor shall temporarily install calibrated time versus temperature/humidity recorders for this purpose. The HVAC systems and controls shall have been fully operational a minimum of 24 hours in advance of commencing data compilation. The specified data shall be included in the [Season I TAB Report] [Season I and Season 2 TAB Report].

d. Air System Diagrams: Provided updated diagrams with final installed locations of all terminals and devices, any numbering changes, and actual test locations.

e. Air Static Pressure Profiles: Report static pressure profiles for air duct systems including: [AHU-1] [RTAC-1] [MUA-1] [____]. Report static pressure data for all supply, return, relief, exhaust and outside air ducts for the systems listed. The static pressure report data shall include, in addition to AABC or NEBB or TABB required data, the following:

(1) Report supply fan, return fan, relief fan, and exhaust fan inlet and discharge static pressures.

(2) Report static pressure drop across chilled water coils, DX coils, hot water coils, steam coils, electric resistance heating coils and heat reclaim devices installed in unit cabinetry or the system ductwork.

(3) Report static pressure drop across outside air, return air, and supply air automatic control dampers, both proportional and two-position, installed in unit cabinetry.

(4) Report static pressure drop across air filters, acoustic silencers, moisture eliminators, air flow straighteners, air flow measuring stations or other pressure drop producing specialty items installed in unit cabinetry, or in the system ductwork. Examples of these specialty items are smoke detectors, white sound generators, RF shielding, wave guides, security bars, blast valves, small pipes passing through ductwork, and duct mounted humidifiers.

Do not report static pressure drop across duct fittings provided for the sole purpose of conveying air, such as elbows, transitions, offsets, plenums, manual dampers, and branch takes-offs.

(5) Report static pressure drop across outside air and relief/exhaust air louvers.

(6) Report static pressure readings of supply air, return air, exhaust/relief air, and outside air in duct at the point where these ducts connect to each air moving unit.

NOTE: Delete the brackets below for large air moving systems, i.e., include in the specification the duct traverses for the branch mains for air moving systems 4720 L/S10000 CFM and larger.

[f. Duct Traverses: Report duct traverses for main [and branch main]

supply, return[, exhaust, relief and outside air] ducts. [This shall include all ducts, including those which lack 7 1/2 duct diameters upstream and 2 1/2 duct diameters downstream of straight duct unobstructed by duct fittings/offsets/elbows.] The TAB Agency shall evaluate and report findings on the duct traverses taken. Evaluate the suitability of the duct traverse measurement based on satisfying the qualifications for a pitot traverse plane as defined by [AMCA 203](#), "Field Measurements", Section 8, paragraph 8.3, "Location of Traverse Plane".]

g. Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.

Instrumentation, used for taking wet bulb temperature readings shall provide accuracy of plus or minus 5 percent at the measured face velocities. Submit instrument manufacturer's literature to document instrument accuracy performance is in compliance with that specified.

h. Performance Curves: The TAB Supervisor shall include, in the TAB Reports, factory pump curves and fan curves for pumps and fans TAB'd on the job.

i. Calibration Curves: The TAB Supervisor shall include, in the TAB Reports, a factory calibration curve for installed flow control balancing valves, flow venturis and flow orifices TAB'd on the job.

j. Data From Tab Field Work: After completion of the TAB field work, prepare the TAB field data for TAB supervisor's review and approval signature, using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms shall be furnished by the TAB team. Except as approved otherwise in writing by the Contracting Officer, the TAB work and thereby the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph entitled "Workmanship."

DALT AND TAB SUBMITTAL AND WORK SCHEDULE

NOTE: Modify this suggested number of calendar days
to suit the contract construction schedule. Season
1 may be the season of maximum heating load or
maximum cooling load, depending upon the
construction schedule.

Perform the following items of work in the order listed adhering to the
dates shedule specified below. Include the major items listed in this
schedule in the project network analysis schedule required by Section
01 32 17.00 20 NETWORK ANALYSIS SCHEDULES.

Submit TAB Agency and TAB Personnel Qualifications: Within [42]
[_____] calendar days after date of contract award.

Submit the DALT and TAB Work Execution Schedule: within [14] [_____] days after receipt of the TAB agency and TAB personnel qualifications approval. Revise and re-submit this schedule 28 days prior to commencement of DALT work and 28 days prior to the commencement of TAB Season 1 work and TAB Season 2 work.

Submit the DALT and TAB Work Procedures Summary: within [14] [_____] days after receipt of the initial approved DALT and TAB Work Execution Schedule.

Meet with the COTR at the Pre-DALT/TAB Meeting: Within [28] [_____] calendar days after receipt of the approved initial DALT/TAB Execution Schedule.

Submit Design Review Report: Within [56] [_____] calendar days after the receipt of the approved initial DALT and TAB Work Execution Schedule.

NOTE: When the measurement of existing facility
conditions is desired, delete the brackets from the
paragraph below.

[Conduct measurements and submit the Record of Existing Facility Conditions: within [28] [_____] days after receipt of approved DALT and TAB WorkProcedures Summary.]

Advance Notice of Pre-Final DALT Field Work: After the completed installation of the HVAC duct system to be DALT'd, submit to the Contracting Officer an [Advance Notice of Pre-Final DALT Field Work](#) accompanied by the [completed Pre-Final DALT Work Checklist](#) for the subject duct system.

Ductwork Selected for DALT: Within 14 calendar days after receiving an acceptable completed Pre-Final DALT Work Checklist, the Contracting

Officer's technical representative (COTR) will select the project ductwork sections to be DALT'd.

DALT Field Work: Within 48 hours of COTR's selection, complete DALT field work on selected project ductwork.

Submit Pre-Final DALT Report: Within two working days after completion of DALT field work, submit Pre-final DALT Report. Separate Pre-final DALT reports may be submitted to allow phased testing from system to system.

Quality Assurance - COTR DALT Field Checks: Upon approval of the Pre-final DALT Report, the COTR's DALT field check work shall be scheduled with the Contracting Officer.

Submit Final DALT Report: Within [14] [_____] calendar days after completion of successful DALT Work Field Check, submit [Season 1]TAB report.

Advance Notice of [Season 1]TAB Field Work: At a minimum of [14] [_____] calendar days prior to [Season 1]TAB Field Work, submit advance notice of TAB field work accompanied by completed [Season 1]Pre-TAB Work Checklist.

NOTE: Use the following four paragraphs, which requires two separate trips within Season 1 to the contract site by the TAB field team (the first for the TAB field work, the second for the TAB quality assurance work) with the certified TAB report submitted between trips. This is intended to give the design engineer time to review the certified TAB report before the field check of that report is conducted.

[Season 1]TAB Field Work: At a minimum of [84] [_____] calendar days prior to CCD, [and when the ambient temperature is within Season 1 limits,] accomplish [Season 1]TAB field work.

Submit [Season 1]TAB Report: Within [14] [_____] calendar days after completion of [Season 1]TAB field work, submit initial [Season 1]TAB report.

[Season 1]Quality Assurance - COTR TAB Field Check: [30] [_____] calendar days after initial [Season 1]TAB report is approved by the Contracting Officer, conduct [Season 1]field check.

Complete [Season 1]TAB Work: Prior to CCD, complete all TAB work [except Season 2 TAB work] and submit final.

Receive the approved TAB report: Within 21 calendar days, receive the report from Contracting Officer approved TAB report.

NOTE: Include the remaining submittals and items of work only if there is a season 2 TAB Work

Advance Notice of Season 2 TAB Field Work: At a minimum of [126]
[_____]calendar days after CCD, submit advance notice of Season 2 TAB
field work accompanied by completed Season 2 Pre-TAB Work Checklist.

NOTE: Use the following four paragraphs, which
requires two separate trips within Season 2 to the
contract site by the TAB field team (the first for
the TAB field work, the second for the TAB quality
assurance work) with the certified TAB report
submitted between trips. This is intended to give
the design engineer time to review the certified TAB
report before the field check of that report is
conducted.

[Season 2 TAB Field Work: Within [14] [_____] calendar days after date
of advance notice of Season 2 TAB field work and when the ambient
temperature is within Season 2 limits, accomplish Season 2 TAB field
work.

Submit Season 2 TAB Report: Within [14] [_____] calendar days after
completion of Season 2 TAB field work, submit Season 2 TAB report.

Season 2 Quality Assurance - COTR TAB Field Checks: [28] [_____] calendar days after the Season 2 TAB report is approved by the Contracting Officer, conduct Season 2 field check.

Complete Season 2 TAB Work: Within [14] [_____] calendar days after the completion of Season 2 TAB field data check, complete all TAB work.]

Receive the approved TAB report: Within calendar 21 days, receive the report from Contracting Officer.

-- End of Section --