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USACE / NAVFAC / AFCEC | **UFGS-23 05 93 (May 2025)**

Preparing Activity: NAVFAC | **Superseding UFGS-23 05 93 (November 2015)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2026

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DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

05/25

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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC
05/25

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

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project only when brackets are present and in accordance with the designer notes. Remove equipment and systems not required in respective project, whether or not brackets are present; add where required in respective project. Modifications must not substantively change or reduce requirements of TAB activities and are subject to Government approval.

Air Force projects must follow this UFGS and any tailoring options specific to U.S. Army Corps of Engineers (USACE) and Naval Facilities Engineering Systems Command (NAVFAC), depending on which one manages the project. Select the appropriate Service-Specific Tailoring Option.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a UFGS 23 05 93 Criteria Change Request (CCR).

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NOTE: Show the following information on the project drawings:

1. A unique number or mark for each piece of equipment or terminal.

2. Airflow quantities at air terminals.

3. Airflow quantities and air temperatures in air-handling equipment schedules.

4. Airflow balancing devices.

5. Water quantities and temperatures in thermal energy transfer equipment schedules.

6. Water quantities and head pressures in pump schedules.

7. Water flow measurement fittings and balancing devices.

8. Ductwork Construction and Leakage Testing Schedule that defines the Duct Air Leakage Testing (DALT) requirements. Include each applicable HVAC duct system ID or mark, duct pressure classification, seal class, duct leakage class, and duct test pressure. Each piece of HVAC air-moving equipment indicated on the design drawings must be included. Ductwork must meet Seal Class A in accordance with UFC 3-410-01 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS. Use the portable document format (PDF) file Ductwork Construction and Leakage Testing as an example for creating the schedule. Utilize the Leakage Classes in the paragraph DALT Field Work. Utilize more stringent Leakage Classes when the design engineer has determined that less leakage is necessary based on project requirements.

9. 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.

10. When applicable, provide notes on the drawing equipment schedules specifying the system setup utilized for air and hydronic system diversity.

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PART 1 GENERAL

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NOTE: Use this specification for all projects which include new or modifications to existing HVAC systems. This specification section may be used for domestic hot-water recirculation systems.

DALT is required in accordance with UFC 3-410-01 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS. Delete references to DALT throughout only if this project has no ductwork.

This section contains tailoring options for TAILORING OPTION NOTES, ARMY, NAVY, DESIGN-BID-BUILD, DESIGN-BUILD, NO PHASED CONSTRUCTION, PHASED CONSTRUCTION, DOMESTIC HOT WATER SYSTEMS TAB, NO SEASONAL TESTING, and SEASONAL TESTING.

Where multiple tailoring options exist for an item below, if more than one item appears between the dashes below, deselect all but one of the options. Where a single option exists below, if no item appears between the dashes, then the tailoring option has been deselected.

Notes Tailoring Option:
Each time tailoring options are used that significantly alter the text, there is an accompanying designer note describing the text that is tailored. These are separate from the notes indicating the tailoring options selected. As this section makes heavy use of tailoring options, they can distract from designer notes describing other decisions. The designer notes describing tailoring options are all in a "TAILORING OPTION NOTES" tailoring option which can be hidden (in SpecsIntact select View-Tailoring Options and then deselect "TAILORING OPTION NOTES") once this section is tailored and the tailoring option notes are no longer needed. The following option is currently selected:

TAILORING OPTION NOTES

Service-Specific Tailoring Options:
Service-specific tailoring is required. ARMY tailoring applies to construction projects managed by USACE. NAVY tailoring applies to those managed by NAVFAC. Note that text throughout refers only to Army and Navy when meaning the managing agency. The following option is currently selected:

ARMY
NAVY

Project Execution Type Tailoring Options:
Project execution type tailoring is required in addition to Service-specific. Select DESIGN-BID-BUILD tailoring for Design-Bid-Build project execution. Select DESIGN-BUILD tailoring for Design-Build project execution. The following option is currently selected:

DESIGN-BID-BUILD
DESIGN-BUILD

Phased Construction Tailoring Options:
Select PHASED CONSTRUCTION tailoring only in the case when project construction includes turnover of multiple complete buildings, of multiple renovation phases in a single building or a combination of both. Each phase concludes with turnover of each completed building or of each completed renovated portion of an individual building. Refer to the paragraph Phased Construction. Select NO PHASED CONSTRUCTION tailoring in all other cases. The following option is currently selected:

NO PHASED CONSTRUCTION
PHASED CONSTRUCTION

Domestic Hot Water Systems Tailoring Option:
Select DOMESTIC HOT WATER SYSTEMS TAB tailoring only in the case where the project includes domestic hot-water recirculation systems to be tested, adjusted, and balanced. The following option is currently selected:

DOMESTIC HOT WATER SYSTEMS TAB

Seasonal Testing Tailoring Options:
Seasonal testing-related tailoring is required. Select NO SEASONAL TESTING tailoring in the case where the Winter outdoor design dry-bulb temperature and the Summer outdoor design dry-bulb temperature are within 13.9 degrees C 25 degrees F of each other. Subject to approval of the Government, select NO SEASONAL TESTING tailoring when the design engineer has determined that second season testing is unnecessary based on project conditions. When NO SEASONAL TESTING tailoring is selected, this section will require field work and reporting for combined proportional balancing and thermal performance testing. When SEASONAL TESTING tailoring is selected, this section will require thermal performance testing field work, reporting, and acceptance testing within both cooling and heating seasonal outdoor air limitations as well as for proportional balancing TAB work. The following option is currently selected:

NO SEASONAL TESTING
SEASONAL TESTING

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1.1 REFERENCES

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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 Reference Identifier (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.

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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 S1.4	(1983; Amendment 1985; R 2006) Specification for Sound Level Meters (ASA 47)
ASA S1.11 PART 1	(2014) American National Standard Electroacoustics – Octave-Band and Fractional-Octave-Band Filters – Part 1: Specifications

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 203	(1990; R 2011) Field Performance Measurements of Fan Systems

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

ASHRAE HVAC APP IP HDBK	(2023) HVAC Applications Handbook, I-P Edition
ASHRAE HVAC APP SI HDBK	(2023) HVAC Applications Handbook, SI Edition

ASSOCIATED AIR BALANCE COUNCIL (AABC)

AABC MN-1	(2016, 7th ed) National Standards for Total System Balance

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB MASV	(2015) Procedural Standard for Measurement and Assessment of Sound and Vibration
NEBB PROCEDURAL STANDARDS	(2019) Procedural Standard for TAB (Testing, Adjusting and Balancing) of Environmental Systems - Ninth Edition

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70E	(2024) Standard for Electrical Safety in the Workplace

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

SMACNA 016	(2012) HVAC Air Duct Leakage Test Manual - 2nd Edition
SMACNA 1780	(2023) HVAC Systems - Testing, Adjusting and Balancing, 4th Edition
SMACNA 1858	(2004) HVAC Sound And Vibration Manual - First Edition

1.2 DEFINITIONS

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NOTE: This subpart includes tailoring options for SEASONAL TESTING and DOMESTIC HOT WATER SYSTEMS TAB. When SEASONAL TESTING tailoring is selected, Designer Notes and subparagraphs referring to criteria for defining thermal performance testing with seasons will be included. Design engineer is required to generate the timeframes for the two seasons based on the project site location. When DOMESTIC HOT WATER SYSTEMS TAB tailoring is selected, the definition of TAB includes domestic hot-water recirculation systems.
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NOTE: Retain the certifying body standards for CONUS and other locations where a TAB Firm and its employees are likely to achieve this level of qualification. In locations, such as OCONUS, where these standards may not normally be utilized, check with the Contracting Officer for applicable alternative standards and edit the following paragraphs and throughout this section to coordinate.
****

In some instances, terminology differs between this Contract and the TAB certifying body or the TAB Standard primarily because this section intends to use the industry standards specified, along with additional requirements listed within this section, to produce optimal results.

a. AABC: Associated Air Balance Council

b. Certifying Body: An independent body responsible for issuing a formal recognition, such as a certificate, proving that the certification meets specific national or international requirements.

c. COTR: Contracting Officer's Technical Representative

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NOTE: Whether DALT is requried or not, retain the following definition to provide definition of the air system type abbreviations in this Section.
****

d. DALT: Duct Air Leakage Testing (of HVAC duct systems such as supply air (SA), return air (RA), exhaust air (EA), relief air (LA), and outdoor air (OA)).

e. DALT Failure: This phrase means "a leakage rate measured during DALT Field Work and Acceptance Testing which exceeds the allowable leakage rate for the duct test pressure and leakage class indicated."

f. Duct System: When applied to DALT, this phrase means "complete duct system, inclusive of all ductwork, plenums, mains, branches, fittings and duct-mounted components and appurtenances, such as manual balancing dampers, control dampers, access doors, fire dampers, and duct-mounted coils, up to, but excluding flexible ducts and air-handling equipment, such as air-handling units (AHUs), dedicated outdoor air system (DOAS) units, fan coil units (FCUs), water source heat pumps (WSHPs), and variable-air volume (VAV) terminal units."

g. HVAC: Heating, ventilating, and air-conditioning

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NOTE: The following list items include tailoring for SEASONAL TESTING. When SEASONAL TESTING tailoring is selected, Designer Notes and subparagraphs referring to criteria for defining thermal performance testing with seasons will be included.
****

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NOTE: The following list items are tailored for SEASONAL TESTING.

Designer must utilize official Government engineering weather data (EWD) in UFC 3-400-02 to determine the season of maximum cooling load and season of maximum heating load. The expected date of maximum cooling load and date of maximum heating load (peak dates) for the specific project location must be used to determine the 30-day timeframe to be entered into the brackets within the definitions below. Example dates below are provided for information only.

On average for Northern Hemisphere installations, the expected coldest day of the year occurs on about 4-January, which defines the season of maximum

heating load as 20-December through 19-January. For Southern Hemisphere installations, the season of maximum heating load is the month in which the maximum heating degree days occur (see UFC 3-400-02).

On average for Northern Hemisphere installations, the expected warmest day of the year occurs on about 25-July, which defines the season of maximum cooling load as 10-July through 9-August. For Southern Hemisphere installations, the season of maximum cooling load is the month in which the maximum cooling degree days occur (see UFC 3-400-02).

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h. Season 1, Season 2: Depending upon when the project HVAC systems are completed and ready for TAB, Season 1 is defined as Cooling Season or Heating Season, thereby defining Season 2 as the other season.

(1) Cooling Season: A 30-day timeframe centered on the expected date of maximum cooling load or expected warmest day of the year, making the timeframe [10-July through 9-August][_____].

(2) Heating Season: A 30-day timeframe centered on the expected date of maximum heating load or expected coldest day of the year, making the timeframe [20-December through 19-January][_____].

i. TAB: Testing, Adjusting, and Balancing (of HVAC and domestic hot-water recirculation systems).

j. TAB Failure: This phrase means "a measurement taken during TAB Field Acceptance Testing which does not fall within the specified Acceptance Tolerance for a specific parameter."

k. TAB Firm: AABC Certified Member Agency, NEBB Certified Firm, TABB Certified Contractor

l. TAB Standard: Standard utilized by TAB Team based on TAB Firm's certifying body:

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

(2) NEBB - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems (NEBB PROCEDURAL STANDARDS)

(3) TABB - HVAC Systems Testing, Adjusting & Balancing Manual (SMACNA 1780)

m. TAB Team Supervisor: AABC Test and Balance Engineer (TBE), NEBB TAB Certified Professional (TAB CP), TABB TAB Certified Supervisor

n. TAB Team: TAB Firm personnel

o. TABB: Testing, Adjusting and Balancing Bureau

1.3 GENERAL REQUIREMENTS

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NOTE: This subpart includes tailoring option for DOMESTIC HOT WATER SYSTEMS TAB. When DOMESTIC HOT

WATER SYSTEMS TAB tailoring is selected, the scope of work will be modified to include TAB of domestic hot-water recirculation systems. This addition to the scope of work will appear throughout the Section.

****

NOTE: When the measurement of existing conditions is desired, use the bracketed text below and clearly indicate and specify all associated requirements in paragraph EXISTING FACILITY CONDITIONS and PART 3.

****

The work includes DALT and TAB of [new][and][existing] HVAC and domestic hot-water (DHW) recirculation systems, which are located within, on, under, between, and adjacent to buildings.

Perform TAB in accordance with the requirements of the TAB Standard identified by the TAB Firm's certifying body, as supplemented and modified by this specification section. Perform DALT in compliance with the procedures specified in SMACNA 016, as supplemented and modified by this specification section.

1.3.1 Support Personnel

Ensure the TAB Team Supervisor or TAB Team Field Leader is present full-time on the Contract site for overall management and direct observation of the DALT and TAB Field Work. Certified TAB Team Field Technicians may work independently of direct observation by the TAB Team Supervisor or Field Leader.

Ensure the technical personnel, such as factory representatives and HVAC controls contractor technicians, to operate HVAC equipment are present to enable the TAB Team to accomplish the DALT and the TAB measurement work. Provide the personnel to install field designated test ports and test apparatus connections.

1.3.2 Coordination

Coordinate testing schedules with work in other Sections performed on the components or systems to be tested. Ensure support personnel are present at the times required by the TAB Team and cause no delay in the DALT and the TAB Field Work.

1.4 RELATED REQUIREMENTS

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NOTE: This subpart includes tailoring for NAVY. When NAVY tailoring is selected, Sections 01 20 00 PRICE AND PAYMENT PROCEDURES and 01 32 17.00 20 COST LOADED NETWORK ANALYSIS SCHEDULES (NAS) are included.

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NOTE: If any of the following Sections are not included in the project specification, applicable requirements from the excluded section should be inserted and the applicable paragraph deleted.

When the project does not include Commissioning per Section 01 91 00.15 BUILDING COMMISSIONING, the applicable paragraphs for 01 91 19 BUILDING ENCLOSURE COMMISSIONING and 23 08 00 COMMISSIONING OF MECHANICAL AND PLUMBING SYSTEMS are deleted.
****

[Requirements for climate conditions during building pressure testing are specified in Section 01 91 19 BUILDING ENCLOSURE COMMISSIONING.

][Requirements for thermal insulation of ductwork, piping, fittings, and valves are specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

][Requirements for coordination with commissioning are specified in Section 23 08 00 COMMISSIONING OF MECHANICAL AND PLUMBING SYSTEMS.

][Requirements for calibration and testing of HVAC controls system devices are specified in Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC.

][Requirements for Detail Drawings, construction and sealing of HVAC air distribution systems are specified in Section 23 30 00 HVAC AIR DISTRIBUTION.

] **********
NOTE: The following items are tailored for NAVY.
****

Requirements for price breakdown of HVAC TAB work are specified in Section 01 20 00 PRICE AND PAYMENT PROCEDURES.

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

1.5 SUBMITTALS

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NOTE: The following subpart includes tailoring options for ARMY, NAVY, DESIGN-BID-BUILD, DESIGN-BUILD, NO PHASED CONSTRUCTION, PHASED CONSTRUCTION, NO SEASONAL TESTING, AND SEASONAL TESTING.

When NAVY and DESIGN-BUILD tailoring are selected, Section 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES is utilized and additional content related to requirements for electronic submittals is included for clarification that is not provided in Section 01 33 00.05 20. When other combinations of ARMY, NAVY, DESIGN-BUILD and DESIGN-BID-BUILD tailoring are selected, Section 01 33 00 SUBMITTAL PROCEDURES is utilized.

When SEASONAL TESTING tailoring is selected, thermal performance testing is performed during two separate climatic seasons as provided in the paragraph DEFINITIONS and separate TAB Reports are required. The second season requirements are listed under

SD-11 Closeout Submittals. When NO SEASONAL TESTING tailoring is selected, thermal performance testing is performed without climatic restrictions.

When PHASED CONSTRUCTION tailoring is selected, this subpart includes example DALT and TAB Report submittals to clarify the requirements, nomenclature, and classifications applicable to the project. Refer to the paragraph Phased Construction and to the notes below. When NO PHASED CONSTRUCTION tailoring is selected, this subpart includes the minimal submittal requirements.

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NOTE: This subpart and the associated NOTES are tailored for ARMY NAVY DESIGN-BID-BUILD, DESIGN-BUILD, NO SEASONAL TESTING, SEASONAL TESTING, and NO PHASED CONSTRUCTION PHASED CONSTRUCTION.

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. Review Submittal Description (SD) definitions in Section 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification with a code of up to three characters 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 and Air Force projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding

Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES. The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES. The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES.

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Unless otherwise specified or directed by the Contracting Officer, provide submittals in electronic format.[In addition to the electronic submittal, provide [three][_____] hard copies of the submittals.]

Compile the electronic submittal file as a single, complete document, to include the Transmittal Form required by Section 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES. Name the electronic submittal file specifically according to its contents and coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is clear and legible. Use portable document format (PDF) as the electronic format, unless otherwise specified or directed by the Contracting Officer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is searchable and can be copied. If documents are scanned, optical character resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature or a scan of an ink signature.

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NOTE: For Navy Design-Build projects, delete 01 33 00 SUBMITTAL PROCEDURES, and replace with UFGS 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES and UFGS 01 33 10.05 20 DESIGN SUBMITTAL PROCEDURES.

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NOTE: The following paragraph is tailored for NAVY and DESIGN-BUILD, UFGS 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES and UFGS 01 33 10.05 20 DESIGN SUBMITTAL PROCEDURES are utilized in place of 01 33 00 SUBMITTAL PROCEDURES.

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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES: Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES: Submit the following in accordance with Sections 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES and 01 33 10.05 20 DESIGN SUBMITTAL PROCEDURES:

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For USACE and NAVFAC projects, keep "G" for submittals.
****

SD-01 Preconstruction Submittals

TAB Firm And Personnel Qualifications; G, [____]

Design Review Report; G, [____]

TAB Pre-Field Engineering Plan; G, [____]

SD-06 Test Reports

****
NOTE: When the measurement of existing facility conditions is included in the project, retain the following submittal.
****

[Existing Facility Conditions Report; G, [____]

] **********
NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. Retain the single submittal item.
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NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the phase submittal items to coordinate with the paragraph Pre-Final DALT Report. Add items as necessary.

For phased construction within a single building, edit the submittal requirements below to include a Pre-Final DALT Report for each phase (e.g., Phase 1 Pre-Final DALT Report, Phase 2 Pre-Final DALT Report).

For phased construction of multiple buildings, edit the submittal requirements below to include a Pre-Final DALT Report for each building (e.g., Bldg 214 Pre-Final DALT Report, Bldg 215 Pre-Final DALT Report). Replace each instance of the term "Phase" with the term "Bldg". Edit the submittal requirements below to include a Certified Final DALT Report for each building (e.g., Bldg 214 Certified Final DALT Report, Bldg 215 Certified Final DALT Report).
****

Pre-Final DALT Report; G, [____]

Phase [1][_____] Pre-Final DALT Report; G, [____]

Phase [2][_____] Pre-Final DALT Report; G, [____]

Certified Final DALT Report; G, [____]

****
NOTE: When NO SEASONAL TESTING tailoring is selected, a Certified TAB Report is required and listed below. When SEASONAL TESTING tailoring is selected, separate proportional balancing, Season 1 and Season 2 (SD-11 Closeout Submittals) test report submittals are required and listed below.
****

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NOTE: This subpart is tailored for NO SEASONAL TESTING.
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NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. Retain the following submittal item. There will be a single overall TAB Report.
****

Certified TAB Report; G, [____]

****
NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following submittal items to coordinate with the paragraph Certified TAB Reports. Add items as necessary.

For phased construction within a single building, edit the submittal requirements below to include a Certified TAB Report for each phase (e.g., Phase 1, Phase 2).

For phased construction of multiple buildings, edit the submittal requirements below to include a Certified TAB Report for each building (e.g., Bldg 214, Bldg 215). Replace each instance of the term "Phase" with the term "Bldg".
****

Phase [1][_____] Certified TAB Report; G, [____]

Phase [2][_____] Certified TAB Report; G, [____]

****
NOTE: This subpart is tailored for SEASONAL TESTING.
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NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. Retain the following submittal items.
****

Certified TAB Report of Proportional Balancing; G, [____]

Certified TAB Report of Season 1; G, [____]

****

NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following submittal items to coordinate with the paragraph Certified TAB Reports. Add items as necessary.

For phased construction within a single building, edit the submittal requirements below to include a Certified TAB Report for each phase (e.g., Phase 1, Phase 2).

For phased construction of multiple buildings, edit the submittal requirements below to include a Certified TAB Report for each building (e.g., Bldg 214, Bldg 215). Replace each instance of the term "Phase" with the term "Bldg".

****

Phase [1][_____] Certified TAB Report of Proportional Balancing; G, [____]

Phase [1][_____] Certified TAB Report of Season 1; G, [____]

Phase [2][_____] Certified TAB Report of Proportional Balancing; G, [____]

Phase [2][_____] Certified TAB Report of Season 1; G, [____]

****

NOTE: This subpart is tailored for SEASONAL TESTING. SD-11 Closeout Submittals are included in SEASONAL TESTING.

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SD-11 Closeout Submittals

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NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. Retain the following submittal item.

****

Certified TAB Report of Season 2; G[, [____]]

****

NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following submittal items to coordinate with the paragraph CLOSEOUT ACTIVITIES. Add items as necessary.

For phased construction within a single building, edit the submittal requirements below to include a Certified TAB Report of Season 2 for each phase (e.g., Phase 1, Phase 2) and a Certified Final TAB Report including all phases.

For phased construction of multiple buildings, edit the submittal requirements below to include a Certified TAB Report of Season 2 for each building (e.g., Bldg 214, Bldg 215). Replace each instance of the term "Phase" with the term "Bldg".

****

Phase [1][_____] Certified TAB Report of Season 2; G, [____]

Phase [2][_____] Certified TAB Report of Season 2; G, [____]

Certified Final TAB Report; G, [____]

1.6 TAB FIRM AND PERSONNEL QUALIFICATIONS

****

NOTE: This subpart includes tailoring for ARMY, NAVY, DESIGN-BID-BUILD, AND DESIGN-BUILD.

When ARMY or NAVY and DESIGN-BID-BUILD tailoring are selected, the Personnel's years of experience are counted from Contract Award. When ARMY and DESIGN-BUILD tailoring are selected, the years are counted from Notice to Proceed. When NAVY and DESIGN-BUILD tailoring are selected, the years are counted from Design Acceptance.

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NOTE: This subpart is tailored for ARMY NAVY and DESIGN-BID-BUILD and DESIGN-BUILD.

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Engage the services of a qualified TAB Firm to perform DALT and TAB work for this project. Only approved firm and personnel are allowed to perform DALT and TAB work on this Contract. Any firm or individual that has been the subject of disciplinary action by their certifying body within the 5 years preceding Contract Award is not eligible to perform any duties related to DALT and TAB. Any firm or individual that has been the subject of disciplinary action by their certifying body within the 5 years preceding Notice to Proceed is not eligible to perform any duties related to DALT and TAB. Any firm or individual that has been the subject of disciplinary action by their certifying body within the 5 years preceding Design Acceptance is not eligible to perform any duties related to DALT and TAB. Comply with the following:

a. Certification: Maintain TAB Firm and personnel certifications for the entire duration of duties specified. Renew Certifications which expire prior to completion of the TAB work in a timely manner so there is no lapse in certification. Provide written notice to the Contracting Officer, with a copy of renewed certificates of the TAB Firm and personnel, prior to expiration of the previous certificate(s). If, for any reason, the TAB Firm or its employee loses subject certification during this Contract, immediately notify the Contracting Officer in writing and comply with the requirements for the replacement of TAB Firm and TAB Team Members. An approved successor must validate all work performed for this project by the TAB Firm or TAB Team Member who lost certification.

b. Replacement of TAB Firm and TAB Team Members: Replacement or substitution of firm or individual members may occur if each complies with the applicable qualifications and is approved by the Contracting Officer prior to the performance of its duties on this Contract. Submit replacement TAB Firm and Personnel Qualifications in accordance

with this section.

Submit the TAB Firm and Personnel Qualifications within 60 calendar days after the date of Contract Award. Submit the TAB Firm and Personnel Qualifications within 60 calendar days after the date of Notice to Proceed. Submit the TAB Firm and Personnel Qualifications within 60 calendar days after the date of Design Acceptance.

****

NOTE: Coordinate the following certifications with the paragraph DEFINITIONS. In locations, such as OCONUS, where these certifications may not normally be acquired, check with the Contracting Officer for applicable alternative qualifications.

****

1.6.1 TAB Firm

Provide documentation that the TAB Firm is a first tier subcontractor to the prime Contractor and an independent company, not participating in any other work on this Contract or affiliated to any other company participating in work on this Contract, including, but not limited to, design, furnishing equipment, or construction. No work may be performed by a second tier subcontractor.

Provide a copy of current certificate, with expiration date, to certify that the TAB Firm is certified by AABC, NEBB, or TABB in categories and functions of the DALT and TAB field work specified. Designate the single certifying body to be utilized when the firm is certified by more than one.

1.6.2 TAB Personnel

For each TAB Team role below, provide at least one qualified, full-time employee of the TAB Firm for approval. Include the proposed role(s) of each employee with their qualification documentation. It is acceptable for a TAB Team member to perform duties of another TAB Team role if they meet the qualifications of both.

a. TAB Team Supervisor

Provide documentation, including full name and a copy of current certificate, that the TAB Team Supervisor is a AABC TBE, a NEBB TAB CP, or a TABB TAB Certified Supervisor.

b. TAB Team Field Leader

Provide documentation that the TAB Team Field Leader is a certified TAB Technician by AABC, NEBB, or TABB, and has satisfactorily performed full-time supervision of TAB work of others in the field for a minimum of 3 years immediately preceding Contract Award. Provide documentation that the TAB Team Field Leader is a certified TAB Technician by AABC, NEBB, or TABB, and has satisfactorily performed full-time supervision of TAB work of others in the field for a minimum of 3 years immediately preceding Notice to Proceed. Provide documentation that the TAB Team Field Leader is a certified TAB Technician by AABC, NEBB, or TABB, and has satisfactorily performed full-time supervision of TAB work of others in the field for a minimum of 3 years immediately preceding Design Acceptance. Include full name, a copy of current certificate, and a list of projects, roles

performed, and associated dates.

c. TAB Team Field Technician

Provide documentation that each TAB Team Field Technician is a certified TAB Technician by AABC, NEBB, or TABB, or has satisfactorily performed DALT and TAB work in the field for a minimum of 1 year immediately preceding Contract Award.Provide documentation that each TAB Team Field Technician is a certified TAB Technician by AABC, NEBB, or TABB, or has satisfactorily performed DALT and TAB work in the field for a minimum of 1 year immediately preceding Notice to Proceed. Provide documentation that each TAB Team Field Technician is a certified TAB Technician by AABC, NEBB, or TABB, or has satisfactorily performed DALT and TAB work in the field for a minimum of 1 year immediately preceding Design Acceptance. Include full name, a copy of current certificate when applicable, and a list of projects, roles performed, and associated dates.

1.7 TAB STANDARD

All recommendations and suggested practices contained in the TAB Standard are mandatory. Maintain a hard copy [and an electronic PDF file copy]of the standard on site.

All quality assurance provisions of the TAB Standard, such as performance guarantees, are part of this Contract. For systems or system components not covered in the TAB Standard, TAB procedures and report forms must be developed by the TAB Team Supervisor and included in the TAB Pre-Field Engineering Plan. Where new procedures and requirements, applicable to the Contract requirements have been published or adopted by the certifying body responsible for the TAB Standard, the more stringent of the requirements and recommendations contained in these procedures and requirements are considered mandatory.

1.8 INSTRUMENTATION

It is the responsibility of the TAB Firm to use instrumentation that meets the requirements of the TAB Standard. Select appropriate instruments to achieve the applicable TAB tolerances. Instrumentation used for taking air wet-bulb temperature readings must provide accuracy of a minimum of plus or minus 5 percent at the measured face velocities. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. Instrumentation must be in proper operating condition and must be applied in accordance with the instrumentation's manufacturer recommendations.

All instrumentation must bear a valid National Institute of Standards and Technology (NIST) traceable calibration certificate, dated within one year, during field work and Field Acceptance Testing.

1.9 DESIGN REVIEW

****

NOTE: This subpart includes tailoring for ARMY, NAVY, DESIGN-BID-BUILD, DESIGN-BUILD and DOMESTIC HOT WATER SYSTEMS TAB.

When NAVY and DESIGN-BUILD tailoring are selected,

Section 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES is utilized. When other combinations of ARMY, NAVY, DESIGN-BUILD and DESIGN-BID-BUILD tailoring are selected, Section 01 33 00 SUBMITTAL PROCEDURES is utilized

****

The TAB Team Supervisor must review the Contract Plans and Specifications to advise the Contracting Officer of any omissions and deficiencies that would prevent the effective and accurate TAB of the systems in compliance with the requirements of this section[, including performing the field work for the reporting of existing facility conditions]. Accomplish the following:

a. Verify in the documents the presence and location of permanently installed test ports and other devices needed, including gauge cocks, thermometer wells, flow control devices, flow measuring devices, balancing valves, and manual balancing dampers.

b. Confirm the inclusion of the design values necessary to complete the DALT and TAB report forms required for the TAB Pre-Field Engineering Plan.

c. Generate a list of submittals, from those in the Contract Submittal Register of Section 01 33 00 SUBMITTAL PROCEDURES, that relate to the successful accomplishment of all HVAC and DHW recirculation systems TAB. Generate a list of submittals, from those in the Contract Submittal Register of Section 01 33 00 SUBMITTAL PROCEDURES, that relate to the successful accomplishment of all HVAC and DHW recirculation systems TAB. Generate a list of submittals, from those in the Contract Submittal Register of Section 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES, that relate to the successful accomplishment of all HVAC and DHW recirculation systems TAB.

d. Prepare a report containing a detailed listing of the items identified during the review. Provide the omission and deficiency listing in a tabular format, with each item sequentially numbered and with a reference to the applicable design document. For each omission and deficiency, provide a complete explanation including supporting documentation detailing the design deficiency. If no deficiencies are evident, state so in the report. In addition, the design engineer must respond to the Design Review Report items and the responses, with dated signature, must accompany the report. Include the TAB Related Submittals List in the report.

Submit the Design Review Report to the Contracting Officer for approval within 30 calendar days after approval of the TAB Firm and Personnel Qualifications.

1.10 TAB PRE-FIELD ENGINEERING PLAN

****

NOTE: This subpart includes tailoring for SEASONAL TESTING, NO SEASONAL TESTING, PHASED CONSTRUCTION and DOMESTIC HOT WATER SYSTEMS TAB.

When SEASONAL TESTING tailoring is selected, Step-by-Step Procedures include a requirement to provide specific procedures related to seasonal TAB.

When PHASED CONSTRUCTION tailoring is selected, project summary sections for each phase are required.
****

The TAB Team Supervisor must utilize the TAB Standard, Contract Plans, Contract Specifications, approved contract revisions, and contract change orders to prepare a plan for the DALT and TAB field work, including procedures, report forms, diagrams, instrumentation and other supporting documents in compliance with the following:

a. Project Summary: Provide a detailed narrative describing the DALT and TAB Field Work to be performed, including systems and equipment. Clearly distinguish between DALT information and TAB information. Include separate sections for each[construction phase][building].

b. Step-by-Step Procedures: Provide a list of the intended procedural steps for DALT and TAB Field Work from start to finish. Include the following:

   (1) The intended procedural steps for TAB work for systems, subsystems, and system components. TAB Standard procedure excerpts may be provided to supplement this requirement.

   (2) A description of how each type of data measurement will be obtained.

   (3) A complete methodology for accomplishing each seasonal TAB Field Work requirement.

   (4) A list of Contractor support personnel required for each step, and tasks they need to perform.

c. Report Forms: Provide the report forms to be used in the DALT and TAB reports to document the DALT and TAB Field Work, with the preliminary information and design values filled in. Utilize contract document design HVAC and DHW systems values. For TAB report forms, use forms inclusive of all data on TAB Standard sample report forms, or generate where no TAB Standard form exists, for all data collection requirements. Ensure report forms contain data fields for each HVAC controls system flow measuring device's calibration, including design flow rate, actual flow rate, controls system reading and factor. For DALT report forms, use forms comparable to the "Air Duct Leakage Test Summary Report Forms" located in SMACNA 016, with an example of design and test data in the plan. Coordinate the key numbering used in the report forms with that used in the TAB Schematic Drawings.

d. TAB Schematic Drawings: Provide the schematic drawings to be used in the required reports, which may include building floor plans, mechanical room plans, equipment schedules, duct system plans, and equipment elevations. Use the contract drawings and, if available, ductwork shop drawings to provide the following:

   (1) Air moving equipment and pump schedules.

   (2) Thermal energy transfer equipment schedules.

   (3) Duct Construction and Leakage Testing Schedule.

(4) Air system plans showing the location and airflow quantities of all supply, return, exhaust, relief, outdoor, and transfer air terminal devices such as registers, grilles, diffusers, louvers, and rooftop hoods and their respective airflow quantities.

(5) A key numbering system on the drawings which identifies each piece of equipment and each air terminal device contained in the air terminal airflow report sheets. It is acceptable to utilize the contract drawing numbering system when provided for equipment.

(6) A unique number or mark for each water flow measurement fitting and balancing valve. It is acceptable to utilize the contract drawing numbering system when provided for valves and fittings.

(7) Intended TAB measurement locations, including where test ports need to be provided by the Contractor.

For Static Pressure Profile and Duct Traverse Equipment Diagrams, provide diagrams, representative of the actual equipment configuration, developed from TAB Standard forms, contract drawings or approved equipment submittals.

For DALT schematic drawings, provide a representative diagram matching the example DALT report form in this plan.

e. Instrumentation: Provide a list of DALT and TAB instruments for this project. 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. Submit instrument manufacturer's literature to document instrument accuracy performance is in compliance with that specified. Provide a copy of the calibration certificate for each calibrated instrument to be used.

f. Pre-DALT Field Work Checklist: Provide a thorough checklist of the work items and inspections that need to be accomplished before DALT Field Work can be performed. Include signature and date lines for the Contractor's quality control representative and mechanical contractor's representative acknowledging completion of the marked checklist items.

****

NOTE: This list item includes tailoring for NO SEASONAL TESTING and SEASONAL TESTING.

When SEASONAL TESTING tailoring is selected, the Checklist will be separated into three sections (e.g., proportional balancing, heating season, and cooling season). When NO SEASONAL TESTING tailoring is selected, the Checklist will be separated into two sections (e.g., proportional balancing and thermal performance testing).

****

g. Pre-TAB Field Work Checklist: Provide a thorough checklist of the work items and inspections that need to be accomplished before the proportional balancing and thermal performance testing TAB Field Work can be performed. Provide a thorough checklist of the work items and inspections that need to be accomplished before the proportional

balancing, heating season, and cooling season TAB Field Work can be performed. Include items such as completion of applicable HVAC controls systems installation, cleaning of hydronic system including but not limited to strainers, and replacement of HVAC system air filters. Provide separate sections of checklist items for proportional balancing and thermal performance testing TAB Field Work. Provide separate sections of checklist items for proportional balancing, heating season thermal performance testing, and cooling season thermal performance testing TAB Field Work. Each section must include signature and date lines for the Contractor's quality control representative and mechanical contractor's representative acknowledging completion of the marked checklist items.

****

NOTE: Retain the field work (DALT or TAB) that occurs first in the project sequence.

When the measurement of existing facility conditions is included in the project, retain the bracketed text to ensure the Plan is approved prior to the field work required of the subpart EXISTING FACILITY CONDITIONS.

****

Submit the TAB Pre-Field Engineering Plan to the Contracting Officer for approval a minimum of [60][_____] calendar days in advance of commencement of [DALT][TAB] field work[required of Existing Facility Conditions].

1.11 PRE-DALT/TAB MEETING

****

NOTE: This subpart includes tailoring for ARMY, NAVY, and DESIGN-BUILD.

When DESIGN-BUILD is selected, the HVAC design engineer is required to attend the meeting. When ARMY is selected, project schedule is used. When NAVY is selected, network analysis schedule (NAS) is used.

****

****

NOTE: Inclusion of this meeting requirement in the specification is 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 design engineer of the HVAC systems to develop a mutual understanding relative to the details of the DALT and TAB work requirements. Requirements to be discussed include required submittals, work schedules, and field quality control. Ensure that the TAB Team Supervisor and a representative for the sheet metal contractor, mechanical contractor, electrical contractor, and HVAC controls system contractor are present at this meeting. Conduct the Pre-DALT/TAB Meeting a minimum of 30 calendar days in advance of the commencement of ductwork installation.

Provide written notice to the Contracting Officer of the proposed date of the Pre-DALT/TAB Meeting at a minimum of 14 calendar days prior to the

proposed date. The notice must include the proposed date and time; required, and optional if any, attendees' names and job titles; a copy of the current submittal register; and a copy of the current project schedule containing the sequencing and durations of the DALT and TAB activities and submittals in this section. The notice must include the proposed date and time; required, and optional if any, attendees' names and job titles; a copy of the current submittal register; and a copy of the current network analysis schedule containing the sequencing and durations of the DALT and TAB activities and submittals in this section.

[1.12 EXISTING FACILITY CONDITIONS

****
NOTE: Retain this subpart when the measurement of existing facility conditions is included in the project.
****

****
NOTE: Edit the following requirements to explicitly identify existing systems and components requiring DALT or TAB. It is important to verify existing to remain (ETR) equipment performance is still sufficient to ensure project goals can be accomplished. Exercise particular care in defining existing systems and components. Specify the systems identically to the labeling and terminology used on project drawings.

Edit the field survey scope to explicitly identify areas or items of concern based on the new work to be performed, if any.

Existing conditions DALT and TAB work rarely includes Field Acceptance Testing except for ETR equipment and systems. Retain the applicable bracketed text below.
****

Conduct [DALT][TAB][DALT and TAB]measurements, survey, and generate report(s) in accordance with the procedures in this section, [exclusive][inclusive] of Field Acceptance Testing, for the following:

a. [_____]

b. [_____]

c. [_____]

Perform a field survey, including inspection, by the TAB Team of the existing equipment, ductwork, and associated systems to confirm the location and condition of the equipment, test ports, flow measuring devices, balancing devices, fire and smoke dampers, and other items that impact the [DALT][TAB][DALT and TAB]work required of this Contract. Include a visual inspection of ductwork and duct liner for the presence and condition of duct sealant, material deterioration, and visible duct blockages and restrictions.

****

NOTE: When construction phase DALT or TAB Field Work is included in the project, retain the bracketed sentence.

****

Submit the Existing Facility Conditions Report to the Contracting Officer for approval within [14][_____] calendar days of completion of the associated field work.[Submit an updated TAB Pre-Field Engineering Plan to the Contracting Officer for approval within 30 calendar days of approval of the Existing Facility Conditions Report as a result of this field work.]

]1.13 REPORTS

****

NOTE: The following subpart includes tailoring forNAVY and DESIGN-BUILD.

When NAVY and DESIGN-BUILD tailoring is selected, Navy has additional requirements for submittals based on the unique use of 01 33 00.05 20 CONSTRUCTION SUBMITTAL PROCEDURES. Refer to the NOTE in the paragraph SUBMITTALS.

****

Format: All submitted documentation must be typed, neat, and organized. Include a dated title page, a certification page, a table of contents identifying the location of each report section, sequentially numbered pages throughout, and all sections bookmarked. Tables, lists, and diagrams must be titled.[Hardcopy report forms and report data must be typewritten and bound with a waterproof front and back cover.] Handwritten report forms or report data are not acceptable. Submit electronic reports with the additional requirements in accordance with the paragraph SUBMITTALS.

Submit the completed report forms approved in the TAB Pre-Field Engineering Plan, and any other data sheets and supporting documentation necessary, to document the required design data; field measurements data; system configuration and settings during testing; design and installation deficiencies; and, required data evaluations. Reports must be completed by the TAB Team, and reviewed and certified by the TAB Team Supervisor.

[1.13.1 Existing Facility Conditions Report

****

NOTE: Retain this subpart when the measurement of existing facility conditions is included in the project.

****

Provide a consolidated report of the [DALT][TAB][DALT and TAB][_____][and]survey Field Work performed in compliance with the following requirements:

a. Project Summary: Provide a description of the scope of the Field Work, including a narrative describing the outcome of the Field Work. When applicable, provide notations describing how actual field procedures differed from those in the TAB Pre-Field Engineering Plan.

b. Survey Results: Provide a narrative describing the items that impact the [DALT][TAB][DALT and TAB]work required of this Contract. For those items considered detrimental to the work or nonfunctional, include explanation of the deficiencies. Define the scheduled need date for repairs of existing nonfunctional equipment and devices.

c. System Variations: Provide a listing in a tabular format, with each item sequentially numbered, that documents:

(1) System variations deviating from the [contract documents][As-Built documents]discovered as a result of the Field Work, including any abnormalities and any items for the attention of the Contracting Officer.

(2) Recommended resolutions developed by the TAB Firm.

(3) References to the associated Field Work Reports or Supporting Documents, as applicable.

(4) Scheduled need date for repairs of existing nonfunctional equipment and devices.

d. Supporting Documents: Provide copies of documentation that clarifies the System Variations such as equipment schedules, product literature, and photographic images. Include this documentation in an appendix to the report with sequential numbering of each separate item for reference in the System Variations list.

e. Field Work Reports: Provide a copy of the approved reports generated from the [DALT][TAB][DALT and TAB]Field Work in an appendix to the report with sequential numbering of each separate document.

][1.13.2 DALT Reports

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

a. Project Summary: Provide, if applicable, notations describing how actual field procedures differed from those in the approved TAB Pre-Field Engineering Plan. If no procedures differed, state so in the report.

b. Data from DALT Field Work: After conducting the DALT Field Work, prepare the DALT field data using the report forms approved in the TAB Pre-Field Engineering Plan. Form data must be recorded for each test iteration of each duct selection. Report forms for each test must indicate either "Pass" or "Fail". In addition, submit in the report, a marked duct shop drawing identifying each section of duct tested with assigned node numbers for each section. Node numbers used in the marked duct shop drawings must be included in the completed report forms to identify each duct section.

c. Supporting Documents: Include a copy of all calculations prepared in determining the duct surface area and the allowable leakage for each duct test section. In addition, provide a copy of the calibration curve for each of the DALT orifices used for testing.

d. Instruments: List the instruments used to measure the data. Include in the listing each instrument's unique identification number,

calibration date, and calibration expiration date. Provide a copy of the calibration certificate for each calibrated instrument used.

e. Certification: Include the TAB Team Supervisor's physical or electronic stamp, issued by the certifying body, and dated signature.

The Certified Final DALT Report consists of the approved Pre-Final DALT Reports, organized in chronological order, the DALT-related Project Summary and Step-by-Step Procedures from the approved TAB Pre-Field Engineering Plan with a brief narrative describing any DALT failures and subsequent passing tests, and a separate Certification.

]1.13.3 TAB Reports

****

NOTE: The following paragraphs include tailoring for SEASONAL TESTING and NO SEASONAL TESTING.

When SEASONAL TESTING tailoring is selected, the project includes separate Certified TAB Reports related to Season 1 and Season 2 field work. When NO SEASONAL TESTING tailoring is selected, the project includes a combined Proportional Balancing and Thermal Performance Testing report.

****

Report the data for the Certified TAB Report of Proportional Balancing, Certified TAB Report of Season 1, and Certified TAB Report of Season 2 in compliance with the following requirements: Report the data for the Certified TAB Report in compliance with the following requirements:

a. Project Summary: Provide a project narrative, including systems and equipment tested, describing the outcome of the testing and balancing and include a list of items documenting system variations deviating from the design tolerances, any abnormalities discovered, and any outstanding items with proposed corrective action. When applicable, provide notations describing how actual field procedures differed from those approved in the TAB Pre-Field Engineering Plan. If no procedures differed, state so in the report.

b. Certification: Include the TAB Team Supervisor's physical or electronic stamp, issued by the certifying body, and dated signature.

c. Data from TAB Field Work: Prepare the TAB field data using the report forms approved in the TAB Pre-Field Engineering Plan and any other data sheets necessary to document the required final system balance and demonstrate accuracy and repeatability during TAB Field Acceptance Testing. For each unique calibration factor utilized, report the traverse airflow, the flow measuring instrument reading (e.g., flow hood airflow), the resulting correction factor, and the location of the traverse taken. Include notation on each form with the date the form's data was collected and with any Supporting Document reference number. Provide a detailed explanation wherever a final measurement did not achieve the required value or fall within the required range of values. Include the following:

(1) System Configuration: Clearly identify system configurations and conditions affecting data for all reported data. Include system operational parameters such as device positioning, system

diversity, modes of operation, and setpoints necessary to set up and duplicate the system configuration during the TAB Field Acceptance Testing. Include final hydronic differential pressure setpoint, hydronic system fill pressure, glycol percentage, pump and fan motor frequency in maximum, fan motor frequency in minimum, fan brake horsepower, calibration coefficients and factors, control damper positions, and primary air static pressure setpoint.

(2) Static Pressure Profiles: Provide static pressure profiles in accordance with this section. Illustrate pressures in an Equipment Diagram representative of the actual installation. Include design static pressure and differential pressure values for comparison where provided.

(3) Duct Traverses: Provide duct traverse measurement data in accordance with this section. Include individual velocities from the duct traverses taken. Illustrate, in an Equipment Diagram, the actual entering and leaving duct traverse airflows for each piece of air-handling equipment exceeding 944 L/S 2,000 CFM.

(4) Air and Water Systems' Open Paths: Identify air and hydronic system open paths in the report form.

(5) Motor Data: Provide motor current (amperage) and voltage for each phase of motors, including those powered by VFDs. Include current setting for thermal overload protection for motors, including starter or VFD brand, model, enclosure type, installed overload devices, rating(s) or rating range, and setpoints, and revised device ratings and setpoints when applicable.

(6) Seasonal Thermal Performance Data: Include capacity field data and design and calculated capacity, along with ambient outdoor temperature data, on seasonal thermal performance report forms. Include notation to identify system configuration settings that deviate from the design sequences of operation and setpoints when necessary to obtain the design capacity.

****
NOTE: When Sound Assessment Field Work is included in the project, retain the following paragraph.
****

[(7) Sound Assessment: Provide, for each area, the sound pressure levels measured for each octave band in tabular format and the resultant noise criteria curve and the noise criteria (NC) goals. Include notation indicating those areas with sound levels above 65 dB in octave bands below 63 Hz. Include notation to identify system configuration settings and the design sequences of operation and setpoints utilized to obtain the sound data.

] d. Flow Measuring Device Calibration: Provide calibration data at each scheduled design volumetric flow rate.

e. Instruments: Provide an updated list of the instruments used to measure the TAB data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date. Include a copy of the instrument calibration certificate when updated from the copy in the approved TAB Pre-Field Engineering Plan.

f. Performance Curves: Provide copies of the factory pump curves and fan curves for pumps and fans included on the job, and manufacturer equipment data curves or tables correlating pressure drop and water flow rate. Include marks or notation indicating the reported final balance values on each curve.

g. Calibration Charts: Provide a factory calibration chart, table, graph, or diagram, as applicable, for each applicable balancing valve and flow measuring device such as a venturi flow meter and an orifice flow meter.

h. TAB Schematic Drawings: Provide updated drawings and diagrams with the final installed locations of all terminals and devices, any numbering changes, and actual test locations including duct traverse and static pressure measurements. Indicate the air terminal device and water coil of the open paths for those identified.

i. Mechanical Equipment Schedules: Include a copy of the mechanical equipment schedules.

j. Supporting Documents: Provide copies of any request for information (RFI) with the RFI response; summaries of implemented change order(s); meeting minutes with participants; electronic mail with addresses; and, other documentation substantiating any deviations of the reported design values from the initial contract design documents. Include this documentation in an appendix to the TAB report with sequential numbering of each separate document for reference in the data presentation forms.

k. Guarantee: Provide documentation substantiating the inclusion of the quality assurance program such as a certificate of conformance or performance guarantee issued by the TAB Firm's certifying body.

1.14 SEQUENCING AND SCHEDULING

****
NOTE: The following subpart includes tailoring for ARMY, NAVY, NO PHASED CONSTRUCTION, PHASED CONSTRUCTION, NO SEASONAL TESTING, AND SEASONAL TESTING.

When PHASED CONSTRUCTION is selected, the subpart Phased Construction is included, and the subpart Submittal and Work Schedule is edited, to define the specific phasing sequence intended by the design. When NO PHASED CONSTRUCTION is selected, the subpart Phased Construction is not included.
****

****
NOTE: This subpart is tailored for PHASED CONSTRUCTION. When phased construction is included in the project (e.g., multiple renovation phases, multiple buildings), retain the following subpart Phased Construction.
****

1.14.1 Phased Construction

****

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

Include in this subpart the specific phasing sequence intended by the design. Edit the bracketed phase descriptions to ensure each is included. Specify the building and phasing identically to labeling used on the project drawings.

When the project includes multiple new buildings as the phasing, retain the bracketed building text. When the project includes renovation of a single or multiple buildings with phases within each, retain the bracketed phase text.

****

This project includes multiple [phases][and][buildings]. DALT and TAB work for each project [phase][and][building] must be scheduled separately and must correspond to each completion milestone in the master schedule. The DALT and TAB work, including all associated submittals, must be completed and approved with each [phase][building], excluding Season 2, prior to turnover.[At completion of the Season 2 TAB Field Acceptance Testing for the final phase in the building, compile all approved TAB reports and submit as one document.][_____].

****

NOTE: When the project includes multiple new buildings as the phasing, replace the bracketed text with the building designation or description. When the project includes renovation of a single or multiple buildings with phases within each, replace the bracketed text with the building and phase designation or description.

Coordinate the phasing and building labels below within other requirements in this section.

****

The following [phases][buildings] are included:

a. [Phase [_____]]

b. [Phase [_____]]

c. [Phase [_____]]

1.14.2 Submittal and Work Schedule

****

NOTE: This subpart includes tailoring for ARMY, NAVY, DOMESTIC HOT WATER SYSTEMS TAB, NO PHASED CONSTRUCTION, PHASED CONSTRUCTION, NO SEASONAL TESTING, and SEASONAL TESTING.

****

****
NOTE: Review and modify this paragraph to suit this contract's scope of work.
****

****
NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. The items listed are based on a single occurance of DALT and TAB field work, submittals, and acceptance testing.
****

****
NOTE: This subpart is tailored for PHASED CONSTRUCTION. The items listed are based on a single occurance of DALT and TAB field work, submittals, and acceptance testing.

When the project includes multiple new buildings as the phasing, retain the bracketed building text. When the project includes renovation of a single or multiple buildings with phases within each, retain the bracketed phase text.
****

This schedule is structured as though the HVAC and DHW systems construction, and thereby the DALT and TAB work, submittals, and field acceptance testing, is going to be completed in a single phase for the contract, including the seasonal work. All DALT and TAB field work, submittals, and acceptance testing must be planned and completed separately for each[phase][building]. This schedule is structured as though the HVAC and DHW systems construction, and thereby the DALT and TAB work, submittals, and field acceptance testing, is going to be completed in a single occurance for the contract, including the seasonal work. All DALT and TAB field work, submittals, and acceptance testing must be planned and completed separately for each occurance. Include the items listed in this schedule in the Project Schedule required by Section 01 32 01.00 10 PROJECT SCHEDULE. Include the items listed in this schedule in the Network Analysis Schedule (NAS) required by Section 01 32 17.00 20 COST-LOADED NETWORK ANALYSIS SCHEDULES. Ensure sufficient time is scheduled to complete each item, including Government review period for submittals. The order of items listed below does not imply a specified sequence:

a. Submission of TAB Firm and Personnel Qualifications

b. Submission of Design Review Report

c. Submission of TAB Pre-Field Engineering Plan

d. Pre-DALT/TAB Meeting

****
NOTE: When the measurement of existing facility conditions is included in the project, retain the following bracketed items.
****

[e. Existing Facility Conditions Field Work

f. Submission of Existing Facility Conditions Report

] g. DALT Field Work

h. Submission of Pre-Final DALT Reports

i. DALT Field Acceptance Testing

j. Submission of Certified Final DALT Report

k. Proportional Balancing TAB Field Work

****
NOTE: When Sound Assessment Field Work is included in the project, retain the following bracketed item.
****

[l. Sound Assessment Field Work

]**********
NOTE: The following items include tailoring for NO SEASONAL TESTING and SEASONAL TESTING.

NOTE: When NO SEASONAL TESTING tailoring is selected, a Certified TAB Report is required and listed below. When SEASONAL TESTING tailoring is selected, separate proportional balancing, Season 1 and Season 2 test report submittals are required and listed below.
****

m. Submission of Certified TAB Report

n. TAB Field Acceptance Testing

o. Submission of Certified TAB Report of Proportional Balancing

p. Proportional Balancing TAB Field Acceptance Testing

q. Season 1 TAB Field Work

r. Submission of Certified TAB Report of Season 1

s. Season 1 TAB Field Acceptance Testing

t. Season 2 TAB Field Work

u. Submission of Certified TAB Report of Season 2

v. Season 2 TAB Field Acceptance Testing

1.15 WARRANTY

****
NOTE: This subpart includes tailoring for ARMY. Use this subpart for ARMY projects only.
****

Furnish workmanship and performance warranty for the [DALT and]TAB system work performed for a period of [1][2][3][5][_____] years from the date of Government acceptance of the work, issued directly to the Government. Include provisions that if within the warranty period the system shows evidence of major performance deterioration, or is outside of the tolerances noted within the TAB System Tolerance section, resulting from defective TAB or DALT workmanship, the corrective repair or replacement of the defective materials and correction of the defective workmanship is the responsibility of the TAB Firm. Perform corrective action that becomes necessary because of defective materials and workmanship while system TAB and DALT are under warranty 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time constitutes grounds for having the corrective action and repairs performed by others and the cost billed to the TAB Firm. The Contractor must also provide a [1][2][3][5][_____] year contractor installation warranty.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 DALT PROCEDURES

****
NOTE: This subpart includes tailoring for NO PHASED CONSTRUCTION and PHASED CONSTRUCTION.

When PHASED CONSTRUCTION tailoring is selected, the project includes Pre-Final DALT Reports and a Certified Final DALT Report for each phase. Refer to the paragraph Phased Construction. When NO PHASED CONSTRUCTION tailoring is selected, the project includes a Pre-Final DALT Report and a Certified Final DALT Report.
****

3.1.1 Systems Requiring DALT

****
NOTE: When DALT of transfer air ductwork is not required, retain the bracketed text.
****

All duct systems, regardless of duct pressure classification, are subject to DALT including supply, return, exhaust, relief, and outdoor air[with exception of transfer air]. From each duct system indicated as subject to DALT, the Contracting Officer will randomly select sections of each completed duct system for testing such that the duct selections will not exceed 25 percent of the total measured linear footage of each duct system. Include notation within the associated Advance Notice indicating the specific unit(s) when electing the following for any single unit or quantity of similar units:

a. It is acceptable for an entire duct system associated with a single unit (e.g., 100 percent of AHU-1 supply air ductwork) to be leak tested instead of disassembling that system in order to DALT only the

25 percent duct selection specified. Testing an entire duct system for a unit does not reduce the DALT requirements for any other duct system or selection.

b. It is acceptable for the duct systems (e.g., FCU supply air and return air) for 25 percent of the total quantity of similar terminal units and light-duty air-handling equipment (e.g., WSHPs less than 5 tons cooling capacity, VAVs, and FCUs) to be leak tested instead of disassembling 25 percent of each duct system for each of these units.

3.1.2 Prerequisites for DALT Field Work

Complete the following prior to starting DALT Field Work:

a. Submission and approval of the SD-01 Preconstruction Submittals.

b. Installation and sealing in conformance with the contract documents of those duct systems indicated completed and ready for testing.

c. Confirmation ductwork to be air leakage tested is accessible and not concealed or insulated.

d. Work items and inspections indicated in the Pre-DALT Field Work Checklist.

e. Furnish the TAB Team a copy of the ductwork layout Detail Drawings indicating the completed duct systems available for DALT.

3.1.3 Advance Notice for Pre-Final DALT Field Work

Provide the Contracting Officer with written notification including the proposed date for DALT and a copy of the ductwork layout Detail Drawings with indication and dimensions of the duct systems, or portion thereof, completed and ready for DALT. Include with the notice the signed and dated Pre-DALT Field Work Checklist, with all work items certified by the Contractor and mechanical contractor as completed.

Provide the notice after completion of the installation of duct systems indicated as ready for testing.

3.1.4 Ductwork Selections

From each duct system indicated within the Advance Notice of Pre-Final DALT Field Work, the Contracting Officer will select sections of each completed duct system for testing in accordance with this section. Maintain a hard copy of the drawings indicating ductwork selections on site.

Sealing of the ductwork selections is prohibited, with exception of temporary end caps and connection for test apparatus, from the time the Contractor is notified of the selections until DALT measurements are recorded.

3.1.5 DALT Field Work

Conduct DALT Field work on the ductwork selections in compliance with the procedures specified in SMACNA 016, as supplemented and modified by this section. Use a duct test pressure equivalent to each ductwork selection's pressure classification. Calculate the ductwork selection allowable

leakage using the more stringent, lower numerical value, of the duct system leakage class for the duct pressure classification indicated on the drawings or the maximum permitted leakage class defined as follows:

a. Round/Oval Leakage Class = 3 and Rectangular Leakage Class = 4 at duct pressure classification of 1000 Pa 4 in. WG and above.

b. Round/Oval Leakage Class = 4 and Rectangular Leakage Class = 8 at duct pressure classification of 500 Pa 2 in. WG and 750 Pa 3 in. WG.

c. Round/Oval Leakage Class = 8 and Rectangular Leakage Class = 16 at duct pressure classification of 250 Pa 1 in. WG.

Complete DALT Field Work on the ductwork selections within 48 hours from receipt of selections, including disconnection, capping, measuring, and testing of ductwork. If any of the duct sections tested is a DALT failure, terminate testing for that system and report the duct selection as failed and the duct system as DALT terminated in the Pre-Final DALT Report.

3.1.6 Pre-Final DALT Report

****
NOTE: This subpart includes tailoring for PHASED CONSTRUCTION and NO PHASED CONSTRUCTION. Retain and edit the portions applicable to the project as indicated.

When PHASED CONSTRUCTION tailoring is selected, edit the submittal requirements below to include a Pre-Final DALT Report for each phase, with submittal tags to ensure inclusion in the paragraph SUBMITTALS. Retain the bracketed text that applies. When NO PHASED CONSTRUCTION tailoring is selected, the submittal requirements below include only a single Pre-Final DALT Report for the project.
****

Upon completion of the DALT Field Work, prepare a Pre-Final DALT Report. Prepare separate Pre-Final DALT Reports when DALT is not completed in a single event[for each phase][for each building] and differentiate these with a sequential numerical suffix such as Pre-Final DALT Report 1.

****
NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. Retain the following paragraph.
****

Submit the Pre-Final DALT Report to the Contracting Officer for approval within two working days of completion of the related DALT Field Work.

****
NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following paragraphs.

For phased construction within a single building, edit the submittal requirements below to include a Pre-Final DALT Report for each phase (e.g., Phase 1, Phase 2), with submittal tags to ensure inclusion in

the paragraph SUBMITTALS.

For construction of multiple buildings, edit the submittal requirements below to include a Pre-Final DALT Report for each building (e.g., Bldg 214, Bldg 215), with submittal tags to ensure inclusion in the paragraph SUBMITTALS. Replace each instance of the term "Phase" with the building designation.

For phased construction within each of multiple buildings, edit the submittal requirements below to include a Pre-Final DALT Report for each phase within each building (e.g., Bldg 214 Phase 1), with submittal tags to ensure inclusion in the paragraph SUBMITTALS. Replace each instance of the term "Phase" with the building designation and phase designation.

****

Submit a Pre-Final DALT Report to the Contracting Officer for approval within two working days of completion of the DALT Field Work for each of the following:

****

NOTE: Insert SUB tags around each submittal.

****

Phase [1][_____] Pre-Final DALT Report

Phase [2][_____] Pre-Final DALT Report

[_____]

3.1.7 Quality Assurance

3.1.7.1 DALT Field Acceptance Testing

In the presence of the Contracting Officer and TAB Team Field Leader, conduct field acceptance testing of a maximum of 50 percent of the duct sections in the approved Pre-Final DALT Report as selected by the Contracting Officer. If any of the duct sections tested is a DALT failure, terminate data checking for that section; the associated Pre-Final DALT Report data for the given duct selection will be disapproved.

Provide the Contracting Officer with written notification of the proposed date for DALT Field Acceptance Testing within 14 calendar days of approval of the Pre-Final DALT Report and a minimum of 7 calendar days in advance of proposed field acceptance testing date.

3.1.7.2 Retesting and Additional Testing

For any duct section indicated as a DALT failure, make the necessary repairs. Repairs must be applied to similar conditions in all untested duct sections. For each DALT failure, and after repairs are completed, conduct DALT on the untested duct selection(s) of the terminated duct system, on the failed section, and one additional duct section as selected by the Contracting Officer. Prepare and resubmit the Pre-Final DALT Report with the original, retesting, and additional selection test results

for approval. Reschedule field acceptance testing of the approved revised report with the Contracting Officer.

3.1.8 Certified Final DALT Report

****
NOTE: When the project includes multiple buildings, edit the submittal requirements below to include a Certified Final DALT Report for each building (e.g., Bldg 214 Certified Final DALT Report, Bldg 215 Certified Final DALT Report), with submittal tags to ensure inclusion in the paragraph SUBMITTALS. Retain the bracketed text as applicable in the following paragraphs.
****

Prepare the Certified Final DALT Report using data furnished by the TAB Team in the Pre-Final DALT Report(s) for[each phase][each building].

Submit the Certified Final DALT Report to the Contracting Officer for approval within 14 calendar days of successful completion of all DALT Field Acceptance Testing for[the][each] building.

3.2 TAB PROCEDURES

****
NOTE: This subpart includes tailoring for DESIGN-BID-BUILD, DESIGN-BUILD, DOMESTIC HOT WATER SYSTEMS TAB, NO PHASED CONSTRUCTION, PHASED CONSTRUCTION, NO SEASONAL TESTING and SEASONAL TESTING.

When DESIGN-BID-BUILD tailoring is selected, the Government is responsible for addressing design deficiencies. When DESIGN-BUILD tailoring is selected, the Contractor is responsible for addressing design deficiencies.

When DOMESTIC HOT WATER SYSTEMS TAB tailoring is selected, the field work scope includes testing, adjusting, and balancing the specified systems and equipment provided in accordance with Division 22.

When SEASONAL TESTING tailoring is selected, thermal performance testing is performed during two separate climatic seasons as provided in the paragraph DEFINITIONS. When NO SEASONAL TESTING tailoring is selected, thermal performance testing is performed without climatic restrictions.

When PHASED CONSTRUCTION tailoring is selected, the project includes Certified TAB Reports for each phase. Refer to the paragraph Phased Construction. When NO PHASED CONSTRUCTION tailoring is selected, the project includes Certified TAB Reports based on the selection of SEASONAL TESTING or NO SEASONAL TESTING.
****

****
NOTE: Edit, delete, and add to the paragraphs below to ensure that air, hydronic, and DHW recirculation systems indicated on project drawings are listed for TAB work. Explicitly identify new and existing systems and components which are to be tested. Exercise particular care in defining existing systems and components. Specify the systems identically to labeling and terminology used on project drawings. Delete the items which do not apply to this project.
****

3.2.1 Systems Requiring TAB

All DHW recirculation, air and hydronic systems are subject to TAB. All DHW recirculation, air and hydronic systems are subject to TAB such as the following:

****
NOTE: The following systems require TAB when included in the design. Add systems as required by the scope of the project.
****

a. Air Systems:

(1) Supply Air (SA)

(2) Return Air (RA)

(3) Outdoor Air (OA)

(4) Exhaust Air (EA)

(5) Relief Air (LA)

(6) [_____]

b. Hydronic Systems:

(1) Chilled Water (CHW)

(2) Condenser Water (CW)

(3) Heating Hot-Water (HHW)

(4) [_____]

c. Other Systems:

(1) DHW Recirculation

(2) [_____]

Each system includes the associated equipment, devices, and components such as:

a. Air systems: AHUs, DOAS units, Heating and Ventilating Units (HVUs),

VAV terminal units, FCUs, WSHPs, fans, duct systems, energy recovery systems, exhaust hoods, flow measuring and balancing devices, grilles, registers, and diffusers.

b. Hydronic and DHW systems: chillers, boilers, cooling towers, coils, pumps, piping systems, heat exchangers, energy recovery systems, pressure reducing valves, flow-measuring and balancing devices, and pressure and temperature ports.

c. Other systems: DHW heaters, pressure and temperature ports, flow balancing valves, [and] thermostatic mixing valves[,_____][,_____][, and _____].

3.2.2 TAB Tolerances

3.2.2.1 System Tolerances

System tolerances apply to the design flow rates as specified or indicated in the contract documents. HVAC systems' tolerance is plus or minus 5 percent, except as indicated below:

****

NOTE: As applicable to the project, retain the following sentences. Do not edit the tolerance values.

Ensure TAB tolerances allow achievement of ASHRAE 62.1 - Outdoor Airflow Minimum Ventilation Rates in Breathing Zone, ASHRAE 62.1 – Minimum Exhaust Airflow requirements, and, as applicable to the project, other minimum OA and EA airflow criteria. Additionally, coordinate TAB tolerances to achieve proper building pressurization. Ensure equipment schedules, systems' capacity and allowed leakage support TAB tolerance strategy.

Where specific equipment or systems require tighter airflow or water flow tolerance, add the specific system or equipment designation from the contract documents in the brackets below and the associated tighter tolerance.

****

a. Air Systems:

[(1) OA 23.5 L/s 50 CFM or less: plus 2.35 L/s 5 CFM to minus zero L/s zero CFM

][(2) EA 23.5 L/s 50 CFM or less: plus zero L/s zero CFM to minus 2.35 L/s 5 CFM

][(3) SA and RA of 100 percent recirculating single-zone air-handing equipment: plus or minus 10 percent

][(4) SA and RA 23.5 L/s 50 CFM or less: plus or minus 1.42 L/s 3 CFM

][(5) [_____]

] b. Hydronic Systems:

[(1) Heating Hot-Water (HHW) at coils: plus or minus 10 percentHW at coils: plus or minus 10 percent

][(2) [_____]

] c. Other Systems:

(1) DHW Recirculation: plus or minus 10 percent

[(2) [_____]

]3.2.2.2 Acceptance Tolerances

****
NOTE: When the System Tolerances include a range of plus or minus 10 percent, retain the bracketed sentence.
****

Field Acceptance Testing measurements must remain within the associated System Tolerance of the design flow rate.[When the associated System Tolerance is plus or minus 10 percent, Field Acceptance Testing measurements must remain within the associated System Tolerance of the design flow rate and repeat within plus or minus 5 percent of the approved Certified TAB Report data.]

3.2.3 Advance Notice for TAB Field Work

Provide the Contracting Officer with written notification including the proposed dates for TAB Field Work and a list of the systems ready for TAB on the proposed start date. Include with the notice the signed and dated Pre-TAB Field Work Checklist, with the applicable work items certified by the Contractor and mechanical contractor as having been completed and working as designed.

****
NOTE: The following paragraph includes tailoring for NO SEASONAL TESTING and SEASONAL TESTING. When SEASONAL TESTING tailoring is selected, three separate notices are required as thermal performance testing includes Season 1 and Season 2. When NO SEASONAL TESTING tailoring is selected, only two separate notices are required.
****

Furnish the Advance Notice for Proportional Balancing TAB Field Work, for Season 1 TAB Field Work, and for Season 2 TAB Field Work TAB Field Work prior to start of the TAB Field Work.Furnish the Advance Notice for TAB Field Work prior to start of the TAB Field Work.

3.2.4 Proportional Balancing TAB Field Work

Conduct TAB Field Work in conformance with the TAB Standard, as supplemented and modified by this section. Test, adjust, and balance the HVAC and DHW recirculation systems until measured flow rates (air and water flow) are within the specified System Tolerances. Do not exceed maximum rated revolutions per minute (RPM) and rated full load amperage for equipment during any mode of operation, including with loaded filters

and wet cooling coils. Variable speed drives must be capable of controlling to maximum and minimum flows with a drive operational range not less than 25 Hz. Operation exceeding 60 Hz is permitted only for direct-drive plenum fans rated for operation at higher frequencies. Follow the procedures specified in NFPA 70E during electrical measurements on exposed energized conductors or circuits. Additionally, this work includes the following:

a. Adjustment of flow control and balancing devices such as balancing valves, balancing dampers, and sheaves.

b. Adjustment of variable frequency drives and speed controllers.

c. Calibration of each controls system flow measuring device at each scheduled design volumetric flow rate.

d. Changing out fan sheaves if required to obtain flow rates specified or indicated.

****

NOTE: When the project includes direct digital controls (DDC) system performance verification testing (PVT), commissioning (Cx) functional performance testing (FPT), or both, utilize the 120 day completion timing to ensure sufficient calendar days for all activities through facility Beneficial Occupancy Date (BOD). When the project TAB report submittal review and field acceptance testing durations, including seasonal efforts, warrant, utilize the empty brackets to provide alternate completion timing.

****

Complete Proportional Balancing TAB Field Work at a minimum of [90][120][_____] calendar days in advance of the scheduled Beneficial Occupancy Date (BOD).

3.2.4.1 Prerequisites for TAB Field Work

****

NOTE: Edit, delete, and add items below as applicable to the project scope.

****

Complete the following prior to starting Field Work:

a. DALT Field Work and obtain approval of the Certified Final DALT Report.

b. Installation of pressure and temperature test ports adjacent to inlet and outlet of every pump, heat exchanger, chiller, boiler, and coil, and as required by the TAB Team Supervisor.

c. Work items and inspections indicated in the Pre-TAB Field Work Checklist, including providing new air filters and cleaning screens of hydronic system strainers.

d. Enclosure of the building envelope according to the contract documents with the Air Barrier Pressure Test completed and the Air Leakage Test Reports and Diagnostic Test Reports approved. Hydronic system TAB

field work may commence prior to air barrier test completion.

e. Manufacturer's equipment start-up forms for each piece of equipment to be tested.

f. HVAC controls system installation and start-up for each piece of equipment to be tested.

[3.2.4.2 TAB Air Distribution Systems

Balance systems to minimize throttling losses with at least one open path, with fully open balancing dampers from the fan discharge to an outlet and from fan suction to an inlet, for fans greater than 1 hp.

a. Static Pressure Profile Work

Measure and record static pressure profiles under maximum airflow conditions for air systems of 944 L/S 2,000 CFM and greater.

Measure static pressure data for supply, return, relief, exhaust, and outdoor air ducts for the systems. The static pressure measurement data must include, in addition to TAB Standard requirements, the following:

(1) Inlet and discharge static pressures for fans.

(2) Static pressure drop across coils and heat reclaim devices installed in unit cabinetry or the system ductwork.

(3) Static pressure drop across automatic control dampers.

(4) Static pressure drop across air filters, acoustic silencers, moisture eliminators, airflow straighteners, airflow measuring stations, and 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, and duct mounted humidifiers.

Do not report static pressure drop across duct fittings provided for the sole purpose of conveying air, such as elbows with or without turning vanes, transitions, offsets, plenums, manual dampers, and branch take-offs.

(5) Report static pressure drop across louvers.

(6) Report static pressure readings in the duct at the point where the ducts connect to air-handling equipment.

****

NOTE: For projects with large air moving systems such as those 1415 L/S 3000 CFM and larger, retain the bracketed text.

AMCA 203 and ASHRAE Handbook Fundamentals have additional guidance on definitions of satisfactory and unsatisfactory duct traverse locations and data when evaluating the results.

****

b. Duct Traverse Work

Perform duct traverses, in addition to TAB Standard requirements, for main[and each branch main] supply, return, exhaust, relief and outdoor air ducts for each piece of air-handling equipment exceeding 472 L/s 1,000 CFM. Include those ducts which lack 7 1/2 duct diameters upstream and 3 duct diameters downstream of straight duct unobstructed by duct fittings, offsets, and elbows.[Perform additional duct traverses as shown on the contract drawings.] Evaluate the suitability of the duct traverse measurement based on satisfying the qualifications for a satisfactory pitot traverse plane as defined by AMCA 203.

c. Building Pressurization Work

Perform measurements upon completion of air system balancing and during climate conditions suitable for a pressure test in accordance with Section 01 91 19 BUILDING ENCLOSURE COMMISSIONING. Record building differential pressure for all sides of the building on each floor where openings allow measurements by instrumentation. Report all system setup parameters affecting building pressure measurement (e.g., exhaust, relief and outdoor airflow, damper positions, and fan speeds) and indicate wind speed during time of building pressure measurements. Measure in maximum and minimum building systems configuration.

****

NOTE: The conditions and system setup must be defined for all differential pressure measurements.

Where applicable, retain the following bracketed specific parameters for system setup in maximum and minimum building systems configuration (operation). Coordinate the parameters with project design sequences of operation terminology.

List spaces with special or critical pressurization requirements in the brackets below.

****

Measurements must occur during building system setup with building exterior doors and windows closed and as follows:

[(1) Occupied Mode; air-handling equipment and fans in maximum cooling, maximum design airflow.

][(2) Occupied Mode; air-handling equipment with all zones satisfied such as VAVs at minimum design airflow.

][(3) Occupied Mode; air-handling equipment in full Economizer Mode.

][(4) Occupied Mode; air-handling equipment in Demand Controlled Ventilation Occupied-Standby Mode.

][(5) [_____]

] Measure differential pressure for the following locations: [_____][, _____].

][3.2.4.3 TAB Hydronic and Domestic Hot Water Distribution Systems

Balance systems to minimize throttling losses with at least one path, with fully open balancing valves, from the pump discharge to a terminal device and back to the pump suction, for pumps greater than 1 hp. Measure and record flow rates at all balancing valves and flow measuring devices.

****

NOTE: When specific deviations from or additions to the standard procedures for TAB of Hydronic and Domestic Hot Water Distribution Systems are required on the project, retain the following paragraphs and clearly indicate and specify all requirements.

Explicitly state the deviation from or addition to the TAB Standard procedures. Explicitly identify existing systems and components which are to be tested. Exercise particular care in defining existing systems and components. Specify the systems identically to labeling and terminology used on project drawings.

****

a. [_____]

b. [_____]

]3.2.4.4 Marking of Settings and Test Ports

Upon completing each item of work for TAB Field Work specified and prior to TAB Field Acceptance Testing, the TAB Team is to permanently mark the settings of HVAC adjustment devices including valves, gauges, and dampers so that adjustment can be restored if disturbed at any time. Secure balancing damper handles and set valve memory stops. Label variable frequency drives with final frequency (Hz) and control setpoint. Provide permanent markings clearly indicating the settings on the adjustment devices which result in the data reported on the Certified TAB Report. Permanently and legibly mark and identify the duct test ports. If the ducts have external insulation, make these markings on the exterior side of the insulation. Show the location of test ports on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

[3.2.5 Sound Assessment Field Work

****

NOTE: When Sound Assessment Field Work is included in the project, retain the following paragraph and clearly indicate and specify all requirements.

****

****

NOTE: Edit the following Areas list to explicitly identify the systems and locations required for this field work. HVAC mechanical rooms include machinery spaces and other spaces containing HVAC power drivers and power driven equipment. Adjacent spaces include those spaces sharing a common barrier with

each mechanical room (e.g., spaces on all six sides of a room). Locations include outdoor areas when equipment yards or rooftop equipment are part of the design. Verify the sound pressure level in locations (rooms) with specific Noise Criteria (NC) ratings in the project's room requirements. Specify the systems and locations identically to labeling and terminology used on project drawings.

****

Conduct sound measurements and assessments in accordance with the TAB Firm certifying body's sound standard, either AABC MN-1, NEBB MASV, or SMACNA 1858 for TABB, as supplemented and modified by this section.

3.2.5.1 Prerequisites for Sound Field Work

****

NOTE: Edit, delete, and add items below as applicable to the project scope.

****

Complete the following prior to starting Field Work:

a. Proportional Balancing TAB Field Work.

b. [_____]

3.2.5.2 Areas Requiring Sound Assessment

The following spaces are subject to sound assessment:

a. HVAC mechanical rooms: Room [_____] [, _____][, _____].

b. Adjacent spaces sharing a common barrier with each mechanical room: Room [_____] [, _____][, _____].

****

NOTE: 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 assessed that will accomplish the aforementioned sound assessment philosophy. List the rooms by terminology identical to labeling indicated on drawings.

****

[c. AHU-1 System: Rooms: [_____]

][d. [_____] System: Rooms: [_____]

][e. [_____] System: Rooms: [_____]

]3.2.5.3 Procedure

Conduct sound measurements in each interior room, when unoccupied except

for the TAB Team, and each exterior location, when applicable, with all HVAC systems that would cause sound readings in the specified room or location operating in their noisiest mode such as maximum cooling. Measure sound pressure levels in each octave band.

****

NOTE: ASHRAE HVAC APP SI HDBK ASHRAE HVAC APP IP HDBK Design Guidelines for HVAC-Related Background Sound in Rooms, Table 1, is not inclusive of all spaces and a maximum acceptable value (NC goal) for those spaces in the design that have no HDBK NC goal must be provided. For occupied spaces without specific NC goal, the recommended goal is NC 35.

****

Attempt to mitigate the sound level and bring the level to within the specified ASHRAE HVAC APP SI HDBK ASHRAE HVAC APP IP HDBK NC goals, if such mitigation is within the TAB Team's control. When no NC goal exists, utilize NC 35. If the sound level cannot be brought into compliance, provide written notice of the deficiency to the Contractor for correction. If the sound level cannot be brought into compliance, provide written notice of the deficiency to the Contracting Officer for resolution.

3.2.5.4 Timing

Measure sound levels during the period when the background noise is quietest, unless otherwise specified.

3.2.5.5 Meters

Measure sound levels with a sound meter complying with ASA S1.4, Class 1 or 2, and an octave band filter set complying with ASA S1.11 PART 1, Class 1. Calibrate meters as prescribed by the TAB Firm certifying body's sound standard, except that calibrators emitting a sound pressure level tone of 94 dB at 1000 hertz (Hz) are also acceptable.

3.2.5.6 Background Noise Correction

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

]3.2.6 Seasonal Thermal Performance TAB Field Work

****

NOTE: The following subpart includes tailoring for SEASONAL TESTING and NO SEASONAL TESTING. When SEASONAL TESTING tailoring is selected, the project includes two seasons for thermal performance testing. Season 2 requirements are included in CLOSEOUT ACTIVITIES. When NO SEASONAL TESTING tailoring is selected, the project includes the minimum field work for thermal performance testing.

****

Perform operational thermal performance testing of the HVAC systems as soon as all prerequisites are completed, but prior to facility turnover, regardless of the season. In addition, perform thermal performance testing during Season 1 and Season 2 when the outdoor air temperature (OAT) is within the seasonal temperature ranges below for equipment with

performance that is OAT dependent. It is acceptable to conduct Season 1 testing prior to the applicable season dates if all prerequisites are complete including OAT within range.

****
NOTE: Indicate each season's temperature range in the following items. For Cooling Season, the range is plus or minus 2.8 degree C5 degree F of Summer outdoor design dry-bulb temperature. For Heating Season, the range is plus or minus 11.1 degree C20 degree F of Winter outdoor design dry-bulb temperature. Round degree F to the nearest whole number.
****

a. Cooling Season: [XX.X to XX.X] degrees C [XX to XX] degrees F dry-bulb temperature.

b. Heating Season: [XX.X to XX.X] degrees C [XX to XX] degrees F dry-bulb temperature.

Complete Season 1 Thermal Performance Testing Field Work a minimum of 60 calendar days in advance of the scheduled BOD.

3.2.6.1 Prerequisites for Season 1 Thermal Performance Field Work

****
NOTE: Edit, delete, and add items below as applicable to the project scope.
****

Complete the following prior to starting Field Work:

[a. Proportional Balancing TAB Field Work.

][b. Sound Assessment Field Work.

] c. Work items and inspections indicated in the Pre-TAB Field Work Checklist for the applicable season, including confirming clean filters and strainers.

d. Advance Notice for Season 1 TAB Field Work.Advance Notice for Thermal Performance TAB Field Work.

e. [_____]

3.2.6.2 Thermal Performance Testing

Conduct thermal performance (capacity) tests to verify thermal energy transfer components, devices, and equipment meet the indicated design capacity. This work includes:

a. Verifying, using the same procedures and instruments for proportional balancing TAB field work, flows (air and water) remain within the System Tolerances. If the measurements exceed the specified System Tolerances, report these as deficiencies in accordance with this section.

b. Measuring water temperatures through immersion into fluid stream.

c. For ducted units, measuring airflows via duct traverse.

d. Measuring the range, from minimum to maximum, of the outdoor ambient dry-bulb temperature and corresponding dew-point temperature within which the TAB seasonal data was recorded. Record these temperature ranges on each day of seasonal data measurements.

Report all design data, actual field measurements, and capacity calculations for the components, devices, and equipment below.

3.2.6.3 Units with Coils

****
NOTE: Edit the paragraphs below to ensure that thermal energy transfer components indicated on the project drawings are listed for Thermal Performance TAB Field Work.
****

Report heating and cooling performance tests for heating and cooling coils such as heating hot-water, chilled-water, direct-expansion, and steam coils:

a. For units with capacities greater than 26,370 Watts 7.5 tons (90,000 BTU/H) cooling, such as factory manufactured units, central built-up units and rooftop units, determine the apparent air-side coil capacity by calculations utilizing direct measurement of airflow, and measurements of entering and leaving wet-bulb and dry-bulb temperatures for cooling capacity and dry-bulb temperatures only for heating capacity. Calculate water-side coil capacity utilizing direct measurements of water flow rate, and entering and leaving water temperatures. Measure and record coil water pressure drop.

   Measure and report dry-bulb temperature and relative humidity within the supply air duct downstream of each cooling coil. Report the corresponding dewpoint temperature.

b. For units with capacities of 26,370 Watts 7.5 tons (90,000 BTU/H) or less, such as fan coil units, duct mounted reheat coils associated with VAV terminal units, and unitary units, determine the apparent air-side coil capacity by calculations using direct measurement of airflow, single point measurement centered within the airstream of entering and leaving wet-bulb and dry-bulb temperatures for cooling capacity and dry-bulb temperatures only for heating capacity.

3.2.6.4 Units with Heat Recovery Devices

****
NOTE: Edit the paragraphs below to ensure that thermal energy transfer components indicated on the project drawings are listed for Thermal Performance TAB Field Work.
****

Report heating and cooling energy recovery performance tests for energy recovery devices such as wheels, coils, and fixed plate exchangers.

Report total cooling capacity, heating capacity, and energy recovery

effectiveness. For outdoor air and exhaust airstreams measure and report airflows and entering and leaving wet-bulb and dry-bulb temperatures across heat recovery device. For water-side calculations, utilize direct measurements of water flow rate and entering and leaving water temperatures. Measure and record water pressure drops.

3.2.6.5 Thermal Energy Transfer Equipment

****
NOTE: Edit the paragraphs below to ensure that thermal energy transfer components indicated on the project drawings are listed for Thermal Performance TAB Field Work.
****

Report heating and cooling performance tests for thermal energy transfer equipment (e.g., boilers, chillers, and cooling towers). Measure and report water flow rates, water-side pressure drops, and entering and leaving water temperatures. Report capacities.

3.2.7 Deficiencies

****
NOTE: This subpart includes tailoring for DESIGN-BID-BUILD and DESIGN-BUILD

When DESIGN-BID-BUILD tailoring is selected, the Government is responsible for addressing design deficiencies. When DESIGN-BUILD tailoring is selected, the Contractor is responsible for addressing design 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 or system design or installation prevent TAB work from being accomplished in accordance with this section, the TAB Team Supervisor must submit written notification within five working days from discovery of all such deficiencies for resolution. The TAB Firm must issue notice concurrently to the Contractor for corrective action and to the Contracting Officer for information. Provide a complete explanation, including supporting documentation, detailing the deficiencies and proposed corrective actions in the notification. Where deficiencies are encountered that adversely impact successful completion of:

a. TAB Field Work: Resolve deficiencies prior to submission of the Certified TAB Report.

b. TAB Field Acceptance Testing: The Contractor must, within five working days of the TAB Firm notice, submit written notification directly to the Contracting Officer, with a separate copy to the TAB Firm, of all such deficiencies, the intended or implemented corrective action, and the planned or actual date(s) for completion of each corrective action.

Responsibility for correction of design and installation deficiencies is the Contractor's. Responsibility for correction of installation deficiencies is the Contractor's.

3.2.8 Certified TAB Reports

****
NOTE: This subpart includes tailoring for DESIGN-BUILD, DOMESTIC HOT WATER SYSTEMS TAB, PHASED CONSTRUCTION, NO PHASED CONSTRUCTION, SEASONAL TESTING, and NO SEASONAL TESTING.

When DEIGN-BUILD tailoring is selected, the design engineer for the HVAC and DHW recirculation systems must perform a review of the TAB Report(s) prior to submission to the Government.

When NO SEASONAL TESTING tailoring is selected, a Certified TAB Report is required and listed below. When SEASONAL TESTING tailoring is selected, separate proportional balancing, Season 1 and Season 2 test report submittals are required and listed below.

When PHASED CONSTRUCTION tailoring is selected, the project includes Certified TAB Reports for each phase. Retain the bracketed text that applies. When NO PHASED CONSTRUCTION tailoring is selected, the project includes Certified TAB Reports based on the selection of SEASONAL TESTING or NO SEASONAL TESTING.
****

****
NOTE: This subpart contain options for projects with phased construction and multiple buildings. Retain and edit the portions applicable to the project as indicated.

For projects with phased construction, edit the submittal requirements below to include a Certified TAB Report for each phase, with submittal tags to ensure inclusion in the paragraph SUBMITTALS. For multiple phases in mulitple buildings, retain the bracketed text to require a Final TAB Report for each building of the project.
****

Upon completing each item of work for TAB Field Work specified, prepare a TAB Report in accordance with this section using data furnished by the TAB Team. In addition, the design engineer must review the Certified TAB Report and the comments, with dated signature, must accompany the report. If there are no comments generated during the Certified TAB Report review process, state so in the report. Prepare separate Certified TAB Reports, identified as indicated, for each[construction phase and a final, consolidated Certified Final TAB Report inclusive of Certified TAB Reports for all phases upon completion of all TAB Field Acceptance Testing required for[each building of] the project][building].

****
NOTE: The following paragraph is tailored for NO SEASONAL TESTING.
****

****
NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. Retain the following paragraph.
****

Submit the Certified TAB Report to the Contracting Officer for approval within 14 calendar days of completion of the TAB[and Sound Assessment] Field Work.

****
NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following paragraph.

For phased construction within a single building, edit the submittal requirements below to include a Certified TAB Report for each phase (e.g., Phase 1, Phase 2), with submittal tags to ensure inclusion in the paragraph SUBMITTALS.

For phased construction of multiple buildings, edit the submittal requirements below to include a Certified TAB Report for each building (e.g., Bldg 214, Bldg 215), with submittal tags to ensure inclusion in the paragraph SUBMITTALS. Replace each instance of the term "Phase" with the building designation.

When the project includes Sound Assessment Field Work, retain the bracketed text.
****

Submit a Certified TAB Report for each phase to the Contracting Officer for approval within 14 calendar days of completion of the TAB[and Sound Assessment] Field Work for each of the following:

****
NOTE: Insert SUB tags around each submittal.
****

Phase [1][_____] Certified TAB Report

Phase [2][_____] Certified TAB Report

[_____]

****
NOTE: The following paragraphs are tailored for SEASONAL TESTING.
****

****
NOTE: This subpart is tailored for NO PHASED CONSTRUCTION. Retain the following paragraph.
****

Submit the Certified TAB Report of Proportional Balancing to the Contracting Officer for approval within 14 calendar days of completion of the Proportional Balancing TAB[and Sound Assessment] Field Work.

Submit the Certified TAB Report of Season 1 to the Contracting Officer for approval within 14 calendar days of completion of the Season 1 TAB Field Work.

****

NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following paragraphs.

For phased construction within a single building, edit the submittal requirements below to include a Certified TAB Report for each phase (e.g., Phase 1, Phase 2), with submittal tags to ensure inclusion in the paragraph SUBMITTALS.

For phased construction of multiple buildings, edit the submittal requirements below to include a Certified TAB Report for each building (e.g., Bldg 214, Bldg 215), with submittal tags to ensure inclusion in the paragraph SUBMITTALS. Replace each instance of the term "Phase" with the building designation.

When the project includes Sound Assessment Field Work, retain the bracketed text.

****

Submit a Certified TAB Report of Proportional Balancing to the Contracting Officer for approval within 14 calendar days of completion of the Proportional Balancing TAB[and Sound Assessment] Field Work for each of the following:

****

NOTE: Insert SUB tags around each submittal.

****

Phase [1][_____] Certified TAB Report of Proportional Balancing

Phase [2][_____] Certified TAB Report of Proportional Balancing

[_____]

Submit a Certified TAB Report of Season 1 to the Contracting Officer for approval within 14 calendar days of completion of the Season 1 TAB Field Work for each of the following:

****

NOTE: Insert SUB tags around each submittal.

****

Phase [1][_____] Certified TAB Report of Season 1

Phase [2][_____] Certified TAB Report of Season 1

[_____]

****

NOTE: For USAF projects, regardless of the managing agency, retain the following paragraph.

****

[Provide a copy of the approved Certified TAB Report data in an electronic spreadsheet file, along with all supporting graphs, charts, and curves, within 21 calendar days of receipt of TAB Report approval.

]3.2.9 Quality Assurance

****

NOTE: This subpart includes tailoring for DOMESTIC HOT WATER SYSTEMS TAB and SEASONAL TESTING.

When SEASONAL TESTING tailoring is selected, separate Field Acceptance Testing is required for proportional balancing, Season 1 and Season 2.

****

3.2.9.1 TAB Field Acceptance Testing

In the presence of the Contracting Officer and TAB Team Field Leader, conduct field acceptance testing of points and areas in the approved Certified TAB Report as selected by the Contracting Officer. The selections include data types such as water and air volumetric flow rates, velocity, pressure, rotational speed (RPM), temperature, [sound level readings,]and electrical current recorded in the TAB Report. Measurement and test procedures are the same as required for TAB Field Work. If any of the measurements is a TAB failure, the Contracting Officer may terminate data verification. The sample group will be disapproved and require retesting and additional testing. Conduct TAB Field Acceptance Testing for the Certified TAB Report of Season 1 and for the Certified TAB Report of Season 2 within the applicable Cooling Season or Heating Season.

Provide the Contracting Officer with written notification of the proposed date for TAB Field Acceptance Testing within 14 calendar days of approval of the Certified TAB Report and a minimum of 7 calendar days in advance of proposed TAB Field Acceptance Testing date. Provide the Contracting Officer with written notification of the proposed date for Proportional Balancing TAB Field Acceptance Testing within 14 calendar days of approval of the Certified TAB Report of Proportional Balancing and a minimum of 7 calendar days in advance of proposed TAB Field Acceptance Testing date. Provide the Contracting Officer with separate written notification of the proposed date for Season 1 and for Season 2 TAB Field Acceptance Testing within 7 calendar days of approval of the associated Certified TAB Report and a minimum of 7 calendar days in advance of proposed TAB Field Acceptance Testing date.

3.2.9.2 Sample Strategy

Field acceptance testing includes verification of selections using the sample strategy indicated for each Category. For each of the following Categories, the Contracting Officer will select a sample group for testing:

Category 1: 100 percent of the air system equipment such as DOAS units, AHUs (rooftop and central stations), return fans, computer room air-conditioning (CRAC) units, and energy recovery units (ERUs) and 25 percent of the associated air terminal devices.

Category 2: 100 percent of the water system equipment such as chillers, boilers, cooling towers, pumps, DHW heaters, and Category 1

equipment's coils.

Category 3: 25 percent of the air terminal units (e.g., VAV terminal units, FCUs), and of the exhaust fans, supply fans, and relief fans and 100 percent of the selected equipment's air terminal devices.

Category 4: 25 percent of the hydronic and DHW recirculation systems' flow measuring devices (e.g., manual balancing valves and flow meters) and Category 3 equipment's hydronic coils.

Quantity is rounded up to a whole number for a sample size and is a minimum of three units or devices when three or more exist.

3.2.9.3 Retesting and Additional Testing

For any data indicated as a TAB Failure and when the data verification is terminated, make the necessary corrections, conduct TAB Field Work, set and secure balancing devices, and mark settings. Prepare and resubmit the applicable TAB Report with the corrected test results for approval. Reschedule TAB Field Acceptance Testing of the approved revised report with the Contracting Officer. For each TAB Failure, and after the revised report is approved, conduct field acceptance testing of the failed data point, one additional selection by the Contracting Officer from the same Category for each failure, and new selections by the Contracting Officer in the same Category using the Category's sample strategy. If there is insufficient quantity of data in the same Category, the Contracting Officer may select data from a different Category.

3.3 CLOSEOUT ACTIVITIES

****
NOTE: This Article is tailored for SEASONAL TESTING and describes the requirements for thermal performance testing during the season opposite Season 1.
****

3.3.1 Season 2 Thermal Performance TAB Field Work

Perform operational thermal performance testing of the HVAC systems during Season 2 when the OAT is within the seasonal temperature range.

3.3.1.1 Prerequisites for Season 2 Thermal Performance Field Work

****
NOTE: Add items below as applicable to the project scope.
****

Complete the following prior to starting Field Work:

a. Proportional Balancing TAB Field Work.

b. Work items and inspections indicated in the Pre-TAB Field Work Checklist for the applicable season, including confirming clean filters and strainers.

c. Advance Notice for Season 2 TAB Field Work.

d. [_____]

3.3.1.2 Season 2 Thermal Performance Testing

****
NOTE: This subpart contains options for projects with phased construction and multiple buildings. Retain and edit the portions applicable to the project as indicated, with edits similar to Season 1 in the paragraph Certified TAB Reports.

For projects with phased construction, edit the submittal requirements below to include a Certified TAB Report for each phase and one final report inclusive of all the previous reports, with submittal tags to ensure inclusion in the paragraph SUBMITTALS.
****
****
NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following bracketed sentences to ensure a complication of all the previous TAB Reports is submitted as one at the completion of the project.
****

Conduct thermal performance (capacity) tests to verify thermal energy transfer components, devices, and equipment meet the indicated design capacity within the parameters for Season 2. Prepare separate Certified TAB Reports, identified as indicated, for each[construction phase and a final, consolidated Certified Final TAB Report inclusive of TAB Field Work for all phases upon completion of all TAB Field Acceptance Testing required for[each building of] the project][building].

****
This subpart is tailored for NO PHASED CONSTRUCTION. Retain the following paragraph.
****

Submit the Certified TAB Report of Season 2 to the Contracting Officer for approval within 14 calendar days of completion of Season 2 Thermal Performance TAB Field Work.
****
NOTE: This subpart is tailored for PHASED CONSTRUCTION. Retain the following paragraph, with edits similar to Season 1 in the paragraph Certified TAB Reports.
****

Submit a Certified TAB Report of Season 2 to the Contracting Officer for approval within 14 calendar days of completion of Season 2 TAB Field Work for each of the following:

****
NOTE: Insert SUB tags around each submittal.
****

Phase [1][_____] Certified TAB Report of Season 2

Phase [2][_____] Certified TAB Report of Season 2

[_____]

3.4 PREREQUISITE FOR SYSTEMS ACCEPTANCE

Compliance with field acceptance testing requirements of this section is a prerequisite for the final Contracting Officer acceptance of the HVAC systems.

-- End of Section --