UFS 3-401-01
28 July 2025
Change 1, 14 May 2026

UNIFIED FACILITIES SUPPLEMENT (UFS)

MECHANICAL ENGINEERING

FOREWORD

Unified Facilities Supplements (UFS) provide non-mandatory, supplemental information in support of Unified Facilities Criteria (UFC). Only UFC establish enforceable criteria. UFS are For Information Only (FIO) and exist to help users understand and apply UFC requirements.

The purpose of UFS is to offer procedural guidance, best practices, lessons learned, examples, and explanatory materials that clarify how to meet UFC criteria. They may include step-by-step procedures, checklists, illustrations, or decision aids, but they do not create new requirements or modify UFC content.

UFS are developed by Discipline Working Groups (DWGs) and published by the Military Services under MIL-STD-3007. Because they are not criteria, they do not require Coordinating Panel (CP) or Engineering Senior Executive Panel (ESEP) approval.

UFS content may be referenced or incorporated into project documents at the discretion of project delivery teams but are not binding unless explicitly included in contract requirements. For Service-specific supplemental guidance, refer to Facilities Supplements (FS).

UNIFIED FACILITIES SUPPLEMENT (UFS)

MECHANICAL ENGINEERING

Indicate the Military Department Preparing Activity responsible for the document.

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	Date	Location
1	14 May 2026	Added paragraph 2-1.2.2 Refrigerant Safety Added paragraph 2-1.2.3 Noise and Vibration Analyses and Measurements

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CHAPTER 1 INTRODUCTION

1-1 PURPOSE AND SCOPE.

This Unified Facilities Supplement (UFS) provides documentation requirements, commentary, best practices, and other information related to UFC 3-401-01 Mechanical Engineering. Figure 1-1 shows the relationship of this UFC to other related mechanical UFCs.

1-2 DESIGN ANALYSIS AND DRAWING REQUIREMENTS.

The design analysis and drawing requirements chapter provides documentation requirements necessary to demonstrate compliance with mechanical engineering UFC.

CHAPTER 2 DOCUMENTATION REQUIREMENTS

2-1 DESIGN ANALYSIS.

Submit the Design Analysis at a preliminary design stage equivalent to 35% design for concurrence of the results. The Design Analysis must consist of a Basis of Design Narrative and Calculations. Update the analysis as necessary as the design progresses. The results of this analysis are used for decision-making in reducing total life cycle cost, while meeting mission objectives.

2-1.1 Basis of Design Narrative.

Provide a Basis of Design narrative as part of all design analysis.

2-1.1.1 User Requirements.

Provide a description of ventilation, temperature and humidity requirements, occupancies, functions, usage schedules, equipment loads, and exhaust requirements by space.

2-1.1.2 Criteria/Codes.

Provide a description of the governing codes and criteria. Include the titles and the date of the applicable edition or publication.

2-1.1.3 Site Conditions.

Conduct detailed field investigation and interview the appropriate field personnel. Do not rely solely on the as-built drawings.

Provide a description of energy sources available at the project site. Provide a description of the source of thermal energy that will be used (such as extensions of central high-pressure steam, hot water, natural gas, or stand-alone heat source with the type of fuel utilized).

2-1.1.4 System Selection.

Provide a description of all system alternatives considered. Describe in detail all systems and components selected and reason for selection.

2-1.1.5 Special Mechanical Systems.

Provide a description of special mechanical systems such as compressed air, hydraulic, nitrogen, or lubrication oil.

2-1.1.6 Other Basis of Design Narrative Requirements.

Provide any additional basis of design documentation as required by other applicable mechanical UFCs.

2-1.2 Calculations and Analysis.

Provide calculations and assumptions, supporting equipment selections, in a clear and organized manner. When charts or tables are used in the design analysis, cite the source and date of the publication.

2-1.2.1 Sizing Calculations.

Provide calculations for sizing equipment, piping, ductwork and all accessories. Provide the model number and manufacturer of each major piece of equipment used as the basis for the design.

2-1.2.2 \1\ Refrigerant Safety. /1/

\1 Provide calculations demonstrating compliance with ASHRAE Standard 15. **/1/**

2-1.2.3 \1\ Noise and Vibration Analyses and Measurements. /1/

2-1.2.3.1 \1\ Acoustical Design Analyses. /1/

\1 Include analyses for HVAC noise and vibration control, interior sound isolation, and reverberant noise control to the extent applicable based on project criteria. Provide calculations to test design compliance with criteria. Refer to the Noise and Vibration Control Technical Guide for sample calculations and information regarding analyses procedures.

Include the following:

- Applicable acoustical design criteria such as the NC or RC levels or reverberation times. Cite the source criteria such as UFC, code, or standard.
- Supporting calculations and results of the analyses.
- Recommendations for any non-compliance. **/1/**

2-1.2.3.2 \1\ Acoustical Measurements. /1/

\1 When acoustical measurements are required for a facility, provide a report outlining the measurement findings. Include the following:

- Methods (including citation of source criteria such as UFC, code, or standard), measurement equipment, and measurement locations.
- Applicable design or target criteria.
- Measurement results and compare to design or target criteria.
- Recommendations for any non-compliance. **/1/**

2-1.2.4 Energy Optimization.

Provide documentation in accordance with UFC 1-200-02. Include all model and analyses inputs and outputs.

2-1.2.5 Energy Compliance Analysis (ECA).

Provide an ECA complying with UFC 1-200-02.

2-1.2.6 Other Calculation Requirements.

Provide any additional calculation documentation as required by other applicable mechanical UFCs.

2-2 FINAL DRAWING REQUIREMENTS.

Drawings must be accurate and to scale. Drawings must show equipment, ductwork, and piping sufficiently to indicate all aspects of installation.

2-2.1 Drawing Units.

Unless otherwise authorized, use the IP System of measurement on CONUS projects and the SI system of measurement on OCONUS projects.

2-2.2 Legend.

Provide legends to clarify all symbols and abbreviations used on the drawings.

2-2.3 Seismic.

Show all pertinent seismic detailing for the mechanical systems on the contract drawings unless seismic design will be an extension of design deferred to the construction contractor. When the construction contractor will be responsible for seismic design, include appropriate requirements in specifications.

2-2.4 Demolition Plans.

“Demolition” plans must be separate and distinct from “new work” plans.

2-2.5 Floor Plans and Site Plans.

Exercise judgment to avoid overly congested drawings.

2-2.6 Sections and Elevations.

Provide sections and elevations as required to supplement plan views.

2-2.7 Access Space.

Identify space necessary to access and replace items that require maintenance, such as filters, coils, heat exchangers, tube bundles, strainers, and chillers on the drawings in three-dimensions.

2-2.8 Special Detailing.

Provide details on the drawings necessary to ensure drainage for “winterizing” equipment where appropriate.

2-2.9 Equipment Schedules.

The equipment installed on a project may be different from that used as the basis of design. Therefore, mechanical equipment schedules must reflect actual required equipment capacities as calculated, rather than capacities provided by manufacturers' catalog data. This helps ensure that the installed equipment is optimally sized for the application.

2-2.10 Other Drawing Requirements.

Provide any additional drawing requirements indicated in other applicable mechanical UFCs.