

UNIFIED FACILITIES CRITERIA (UFC)

MECHANICAL ENGINEERING



APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

This Page Intentionally Left Blank

UNIFIED FACILITIES CRITERIA (UFC)

MECHANICAL ENGINEERING

Any copyrighted material included in this UFC is identified at its point of use. Use of the copyrighted material apart from this UFC must have the permission of the copyright holder.

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	23 Jan 2026	Modified paragraph 2-1; Added paragraph 2-5.2 Flammability Classification Restriction.
2	14 May 2026	Modified paragraph 2-5.2 regarding flammability classification restrictions for refrigerant. Added paragraph 2-7 Noise and Vibration Control.

This UFC supersedes UFC 3-401-01, dated 01 July 2013.

This Page Intentionally Left Blank

FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with [USD \(AT&L\) Memorandum](#) dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States, its territories, and possessions is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA). Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Military Department's responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Systems Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Technical content of UFC is the responsibility of the cognizant DoD working group. Defense Agencies should contact the respective DoD Working Group for document interpretation and improvements. Recommended changes with supporting rationale may be sent to the respective DoD working group by submitting a Criteria Change Request (CCR) via the Internet site listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

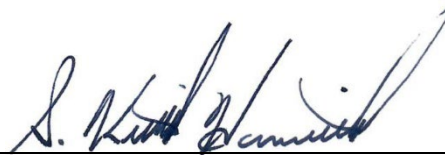
- Whole Building Design Guide website <https://www.wbdg.org/dod>.

Refer to UFC 1-200-01, *DoD Building Code*, for implementation of new issuances on projects.

AUTHORIZED BY:



THOMAS P. SMITH, P.E., SES
Chief, Engineering and Construction
U.S. Army Corps of Engineers



S. KEITH HAMILTON, P.E., SES
Chief Engineer and Assistant Commander
Planning, Design and Construction
Naval Facilities Engineering Systems Command



THOMAS P. BROWN, SES
Deputy Director of Civil Engineers
DCS/Logistics, Engineering &
Force Protection (HAF/A4C)
HQ United States Air Force



MARK S. SINDER, SES
Deputy Assistant Secretary of Defense
(Infrastructure Modernization and Resilience)
Office of the Secretary of Defense

This Page Intentionally Left Blank

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION		1
1-1	REISSUES AND CANCELS	1
1-2	PURPOSE AND SCOPE	1
1-3	APPLICABILITY	1
1-4	GENERAL BUILDING REQUIREMENTS	1
1-5	CYBERSECURITY	1
CHAPTER 2 TECHNICAL REQUIREMENTS		3
2-1	DOCUMENTATION REQUIREMENTS	3
2-2	SUSTAINABILITY AND LIFE CYCLE	3
2-3	MAINTAINABILITY	3
2-4	MECHANICAL ROOMS	3
2-4.1	Mechanical Rooms on Grade	3
2-4.2	Mechanical Rooms Above Grade	4
2-5	REFRIGERANTS	4
2-5.1	EPA Refrigerant Regulations	4
2-5.2	\2\ Refrigerant Safety. /2/	4
2-6	WEATHER DATA	5
2-7	\2\ NOISE AN VIBRATION CONTROL. /2/	5
2-7.1	ROOM NOISE CRITERIA	5
2-7.2	VIBRATION CONTROL	5
2-7.3	SOUND ISOLATION BETWEEN ROOMS	7
2-8	CONFLICTS IN CRITERIA	8

FIGURES

Figure 1-1	Associated Mechanical Systems Criteria	2
Figure 2-1	Approximate Sensitivity – Response to Feelable Vibration	6

TABLES

Table 2-1	Sound Transmission Isolation Requirements for Privacy	7
-----------	---	---

CHAPTER 1 INTRODUCTION

1-1 REISSUES AND CANCELS.

This UFC reissues and cancels UFC 3-401-01, *Mechanical Engineering*, 01 July 2013, and all subsequent changes.

1-2 PURPOSE AND SCOPE.

This UFC provides requirements and guidance for mechanical systems designed and constructed for the Department of Defense (DoD). Figure 1-1 shows the relationship of this UFC to other related mechanical UFCs.

1-3 APPLICABILITY.

This UFC follows the same applicability as UFC 1-200-01, paragraph 1-3, with no exceptions.

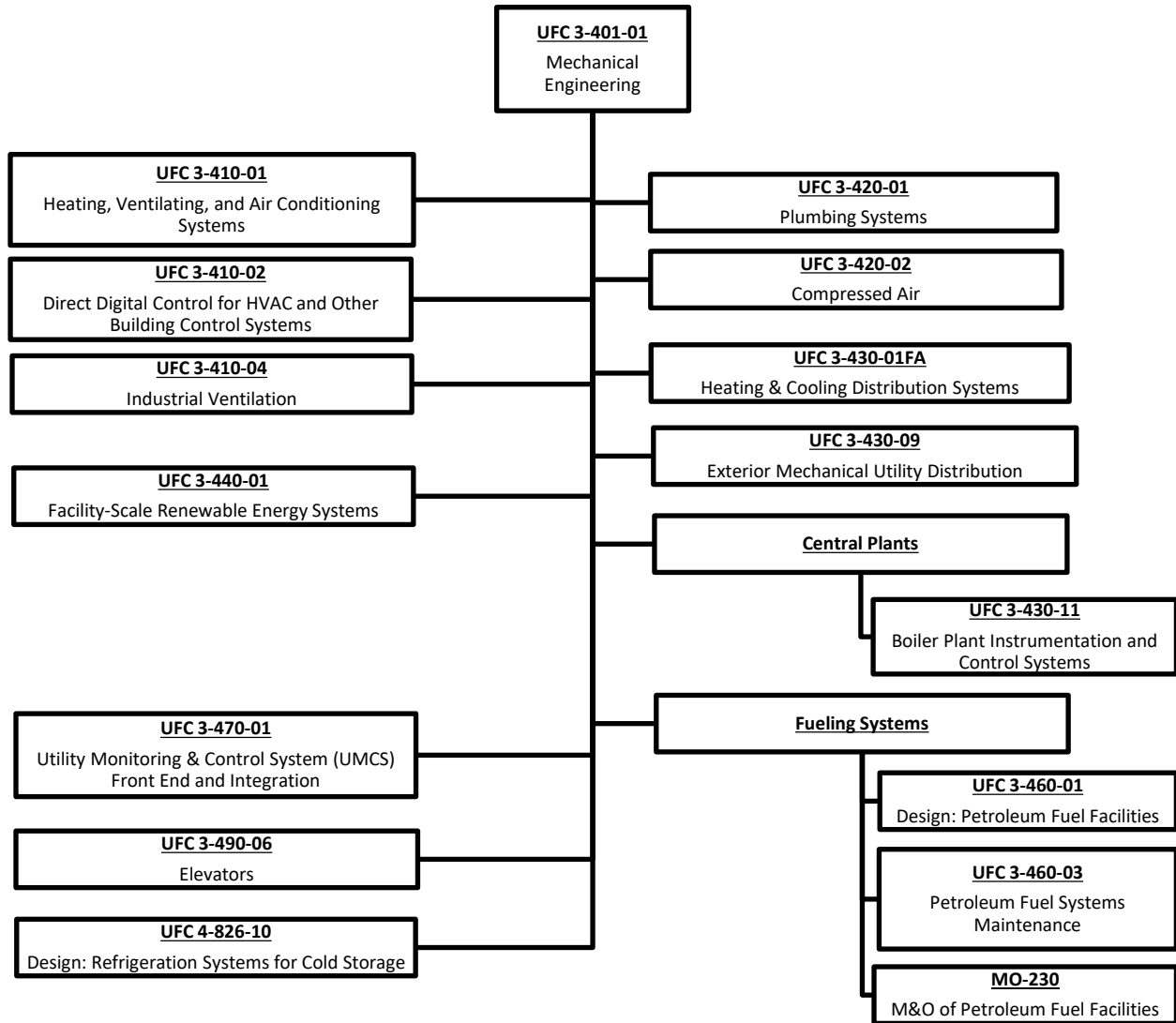
1-4 GENERAL BUILDING REQUIREMENTS.

Comply with UFC 1-200-01. UFC 1-200-01 provides applicability of model building codes and government unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high performance and sustainability requirements, and safety. Use this UFC in addition to UFC 1-200-01 and the UFCs and government criteria referenced therein.

1-5 CYBERSECURITY.

All control systems (including systems separate from a utility monitoring and control system) must be planned, designed, acquired, executed, and maintained in accordance with UFC 4-010-06 and as required by individual Service Implementation Policy.

Figure 1-1 Associated Mechanical Systems Criteria



CHAPTER 2 TECHNICAL REQUIREMENTS

2-1 DOCUMENTATION REQUIREMENTS

Comply with the design analysis and drawing requirements in the UFC 3-401-01 Supplement \1\ located under Related Materials on the UFC 3-401-01 webpage: <https://www.wbdg.org/dod/ufc/ufc-3-401-01>. /1/

2-2 SUSTAINABILITY AND LIFE CYCLE.

Comply with UFC 1-200-02 which provides requirements that influence the selection and design of mechanical systems and fuel sources.

2-3 MAINTAINABILITY.

Mechanical equipment not required to be located outside must be located in an equipment room. Provide system designs with the features necessary for easy access for maintenance and for successful testing, adjusting, balancing, and system commissioning. Provide protection for equipment materials located in corrosive environments. When mechanical appliances and equipment are installed at heights in excess of 12 feet (3.6 m), provide special maintenance accommodations such as a service platform, railings, catwalk with railings, and a permanent ladder or stairs for access of maintenance, repair, and replacement. Special maintenance accommodations must be approved by the real property owner. Include documentation of real property owner acceptance for record in the project files.

2-4 MECHANICAL ROOMS.

“Mechanical rooms” refer to appliance, boiler, furnace, equipment, and machinery rooms as outlined in the International Mechanical Code (IMC). “Equipment” refers to appliances, equipment, or machinery.

Size the mechanical room to accommodate the space required to house all equipment and piping including all associated maintenance and access clearances. All mechanical rooms must have exterior access sized to accommodate all maintenance and equipment replacement throughout the life of the building. Incorporate provisions for future equipment removal and replacement including a replacement route and adequate door dimensions. Provide fall protection as required. Handrails must be removable. For supplemental mechanical spaces with equipment weighing 125 lbs (56.7 kg) or less, provide exterior access as required by the real property owner.

2-4.1 Mechanical Rooms on Grade.

Mechanical rooms on grade must be provided with door(s) on the building exterior. At the sole discretion of the real property owner, interior access, adequate for all maintenance throughout the life of the equipment in the space, may be provided in lieu of direct exterior access for equipment rooms on grade. Such access must include a route through interior doors and corridors that allows replacement of any equipment

within the equipment space. Include documentation of the real property owner's decision in the project documentation for record.

2-4.2 Mechanical Rooms Above Grade.

Mechanical rooms above grade must be provided with exterior access that will allow crane or mobile lift access to equipment. Coordinate with the Architect on this requirement to address historical preservation requirements.

2-5 REFRIGERANTS.

2-5.1 EPA Refrigerant Regulations.

Provide only refrigerant systems that comply with the requirements of the Environmental Protection Agency (EPA) Technology Transitions Program and other relevant EPA regulations such as the Significant New Alternatives Policy (SNAP) Program. Coordinate with equipment manufacturers for options for compliant equipment.

Refer to the US EPA Technology Transitions webpage or latest EPA requirements for further information: <https://www.epa.gov/climate-hfcs-reduction/technology-transitions>. Refer to the US EPA SNAP Program webpage for further information regarding SNAP: <https://www.epa.gov/snap>.

2-5.2 \2\ Refrigerant Safety. /2/

\2\ Comply with ASHRAE Standard 15 and IMC.

[C] Refer to UFC 3-410-01 for modifications to IMC and any additional refrigerant safety requirements.

2-5.2.1 [Air Force Only] Flammability Classification Restriction

Refrigerant lines and coils containing ASHRAE Standard 34 Class A2L refrigerants, are restricted to non-occupied facility spaces or to the exterior of the facility. Non-occupied facility spaces must not have a direct transfer path to the occupied space (i.e., interior doors, wall louvres, ductwork connected to occupied spaces, etc.). All penetrations (e.g., duct and pipes) through adjacent walls must be sealed.

[C] This restriction is imposed until the Air Force completes a risk assessment, including testing, of Class A2L hazards and concludes the risk is negligible.

/2/

2-6 WEATHER DATA.

Obtain engineering weather data needed for design calculations and analyses from the 14th Weather Squadron (<https://climate.af.mil/>) unless otherwise indicated in associated Mechanical Systems UFCs. Refer to UFS 3-410-01 for access instructions. Refer to technical guide, Design: Engineering Weather Data, located in related materials on the UFC 3-410-01 webpage, for information regarding 14th Weather Squadron data and usage.

2-7 \2\ NOISE AN VIBRATION CONTROL. /2/

\2\ Additional information regarding noise and vibration design and testing is in the Noise and Vibration Technical Guide located in related materials on the UFC 3-401-01 webpage.

2-7.1 ROOM NOISE CRITERIA.

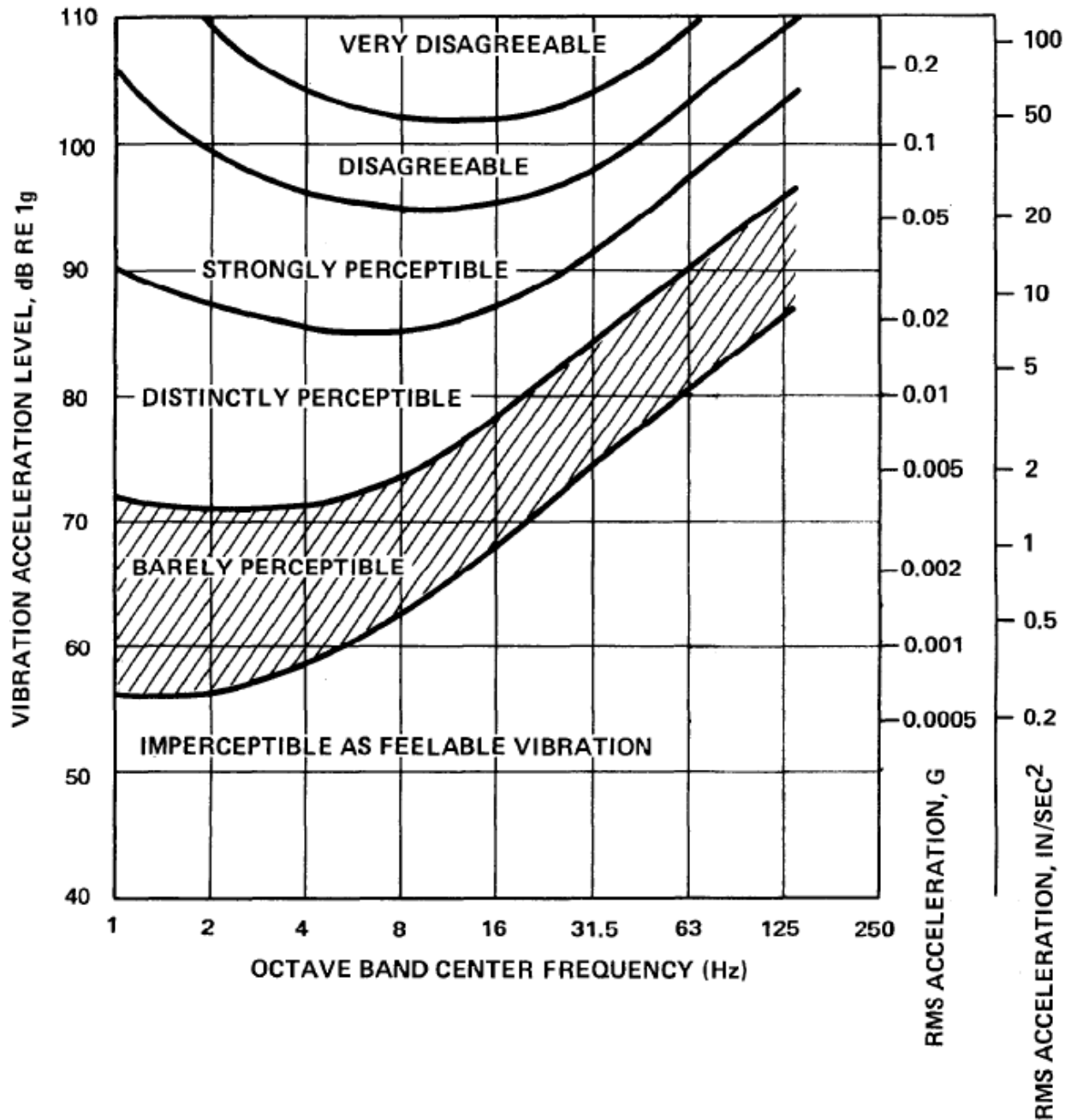
Design systems such that noise exposure limits in OSHA Standard 29 CFR 1910.95 are not exceeded. Comply with UFC 3-101-01 noise criteria (NC) or room criteria (RC) levels and reverberation time (RT60) for typical facility spaces. For spaces not covered in UFC 3-101-01, comply with the Table 1 Design Guidelines for HVAC-Related Background Sound in Rooms in the ASHRAE Applications Handbook. Reverberation time for spaces not covered in UFC 3-101-01 must match the criteria for the most similar space type. Rooms with noise intrusion from outdoors such as from traffic and aircraft flyovers must limit approximate overall sound pressure level from mechanical equipment or ventilation systems to 45 dBA and 70 dBC. When NC is used, the sound levels of mechanical equipment or ventilation systems must be equal or lower than the selected NC curve in all octave bands.

2-7.2 VIBRATION CONTROL.

2-7.2.1 Occupant Comfort.

Structural vibration caused from mechanical equipment operation must be imperceptible to occupants. Vibration in occupied areas must be in the area designated "IMPERCEPTIBLE AS FEELABLE VIBRATION" in Figure 2-1.

Figure 2-1 Approximate Sensitivity – Response to Feelable Vibration



2-7.2.2 Building Structures.

Structural vibration from mechanical equipment vibration must not result in damage to building components.

[C] Refer to the Noise and Vibration Technical Guide for further information.

2-7.2.3 Sensitive Equipment.

Structural vibration from mechanical equipment operation must not interfere with equipment operation. For applications including vibration-sensitive equipment such as microscopes or other instruments or processes, limit vibration to acceptable levels coordinated with and approved by the end-users and manufacturers.

2-7.3 SOUND ISOLATION BETWEEN ROOMS.

Apply the sound isolation criteria of partitions and doors in compliance with UFC 3-101-01. The sound transmission isolation requirements in Table 2-1 apply in cases where a specific privacy room level is necessary. Privacy room level must be as required by facility standard documents or determined in coordination with and approved by the end-user and real property owner. When rooms of differing privacy levels are adjacent to each other, the higher of the two sound transmission isolation requirements must be used at the dividing partition. Comply with the more stringent of the two sets of sound transmission requirements when both sets of requirements apply.

Table 2-1 Sound Transmission Isolation Requirements for Privacy

Room Privacy Level	Typical Adjacency	Sound Isolation Requirement
Private	Occupied Space	STC 45 - 50
	Corridor	STC 40 - 45
	Stairwell	STC 45 - 50
Confidential/Classified	Occupied Space	STC 50 - 55
	Corridor	STC 50 - 55
	Stairwell	STC 50 - 55
Collaborative/Multi-use	Occupied Space	STC 35 - 40
	Corridor	STC 35 - 40
	Stairwell	STC 35 - 40

2-7.3.2 Privacy Level Categories.

Each privacy level category is described as follows:

- Private. Moderate speech privacy is required. Speech intelligibility and concentration are preferred but not critical. Typically include private offices, exam rooms, or study rooms.
- Confidential or Classified. Critical speech privacy is required or speech intelligibility and concentration are essential. Typically includes conference rooms, classrooms, or consultation rooms.
- Collaborative/Multi-use. Speech privacy is not critical. Occupied by multiple occupants. Typically includes open offices or laboratories.

2-7.3.3 Mechanical Rooms and Restrooms.

Mechanical rooms partitions and door STC must be 60 – 65. Restroom partitions and doors STC must be 50 – 55. */2/*

2-8 CONFLICTS IN CRITERIA.

Where there is a conflict between a general requirement and a specific requirement, the specific requirement is applicable. Where, in a specific case, different sections of the mechanical UFC specify different materials, methods of construction or other requirements, the most restrictive govern unless determined otherwise by the Authority Having Jurisdiction.