

Summary of Modifications/Changes in this Update

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U.S. Department of Veterans Affairs ♦ Office of Construction & Facilities Management

DATE OF THIS VERSION:

November 1, 2017

TITLE OF DOCUMENT:

2017 HVAC Design Manual

DATE OF VERSION BEING SUPERSEDED (old):

March 1, 2011

DESCRIPTION OF DOCUMENT (previous title, number, other identifying data):

VA 2011 HVAC Design Manual for New, Replacement, Additions, and Renovations of Existing VA Facilities (March 2011 with Amendments A and B); HVAC Design Manual for Community Living Centers and Domiciliary (March 2011)

SUMMARY OF CHANGES IN THIS VERSION:

1. The new 2017 HVAC Design Manual is a consolidation of the 2011 HVAC Design Manual for New, Replacement, Additions, and Renovations of Existing VA Facilities (March 2011 with Amendments A and B), and HVAC Design Manual for Community Living Centers and Domiciliary (March 2011). Use of this manual will result in meeting the primary objective of providing environmental comfort to patients, staff, and visitors. These manuals are revised so as to combine both documents into one comprehensive manual and to incorporate changes generally resulting from the following:
 - International Building Code (IBC) Including IMC and IPC
 - ASHRAE Standard 170 – 2013 (Ventilation of Health Care Facilities)
 - HVAC Design Criteria Revisions – Surgery Suite, SPS Suite, Animal Research, Procedure Rooms, etc.
 - Coordination with Current VA Design Guides, VHA Directives, Miscellaneous Corrections and Users' Input and requirements of VA Sustainable Design Manual

- Addition of Requirements for Central Laundries, Warehouses, and Office Buildings
2. The new HVAC Manual revisions are made to rearrange the text sections to improve the flow of the text, to change words for clarity, and to respond to comments regarding improvements.
 - Updated references to latest energy design guidance, codes and technologies. The Manual is in compliance with all applicable safety standards, meets the Section 508 of the Rehabilitation Act of 1973 requirements, compatible with SEPS and includes prescribed noise and vibration levels. Revised all embedded HTML links to referenced documents in the VA Technical Information Library (TIL) and revised and updated cover sheet.
 3. Significant updates to all chapters (1-8). See attached chapter summaries. These summaries indicate significant items for each chapter and are not all inclusive.

Chapter 1 – Changes:

General:

- Updated references, codes, and standards throughout the chapter.
- Re-organized the list of VA Standards under paragraph 1.7 to show standards in numerical / alphabetical order.
- Added current documents to the list of VA Standards under paragraph 1.7.

The following highlights the more significant changes made to the chapter:

1.1

- Updated the synopsis on this paragraph to reflect the more significant changes.
- Clarified / reinforced the definition of “the VA Authority”.
- Added the list of required deliverables as well as a request for deviation from the manual.

1.2.1

- Updated to match the current Federal Energy Program administrative requirements for new construction.

1.2.2

- Updated to match the current Federal Energy Program administrative requirements for major renovations.

1.3.3

- Clarified and verified TLCC requirements. The A/E is now directed to use the NIST Manual.

1.6

- Added references to the VA Whole Building Commissioning Process Manual and Sustainable Design Manual.
- Added all the VA Design Guides.
- Reorganized the references.

Chapter 2 – Changes:

General:

- Updated references, codes, and standards throughout the chapter.

The following highlights the more significant changes made to the chapter:

2.1

- Condensed introduction information.

2.2.1.1

- Expanded and clarified the list and use of outside weather conditions for load calculations.

2.2.1.2

- Expanded and clarified the list and use of outside weather conditions for mixed air calculations.

2.2.3.2

- Provided additional directions for calculating occupant heat loads.
- Added directions for the calculating animal heat loads in laboratories.

2.2.3.3

- Added requirement for submitting a list of equipment with associated heat dissipation for each space.

2.2.3.5

- Updated the list of ventilation criteria.
- Provided additional requirements for building pressure calculation.
- Provided additional requirements for calculating building air balance and added new Table 2-1.
- Renamed existing Table 2-1 and Table 2-2, and added columns for minimum airflow and maximum reheat temperature.

2.2.4

- Provided criteria for determining the suitability of load and energy calculation software.

2.2.4.4

- Clarified air handling unit sizing and removed duplicated information.

2.2.5.2

- Provided additional spaces to the list of Individually Temperature Controlled Spaces.

2.2.5.4

- Clarified the definition of “exterior zone.”

2.2.6.2

- Added wall radiant panels to the list of allowed perimeter heating systems.
- Increased requirements for sequencing cooling and perimeter heating.

2.2.6.3

- Provided further clarification on the use of hot water as heating medium.

2.3.1.2

- Modified requirements for interior HVAC systems acoustical analysis.
- Added requirement for reactive sound attenuation.

2.3.1.3

- Modified requirements for exterior equipment analysis.

2.3.2.1

- Made dispersion analysis mandatory for all projects that affect exhaust or intake.
- Defined the type of dispersion analysis required.
- Added ASHRAE reference and acceptable software.

2.5

- Deleted the paragraph relating to the building thermal envelope to avoid information duplication.

2.6.1

- Clarified the required references.
- Provided additional scope of services.

2.6.2

- Clarified the required references.
- Provided additional scope of services.

2.6.3

- Clarified the required references.
- Provided additional scope of services.

2.6.4

- Clarified the required references.
- Provided additional scope of services.

2.7.1

- Added references.

2.7.2.1

- Added instruction to design for maintainability.

2.7.2.2

- Added the requirement for equipment maintainability.

2.7.2.6

- Updated requirement for elevator shaft venting.

2.8.1.3

- Added and defined requirements for pre-design TAB.
- Defined pre-design TAB report requirements.

2.8.2.1

- Provided more directions for the use of existing radiators when possible.

2.8.2.2

- Added prohibition of dual duct systems for HVAC system replacements and new facilities.

2.8.2.4 (NEW)

- Clarified / expanded requirements for re-using existing ductwork.

2.8.2.4 (OLD)

- Deleted the paragraph.

2.9.1

- Added phasing requirements.

2.11.2

- Updated design guidelines for outside air intakes.

Chapter 3 – Changes:

General:

- Updated references, codes, and standards throughout the chapter.
- Included additional Heat Recovery Systems.
- Moved Air Distribution Systems design criteria from section 3.10 to section 3.7.
- Moved Exhaust Systems from section 3.7 to section 3.8.
- Moved Fume Hoods from section 3.8 to section 3.10.
- Moved Biological Safety Cabinets (BSC) from section 3.9 to section 3.11.
- Referenced chapter 4- section 4.4 for the application of electric heating coils.

The following highlights the more significant changes made to the chapter:

3.1:

- Replaced Minimum Ventilation Air Handling Units (100% Outdoor Air) with Dedicated Outdoor Air Systems (DOAS).
- Added limitations to the use of Rooftop Air Handling Units (3.2.1.4).

3.2.1.1

- Included additional information and requirements for a LCCA.

3.2.1.3

- Updated figure 3-1 to reflect changes in AHU configuration.

3.2.1.4

- Added limitations to the use of RTUs in extreme weather locations.

3.2.2.1

- Updated information regarding plenum fans.

3.2.2.5

- Updated AHU casing to require foam injected insulation.

3.2.2.7

- Provided clarification and further guidance on use of blender section.

3.2.2.9

- Added requirement for stainless steel cooling coil support frames.

3.2.2.14

- Added clarification on when to utilize boiler plant steam for humidification.

3.2.3.1

- Added requirements for single zone VAV air handling units.

3.2.3.3

- Changed minimum flow for VAV terminals to a minimum heating capacity.

3.3.1

- Terminal cooling systems: Use of radiant (cooling) panels, chilled beams (active and passive) and valance systems are now allowed with the approval from the VA Authority.

3.3.2.3

- Changed filtration reference to room data sheets in chapter 6.

3.5

- Increased largest single square diffuser to 600 cfm.

3.6.2.2

- Added fixed membrane heat exchanger as allowable sensible and latent heat transfer device.

3.7

- Added reference to NFPA 90A for compliance.

3.7.1.10

- Updated duct sizing criteria table.

3.9

- Added the new section to cover Laboratories and Animal Facilities.

3.10

- Updated requirements for fume hoods.

Chapter 4 – Changes:

General:

- Updated references, codes, and standards throughout the chapter.

The following highlights the more significant changes made to the chapter:

4.2.1.1

- Rearranged content and added information regarding small chiller plants.

4.2.1.2

- Updated requirements for chilled water optimization study.
- Updated list of acceptable refrigerants based on current industry positions.

4.2.1.3

- Clarified Chilled Water Plant sizing requirements.
- Added information regarding special cooling applications.

4.2.1.5

- Re-defined N+1 to include system components and piping arrangements.

4.2.1.6

- Provided additional information regarding small chillers and associated minimum chilled water system volume requirement.

4.2.1.7

- Added a new paragraph relating to process chillers.

4.2.1.8 (OLD)

- Deleted table from ASHRAE 90.1.

4.2.2 (NEW)

- Provided guidance on sustainable practices, and system reliability and maintainability.

4.2.3.1

- Added a requirement to furnish NPSHA calculations with design analysis.

4.2.3.2

- Expanded selection criteria and other design requirements for cooling towers.

4.2.3.3

- Expanded chilled water treatment system requirements.

4.2.3.4

- Expanded condenser water treatment system requirements.

4.2.4.1

- Clarified ASHRAE Standard 90.1 requirements.

4.2.5.1

- Clarified use of glycol solution for chilled water system application.

4.2.5.2

- Included more potential options for freeze protection.

4.3.3.2:

- Added a requirement for multiple compressors in DX systems.
- Added hot gas controls considerations.
- Added low ambient control considerations.

4.3.3.4

- Added requirements for Sustainability and Serviceability.

4.4

- Added reference to the Steam Heating, Hot Water, and Outside Distribution System Design Manuals.

4.4.1.3

- Updated suggested steam operating pressures.
- Added a requirement for a steam pressure reduction strategy.

4.4.2

- Updated requirements for Steam Heating, Hot Water, and Outside Distribution systems.

4.4.2.3

- Removed information regarding hot water boilers and referenced the Steam Heating, Hot Water, and Outside Distribution System Design Manuals.

4.4.2.4

- Changed recommended heating water temperature upper range to 180 F.

4.4.2.8

- Added requirements for Sustainability and Serviceability.

4.4.3.1

- Added a requirement for written approval from the VA Authority for the use of electric resistance heaters.

4.4.4.1

- Added a requirement for written approval from the VA Authority for the use of natural gas or LPG as a direct heating source.

4.4.5

- Removed language regarding Geothermal heating. Provided further guidance on the use of Geothermal systems.

4.5.2

- Added steam pipe sizing criteria table.

Figure 4-5

- Added steam to hot water hydronic hot water distribution figure.

Figure 4-6

- Updated Hydronic Hot Water Distribution figure.

Chapter 5 – Changes:

5.1

- Added requirements and level of AE coordination with the VA Medical Center Representative.
- Added various DDC Controls Options and potential site specific LAN Options.

5.5.1

- Prohibited pneumatic actuators except when rebuilding existing actuators.
- Added information regarding selection of actuators and their normal position.

5.5.2

- Added a requirement to coordinate with the specifications for control valves selection.
- Added information regarding types of valves (modulating vs open-close).

5.5.3

- Added selection criteria for damper type.
- Added sizing criteria for proper damper control authority.

5.5.4

- Added requirements for the use of end switches.

5.5.5

- Added general information about the application of alarms and safeties.
- Added a list of required alarms and safeties.

5.5.6

- Added requirements for control wiring type and installation.

5.5.7

- Added design requirements for air flow measurement stations.

5.5.9

- Deleted prescriptive PC computer hardware information.
- Added a requirement to refer to VA specifications for Controls PC and associated hardware.

5.5.10

- Deleted prescriptive laptop computer hardware information.
- Added a requirement for the laptop computer to match the PC specifications.

5.5.15

- Added requirements for equipment status monitoring.

5.5.16

- Added recommendations for type and location of space temperature sensors.

5.6

- Added design requirements for relative humidity measurement and control.

5.6.1

- Added requirements for metering systems.

5.7.2 .1 f

- Added Integral Face and Bypass coil control.

5.7.2.1 i

- Added demand control ventilation.
- Added minimum outside air damper control.

5.7.2.1 k

- Added missing filter alarm.
- Added filter Maintenance alarms.

5.7.2.1 m

- Added heat recovery wheels.
- Added bypass system for heat recovery.

5.7.2.1 n

- Added desiccant systems.

5.7.2.1 o

- Added special systems.

5.7.3 c

- Added additional control points for boiler systems.

5.8

- Added suggestions on medical center level control standardization.

Chapter 6 – Changes:

General:

- Updated references, codes, and standards throughout the chapter.
- Reorganized the room and air handling unit data sheets to be alphabetical by clinical / support function.
- Revised HVAC Room Data Sheets to include spaces from VA Design Guides and PG 18-9, with HVAC design criteria from the following:
 - VA Design Guides and Directives
 - ASHRAE Standard 170-2013
 - Coordination with SMEs
- Added Room Data Sheets for animal laboratories and main laundries, with reference to sources outside the VA. Design criteria was applied from:
 - ASHRAE Standard 170-2013
 - American Association for Accreditation of Laboratory Animal Care (AAALAC)
 - Coordination with SMEs
- Deleted SPS (formerly SPD) air flow schematic.
- Added air flow schematic for SPS and other spaces with significant pressure gradient requirements.

The following highlights the more significant changes.

6.1

- Modified to match the revised space organization.

6.2

- Added a paragraph to relax of the requirements for dedicated air handling units in smaller facilities.

6.3

- Expanded the paragraph to relax of the requirements for dedicated air handling units in smaller facilities

6.4.1.1

- Clarified the general intent of indoor design temperatures.
- Clarified the general intent of indoor design relative humidity.
- Clarified the general intent of indoor relative humidity control scheme (sequence).

6.4.2.2 c

- Expanded paragraph to require designers to consider construction type when designing space pressurization systems.
- Clarified the intent of pressure and directional air control.

Chapter 7 – Changes:

General:

- Verified and updated weather data to match ASHRAE Handbook of Fundamentals 2013.
- Added locations for new facilities (closest ASHRAE Handbook of Fundamentals 2013 locations used in all cases).
- Replaced old data from Army TM 5-785 with ASHRAE Data.

Chapter 8 – Changes:

General:

- Updated Abbreviations.