DESIGN REVIEW CHECKLIST

HEATING, VENTILATING, AND AIR CONDITIONING

☑**Reviewers shall -** Use Checklists when reviewing design documents for any type of VA construction project for the following disciplines:

- Architectural,
- Electrical,
- Heating, Ventilating, and Air Conditioning (HVAC),
- Incineration/Solid Waste,
- Plumbing, Fire Protection, and Sanitary,
- Site and Landscape,
- Steam Distribution,
- Steam Generation, and
- Structural.

☑**Reviewers should -** Ensure that A/E Submission Instructions (PG-18-15) for Schematic, Design Development, and Construction Documents are followed for various types of VA construction projects.

☑**Reviewers should -** Ensure that every VA construction project is in compliance with all life safety issues.

☑**Reviewers should -** Be aware that these checklists are not all-inclusive but only provide minimum review items.

HEATING, VENTILATING, AND AIR CONDITIONING DESIGN REVIEW CHECKLIST

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GENERAL INFORMATION FOR REVIEWERS

The reviewer should be thoroughly familiar with the following VA standards before conducting a design review. These are available on the CFM Internet Web site: https://www.cfm.va.gov/til

ITEM	DESCRIPTION
1.	**HVAC DESIGN MANUALS (PG-18-10)**
2.	**MASTER CONSTRUCTION SPECIFICATIONS (PG-18-1)**
3.	**STANDARD DETAILS (PG-18-4, VOL. 3, SECTION II)**
4.	**DESIGN AND CONSTRUCTION PROCEDURES (PG-18-3)**
5.	**DESIGN GUIDES (PG-18-12)**
6.	**DESIGN ALERTS**
7.	**A/E SUBMISSION INSTRUCTIONS (PG-18-15)**
7.	**VA BIM & CAD STANDARDS**
8.	**COMMISSIONING STANDARD**

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LIFE SAFETY ISSUES

The reviewer should be aware of following life safety issues that designer is required to meet and can find detailed information on this in the referenced material. The reviewer should check A/Es compliance with these issues.

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – LIFE SAFETY ISSUE ITEM	COMMENTS/ YES/NO/NA
A	**SMOKE AND FIRE PROTECTION**	
1	General: • Meet requirements of NFPA 30, 45, 72E, 90A, 96, 99, and 101. • Coordinate work with the Electrical trade.	
2	Show all smoke and fire partitions on HVAC floor plans.	
3	Show all duct-mounted smoke detectors and dampers, and fire dampers on HVAC floor plans.	
4	Individually number all duct mounted smoke and combination fire/smoke dampers on HVAC floor plans and provide a schedule.	
5	Provide smoke control based on fan shut down. No engineered smoke control permitted for the building, except for the atrium area.	
6	Provide engineered smoke control for Atrium with capacity as per NFPA 92B, and Uniform Building Code, 1994, sections 402, and 905.	

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – LIFE SAFETY ISSUE ITEM	COMMENTS/ YES/NO/NA
7	See smoke control flow diagram for air handling units. Note requirements for unit sizes exceeding 56 m^3 /min (2,000 CFM) and 420 m^3 / min (15,000 CFM). • Unit > 56 m^3 / min (2,000 CFM): Provide a smoke detector in main supply duct • Unit > 420 m^3 / min (15,000 CFM), and the system serves more than one story: Provide a smoke detector in each return branch at each floor in addition to a detector in supply main; Isolate unit by providing smoke dampers in the supply and return air ducts only if it serves more than one floor.	
8	Show control diagrams for control of smoke dampers with smoke detectors.	
9	No duct mounted smoke detectors or smoke dampers required when crossing a smoke or fire barrier in a fully sprinkled building with quick response sprinklers,	
10	Pressurization of stairwells is not required.	
11	NFPA 45 does not permit fire dampers in Laboratory fume hood exhaust. Provide a separate fire rated shaft from each fire zone to reach top of the building.	
12	Provide smoke venting for elevator shafts. When essential (emergency) power is connected to an elevator, NFPA 101 requires the machine room ventilation/air conditioning system also to be connected to essential power.	
13	Per NFPA 90A, the following hazardous exhaust ducts shall not be housed in the same shaft carrying environmental supply, return or exhaust ducts: Exhaust from fume hoods, ETO sterilizers, kitchen grease laden hoods ortho/prosthetic lab, and battery charging rooms.	
14	Per NFPA 30, provide a dedicated exhaust system for each flammable and combustible liquid storage space. Provide an explosion proof motor and spark proof fan, and flow monitoring and alarm system.	
15	Conform kitchen hood exhaust to NFPA 96.	
B	**EMERGENCY POWER**	
1	Where outdoor winter design temperature is -6.5 degrees C (20 degrees F) or less, provide building heating equipment on emergency power as required by NFPA 99.	

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – LIFE SAFETY ISSUE ITEM	COMMENTS/ YES/NO/NA
2	Exhaust fans serving labs, emergency generator rooms, SPS areas ETO exhaust, Xenon and Iodine gases, battery charging rooms, flammable storage rooms, Atrium smoke control, and HVAC equipment serving critical areas of OPCs in seismic and high-risk hurricane areas etc.	
C	**LEAD WRAPPING OF DUCT WORK**	
	Provide lead wrapping on ductwork penetrating lead lined walls.	
D	**SPECIAL VENTILATION**	
	Radioactive Xenon gas and iodine require special exhaust system.	
E	**REFRIGERATION SYSTEMS FOR AIR - CONDITIONING**	
	Follow ASHRAE standard 15 - Safety Standard for Refrigeration Systems for personnel safety in chiller rooms. VA allows use of HCFC -123, HFC -134a, and HCFC - 22 refrigerants for its chillers.	
F	**MAINTENANCE OF MECHANICAL EQUIPMENT**	
	Provide guards, handrails, ladders, and platforms for maintenance to meet OSHA requirements.	
G	**SEISMIC REQUIREMENTS**	
1	See VA Design and Construction Procedures, VA Handbook H-18-8, and Uniform Building Code.	
2	Provide seismic restraints for equipment where ‘Z’ value is equal or greater than 0.10. Comply with local code if there are more stringent requirements.	
3	Provide seismic bracing of piping and ductwork where ‘Z’ value is equal or greater than 0.20. Comply with local code requirements if there are more stringent requirements.	
4	Z values of various VA medical Centers are listed in VA Handbook H-18-8. Verify these values before proceeding on a specific project.	
5	VA allows use of SMACNA or NUSIG details for seismic bracing.	

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COORDINATION ISSUES

The reviewer should be aware of following coordination issues that design is required to meet, and may find detailed information in the applicable HVAC Design Manual. Coordination within HVAC trade and other disciplines is one of the biggest problems requiring thorough review.

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – COORDINATION ISSUE ITEM	COMMENTS/ YES/NO/NA
1	Verify if the equipment schedules, control and flow diagrams, floor plans, and details show consistent information, and the information is coordinated with the contract specifications. *	
2	Verify if the mechanical equipment rooms have adequate space for performing maintenance with ease, and adequate number of building cross-sections are shown establishing adequacy of ceiling and shaft spaces to fit work of all trades.	
3	Review if symbols, notes, and abbreviations are consistent throughout the contract drawings, and compliant with the VA BIM Standard.	
4	Interdiscipline Coordination: HVAC design must be coordinated with all other disciplines such as Architectural, Structural, Electrical, Plumbing, and Site planning	
	a. Refer to 'SCOPE OF HVAC DESIGN' in applicable HVAC Design Manual for interdiscipline items requiring coordination.	
	b. Refer to A/E Quality Alerts for repeat errors and omissions items those VA experiences and must be avoided.	

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SCHEMATIC 1

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – SCHEMATIC 1 ITEM	COMMENTS/ YES/NO/NA
1	Verify if the A/E submission is in compliance with PG-18-15.	
2	Summary of PG-18-15 A/E submission requirements for the designers:	
	a. Provide estimated heating and cooling loads based on floor area.	
	b. Coordinate estimated preliminary steam demand with steam generation designer.	
	c. Investigate condition and available capacity of existing utilities.	
	d. Provide description of tentative zoning.	
	e. Select three different applicable systems for life cycle cost analysis.	
	f. Provide a list of energy conservation measures to be used in design, and life cycle cost analysis.	
3	Verify compliance by the designer, requirements stated in the applicable VA, HVAC Design Manual.	
4.	Verify Compliance with VA BIM Standard.	

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SCHEMATIC 2

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – SCHEMATIC 2 ITEM	COMMENTS/ YES/NO/NA
1	Verify if the A/E submission is in compliance with PG-18-15.	
2	Summary of PG-18-15 A/E submission requirements for the designers:	
	a. Provide description of HVAC systems and equipment for each functional space.	
	b. Provide complete life cycle cost analysis with specific recommendations and full back-up data.	
	c. Provide heating and cooling capacities of each functional area, and bloc loads for each building.	
	d. Indicate tentative locations and sizes of all mechanical equipment rooms, and main shafts.	
	e. Show block layouts of major pieces of equipment.	
	f. Resolve locations of louvers. Outside air intake louvers must be away from loading dock and truck waiting areas, and emergency generator exhaust etc.	
3	Verify compliance by the designer, requirements stated in the applicable VA, HVAC Design Manual.	
4	Verify Compliance with VA BIM Standard	

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DESIGN DEVELOPMENT

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – DESIGN DEVELOPMENT ITEM	COMMENTS/ YES/NO/NA
1.	Verify if the A/E submission is in compliance with PG-18-15.	
2	Summary of PG-18-15 A/E submission requirements for the designers:	
	a. Provide detailed version of zone and room by room heating and cooling loads accompanied by architectural drawings 1:200 (1/16") scale showing various zones, floor areas, and coded room numbers used for computer input.	
	b. Provide input manual for the computer program used for the above.	
	c. Provide capacities of air handling units, fans, pumps, and motor HP.	
	d. For chiller and boiler plant, provide number and types their capacities, and electrical requirements.	
	e. Coordinate cooling tower location with other disciplines.	
	f. Perform and provide sound/acoustic analysis to ensure compliance with the HVAC Design manual.	
	g. Provide compilation of heating loads based on space heating, domestic water, humidification, and equipment steam loads.	
	h. Provide description of zoning of heating equipment.	
	i. Provide electrical normal and emergency power loads to electrical designer.	
	j. Provide impact of new requirements on existing HVAC systems.	
	k. Provide description of seismic provisions for HVAC systems.	
	l. Provide a list of VA standard symbols and abbreviations.	
	m. Submit 1:100 (1/8") scale HVAC floor plans for typical areas showing at least duct mains with sizes based on updated calculations. All ductwork and piping larger than 150 mm (6") to be in double line.	
	n. Provide schedule for each major piece of equipment.	
	o. Submit 1:50 (¼") scale floor plans of typical mechanical equipment rooms with minimum two cross sections at right angles to each other; show space required for maintenance; and major ductwork and piping.	
	p. Provide schematics, flow and riser diagrams, control diagrams and control devices for each type of air handling and hydronic system.	

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – DESIGN DEVELOPMENT ITEM	COMMENTS/ YES/NO/NA
	q. Investigate and provide the use of existing Engineering Control Center (ECC), if any.	
3	Verify compliance with the requirements stated in the applicable VA HVAC Design Manual.	
4	Verify smoke and fire protection, and other life safety provisions in the design:	
5	Compliance with VA BIM Standard	
	r. Submit selection of major pieces of equipment with catalogue cuts.	
	s. Ensure coordination with other disciplines and provide pertinent information required by them.	
	t. Indicate individual room air distribution and temperature controls for representative samples of typical spaces.	
	u. Provide separate floor plan drawings for ductwork and piping, unless waived by VA.	
	v. Provide updated controls, flow and control diagrams.	
	w. Provide sound/acoustic analysis to ensure compliance with the HVAC Design Manual.	
	x. Provide demolition drawings indicating scope of work for demolition.	
	y. Show phasing plans with narrative.	
	z. Show outside chilled and condenser water piping as well as steam and condensate piping system. Show how the pipes will be laid.	
	aa. Show scope of work for ECC, its planned capabilities, and point schedule.	
	ab. Submit VA Master Specifications edited to reflect scope of work of the project. Provide a list of all sections that will be required for the project.	

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CONSTRUCTION DOCUMENTS 1

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – CONSTRUCTION DOCUMENTS 1 ITEM	COMMENTS/ YES/NO/NA
1	Check whether the A/E submission is in compliance with PG-18-15.	
2	Summary of PG-18-15, A/E submission requirements for the designers:	
	a. Provide complete and final calculations of all HVAC equipment and systems.	
	b. Submit sound analysis of various systems and steps taken to ensure compliance with the noise criteria.	
	c. Complete coordination with other disciplines by providing revised information developed since the last submission.	
	d. Submit 100 % complete 1:100 (1/8") scale all HVAC floor plans. Separate floor plans for ductwork and piping, unless waived by VA.	
	e. Submit 100% complete 1:50 (¼") scale all mechanical equipment room floor plans with minimum two cross sections at right angles to each other.	
	f. Show all roof-mounted equipment on roof plans.	
	g. Provide 100% complete drawings of the outside chilled and condenser water distribution with profiles, sections, and details etc. Show existing utilities through actual inspection at the site and discussions with the medical center.	
	h. Provide 100% complete automatic temperature control drawings including point schedules for all trades, a riser diagram showing locations of ECC, and field data gathering panels. Show actual location of ECC and peripherals on floor plans.	
	i. Provide 100% complete HVAC demolition drawings showing clearly the extent of demolition work.	

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – CONSTRUCTION DOCUMENTS 1 ITEM	COMMENTS/ YES/NO/NA
	j. Submit HVAC original VA Master Specification drafts marked-up showing the editing for the project. Ensure the specification sections represent accurate coordination between drawings and specifications.	
3	Check compliance by the designer requirements stated in the applicable VA, HVAC Design Manual.	
4	Check smoke and fire protection, and other life safety provisions in the design:	
5	Compliance with VA National CAD Standard Application Guide and applicable National CAD Standard modules.	

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FINAL BID DOCUMENTS

NO.	HEATING, VENTILATING, AND AIR CONDITIONING – FINAL BID DOCUMENTS ITEM	COMMENTS/ YES/NO/NA
1	Check if the A/E submission is in compliance with PG-18-15.	
2	Summary of PG-18-15 A/E submission requirements for the designers:	
	a. Place the seal of the professional engineer responsible for the design on the drawings.	
	b. Submit revised draft specifications to incorporate all changes, resolution of conflicts and modifications noted at CD1 review. Revisions shall also include results of any drawing changes not shown on CD1 documents that affect the specifications.	
	c. Type specifications in final format and submit a complete set for review. Include a set of full-size final drawings fully coordinated.	
	d. Return all draft specifications reviewed at CD 1 review to aid the final bid documents review.	
3	Compliance with VA National CAD & BIM Standards Application Guide	