NATIONAL GUARD BUREAU
3501 FETCHET AVENUE
JOINT BASE ANDREWS MD 20762-5157

1 May 2015

MEMORANDUM FOR DISTRIBUTION

FROM: NGB/A7

SUBJECT: Air National Guard Engineering Technical Letter (ANGETL) 15-01-04: "Mechanical Engineering"

1. PURPOSE. To provide guidance in implementing the mechanical and plumbing design policy.

2. APPLICABILITY.

2.1. **Effective Date:** Immediately

2.2. **Intended Users:** Base Civil Engineers (BCE) and architect-engineering consultants (A-E).

2.3. This ANGETL is applicable for all new designs, designs for which NGB/A7O formal approval of the Type A-2 Concept Development Submittal has not yet been issued and for all code and criteria review. Application of this ANGETL for projects that have obtained formal approval of the Type A-2 Submittal will be on a case-by-case basis and as directed by the NGB/A7O Project Manager.

3. REFERENCES. Refer to Attachment 1 for a list of referenced publications and active links, if available.

4. MECHANICAL DESIGN CRITERIA: The mechanical systems including plumbing and heating, ventilation, air conditioning (HVAC) systems shall follow the guidelines set in the Unified Facility Criteria (UFC) series 3-400: Mechanical and referenced criteria.

5. GENERAL

5.1. A life cycle cost analysis (LCCA) shall be performed for a minimum of three alternative mechanical systems. The LCCA shall be performed in accordance with ANGETL 15-01-00, Air National Guard Design Policy. The A-E shall include ground source heat pumps as one of the three alternatives if it is technically feasible for the project. The A-E shall select the mechanical system with the lowest LCCA unless otherwise approved by NGB/A7O.

5.2. Selection of systems, equipment and materials shall be coordinated with the BCE and generally continue existing base standards and conform to the base's mechanical master plan. All mechanical systems shall take into consideration the need to efficiently accommodate both the Unit Training Assemble (UTA) weekend and the lower weekday occupancy.

5.3. Energy Consumption. Select, design and specify heating, air conditioning, evaporative cooling, dehumidification, mechanical ventilation and refrigeration equipment in accordance with EPAct 2005 and ASHRAE 90.1. Refer to ANGETL 15-01-01, Sustainable Design, Development and Resource Conservation for information on sustainable designs. All mechanical systems shall be designed to incorporate energy efficient equipment covered by the Energy Star program or Federal Energy Management Program (FEMP) designated product listing.

6. AIR CONDITIONING

6.1. Limitations. Air conditioning, evaporative cooling, dehumidification and mechanical ventilation systems are authorized for those buildings and facilities where it is common practice to do so in the local area. All equipment selections should be based on process needs, efficiency, occupant comfort, maintainability and an LCCA.

6.2. Replacement of existing systems with differing systems is permitted provided a detailed LCCA shows the different configuration is more maintainable and economical.

6.3. Provide restrooms, locker rooms and showers with indirect air conditioning. Draw conditioned air from the administrative space air conditioned areas to provide cooling for restroom, locker and shower areas. If not possible, then dedicated air conditioning may be provided.

6.4. ANG projects involving refrigerants shall be in accordance with USAF Pamphlet 32-7089, Refrigerant Management. If HCFC-22 refrigerant is used in an existing system, designers should replace the system with a low ozone depleting potential and low global warming potential refrigerant in accordance with UFC 3-410-01, Heating, Ventilating, and Air Conditioning Systems.

6.5. Provide chillers with manufacturer flow switch, flow controls, heavy duty coil guards, single point connection and factory-wired controls.

6.6. Where year round cooling is required, air conditioning (A/C) systems shall have low outdoor ambient operating kits and options (as local climate dictates). The use of water side economizer or A/C dry coolers is encouraged in chilled water systems for energy conservation.

6.7. Provide stand-alone, dedicated heating, ventilation, air conditioning (HVAC) equipment in critical use, data processing and server rooms. Also consider satisfying the cooling

load with underfloor supply air plenum from down flow, floor-set Computer Room Air Conditioning (CRAC) unit(s).

6.8. Due to additional maintenance requirements water-cooled chillers are not preferred for ANG facilities.

6.9. Where required by mission or weapons system support, provide redundant equipment sized for the full load and shall be limited to the mission areas. Dual circuit chillers are not considered redundant. Each individual chiller must be sized for the full system load. Redundancy requirements shall be coordinated with NGB mission owner through the BCE and shall conform to Mission Critical Facility Engineering Standard (MCFES) 12-01, Facility Electrical and Mechanical Infrastructure Redundancy Requirements.

7. HEATING

7.1. Modular packaged high efficiency boilers should normally be specified in boiler heating systems. For efficiency and reliability, the use of multiple boilers is encouraged. Size multiple boiler installations in accordance with UFC 3-410-01 Heating, Ventilating, and Air Conditioning Systems.

7.2. Provide chemical treatment systems for the boiler water system to reduce scale formation and corrosion problems.

7.3. For all heating systems, where natural gas is available, provision of gas-fired hot water boilers is the preferred system. Boilers and pumps should be located in a single mechanical room.

7.4. Direct-fired heaters are prohibited in areas subject to hazardous concentrations of flammable vapors or dust.

7.5. Hangar bay heaters should be provided with automatic cutoff controls when doors are opened. An allowance of 4 hours should be made for hangar and aircraft warm-up after the entrance of the largest aircraft to be used, unless infrared heating is provided, in which case the designer should make appropriate adjustments.

8. VENTILATION

8.1. Utilize UFC 3-410-01 Heating, Ventilating, and Air Conditioning System in the design of general and specialized ventilation systems. Special consideration should be given to ventilation designs in industrial applications. The A-E shall coordinate through the BCE with local Bioenvironmental (BE) office and the Safety authorities. Consult AFMAN 48-155, Occupational and Environmental Health Exposure Controls and AFI 91-203, Air Force Consolidated Occupational Safety Instruction for additional guidance.

8.2. Paint booth/area and corrosion control hangar ventilation requirements shall be in accordance with UFC 4-211-02 Aircraft Corrosion Control and Paint Facilities. Also

refer to the design guidance in the Manual of Recommended Practice, by the Industrial Ventilation by the American Conference of Governmental Industrial Hygienists (ACGIH) for sizing airflow and capacities.

8.3. Provide mechanical ventilation for space temperature control in all areas where space conditioning is not specifically required or authorized. Ventilation systems should conform to the following requirements:

8.3.1. Fans should generally exhaust through the wall (avoid roof penetrations).

8.3.2. Ventilation equipment should be supported from the facility structural steel system or wall mounted and should have vibration isolation.

8.4. Refueler vehicle maintenance bays should be provided with a ventilation rate of 500 CFM (minimum) at the trench drain and 1.5 CFM/SF of total bay area as a purge/emergency rate. Purge/emergency exhaust should be enabled by manual control. Purge/emergency exhaust activation should be interconnected with EMCS system and should activate a facility audiovisual alarm as well as send alarm to the base EMCS central control. Ventilation systems should be manually controlled such that they are operational only when a vehicle is in the bay.

8.5. Hangar Ventilation

8.5.1. General: Hangar ventilation systems shall be provided with scalable, modular, and low maintenance energy recovery systems where practical and economically feasible.

8.5.2. Maintenance Hangars: Require a minimum hanger bay general ventilation rate of 0.5 cfm/sf.

8.5.3. Fuel Cell Hangars: Separate and independent systems for general ventilation, purge ventilation, emergency ventilation, and trench drain ventilation (if trench drains exist). Reference Technical Order (TO) 1-1-3, for additional fuel cell hangar requirements and ventilation guidance.

8.5.3.1. General Ventilation: During normal operation a minimum exhaust of 0.5 cfm/sf shall be required, when fuel cell maintenance activities are in process, a minimum of 1.5 cfm/sf exhaust.

8.5.3.2. Emergency ventilation system: Shall have a minimum of 20 air-changes/hour (ACH), with the volume calculated based on a height of 2 ft. above finished floor. Exhaust grilles shall be located 12 in. above finished floor, at a minimum of 3 locations. Makeup air does not need to be conditioned. The emergency ventilation system shall be manually operated.

8.5.3.3. Purge Ventilation: Purge ventilation is intended for localized ventilation during aircraft fuel system maintenance activities. This purge ventilation design shall include a dedicated outdoor air system, conditioned for comfort heating/cooling with a matching exhaust system. The supply air temperature shall be within a suitable range for cleaning, drying, gluing, curing, and other agents used for fuel cell and fuel system maintenance operations. The A-E shall coordinate duct connections to the aircraft and provide a detail. The purge ventilation system shall be manually controlled.

8.5.3.4. The A-E shall detail these systems on the plans.

8.5.4. Corrosion Control Hangars: Ventilation for corrosion control hangars shall comply with UFC 4-211-02, Aircraft Corrosion Control and Paint Facilities. The ventilation rate shall be a minimum of 0.5 CFM/sf.

8.5.5. Combined Use Hangars: Combined use hangars and backup use hangars shall be designed with ventilation to accommodate all planned hangar functions.

8.6. Specialized exhaust systems. The following areas shall be provided with specialized exhaust systems:

8.6.1. Facilities designed to contain vehicles or equipment with internal combustion engines or where carbon-monoxide can be produced.

8.6.2. Facilities with battery storage and charging areas required to have exhaust systems in accordance with UFC 3-520-05, Stationary Battery Areas.

8.6.3. Facilities with areas that may be defined as permit-required confined spaces should have exhaust systems that can be activated prior to a person’s entry into that space.

8.6.4. Trench Drains requiring exhaust systems.

8.6.5. Refueler vehicle maintenance bays and POL pump houses.

8.6.5.1. Shall have a minimum of 20 ACH, with the volume calculated based on a height of 2 ft. above finished floor with low level pick-up at 12 in. above finished floor.

8.6.5.2. Emergency Exhaust: 1.5 CFM/SF of total bay area. Emergency exhaust should be enabled by manual control and shall be interconnected with EMCS system and activate a facility audiovisual alarm as well as send an alarm to the base EMCS central control.

8.6.6. Exhaust systems with dust collector interlocked to individual pieces of equipment.

8.6.7. Paint bay exhaust systems should be interlocked with the breathing, makeup air, and paint spray equipment systems.

9. ROOF MOUNTED EQUIPMENT: Mechanical equipment and ductwork should not be located on roofs. The A/E must provide justification for equipment that cannot be located anywhere other than the roof.

10. AIR DISTRIBUTION SYSTEM

10.1. The design and construction of the air distribution system should conform to the most recent Sheet Metal and Air Conditioning Contractors National Association (SMACNA) standards.

10.2. Flexible duct should be factory pre-insulated meeting NFPA 90A. All flex duct runs should be limited to 5 foot maximum length.

10.3. Avoid insulated duct liners except in very limited runs such as transfer ducts where necessary for noise control. Only use duct liner with 100% adhesive coverage; butted ends to be seal coated; pin fasteners alone are not adequate. Use a higher quality liner with a low friction surface. Require that duct sizes must be increased to maintain minimum duct dimensions when using duct liner. Show detail if used.

10.4. Support all duct systems from facility structural members and not from the roof deck system.

10.5. Exterior intake louvers should be located opposite from the prevailing wind direction on leeward side of facilities. All intake air louvers should be located clear of any sources of heat, noise, odor and pollution.

10.6. Interior supply louvers and grilles should be consistent throughout the facility. Avoid specification of supply grilles that use the honeycomb or egg crate style cover.

10.7. Registers and grilles should be sight proof or the ductwork behind the register or grille should be painted full flat black.

10.8. Provide EMCS control to supply outside air meeting ASHRAE minimum CFM per person or CFM per square foot when air demand is the lowest. Monitor outside air rate in accordance to ASHRAE.

10.9. The AHU unit should be capable of 100% outside air intake based on UFC and ASHRAE requirements. Where applicable, it should use a modulating economizer for up to 100% outside air and should be controlled by enthalpy sensors.

10.10. AHU and fan units located above finished floor, in overhead or mezzanine locations should have service platforms and stair access to the platform.

10.11. VAV boxes shall be pressure independent.

10.12. Do not place duct balancing damper assemblies upstream of VAV boxes.

10.13. All VAV boxes shall be fully accessible for maintenance and replacement.

10.14. Support VAV from facility structural members with spring isolators.

11. HYDRONIC SYSTEMS

11.1. Type L copper piping for hot water and chilled water circulation systems for all pipe sizes 3 inches and smaller are recommended, unless local water makeup and conditions would present an unusual corrosion problem. All fittings should be wrought copper. Consider use of type L copper for larger piping sizes based on amount of piping and economics. If practical, use type L copper for all piping sizes. Provide cathodic isolation for all piping systems of dissimilar metals.

11.2. All air vents shall be valved.

11.3. Use manual air vents only in spaces outside of the mechanical rooms. Provide at all high points in all systems.

11.4. Piping should be complete with full port ball shut-off valves.

11.5. For VAV boxes, provide reheat coils with full valve accessories, including balancing sets with memory stop, lockable position with scale and taps for flow measurement, unions, isolation ball valves and sound attenuators.

11.6. Provide calcium silicate (hard) insulation with full pipe saddles at all hangers for all pipe sizes.

11.7. Avoid mounting or running any piping systems up exterior facility walls.

11.8. Provide hydronic design that includes duplex (back up) pumps for all heating systems.

11.9. Provide capability for measurement of full hydronic system flows in all main and sub-main circuits. All hydronic systems should have flow control and flow setting devices.

11.10. Pump casing should be insulated with removable/reusable insulation for servicing (pre-manufactured removable insulation jackets specific to the pump model).

11.11. Circulating pumps must be aligned, shimmed and set in non-shrink grout, per original manufacturer instructions.

11.12. Where ground source heat pumps are being designed, the A-E shall design the wells to be closed loop systems. Where local restrictions to closed loop systems exist, an open loop system may be considered.

12. PLUMBING

12.1. The A-E shall design the plumbing systems in accordance with UFC 3-420-01, Plumbing Systems.

12.2. Base water distribution system. Each system should have curbside ball shutoff valves and individual backflow prevention device for service to each facility or major point of use.

12.3. Sanitary waste and vent lines at facilities.

12.3.1. Above grade: cast iron, hubless, CISPI 301.

12.3.2. Below grade: cast iron, hub and spigot, ASTM A74.

12.4. Plumbing Fixtures and Equipment:

12.4.1. Toilets should be vitreous china, elongated bowl, siphon jet style, water saving type with white, open front seat. Toilets should be wall mounted.

12.4.2. Valves should be provided at a minimum in the following locations:

12.4.2.1. At branch from main base utility.

12.4.2.2. On main upon entering facility.

12.4.3. Battery operated fixtures and valves are prohibited.

12.4.4. Waterless urinals should not be used unless the A-E can prove that they are virtually maintenance and odor free and can fulfill their full function.

12.4.5. The use of oil-water separators should be limited to areas required in accordance with UFC 3-420-01, Plumbing Systems and the base environmental office.

12.5. Backflow prevention devices should conform to AFI 32-1067, Water and Fuel Systems.

12.6. The design of the plumbing system should follow local public utility standards and any local regulatory requirements applicable to specific ANG locations. Coordinate environmental requirements regarding the plumbing system with the local environmental office.

12.7. ANG projects involving natural gas and propane should be in accordance with NFPA 54 and NFPA 58

12.8. Interruptible gas supply. Bases and facilities that are serviced by interruptible gas supply contracts should be provided with dual fuel systems. The back-up dual fuel source should either be oil or propane system. Backup fuel capacity should be sized for not less than 10 days of operation.

13. UTILITIES

13.1. All building utilities such as gas and water should enter the building at the mechanical room. Utilities should not be run on the exterior of the building.

13.2. Water meters on dedicated fire water lines are not usually required unless the base is billed for quantities used.

13.3. Utility metering shall be in accordance with UFC 1-200-02, High Performance and Sustainable Building Requirements.

13.4. Facility and non-facility major point-of-use meter outputs should be capable of being read at the facility or point of use as well as be capable of being obtained through the base EMCS monitoring.

14. MECHANICAL ROOM/COURTYARD DESIGN

14.1. Ensure that design of mechanical equipment areas is of sufficient size for accessibility and maintenance. Clearance is required around all mechanical equipment to allow for the replacement of filters, removal of coils, opening of doors, removal of motors, etc. Mark clear zone for coil and tube pull on the plans and specify that clear zone should be painted on mechanical room floor.

14.2. Centrally locate all mechanical equipment in mechanical room to fullest extent possible. This includes water heaters, central air handling units, fans and blowers, boilers, pumps, heat exchangers, chillers, compression and expansion tanks, compressors, refrigerated dryers, HVAC control panels and other types of mechanical equipment.

14.3. All HVAC equipment that is grade mounted should be mounted on chamfer edge concrete house pads, 4 inch thick and a minimum of 6 inches dimensionally larger than the unit. House pads should be utilized regardless of whether or not an inertia pad is installed.

14.4. Provide sleeves at all penetrations. Sleeve should seal at all wall and floor penetrations. Floor penetration sleeving should extend a minimum of 4 inches beyond the floor and should be completely sealed to the floor material.

14.5. Clearly show in the design reserved clear wall space for posting operation instructions. Consider posting operation instructions on the back of the mechanical room doors.

14.6. Provide a wall-mounted mesh style lockable storage cabinet for copies of O&M manuals in the mechanical room. Locks for each cabinet should be keyed alike.

14.7. Required exterior mechanical equipment such as condensing units, package chillers, generators, etc., should be located in screened mechanical courtyards adjacent to the mechanical room and shall be coordinated with the BCE and comply with UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings.

15. SYSTEMS IDENTIFICATION

15.1. Provide full air distribution system identification at each side of a wall penetration, in the mechanical room, at all changes of direction and at no more than 50 foot intervals. In exposed locations, identification should be preprinted labels. In concealed locations, identification may be professionally stenciled.

15.2. Provide full equipment identification systems. Identification should be large engraved identification plaques screwed or riveted to the units. Coordinate identification systems to the posted instructions and to EMCS graphics.

15.3. Provide full thermal pipe, plumbing pipe, fuel pipe and pneumatic pipe identification systems. Pipe should be identified at all changes in direction, on either side of any wall or floor penetration and at a minimum distance of 40 feet on center. Identification systems should be color coordinated and indexed back to posted operations instructions and to the EMCS graphics. Identification within occupied spaces and mechanical rooms should be professional pre-made slip-on type. Identification above ceilings and in other concealed spaces may be of professional, color-coordinated stencil.

16. OPERATIONS AND MAINTENANCE MANUALS

16.1. Provide concise and comprehensive specifications outlining the requirements outlined in ASHRAE handbooks for project operation and maintenance (O&M) manuals. Standardize O&M manual requirements throughout the project. Manuals should include original data on all materials, systems, components and equipment provided for the project. Manuals should be professionally prepared, including printed spine and cover with full table of contents and tabbed indexing. Full size sheets, if required, should be folded into special holding pockets. O&M manuals should be completed, submitted and approved no less than 30 days before beneficial occupancy. The BCE should receive a minimum of one electronic copy, and two hard copies of the final manuals, one for the file and the other in the contract-furnished O&M manual lock box in each mechanical room.

16.2. All control termination points must be permanently labeled and labeling documented at the panel and in the O&M manual.

16.3. Manuals will be required to include among other things:

16.3.1. Owner's manuals for each item of equipment.

16.3.2. Final certified Testing, Adjusting, and Balancing (TAB) report.

16.3.3. All equipment wiring diagrams.

16.3.4. Full parts lists and exploded schematic diagrams.

16.3.5. Inventory listing and test records of all backflow prevention and cross connection control devices installed under the project.

16.3.6. Full names, addresses, phone numbers, suppliers, service companies, contract numbers and other points of contact/information relative to the project.

16.3.7. Final approved HVAC control sequences and diagrams.

17. POSTED OPERATIONS INSTRUCTIONS

17.1. Provide comprehensive, standardized specifications outlining the requirements for posted operations instructions. Instructions should be completed in a professional manner and should conform to existing base standards where applicable.

17.2. Posted instructions should be prepared for all mechanical systems and should include the following components:

17.2.1. Comprehensive schematics for air distributing and handling systems.

17.2.2. Facility floor plans showing location of all equipment with coordinated identification.

17.2.3. Piping diagrams (hot, cold, heating, chilled, compressed, fire, other).

17.2.4. System diagrams, including isometrics of equipment and systems (boiler, pumps, chiller, AHUs, VAVs exhaust systems, etc.).

17.2.5. Valve charts.

17.2.6. Equipment schedules.

17.3. Posted instructions should also include full control diagrams that should include the following:

17.3.1. Sequence and control sequence of operations diagrams.

17.3.2. Point lists must be included. The point list should include all defined PI/AI/AO/DI/DO points along with a specific sequence of operations.

17.3.3. Schematic HVAC systems and operations diagrams showing piping and ducting systems for each major item of equipment.

17.3.4. All control termination points must be permanently labeled and labeling documented at the panel and in the posted instructions.

17.4. Instructions should be framed in extruded metal frames, mounted under glass. Instructions will be permanently mounted in the clear wall area reserved in each mechanical room.

17.5. For those bases with active EMCS, additionally include facility-posted operations instructions as part of the EMCS database.

18. TRAINING

18.1. Specifications shall include method of delivery and duration of training, and required training media. Training should cover normal operations, emergency operations, and maintenance.

18.2. A complete and appropriate mix of on-site, classroom and off-site training should be specified for all equipment and systems. Training should be specified to be complete with all materials, fees and tuition to be paid for by the contractor; only employee travel costs should not be paid by the contract.

18.3. Training should be provided by factory instructors or factory trained and authorized instructors as recommended by the original equipment manufacturer. Specify clearly the number of hours of training and the number of personnel to be trained. Clearly indicate on what systems and components which personnel are to be trained.

18.4. The base DDC system and EMCS should require training as determined by the BCE and tailored to the project. Training should also be provided on a base-wide system and should include on-site training for the base-wide system. An off-site factory school training session for no fewer than two individuals should be provided.

18.5. A/E to coordinate with the BCE on systems and equipment that will require specialized training including but not limited to:

18.5.1. Variable Refrigerant Flow/Volume

18.5.2. Chiller/Boiler Control Panels

18.5.3. Variable Frequency Drives

18.5.4. Ground Source Heat Pumps

19. HVAC COMMISSIONING AND ACCEPTANCE

19.1. Commissioning should be performed regardless of whether or not the project is a LEED project. The Unified Facility Guide Specifications (UFGS) for commissioning should be included in all projects. The level of commissioning should be commensurate with the level of the work being performed.

19.2. Specifications should define the requirements for checklists and commissioning and acceptance procedures for HVAC systems. Checklists should be comprehensive and based on standards such as ASHRAE and ASME. Commissioning and acceptance checklists should be part of the acceptance procedure for any facility and should be completed by the contractor or commissioning agent. Checklists should be submitted prior to substantial completion inspections. Coordinate commissioning and acceptance of the HVAC systems with the overall commissioning of the facility.

19.3. Initial start-up and pre-operational checkout of large equipment and critical systems should be handled by a factory-authorized technical representative.

19.4. The TAB contractor shall be an independent construction sub-contractor, and have a nationally recognized certification, such as Associated Air Balance Council (AABC) and National Environment Balancing Bureau (NEBB). All TAB work should be in accordance with certified testing and balancing criteria, and shall be coordinated with the commissioning agent and controls contractor. All TAB work should be completed prior to substantial completion inspections.

19.5. The TAB specification shall include provisions to submit the TAB contractor's credentials and shall have a minimum of 5 years of experience.

19.6. Projects requiring any change to an existing system should address potential impacts on the entire existing system and should be considered when determining the scope of work.

19.7. Testing and balancing should be performed on both new and existing systems including:

19.7.1. Hydronic test and balance on chilled water cooling systems.

19.7.2. Hydronic test and balance on hot water heating systems.

19.7.3. An air test and balance on forced air heating or cooling systems.

19.7.4. An air test and balance on exhaust air systems.

19.7.5. Other systems.

19.8. Another part of the commissioning and acceptance process should include the provision of full DDC system verification. Verification test forms should be prepared and completed for all systems such as AHUs, chillers, pumps, boilers, VAVs, exhaust fans, etc. Verification should include demonstrated operations of all equipment as well as seven day trending reports that show all systems operating at optimum performance levels. All verification and documentation should be completed prior to substantial completion.

20. ENERGY MANAGEMENT AND CONTROL SYSTEM (EMCS) AND DIRECT DIGITAL CONTROL (DDC)

20.1. All ANG facility and site projects should provide or expand on the base EMCS. All ANG facility HVAC systems should use complete DDC systems. The following section should be used as guidance. In general, the EMCS should encompass the following type of uses: utility monitoring, lighting control, HVAC equipment control, and specialized systems monitoring. In the ANG, an EMCS is generally not used for liquid fuels system monitoring, fire detection systems or security systems.

20.2. Basic Requirements:

20.2.1. An EMCS using DDC is recommended for each distinct facility when larger than 1,200 SF. Justification of EMCS in smaller facilities should be based on need, at the discretion of the BCE.

20.2.2. All HVAC equipment greater than 20 KVA or 25,000 BTUH input should have EMCS monitoring of input/output/operating conditions. Justification of EMCS at smaller loads should be based on need, at the discretion of the BCE.

20.2.3. Existing Systems: At installations with existing EMCS or DDC systems, all new systems shall be integrated and fully compatible with the established base system. The A-E design shall define the interface and compatibility with the existing system.

20.2.4. New Systems: The first DDC system on base will likely define the base system. The selected system should be able to accept upgrades and interface with future versions by the same manufacturer, without replacing the hardware, control modules, processors, gateways, or sensors.

20.2.5. Scope: Determination of the limits of scope of the base EMCS should be made by the A-E. The A-E should verify with the BCE that the proposed EMCS equipment is compatible with existing systems and operating capacity.

20.3. Features and Functions: The head end of the operating system normally should reside at Civil Engineering. If the head end workstation already exists at the Civil Engineering building, no additional head end system is required.

20.3.1. Require building level connectivity to the head end of the operating system to provide a means for system critical alarms, messages, and warnings to be transmitted. Ensure system alarms are created to capture equipment malfunctions that may result in building freeze up or overheating of building equipment.

20.3.2. In the interest of energy savings, maximize the use of unoccupied/night temperature setbacks. Define the anticipated unoccupied schedules based on the

anticipated building usage. Ensure a building schedule with night setbacks is established in the controls portion of the project.

21. POINTS OF CONTACT: The point of contact for this ANGETL is Mr. Douglas Rowand, NGB/A7OT at (240) 612-8112, DSN 612-8112, or email douglas.s.rowand.civ@mail.mil. Mr. Bob Anderson, NGB/A70C, at 701-857-4302, DSN 344-4302, or email Robert.anderson.8@us.af.mil.

MICHAEL E. MCDONALD, P.E., Colonel, USAF
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Attachments:
1. Reference Documents
2. ANG Best Practices
3. Current ANGETL Index

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