



MECHANICAL (HVAC) SYSTEMS

THE A/E SHALL REVIEW VARIOUS HEATING, VENTILATING, AIR CONDITIONING AND REFRIGERATION SYSTEMS FOR APPROPRIATE APPLICATION IN THE GEOGRAPHICAL AREA IN WHICH THE PROJECT OCCURS. ELEGIBILITY OF ADMINISTRATIVE FACILITIES FOR AIR CONDITIONING SHALL BE BASED ON CRITERIA FOUND IN ARCHITECTURAL AND ENGINEERING INSTRUCTIONS (A&E)-DESIGN CRITERIA, DATED MARCH 13, 1987. THE HVAC AND REFRIGERATION SYSTEMS SHALL TAKE INTO ACCOUNT AVAILABLE SOURCES OF ENERGY (SUCH AS EXISTING CENTRAL REFRIGERATION AND HEATING PLANTS), LIFE CYCLE COST ANALYSIS OF THE PROPOSED SYSTEMS, ENERGY CONSERVATION MEASURES INCLUDING THE UTILIZATION OF HEAT REJECTED FROM THE REFRIGERATION EQUIPMENT, AND LOCAL CONDITIONS. EASE OF MAINTENANCE MUST BE AN IMPORTANT CONSIDERATION IN THE SYSTEM SELECTION PROCESS.

CRITERIA FOR DRY STORAGE FACILITIES SHALL BE BASED ON GENERAL PROVISIONS OF D.O.D. 4145.19-R-1. MECHANICAL VENTILATION SHALL BE PROVIDED AT THE PROPER RATE TO PREVENT DRY STORAGE ROOM TEMPERATURE FROM EXCEEDING 90°F. MECHANICAL COOLING MAY BE PROVIDED IN AREAS WHERE THE INTERIOR STORAGE AREA TEMPERATURE CANNOT BE MAINTAINED AT 90°F BY MECHANICAL VENTILATION ALONE. DESIRABLE SPACE RELATIVE HUMIDITY IS 40-55 PERCENT. SPACE HEATING SHALL BE PROVIDED TO MAINTAIN A TEMPERATURE OF 40°F. ADDITIONAL VENTILATION INCLUDING THE ATTIC SPACE AND WALL CAVITY AT LOW TEMPERATURE STORAGE AREAS SHALL BE PROVIDED.

REFRIGERATED STORAGE DESIGN TEMPERATURES FOR THE DIFFERENT AREAS WILL BE AS FOLLOWS:

SENSITIVE VEGETABLE & FRUIT COOLER	32-34°F	90-95% RH
HARDY VEGETABLE & FRUIT COOLER	40-45°F	90-95% RH
PERISHABLE COOLER	32-35°F	
ONION & POTATOES	55-60°F	85-90% RH
FREEZER	(-10°F)	
CHILLED DOCK AND MAXI-MART AISLE	45°F	

IN GENERAL, REFRIGERATED STORAGE ROOMS FOR SMALL AND MEDIUM SIZE FACILITIES SHALL BE BASED ON PACKAGED SPLIT COMMERCIAL REFRIGERATION SYSTEMS UTILIZING AIR COOLED CONDENSING UNITS WITH HERMETIC COMPRESSORS AND FAN COIL EVAPORATORS. DEPENDING UPON THE OUTCOME OF LIFE CYCLE COST ANALYSIS AND LOCAL CONDITIONS, A LARGE SIZE FACILITY MAY BE DESIGNED WITH A CENTRAL STATION INDUSTRIAL SYSTEM UTILIZING LARGE OPEN-TYPE COMPRESSORS, EVAPORATIVE CONDENSERS OR COOLING TOWERS AND AIR UNITS.

AS A GENERAL GUIDELINE, DESIGN FOR PACKAGED SPLIT SYSTEMS SHALL INCLUDE THE FOLLOWING ITEMS:

1. A MINIMUM OF TWO INDEPENDENT SYSTEMS SHALL BE INSTALLED TO SERVE EACH ROOM. IF ONLY TWO SYSTEMS ARE INSTALLED, EACH SHALL HAVE A CAPACITY EQUAL TO 70% OF THE TOTAL LOAD.
2. REFRIGERANT FOR SYSTEMS WITH ROOM TEMPERATURE OF 25°F AND LOWER SHOULD BE R-502. REFRIGERATION FOR ROOM TEMPERATURE OF 26°F OR HIGHER SHOULD BE R-22.
3. ALL ROOMS WITH AIR TEMPERATURE LOWER THAN 38°F MUST HAVE AUTOMATIC DEFROST. ELECTRIC DEFROST SHOULD BE FAVORABLY CONSIDERED FOR REASONS OF SIMPLICITY AND WIDE AVAILABILITY WITH AUTOMATIC DEFROST. SYSTEMS SHOULD BE SELECTED FOR 20 HOUR OPERATION.
4. ROOMS HELD AT 38°F TO 44°F CAN UTILIZE ROOM AIR DEFROST, BUT A TIMER MUST BE PROVIDED TO FORCE THE DEFROST. SYSTEM SHOULD BE SELECTED FOR 16 HOUR OPERATION.
5. FOR ROOM TEMPERATURES OF 45°F AND HIGHER, CONTROL TEMPERATURE SHOULD BE HELD ABOVE 30°F TO PREVENT COIL FROSTING.
6. AIR UNIT EVAPORATORS FOR VEGETABLE COOLERS WHERE HIGH HUMIDITY IS DESIRED SHOULD BE SELECTED WITH A 10°F TEMPERATURE DIFFERENCE BETWEEN THE RETURN AIR AND COIL TEMPERATURES.
7. AIR UNITS FOR FREEZER STORAGE SHOULD HAVE NO MORE THAN 4 FINS/INCH. AIR UNITS FOR COOLERS SHOULD HAVE NO MORE THAN 6 FINS/INCH AND 4 FINS/INCH IS MORE DESIRABLE FOR HIGH MOISTURE LOADS WHEN UNIT TEMPERATURE IS BELOW 28°F.
8. ALL JOINTS IN THE PIPING SYSTEM SHOULD BE BRAZED.
9. SYSTEM SHOULD BE COMPLETE WITH SUCTION-LIQUID HEAT EXCHANGERS, SUCTION TRAP ACCUMULATORS FOR COMPRESSOR PROTECTION, DEHYDRATORS AND LIQUID BULLSEYE.
10. ALL SYSTEMS SHOULD CONFORM WITH THE REQUIREMENTS OF THE ANSI-ASHRAE 15-28 SAFETY CODE FOR MECHANICAL REFRIGERATION PIPING.

SPACE FOR MECHANICAL EQUIPMENT HAS BEEN PROVIDED IN EQUIPMENT MEZZANINES. MECHANICAL ROOMS SHALL BE PROPERLY VENTILATED TO PREVENT EXCESSIVE TEMPERATURES, VIBRATION AND NOISE CONTROL CONSIDERATIONS SHALL BE PROVIDED IN THE MECHANICAL ROOMS. THE ULTIMATE LOCATION OF THE MECHANICAL EQUIPMENT IS OPTIONAL.

PROVISIONS MUST BE MADE TO PROVIDE CONTINUOUS HEAT UNDER THE FREEZER FLOOR THROUGH AN UNDERFLOOR WARMING SYSTEM. ANY HEAT SOURCE INCLUDING WASTE HEAT FROM OTHER SYSTEMS TRANSMITTED BY CIRCULATED GLYCOL OR FORCED AIR IS ACCEPTABLE. FORCED AMBIENT AIR SHOULD NOT BE USED EXCEPT WITH AN AUXILIARY HEAT SOURCE EXCEPT IN THE TROPICAL AREAS. GRAVITY INDUCED AIR CIRCULATION SHOULD NOT BE USED IN ANY CIRCUMSTANCES.

A MONITORING SYSTEM INCLUDING A MAIN CONTROL PANEL SHALL BE PROVIDED TO MONITOR THE TEMPERATURE IN EACH REFRIGERATED STORAGE ROOM. THE SYSTEM SHALL BE CAPABLE OF PROVIDING VISUAL AND AUDIBLE ALARMS FOR ABNORMAL CONDITIONS AND SHALL BE CAPABLE OF SENDING ALARM MESSAGES, VIA TELEPHONE LINES, TO A PREDETERMINED LOCATION. THE USE OF A TWO-CHANNEL TELEPHONE DIALER SHOULD BE CONSIDERED. RECORDING THERMOMETERS (24 HOUR LARGE DIAL TYPE) SHALL BE PROVIDED NEAR THE FRONT DOOR ON THE EXTERIOR OF EACH REFRIGERATED STORAGE ROOM. PROVISIONS SHALL BE MADE FOR TIE-IN OF THE MONITORING SYSTEM TO EXISTING (OR FUTURE) POST WIDE ENERGY MONITORING AND CONTROL SYSTEM (EMCS) IN ADDITION TO THE ALARM FUNCTIONS AS INDICATED. THE REFRIGERATION SYSTEMS AND AREAS SERVED BY THOSE SYSTEMS, WHEN CONNECTED TO POST WIDE EMCS, SHALL HAVE PROVISIONS FOR MONITORING FUNCTIONS ONLY (NO OVERRIDING CONTROL FUNCTIONS). IF A FUTURE POST WIDE EMCS IS NOT PROGRAMMED WITHIN 5 YEARS OF PROJECT DESIGN, NO PROVISIONS FOR BUILDING PREPARATION FOR EMCS SHALL BE PROVIDED.

PLUMBING SYSTEMS

DETERMINATION OF PLUMBING FIXTURES SHALL BE BASED ON THE NUMBER OF BUILDING OCCUPANTS STATED ON THE DATA FORM, ASSUMING A RATIO OF 50% MALE AND 50% FEMALE, IN ACCORDANCE WITH THE ARCHITECTURAL AND ENGINEERING INSTRUCTIONS (A&E) DESIGN CRITERIA, DATED MARCH 13, 1987, CHAPTER 15. SANITARY WASTE AND VENT, DOMESTIC COLD AND HOT WATER PIPING SHALL BE PROVIDED TO SERVE THE TOILET ROOMS, JANITOR ROOM, BREAK ROOM, VETERINARIAN INSPECTION ROOM, BATTERY CHARGING AREA, AND WASHDOWN STATIONS LOCATED THROUGHOUT THE FACILITY. WATER SUPPLY AND DRAINS SHALL BE PROVIDED IN THE VENDING MACHINE AREA IF SO REQUIRED. STORM DRAIN PIPING SHALL BE PROVIDED FROM ROOF DRAINS, IF UTILIZED, TO A POINT OF DISPOSAL OUTSIDE THE BUILDING.

ELECTRICAL SYSTEMS

LIGHTING AND REFRIGERATION EQUIPMENT LOADS WILL COMPRISE THE MAJORITY OF THE BUILDING'S ELECTRICAL LOAD. RECEPTACLES AND VENTILATION EQUIPMENT WILL MAKE UP THE REMAINING ELECTRICAL LOADS.

A BUDGET OF 8 WATTS PER SQUARE FOOT FOR LIGHTING AND 120 VOLT RECEPTACLES AND 5 WATTS PER SQUARE FOOT FOR MECHANICAL SYSTEMS IN OFFICE AREAS WILL SUFFICE. BUDGETS FOR DRY STORAGE WILL BE 1 WATT FOR LIGHTING, RECEPTACLES AND VENTILATION WHILE THE BUDGETS FOR COOLERS AND FREEZERS WILL BE 9 WATTS PER SQUARE FOOT.

LIGHTING IN COOLERS, FREEZER, DRY STORAGE AND LOADING DOCK AREAS WILL BE ACCOMPLISHED WITH THE USE OF HIGH PRESSURE SODIUM LIGHTING FIXTURES. THIRTY PERCENT (30%) OF THE HIGH PRESSURE SODIUM LIGHTING FIXTURES SHALL BE INSTALLED WITH AN INTEGRAL QUARTZ LAMP AND SPACED TO PROVIDE AN EVEN LIGHTING DISTRIBUTION, ESPECIALLY IN EGRESS PASSAGEWAYS. FLUORESCENT LIGHTING FIXTURES WILL BE USED IN THE REMAINING AREAS OF THE BUILDING PARTICULARLY OFFICES, TOILETS, CONFERENCE ROOMS, ETC. BALLASTS IN COOLERS AND FREEZERS SHALL BE RATED FOR -20°F OPERATION. METAL HALIDE, MERCURY VAPOR OR FLUORESCENT LAMPS SHALL BE CONSIDERED IN LIEU OF HIGH PRESSURE SODIUM IN AREAS WHERE COLOR RENDITION IS A FACTOR.

EXTERIOR LIGHTING WILL BE OF THE HIGH PRESSURE SODIUM TYPE, CONTROLLED BY A SERIES CONNECTED PHOTOCELL-TIME CLOCK CIRCUIT. ILLUMINATION LEVELS SHALL BE AS SET FORTH BY THE ARCHITECTURAL AND ENGINEERING INSTRUCTIONS (A&E), DESIGN CRITERIA AND THE ILLUMINATING ENGINEERING SOCIETY.

THE ELECTRICAL DESIGN SHALL PROVIDE MEANS OF CONNECTING A PORTABLE EMERGENCY GENERATOR TO POWER THE BUILDING ESSENTIAL ELECTRICAL SYSTEMS INCLUDING ALL EXIT AND EGRESS LIGHTING, FIRE ALARM AND SECURITY SYSTEMS, REFRIGERATION EQUIPMENT, ESSENTIAL COMMUNICATION SYSTEMS AND SELECTED LIGHTING AND RECEPTACLES TO CONDUCT ESSENTIAL OPERATIONS AS AUTHORIZED BY THE A.E.I. DESIGN CRITERIA. AS AN OPTION, AN ON-SITE EMERGENCY GENERATOR SHALL POWER ALL LOADS PREVIOUSLY DESCRIBED AS WELL AS ALL LIGHTING AND RECEPTACLES AROUND THE EMERGENCY GENERATOR LOCATION. CATHODIC PROTECTION SHALL BE PROVIDED TO ALL UNDERGROUND STEEL FUEL TANKS AND LINES.

A CENTRAL, ELECTRICALLY SUPERVISED FIRE ALARM AND SMOKE DETECTION SYSTEM, MEETING ALL LOCAL CODES AND NFPA REQUIREMENTS, WILL BE INSTALLED AS PART OF THE BUILDING SYSTEMS.

A COMPLETE SECURITY SYSTEM WILL BE INSTALLED TO MONITOR ALL OPENINGS AROUND BUILDING, DESIGN AND PROCUREMENT OF THE SECURITY SYSTEMS SHALL BE COORDINATED WITH AND REVIEWED BY THE INTRUSION DETECTION SYSTEMS MANDATORY CENTER OF EXPERTISE (IDS-MCX), U.S. ARMY ENGINEER DIVISION, HUNTSVILLE, CEHND-ED-ME. A COMPLETE INTERCOM SYSTEM SHALL BE INSTALLED TO SERVE THE OFFICE AND OPERATING AREAS.

DEPENDING ON THE GEOGRAPHICAL LOCATION OF THE FACILITY, THE INSTALLATION OF A COMPLETE LIGHTNING PROTECTION SYSTEM SHALL BE EVALUATED.

INFORMATION MANAGEMENT SYSTEM PROVISIONS WILL CONSIST OF TERMINAL/CONCENTRATOR CABINETS, RACEWAYS, OUTLET BOXES, AND DEVICE PLATES, AND UNDERGROUND ACCESS TO THE EXTERIOR INSTALLATIONS INFORMATION MANAGEMENT SYSTEM. INFORMATION MANAGEMENT SYSTEM OUTLETS WILL BE PROVIDED FOR ADMINISTRATIVE WORK STATIONS AND OTHER LOCATIONS DESIGNATED BY THE USING ACTIVITY. THE LOCATION OF CABINET AND OUTLETS FOR THE INFORMATION MANAGEMENT SYSTEM WILL BE COORDINATED WITH THE LOCAL DIRECTOR OF INFORMATION MANAGEMENT.

REV	DATE	DESCRIPTION	BY	APP
DESIGNED:	WOLFBERG/ALVAREZ & ASSOCIATES		DEPARTMENT OF THE ARMY	
DRAWN:	ARCHITECTURE + ENGINEERING + PLANNING		NORFOLK DISTRICT CORPS OF ENGINEERS	
CHECKED:	ARLINGTON, VIRGINIA		NORFOLK, VA.	
SUBMITTED:	W/A & A		DEPARTMENT OF THE ARMY	
	CADD		FACILITIES STANDARDIZATION PROGRAM	
	PM		DEFINITIVE DESIGN	
	MK		TROOP ISSUE SUBSISTENCE ACTIVITY	
			COLD/DRY STORAGE FACILITY	
SCALE:	AS SHOWN	TO ACCOMPANY SPECIFICATION NO.	PROJECT NO.	SHEET NO.
DATE:	OCTOBER 1988		DEF 432-11-01	7