

## MCB CAMP LEJEUNE, N.C. MECHANICAL POLICIES

### HVAC

1. Use the latest revision of ASHRAE 62 for guidance on indoor air quality. For the purposes of outside air ventilation only, typical occupancy is considered that which happens at least once a week for buildings that follow a regular schedule or at least 15 times a year for non-schedule type buildings.
2. Chilled water VAV with zone reheat is the preferred HVAC system **for offices** and should be considered wherever appropriate. VAV zone boxes with out fans are preferable to units with fans. **In non-fan powered zone boxes, when specifying minimum air flow the designer shall consider diffuser dumping. If a zone has a large variance of load profile from neighboring zones a fan powered box should be considered to avoid dumping of diffusers. Chilled water VAV with fan powered terminal units is the preferred HVAC system for BEQ/BOQ's. Zone reheat shall be as specified in the scope (10.14.08).**
3. Particular attention should be given to humidity control by air conditioning equipment. Cooling units 7.5 tons and smaller shall not have modulating water controls unless based on a constant 55 F supply temperature. Larger units may have split face coils to give capacity step control (progressive modulating chilled water valves may be used). Modulating face and bypass dampers are okay on any size equipment
4. Rooftop HVAC equipment should be used with discretion. Maintenance access is more difficult, controls and water piping are exposed to more extreme conditions and roof is exposed to more abuse and wear. Ladders permanent or temporary inhibit personnel, material and equipment access, and therefore stairways shall be provided to roof top equipment.
5. Avoid HVAC systems that modulate cooling supply air temperatures unless outside air is separately conditioned.
6. Avoid use of chilled water fan coil (FCU) systems due the high maintenance associated with them. Coil condensate drain pans are especially problematic. If FCU's are used, ensure adequacy of the drain system.
7. Provide aluminum fins on copper tubes with coating that passes the ASTM B117-90 3000 hour salt spray resistance test for all outdoor coils larger than 10 tons. The heat transfer rating of phenolic-coated coils should be as installed (ie after coating).

8. Air cooled chillers are preferred to water cooled equipment for individual equipment smaller than 150 tons. Camp Lejeune weather is mild and humid which only gives slight efficiency advantage to water cooled equipment. Larger plants such as multiple 400 ton chillers should be water cooled. The efficiency advantage overcomes the additional maintenance of cooling towers.
9. Do not use steam absorption chillers. Helical screw compressors are desirable. Reciprocating and scroll compressors are acceptable. Where applicable on large installations centrifugal equipment is acceptable, (greater than 150 tons).
10. Provide adequate thermal mass in chilled water systems to ensure proper control and longevity of chillers. Chiller manufacturers recommend 2 to 7 minute water loop return times; use a minimum of 5 minutes to size inertia tanks and/or increase pipe sizing/length.
11. **Provide primary/secondary pumping systems on multiple building chiller systems and on systems larger 150 tons. Ensure primary loop has sufficient thermal inertia. Be aware that the secondary loop has little influence on staging cycling during low load conditions. (6.20.8)**
12. HVAC equipment should not be installed in attics or above suspended ceilings, unless absolutely necessary. When placement in an attic is dictated by necessity, provide stairs to access the attic, and maintenance access to and space around equipment; ships ladders are undesirable.
13. Air handling unit filter access doors should be specified as hinged with non-tool captive latching devices, ie captive thumb screws, quarter turn latches etc. Do not specify or approve access panels that are unhinged and/or retained by sheet metal screws.
14. Require contractors to provide a listing of the HVAC filters for each piece of equipment along with their dimensions (width, height and thickness) and types (permanent/washable, throwaway, etc)
15. Do not use plastic preinsulated pipe for buried dual temperature water distribution; use preinsulated copper pipe. **HDPE is acceptable for chilled water applications. (6.13.8)**
16. Do not specify mineral fiber or flexible unicellular insulation on chilled water pipes. Use rigid insulation on all pipes subject to being stepped on or damaged. Cellular glass, or polyisocyanurate up to 1-½ inches (40 mm) thick is preferred on chilled water pipes and other pipes below ambient temperature.
17. Use solids from water separators on all hydronic systems regardless of pipe material (steel or copper).

18. Isolate “steam” mechanical rooms from building. All steam equipment is more prone to leaking, thus making the room humidity saturated. Provide the steam room with an exterior door; do not provide a door(s) to adjacent spaces. Keep electrical equipment out of this room. If possible separate steam rooms from cold equipment rooms. Minimize controls in steam mechanical rooms. Only controls necessary for equipment in the room shall be allowed. If it is convenient put controls in adjacent room. It is preferable to keep air handlers out of this room also. Do not run high pressure steam outside the steam room (ie steam entrance should be directly into steam mechanical room). Separate building for steam equipment and pumps is good. Provide exhaust fan ventilation with 20ac/hr on cooling thermostat.
19. Ventilate “hot” rooms and electrical rooms sufficient to mitigate heat gain
20. Do not ventilate cold equipment rooms. Cold equipment rooms are those rooms with chilled water pumping, cooling air handlers chillers, etc. These rooms should be unvented and with small dehumidifier. Drain condensate to floor drain or other disposal location. Summer dew point ranges from low to high 70’s at Camp Lejeune causing condensation on equipment and piping.
21. Do not permit 400 series refrigerants except 407C and 410A. 400 series refrigerants are zeotropes and cause maintenance problems. **Use of 407C is discouraged, as it is a short term stop gap measure that the manufacturers can drop into basically a R22 machine. Designer shall research the availability of 410A and/or 134A equipment. If sufficient competition is available with 410A and/or 134A, prohibit the use of 407C and R22. 5.22.09**
22. Do not permit/specify engine driven refrigeration equipment.
23. Outside air intakes should be in compliance with force protection criteria, ie; minimum of 10’ above finished grade.
24. A/C terminal units with compressors shall be easily removed. On water source equipment that means unions on the equipment side of the service valves.
25. Design and specify bladder type expansion tanks with automatic air relief valve on air separator.
26. Paint all dual temp and chilled water steel pipe before insulation is installed.
27. Keep in mind fall hazards when locating equipment. Provide necessary fall protection.
28. In refrigerated rooms/boxes: specify all evaporators on a condensing unit to defrost together, separate evaporator/condensing unit pairs should defrost non-concurrently.

29. Provide phase monitors on all 3 phase equipment. For chillers the following shall be included:
  - a) phase unbalance protection
  - b) over/under voltage protection
  - c) phase loss protection
  - d) Delay of break timer to delay automatic restarts
  - e) non critical fault delay
  - f) programmable auto/manual restart
  - g) load and line side monitoring

For all other equipment only phase loss, phase reversal, and phase unbalance need to be monitored. Reset shall be automatic upon correction of the fault.
30. On chillers and large condensing units; provide core filter dryer on suction line as available as standard option
31. On chillers and large condensing units; provide liquid and suction line service valves as available as standard option.
32. Do not permit welding on chillers. Water connections shall be by grooved coupling or flanges. Provide 16-20 mesh strainer on water inlet.
33. **Do not permit grooved couplings in piping system other than the chiller connection. (6.13.8)**
34. **Extruded Tee's in copper piping are acceptable for mains 2" and larger with the branch ½ or less than the main. Joint must be brazed. (6.13.8)**
35. **Do not permit press type fittings in copper. (6.13.8)**
36. Require 5 year warranty on compressor parts. Require 5 year warranty on labor if available.
37. DUCT WORK: specify and draw 45 degree expanded throat take offs with balance damper for all supply run outs to diffusers and grills. Do not permit flexible duct runs exceeding 8' long. Specify that all 90 degree turns be accomplished with hard metal elbows, such as on top of diffusers, and if top take off of trunk duct.
38. Pump Packages: In general do not specify pump/heat exchanger packages. Most of our mechanical rooms are on the smallish side. Pump packages require maintenance space on all sides. If specifying a pump package, designer must work out general lay out of package and mechanical room to ensure maintenance access.
39. Circulating pumps for hot water, chilled water, or dual temperature shall be inline pumps when pumps are installed in noise sensitive areas, or when redundant pumps

are used. Other wise base mounted pumps shall be used. For inline pumps 5 hp and larger include rigging points for maintenance.

40. In buildings where cooling is not available 12 months/year, consider the use of ductless split systems for conference rooms. Consider the use of Package Terminal Heat Pumps for high internal heat spaces such as server rooms.
41. When installing LP or natural gas fired equipment, if the total load is less 1.2 million btu input, specify multiple boilers/water heaters that each have an input of less than 400,000 btu/hr. At 400,000 btu/hr input the boiler or water heater becomes a utility boiler that entails increased surveillance, inspection and maintenance. Under 400,000 btu/hr input the equipment is simply a heating appliance with no maintenance requirements

42. The design for LP gas tanks shall be as follows:
- a) construction contractor to provide:
    - i. 6" thick concrete slab, 4'x8' for 500 gallon tank, 4'x16' for 1000 gallon tank
    - ii. Underground gas line to stub up through oversized sleeve in slab, 3" from edge
    - iii. 1<sup>st</sup> stage regulator
    - iv. Protective bollards, 7' long, 4" schedule 40 galvanized steel, concrete filled, 3' bury with concrete encased, paint bright yellow/black with 4" stripes.
    - v. Make tank hook up
    - vi. Purchase at construction contractor's expense LP gas for start up, and construction period.
  - b) Camp Lejeune will arrange rental, including placement, but not hook up, of the tank. Camp Lejeune will contract for tank fill up after BOD of project.
  - c) Designer shall specify size of the tank (typical sizes are 123, 500, & 1000 gallon), size and location of the concrete pad, and placement/number of protective bollards. Bollards shall be placed to protect from the grass cutters (each open corner), and nearby traffic (may require intermediate bollard spacing). Design shall comply with all applicable codes. As a reminder, 500 gallon tank shall be minimum of 10' from the building, 1000 gallon tank shall be minimum of 25' from the building. The long axis of the tank shall be parallel with the building.
  - d) AROICC will notify Camp Lejeune metering & LP tank inspector (currently Brian Soo @ 545-9222) of the need/timing of tank placement, and tank fill after BOD.

## CONTROLS

43. Avoid use of economizers (dry bulb or enthalpy). High humidity and poor control reliability prohibit success with economizers except in extremely high internal load buildings.
44. Direct Digital Control (DDC) systems are the preferred HVAC control systems for new and replacement control systems. ~~Pneumatics should only be used for applications such as for pilot operators on large control valves.~~ (5.19.8) Re-establish monitoring and control capabilities for replacement control systems. Contact Jim Elliott, telephone: (910) 451-3658 ext 258; email: james.a.elliott1@usmc.mil, for the latest information for connecting to the base energy management system and the interface devices required. **The following change shall be included in the DDC specification: (10.22.08)**

- 1) Specification Section 23 09 54 Direct Digital Control Systems paragraph 1.3.18:  
Delete this paragraph and substitute the following.

### **“Connection to Base Wide EMCS**

The control system specified must interface to and shall be completely incorporated into the Camp Lejeune base wide Energy Management and Control System (EMCS) located in Bldg 24 by the contractor. The contractor is responsible for all work inside the project building. Camp Lejeune will make all modifications to the EMCS servers. All points listed on the Mechanical Drawings, such as; AI, BI, AO, BO, setpoint adjustments, alarms, equipment start/stop schedules and load management shedding objects for mechanical equipment shall communicate via BACnet protocol and be displayed and managed by the Camp Lejeune EMCS server. The Camp Lejeune EMCS system utilizes the Johnson Controls, Inc. Metasys Extended Architecture ADX platform. The contractor shall be responsible for maintaining consistency on object identifier names, descriptions, and graphical presentation of the data.

The contractor shall work with the base energy manager to define the load groups to be incorporated into the EMCS load management program. At a minimum all major mechanical systems shall be incorporated into the load reduction program such as chillers, electric boilers, and air handling units. The load reduction program incorporates the base wide demand limiting / load rolling (DLLR) program. The DLLR program limits peak energy usage by monitoring real time energy consumption from six (6) electrical substations serving the base and shedding the appropriate electrical loads to meet target set points. Building DDC supervisory controllers must have the ability to send /receive/ program load shed object information to the EMCS utilizing BACnet/ IP protocol.

The EMCS system resides on a LAN managed by Camp Lejeune Marine Corps Base. This requires all I/P devices connected and utilizing this network to be certified by the Defense Information Systems Agency (DISA), in coordination with the National Security Agency (NSA) and the Services and Agencies throughout the Department of Defense (DoD). The standard process known as DoD Information Technology Security Certification and Accreditation Process (DITSCAP), integrates security directly into the system lifecycle and is applied uniformly across DoD. As part of the DITSCAP process vendors I/P devices must be listed on the EMCS System Security Authorization Agreement (SSAA). This is a living document that provides information related to the certification and accreditation (C&A) of a system in accordance with the DITSCAP. This SSAA is tailored to meet the requirements of the system under review. It also provides the Certification Authority (CA) and the Designated Approving

Authority (DAA) or DAA at each echelon with a source document for information on the system. It is a user document to assist in establishing sound security policies and practices. Personnel responsible for the security of the system will be familiar with the contents of this document.

The SSAA must be completed prior to final acceptance of the HVAC controls construction under this section. It is the contractor's responsibility to ensure acceptable equipment is proposed and installed. Final approval of the proposed equipment will not be given until the SSAA is complete and Approval to Operate (ATO) is granted from Marine Corps Base Camp Lejeune DAA. To avoid construction delays early submission is advised as the approval process can be lengthy.

Specification Section 23 09 54 Direct Digital Control Systems paragraph 2.1.15 Site Building Controller (SBC): Delete this paragraph

45. Where DDC is not practical, such as with small unitary equipment, use programmable thermostats
46. CO2 sensors and outside air modulation should be considered in facilities with highly varying occupancies.
47. Specify that pneumatic control devices be able to withstand 30 psi without damage.
48. Control valve actuators shall be spring return normally open on preheat coils and other coils subject to freezing, spring return closed on hot water converters, **and spring return closed on outside air dampers.** (10.22.08)
49. Specify individual scheduling for air handlers. Specify a gradual (progressive) startup and a gradual (progressive) shut down of air handlers. A sudden startup or shut down of the entire building is too fast for chiller controls to react and sometimes causes safety trips.

## **PLUMBING**

50. Lubrication oil lines should not be installed below building floor slabs. Lubrication oil lines installed within service bays should be installed in trenches with removable tops.
51. Install shop air compressors in accessible locations with appropriate space for periodic service. Shop air compressors should not be installed within mechanical rooms since occupant access is prohibited by base maintenance. Shop air compressors should be provided with sufficient cooling ventilation. Install air compressors associated with building HVAC controls within mechanical rooms.
52. Air compressor receivers over 5 cubic feet (37.4 gal) are unfired pressure vessels that must under go hydrostatic and operational tests **witnessed by the base boiler inspector. (5.19.8)**
53. **Air Compressors should be mounted on vibration pads/mounts. Specify/show flexible connectors on the piping. (10.22.08)**
54. Where practical provide hose bibs near all HVAC coils for wash down/cleaning purposes.
55. Provide floor drains in all mechanical rooms.
56. Provide trap primers on all floor drains except locations that are expected to get regular use thru out the year. **Trap primer shall be pressure type installed on a cold water line, and shall not be installed on a flush valve.(2.27.9)**
57. Provide sectional shut off valves for domestic hot & cold water for each bathroom (group).
58. Do not permit lever type control handles on pressure balance shower valves in BEQ's. This type of handle invites the user to pull for volume control, thereby breaking the handle.
59. Avoid frost proof hose bibs.
60. Provide strainers on RPZ back flow preventers.
61. **Double Check and RPZ type back flow preventers (BFP) shall be tested/certified by the installing contractor prior to BOD. Add the following paragraph to any specification section that includes a BFP(10.22.08).**  
**3.X Back Flow Preventer Certification: After installation all double check and reduce pressure zone type back flow preventers shall be inspected, tested and**

**certified by a certified tester. Submit tester certification and Test Data Certification Sheet.**

- 62. Extruded Tee's in copper piping are acceptable for mains 2" and larger with the branch ½ or less than the main. Joint must be brazed. (6.13.8)**
63. Do not permit rolled grooved connections in domestic water copper piping.
64. Combination waste & vent is discouraged. Make use of circuit venting where appropriate.
65. Drain lines serving commercial dishwashers should be high silicone cast iron. Drains serving low temperature mild acid such as carbonated beverage machine drains should be PVC. Indicate on the drawings drain line material.
- 66. Domestic water piping shall be type L copper for above ground and type K copper for below grade. Do not permit press fittings. For O&M projects cross linked Polyethylene (PEX) is permitted when largest pipe can be served by 1" PEX. (5.19.8)**

## STEAM

67. Meters are required for steam, water and electrical service to MWR facilities and all other reimbursable customers. Use target, strain gauge type steam meters. Do not use orifice plate steam meters. Provide “pulsed output” steam and water meters. Provide “KYZ” electric metering. Consider cyclic counters on the condensate pump for closed systems. Camp Lejeune reads meters by telemetry.
68. **Avoid (5.19.8)** steam pits within mechanical rooms. Steam lines should be counter flowed from an exterior manhole.
69. Steam condensate receiver pumps should be steam pressure powered. Do not use electric duplex condensate pumps. Servicing electric duplex condensate pumps cause an overlap of responsibility between the electrical and mechanical trades.
70. Minimize use of steampits. Those required must be raised 18 inches (450 mm) above finish grade and equipped with a full grated top. Steampits are required for the connection and valving of building service lines. Drip legs can be direct buried with steam trap above ground in a “doghouse” if the steam pit is not required for other reasons. Steampits are required at low points and end of mains in order to gravity drain condensate for cold start up of distribution system. Install two traps in these locations. The first trap is the normal high pressure drip returning to the condensate system. The second trap dumps to drain and locks closed when steam pressure exceeds 15 psig.
71. Do not use FRP pipe for buried steam condensate lines. Use schedule 80 black steel pipe in condensate systems.
72. Steam tunnels and trenches are preferred by base utilities over direct buried preinsulated steam and condensate systems. Trench tops may double as a sidewalk where appropriate.
73. Use externally pressurized bellows expansion joints when inline expansion in steam lines is required and where loops cannot be utilized. Slip tube expansion joints are acceptable but not preferred over externally pressurized bellows joints.
74. Provide check valves and test valves at all steam condensate drip traps.

75. Base operating steam pressures are as follows:

Steam Plant	Steam Pressure
Plant 1700	150 psi (1034 kPa)
Plant AS4151	150 psi (1034 kPa)
Plant G650	100 psi (690 kPa)
Plant M625	100 psi (690 kPa)
Plant RR15	50 psi (345 kPa)
Plant PP2615	50 psi (345 kPa)
Plant M230	50 psi (345 kPa)
Plant BB9	100 psi (690 kPa)
Plant NH100	100 psi (690 kPa)

76. Specify steam control valve actuators that can withstand heat conducted from steam lines and equipment. Do not specify, or approve, hydraulic powered actuators in steam applications.
77. Install blow down valves on all strainers.
78. It is preferred to distribute hot water thru out building or building complex for heating in lieu of direct steam heat.
79. Insulate pipes with rigid insulation where pipes are subjected to being stepped on or damaged, such as low above ground lines and steam pits; cellular glass insulation is preferred.
80. Specify flange gaskets to be metal spiral wound metal ASME B16.20.
81. **Pump Packages: In general do not specify pump/heat exchanger packages. Most of our mechanical rooms are on the smallish side. Pump packages require maintenance space on all sides. If specifying a pump package, designer must work out general lay out of package and mechanical room to ensure maintenance access. (12.31.07)**
82. **All steam pressure powered pumps (PPP) shall have a direct acting pressure regulator on the motive steam. Provide pressure gages on the motive steam line and the condensate collection system. Regulator to be set for 20 psi higher than the condensate back pressure. Regulator shall be 20' from PPP, or the line between the regulator and the pump shall be oversized. (12.31.07)**
83. **Ensure that all steam heated equipment with modulating steam control valves have vacuum breakers, air vents, and gravity drain to a condensate receiver. Show sufficient details to ensure contractor pipes accordingly. The mechanical room plan shall also allow for this. If a pumping trap is required, show it on the drawing. (12.31.07)**

## FIRE PROTECTION

84. Require as built shop drawings of sprinkler systems both as a printed copy on mylar and as an electronic file on CD in Autocad.dwg 2000 version. (12.31.07)

## SWIMMING POOLS (5.10.09)

Swimming pool chemistry and filters are monitored by PW Utilities and pools shall be equipped as followings:

1) Pool shall have pool controller that automatically monitors and feeds sodium hypochlorite and sulfuric acid, and backwashes the filter.

- a) Controller shall read ORP or free chlorine, and PH.
- b) Controller shall transmit free chlorine, and PH values to the corresponding water plant via radio.
- c) Pool water temperature shall also be sensed and transmitted on indoor pools.
- d) Controller shall transmit a master alarm to the corresponding water plant via radio in the event of high or low ORP or PH levels, no sensor water flow, and elapsed chem feed alarm.
- e) Chemical feed system shall be interlocked to shut off in the event of no pool circulation water flow.
- f) The preferred pool controller is Bec System 7.
- g) Electronics shall have a 60 minute battery backup.

2) Filter backwash shall have manual over-ride such that the filters can be backwashed in the event of controller failure.

3) Normal pool water waste shall be to the sanitary sewer, with a bypass to the storm sewer. This can be used to empty pool after dechlorination.

4) A normally energized duplex receptacle needs to be installed near the chemical feed pumps to manually feed chemicals in the event of pool controller failure.

5) Minimum chemical storage for an indoor pool shall be 300 gallons of sodium hypochlorite, and 150 gallons of sulfuric acid.

6) Do not use brass saddles at chemical injection points.

7) Do not locate normally serviced equipment such as pumps, backflow preventers, lint traps, etc in pits.

8) The contractor shall modify the front end software at the water plant to receive and display the new pool.

- a) Wallace creek recreation center shall transmit to the building 20 water plant.
- b) The wounded warrior pool shall transmit to the building 670 water plant.

9) Swimming pools shall comply with 15A NCAC 18.A2500, (North Carolina Rules for Public Swimming Pools), with the following exception:

a) Do not provide an integral vacuum system as called for in 15A NCAC 18A.2518(g). The pool chemistry is maintained by the PW Utilities. The cleaning is done by the pool operators. We do not want pool operators to have access to the pump room, which would be necessary if an integral vacuum system were installed.