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I. DESIGN

A. Submission Requirements

1. The A/E shall send building load letter and plans to the water company with copy to BDCD Project Manager at appropriate times during design.

2. A/E shall submit cut sheets for the major equipment components which form the basis for design, at the Design Development phase. The cut sheets must identify equipment dimensions. Final construction documents shall include detailed part plans and section views (1/4" = 1'- 0"or larger scale) dimensioned to show the major equipment, duct work, and piping located within the mechanical spaces. Detailed plans must reflect that adequate space and clearances are provided for inspection, maintenance and replacement access, and all major mechanical equipment. It is preferred that these clearances be indicated by light dashed lines.

3. For building footprints too large to fit on a single plan sheet, provide a key plan on all plan sheets. Provide a key plan on any sheet where partial plans are utilized and indicate in a light hatch pattern for the area(s) of work. Where feasible, maintain same building orientation for all plans and include column lines even on key plans, as applicable.

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4. Per Fairfax County 2021 Operational Energy Strategy, for new construction and major renovations, design Net-Zero Energy (NZE) structures to incorporate best practice energy-efficient design, using electricity-based space and water heating.

B. Plumbing

1. In addition to the code required locations, provide sanitary sewer clean-outs at each end of building at main sanitary sewer trunk lines. Provide accessible sanitary sewer cleanouts in all locker rooms and rest rooms.
2. Specifications shall require the contractor to conduct camera inspection of sewer lines to confirm lines are clean of all debris. Provide pictures from camera of sewer lines in the O&M manual. Provided pictures must show the main sewer line from beginning to end.
3. The following criteria is to be included in the Plumbing system specifications and indicated accordingly on the plans:

   a. No plumbing piping is to be installed over electrical panels or other distribution equipment, unless in compliance with NEC limitations.

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b. No plumbing piping is to be installed over food service areas, server or data room equipment or books in libraries or within required egress stairs.

c. Freeze proof, lockable/keyed, ¾" hose spigots with backflow prevention shall be provided near outside and rooftop mechanical equipment, to include a shutoff valve with air vent placed upstream of hose spigots. For applications where a roof hydrant is the only option, specify and detail a support system and indicate robust roof sealing so as to prevent pooling and leaks at the roof's penetration.

d. Water Meters
   i. Facility main water meter: Install utility meter plus EMCS integrated submeter.
   ii. Irrigation water, cooling tower water feeds, fire station water filling stations and architectural water features: Install Utility and EMCS integrated submeter. The utility meters servicing a cooling tower or irrigation shall be installed to ensure Fairfax County is not charged for Sewer charges on irrigation or cooling tower water feeds. Provide a manual bypass for the automatic fill.
   iii. Note: utilities generally do not accept owner provided meters for sewer credits. Most water providers will provide water meters at a reasonable cost but these meters are generally not compatible with EMCS remote metering systems.
   iv. The EMCS submeter may be a separate meter installed in line or a device that reads the utility meter and provides 95%+ accurate water consumption data to the EMCS and the FMD central energy meter system (BuildingLogiX).
   v. If a water pressurization pumping system is utilized to feed the entire facility, if so equipped, the digital meter output from the Water pumping system can be used to feed EMCS and the central metering system instead of a separate in line meter. Tigerflow manufactures flow controller and pump systems equipped with a BacNet output. This controller can be integrated with most EMCS.
   vi. Refer also to Metering, Section 260000 Electrical and https://www.fairfaxwater.org/rules-and-regulations.

1 e. Lavatories at all publicly accessible restrooms shall have hard wired infrared sensor controls with power backed-up by generator and have grid drains. Battery operated and/or backup sensor controls are not acceptable for lavatories. Lavatories and pantry sinks in staff only areas may have manual controls and grid drains.

f. All piping that will gain or lose energy to/from the surrounding atmosphere, or may cause condensation problems, shall be properly insulated to minimize energy costs and condensation problems. Insulate piping in accordance with the International Energy Conservation Code**.** All roof drain bodies and horizontal piping including the down turn elbow shall be insulated. All pipe insulation joints must be properly sealed.

g. Electric heat trace, tape system shall not be specified for domestic hot water systems.

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h. Hot Water Piping

i. Avoid long runs of hot water piping, but where impractical provide hot water circulator pump and recirculation piping of at least ¾" diameter. Unless determined otherwise, it is permissible to control the pump's operation with an aqua stat and 24/7 time clock.

ii. Recirculation loops shall extend as close to the most remote fixture as practical. Domestic hot water should be delivered at each hot water outlet within 15 seconds of the time of operation. Design hot water velocity of 4 - 5 feet per second (fps).

iii. The heat loss in the domestic water distribution system shall not exceed 6 °F. Size hot water return lines according to the heat loss method in ASHRAE Applications Handbook, Service Water Heating.

iv. Insulation and pump size shall be selected to limit the hot water system temperature loss to 6°F maximum.

v. Show balancing valves on plans and indicate flow rate.

vi. Include requirements in the Specifications to balance the hot water circulating system and test and balance report shall be submitted by the Contractor for approval**.**

1 i. Domestic tank type water heaters shall have glass lined tanks. ~~Gas fired~~ Instantaneous water heaters are acceptable, but a minimum of two heaters shall be provided at 75% capacity.

j. Storage type water heaters shall utilize DDC EMCS to minimize water heater "standby" losses during the building's unoccupied schedule.

k. Floor or trench drains shall be installed for intentionally level floors and shall be shown on drawings. Provide floor drains at all toilet rooms and shower areas. Design floors to provide positive drainage to floor drains.

l. Provide pressure gauges at high points of piping branches / points furthest away from building's source and at building service. Provide an isolation valve up-stream of pressure gauge. Indicate locations on the riser diagrams as well as on plans.

m. In restrooms, coordinate the requirement for a centralized floor drain with the BDCD Project Manager. Utilize a "water saver" type trap primer directly connected to a nearby lavatory tailpiece or water closet vacuum tube to avoid the maintenance associated with mechanical trap primers.

n. Fixture units shall be tabulated on drawings. Where fixtures have been demolished, demolished fixture units shall also be tabulated on drawings.

o. Low flow fixtures shall be used in order to meet minimum water conservation requirements of the EPA's WaterSense Program. All materials and equipment must be WaterSense labeled or meet or exceed WaterSense program performance requirements.

Plumbing fixtures shall have flow rates/water consumption as follows:

i. Water Closet 1.28 gallons per flush (gpf)
ii. Dual flush water closet 1.6 gpf/1.1 gpf
iii. Urinal 0.5 gpf
iv. Low flow urinal 0.125 gpf
v. Public lavatory 0.25 g per cycle/0.5 (gpm)
vi. Mop sink 2.5 gpm
vii. Kitchenette/pantry sinks 2.2 gpm

p. As a general rule, garbage disposers are not permitted in commercial applications unless required by code. They will be considered and approved by the BDCD Project Manager on a case by case basis for applications such as fire stations and other residential facilities where the end user will be solely responsible for their servicing.

q. Gas piping shall be painted bright yellow with a minimum of two coats of industrial grade enamel and labeled with use. Domestic piping shall be labeled with use and flow directional arrows on the exterior of the insulation. Drainage piping shall be labeled with use and flow directional arrows.

r. Water piping shall not be routed in unheated spaces where there is a potential for freezing.

C. Commissioning

1. Requirements for the domestic hot water system commissioning process shall be included in the construction contract. An independent Commissioning Authority may be hired by the Owner through the A/E's contract. ASHRAE Guideline O or other industry recognized guidelines for commissioning shall serve as the basis for all domestic hot water commissioning and the guidelines will be tailored to the specific requirements of the project.

2. The A/E and Plumbing Engineer and Commissioning Authority will perform reviews of the Plumbing system design from a commissioning perspective at all review phases of the design process and will cooperate fully with the Owner's Commissioning Authority throughout the design review process as applicable.

3. The contract specifications must clearly spell out the responsibilities of the General Contractor and all appropriate subcontractors relative to commissioning and shall also define the role of the Commissioning Authority.

4. The A/E and Plumbing Engineer shall coordinate and cooperate fully with the Owner's Commissioning Agent and with DPWES representatives throughout the actual commissioning process prior and subsequent to, system acceptance. The A/E and Plumbing Engineer shall provide all design and or system information that is requested by the commissioning team members and respond to all comments from the Commissioning Authority from design through system acceptance.

5. The final commissioning reports and documents shall be provided in the Operations and Maintenance Manuals.

II. PRODUCTS

A. Plumbing Equipment Preferences

1. For plumbing systems, American Standard, Kohler, or Moen fixtures with Sloan or Zurn flush valves are preferred. Provide ball type shut off valves to isolate individual rest room areas and provide access to valves in janitor's closets adjacent to rest rooms.

2. All plumbing fixtures shall be specified and installed to be compliant with ADAAG requirements.

3. Provide service valves to enable segmented shutdown of building's water lines. Provide repair kit for any non-standard type plumbing fixtures and faucets.

a. Water Closets:	Water closets shall be floor mounted. American Standard, Madera 1.1-1.6 gpf ADA Universal Flushometer Toilet or FMD Approved Equal
b. Urinals	Low flow as approved by Fairfax County Project Manager and as needed for water savings. Waterless urinals NOT permitted.
c. Flush Valves:	Sloan or FMD Approved Equal Dual flush or low flow valve as appropriate to meet water savings requirements in water closets and urinals.

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d. Faucets:	Infra red sensor- auto type, hard-wired with battery back-up above deck actuators, in public restrooms. Manual in staff toilet rooms. No self-closing metering faucets unless required by code. No plastic handles or knobs. No faucets which require cartridges. Sloan ETF-610-4, Moen, American Standard, ~~Kohler~~ Chicago and T&S-Single lever, No Equals or Substitutions.
e. Frost Free Hydrants:	Josam, Woodford, or FMD Approved Equal
f. Vitreous China Fixtures:	American Standard, Kohler, Zurn, or FMD Approved Equal Integral bowl w/ solid surface preferred.
g. Garbage Disposals:	Insinkerator (I.E.S.); or FMD Approved Equal (Garbage disposals are typically not allowed except in food prep kitchens)
h. Valves:	All valves 2" and smaller should be ball type valves
1 i. Domestic Water Heaters:	Tank Type - AO Smith, State, PVI, or Lochinvar ~~Gas Fired~~ Instantaneous Water Heaters – Rheem. Rinnai (No Equals or substitutions)
j. Domestic Booster Pumps:	Bell and Gosset, Tigerflow, or Ironheart (No Equals or substitutions)
k. Water Cooler/Bottle Filler:	Elkay EZH2O Model LZWS-LRPBM28K (No equals or substitutions) Note: unit requires ~12" clear space in the wall to mount this model.
l. Water Sub-Metering:	Sensus "OMNI C² Series" (No Equals or substitutions)

4. Specifications shall identify at least three acceptable plumbing equipment manufacturers for competitive bidding; unless otherwise noted herein, or unless limited source procurement is approved in advance by the owner.