OWNER'S MEP PROJECT REQUIREMENTS

DISTRICT OF COLUMBIA DEPARTMENT OF GENERAL SERVICES
CAPITAL CONSTRUCTION SERVICES
Version: 2023.12.21

[PROJECT NAME]
[PROJECT ADDRESS 1]
[PROJECT ADDRESS 2]

1. INTRODUCTION

The District of Columbia Department of General Service (DGS) and DC Public Schools (DCPS) have always made sustainable, high-performance schools for their students a priority. With the introduction of the Clean Energy DC Omnibus Amendment Act of 2018, which targets to increase the Renewable Portfolio Standard to 100% by 2032, and establishes a solar energy standard post 2032, DGS recognizes that its public schools play a considerable part in the District s energy reduction goals.

As the District continues to push its sustainable initiatives even further, with the goal of eliminating all fossil fuel use in public buildings, it is important that DGS, in collaboration with Design Teams, take a critical look at the systems that it designs for all modernized and new school buildings.

This document is meant to serve as a guideline and reference for Project Teams to use in the design of all DGS projects including DC public school facilities, but it is not the only reference material available to teams. The following documents, issued by the Department of General Services and DC Public Schools with each project solicitation, should also be referred to, and considered as complimentary to this OPR:

- Department of General Services (DGS) Division 01 Specifications
- DC Public Schools Educational Specifications
- DGS ADA Compliance Quality Control Manual
- DGS MEP Systems-Commissioning-TAB Quality Control Manual

This document is intended to be used as reference for basis of design for all DGS projects. Any specifications and design recommendations changes shall be coordinated with the client and/or user agency and DGS.

2. SCOPE

2.1 Overview and Definition

The Owner s Project Requirements (OPR) provide an explanation of the ideas, concepts and criteria that are considered to be very important to the Owner, coming out of the programming and conceptual design phases and which are desired to be tracked throughout design and construction. The OPR is developed by the owner, not the design team, but includes an area for the Design Team and Owner to include project specific targets and goals.

The OPR document sets the functional goals that the design is judged against and establishes the basis of the criteria used during construction to verify actual performance. The OPR does not list items that are already required by code. The OPR is generally not a description of what specifically will be included in the project design, but is the more general feature and categorical performance criteria to be met by the design. Where practical and known, the OPR includes measurable indicators used to verify that the performance requirements were met.

The OPR will be followed by the basis of design or design narrative written by the design team and included with design package submissions. The basis of design documents the primary thought processes and assumptions behind the design decisions and describes the design elements being incorporated to meet the OPR.

2.2 Scope

This document includes requirements for the building systems that are more likely to be included under the formal commissioning umbrella or be impacted by their interactions. For reference, systems not included in this project and OPR that are typically commissioned and should have an OPR developed for them include: process mechanical and plumbing, exterior envelope performance, and other moving mechanical devices.

This document is not a comprehensive project OPR, and does not include all project requirements and directives to the design team which could include: other disciplines such as fire protection, structural, landscaping, civil, geotechnical and other earth work, utilities, Division 01 specification requirements, demolition, all the materials, furnishings and special construction disciplines, drawing, specification and calculation requirements, codes and references, etc.

This document focuses on the mechanical, energy and comfort related systems and on the sustainability requirements of the project. This document does not replace the Commissioning OPR, but rather should serve as a guide in its development.

2.3 Procedures

All products included in this document or the referenced appendix documents are Basis of Design (BOD) only.

2.3.1 Substitutions

Substitutions or deviations can be considered by the Owner on a case by case basis and should be communicated to the Owner and DC Public Schools during Concept or Schematic Design for evaluation and approval. Substitutions requested by bidders after Design Development must be submitted per the Division 01 specification requirements.

Under each area or building system is a list of pertinent questions and data needed to be answered. Blue, indented italicized text indicates the answers to the questions and specific information about the project requirements for this project.

2.3.2 Submittal Review

Submittal requirements outlined in the DGS Division 01 specifications and DGS MEP Quality Control Manual should be followed.

3. GENERAL PROJECT REQUIREMENTS

This section of the OPR is intended for the Owner and Design Team to input project specific information that may assist in the design and scheduling, as well as describe project specific goals and objectives.

3.1 Overall Objectives

Describe this project, including the general overall objectives: Click or tap here to enter text.

3.2 Existing Site Conditions:

Describe any existing conditions of the site that may aid in, or impair, the ability to meet project objectives: Click or tap here to enter text.

3.3 Occupants

What grades / age ranges does the school serve?

☐ Early Childhood (0 to 30 months)

☐ Pre-Kindergarten (Pre-K3 and Pre-K4)

☐ Elementary School (Kindergarten through 5th Grade)

☐ Middle School (6th Grade through 8th Grade)

☐ High School (9th Grade through 12th Grade)

☐ Other Click or tap here to enter text.

3.4 Zoning

What are the floor number and/or building height requirements, and zoning limitations of the site?

Click or tap here to enter text.

3.5 Community Use

What community function / activities must this facility accommodate?

Click or tap here to enter text.

3.6 Energy Efficiency Goals

What are the overall energy efficiency goals and objectives?

☐ EUI of Click or tap here to enter text.

☐ International Energy Conservation Code Click or tap here to enter text.

☐ Energy Star

☐ Net Zero Energy (NZE)

☐ LEED version: Click or tap here to enter text.; Certification Target: Choose an item.

☐ Other Click or tap here to enter text.

3.7 Sustainability Goals

What other environmental goals and requirements are there?

Click or tap here to enter text.

3.8 Schedule

Describe the expected phasing of the project for construction and occupancy:

Click or tap here to enter text.

4. HEATING, VENDTILATION AND AIR CONDITIONING

4.1 Owner s Preferred Building Systems

4.1.1 HVAC System Performance and Design Considerations

The HVAC design must comply with all applicable DC Construction Codes and standards.

Occupant health and thermal comfort shall be provided by HVAC system that must be designed to maintain the thermal and humidity parameters as described in Section 4.5 below.

Outdoor Air (OA) ventilation for the thermostatic zones must be in accordance with latest edition of ASHRAE Standard 62.1: Ventilation for Acceptable Indoor Air Quality .

Historically almost all large central HVAC systems showed poor part-load efficiencies.

In order to reduce annual power consumption and improve building HVAC system energy performance DGS considers de-centralized building HVAC system design approach to be most energy efficient for their new construction and modernization projects.

For a consistent HVAC system energy conservation design, the engineer should consider terminal units in each thermostatic zone/room coupled with Dedicated Outdoor Air System (DOAS) terminals.

Water Source Heat Pumps and Geothermal Heat Pumps are best suited for this application. DOAS unit(s) shall be Direct Expansion (DX) cooling with electric heat and integral total heat recovery equipment.

4.1.2 Water Source Heat Pump (WSHP) System

Geothermal Heat Pumps (GHP) and Water Source Heat Pumps (WSHP) are the preferred HVAC system for both school modernization and new school projects.

- Geothermal Loop: Where acreage, construction phasing, and programming allows, geothermal heat pump systems should be used.

- Cooling Towers:
    - Cooling Towers with remote basins or below grade basins should be used when GHP system is not feasible.
    - Cooling Towers shall be designed such that freeze protection is unnecessary or minimized.
    - Boilers shall be utilized for providing heat to the heat pump hydronic system

4.1.3 Dedicated Outdoor Air System (DOAS)

DOAS unit(s) shall be capable of pre-filtering, pre-conditioning and delivering OA to all school building zones served by WSHP or GHP system. DOAS unit(s) shall operate during occupied mode to meet ASHRAE Std. 62.1 requirements and shall be off during un-occupied mode. DOAS unit(s) shall modulate their respective supply fan(s) and deliver needed amount of OA in response to demand by each individual control zone. Each zone OA quantity demand shall be controlled by the level of CO2 as measured by the zone CO2 censor.

Whenever possible, DOAS units should be located within the building so as to preserve rooftop area for photovoltaics. Acoustic performance of the units so as not to disturb classrooms when located inside the building, or neighbors if located on the roof, are a priority. The highest level of internal acoustical dampening and isolation shall be specified for either instance.

4.2 Potential Alternate Building Systems

4.2.1 Variable Refrigerant Flow (VRF) Systems – not allowed

4.2.2 Variable Air Volume (VAV) system with Hydronic Terminal Reheat

The VAV system with Hydronic Terminal Reheat may be an acceptable alternate for use in select projects with DGS approval. The VAV system represents a central system that is inherently less energy efficient than Water Source or Ground Source Heat Pumps. The design team will need to offset the increased energy use by the VAV system equipment with premium efficiency motors and energy reduction measures elsewhere, or by additional onsite renewable energy sources which has a potential added cost to the project.

4.3 Zoning and Distribution

On projects where the Building Automation System (BAS), connectivity, and enteliWEB® integration allows, the building should be zoned by use and occupancy to the greatest extent possible, to allow for different spaces (floors, wings, cafeterias, auditoriums, gyms, administrative areas, and lobbies) to be programmed to different setpoints and occupancy schedules as appropriate.

Different program areas may require different systems, and each should be evaluated against how it may affect the space available for the program.

4.3.1 Water Source Heat Pump Closets

Water Source Heat Pump units are well suited to academic and administrative spaces.
WSHP units shall be ducted type to allow for even air distribution to the spaces served.

- Indoor vertical ducted type water source heat pump units are preferred to large rooftop equipment because it allows more rooftop area to be available for photovoltaic panels. WSHP units shall be placed in a dedicated heat pump closets to allow for easy maintenance access. Heat pump closet quantity and distribution should be carefully evaluated before a decision is made to ensure they are not taking too much interior space away from what is needed to meet the DC Public School Educational Specifications.
- If excess floor space is not available, concealed horizontal ducted type water source heat pumps could be located in the ceiling plenum. Accessibility to above ceiling units should be planned carefully. Heat pumps require routine filter replacement.

4.3.2 Direct Expansion (DX) rooftop systems

Direct Expansion packaged rooftop systems with gas or electric heating can be considered for large program spaces such as gymnasiums, cafeterias and auditoriums. For those systems minimum code required OA will be mixed with return air at the rooftop unit mixed air section.

4.4 Occupancy

4.4.1 Time of day schedules

Buildings will be considered in occupied mode during the standard school day. A school will be set to unoccupied mode for any hours outside of the standard school day, weekends, DC Government holidays, and during scheduled school closures.

The school building occupancy schedule is as follows:

Day of Week	State	Morning	Occupied	Unoccupied	Special Event
School Year Weekdays	On	5:00 a.m.	6:30 a.m.	5:00 p.m.	5:00 p.m.
	Off	6:30 a.m.	5:00 p.m.	5:00 a.m.	10:00 p.m.
School Year Weekends	On	8:00 a.m.	8:00 a.m.	5:00 p.m.	5:00 p.m.
	Off	N/A	5:00 p.m.	8:00 a.m.	10:00 p.m.
Summer Break	On	8:00 a.m.	8:00 a.m.	5:00 p.m.	N/A
	Off	N/A	5:00 p.m.	8:00 a.m.	N/A
Winter Break	On	8:00 a.m.	8:00 a.m.	5:00 p.m.	N/A
	Off	N/A	5:00 p.m.	8:00 a.m.	N/A

The anticipated occupancy schedules per zone are as follows:

Zone	Morning Start	Occupied	Unoccupied	Evening Stop
Administration, Library, Gymnasium, & Cafeteria	6:00 a.m.	8:00 a.m.	5:00 p.m.	5:00 p.m.
Kitchen	4:30 a.m.	6:30 a.m.	1:30 p.m.	2:30 p.m.
Classrooms	6:30 a.m.	8:00 a.m.	3:30 p.m.	4:30 pm
All Other Areas	6:30 a.m.	8:00 a.m.	3:30 p.m.	4:30 pm

4.5 Setpoints

The setpoints outlined below have been developed by DGS and are in alignment with peer municipalities, institutions, and ASHRAE Standard 55-2020: Thermal Environmental Conditions for Human Occupancy. Note these standards only address temperature and relative humidity setpoints for terminal equipment serving various building zones and do not address ventilation requirements. Ventilation equipment is not intended to provide for local comfort changes.

4.5.1 Temperature and Humidity

Heating Season (Starting October 15):

- Occupied Mode:
  - Classrooms and offices shall heat to 70oF DB. Where terminal equipment and controls allow, a comfort band shall be established which provides local adjustments of +/- 2oF
  - Gymnasiums and hallways shall be set to 68oF DB
  - Relative humidity will not be controlled
- Unoccupied Mode:
  - All spaces shall be set back to 55oF

Cooling Season (Starting April 15):

- Occupied Mode:
  - All spaces shall cool to 75oF DB. Where terminal equipment and controls allow, a comfort band shall be established which provides local adjustment of +/- 2oF.
  - Gymnasiums and hallways shall be set to 72oF DB

    - Relative Humidity shall be 50% +/- 10%

- Unoccupied Mode:
    - All spaces shall be set back to 85oF DB
    - Relative humidity will not be controlled

4.6 HVAC Performance Requirements

4.6.1 WSHP units

WSHP and GHP unit s efficiency ratings (CoP and EER) shall meet or exceed values prescribed in ASHRAE Std. 90.1 Chapter 6 and latest adopted edition of International Energy Conservation Code (IECC).

4.6.2 Acoustics

Acoustics is a critical component of creating a successful, high-performance classroom environment. It is as critical that students are able to hear what their teachers are saying without the teacher straining their voice as it is to prevent distractions from noises that come from adjacent spaces, corridors, or equipment. Studies performed on DCPS occupied classroom conditions in non-modernized buildings regularly exceeded the industry benchmark standard AS/NZS recommended levels for acoustics and that even unoccupied conditions failed to meet the requirements for the United States Green Building Council (USGBC) LEED credit for Enhanced Acoustics. However, pre- and post-occupancy studies of DCPS schools have also shown that student and teacher satisfaction with acoustics in the modernized schools continues to remain low after renovation. This could be due to more active, contemporary learning styles that make for a more dynamic and louder learning environment. It is very important therefore to keep any additional background sound from HVAC equipment low, within the recommended dB values.

Acoustics of rooftop equipment should also be carefully considered at school sites located in tight residential communities. The highest level of internal, integral, sound attenuation available for the equipment shall be specified.

Whenever possible, it is DGS preference for major HVAC equipment to be located within the building envelope, so as to reserve rooftop area for photovoltaic panels. However, if building size or other conditions do not allow this, the acoustical qualities of the proposed rooftop equipment will be carefully considered. Water source rooftop equipment is preferred by DGS. It is quieter and requires less sound isolation measures than air source units.

4.7 Indoor Environmental Quality (IEQ)

Over the past few years, wellness has become a common topic of concern and focus in public school modernizations. Recent research performed in conjunction with District of Columbia Public Schools suggests that the Indoor Environmental Quality (IEQ) of a learning space can have a large impact on student and teacher happiness and performance. Measurable components of IEQ include the amount of natural daylight, thermal comfort, acoustics, and air quality. This OPR will focus on two of these: Thermal Comfort and Air

Quality.

4.7.1 Thermal Comfort

Thermal discomfort can cause feelings of fatigue, irritability, and depression. Studies have shown that for every decrease of 1.8-degree F between 77-degree F and 68-degree F, students speed performance on tests was improved from 2-4% in all tasks (D.Wyon & P. Wargocki, Indoor Environmental Effects On The Performance of School Work By Children, ASHRAE, 2007). In a study conducted by the Harvard TH Chan School of Public Health, they found that test scores increased by 4% when the temperature in the space did not exceed the upper acceptable thermal limit.

Learning environments shall be designed that promote thermal comfort and health of the students and faculty. The HVAC system design shall allow for this acceptable temperature range to be maintained, while at the same time being cognizant of the energy use of the building and allowing the spaces to drift in the unoccupied time when students are not present.

Access to natural daylight in the classroom can also have a significant impact on a student s concentration and general wellbeing. Proper daylighting should be studied to ensure that not only is there enough light getting into the space, but also to make sure that there’s not too much light, which can lead to unnecessary heat gain within the space, as well as glare problems.

4.7.2 Air Quality

Fresh air is very important to the ability to effectively teach in the classroom settings, and to the cognitive learning of students, and on student attendance. There have been national studies on this effect as well as the independent study performed on modernized and non-modernized DCPS schools. the importance of good indoor air quality on the cognitive learning of students and student attendance.

The ASHRAE 62.1 requirements for ventilation stipulate a maximum CO2 levels for schools at 1000 ppm. Ventilation designs should maintain levels in classrooms and education spaces below the threshold, while also balancing the operation and life cycle costs of required systems to make this an optimal learning environment.

Demand Control Ventilation (DCV)

Demand Control Ventilation (DCV) is an energy-saving control strategy that responds to the actual demand for ventilation in a zone by varying the rate at which outdoor air is delivered to that zone.

Per ASHRAE 90.1-2013 DCV is required for spaces larger than 500 sq. ft. and a design occupancy for ventilation higher than 25 people per 1,000 sq. ft. School classrooms, cafeterias, and auditoriums are all suited for this control strategy.

DCV should be incorporated into HVAC system design so that ventilation air amounts are distributed according to the actual occupant load. Classrooms and all high occupancy spaces shall include CO2 censors to regulate the amount of fresh air required.

4.8 Maintainability

4.8.1 Access / Equipment Locations

Ease of access is critical for ensuring that routine maintenance takes place, and that equipment continue to operate smoothly.

Water Source Heat Pumps: WSHP are preferred option to rooftop equipment as they are located within the building instead of on the roof. It is preferable that they be installed in closets, with filters located within reach. If floor area is at a premium, it is acceptable to install WSHP in the ceiling plenum. The ceiling should be acoustical ceiling tile to allow for easy access above the ceiling grid and provide acceptable level of noise attenuation from WSHP fans. Identification tags should be provided on acoustical ceiling grid.

Installation of WSHP above drywall ceilings is not preferred, but if necessary, access panels should be sized and located as necessary for maintenance access. Locations of access panels should be included on as-built documentation.

Rooftop Ductwork: The use of exposed duct work on the roof should be limited to the greatest extent possible, for maintenance, longevity, and to preserve as much rooftop area as possible for photovoltaic panels.

Unit Wall Heaters: The use of wall mounted unit heaters in stairwells should be avoided. They are prone to vandalism and large amounts of maintenance.

4.8.2 Identification

Equipment labels and tags shall be visibly located within the room.

4.8.3 Materials

The use of mechanical fittings for refrigerant piping is prohibited.

4.9 Operations and Maintenance Documentation

Refer to the Department of General Services Division 01 specifications for the projects Operation and Maintenance (O&M) documentation requirements.

4.10 Training

Refer to the Department of General Services Division 01 specifications for the project s requirements around training and building turnover.

5. ENTERPRISE BUILDING AUTOMATION SYSTEM (eBAS)

5.1 Remote Monitoring

The BAS system shall allow remote monitoring of all electrical, water, and gas meters and services, as well as allow DGS to remotely control all functional equipment.

The BAS system should be BACnet compatible and follow ASHRAE Standard 135 protocols and be capable of connecting to the DGS enteliWEB® system.

5.2 Thermostatic Zoning Layout

The quantity and layout of a buildings HVAC thermostatic zones has a direct impact on meeting the Owner s energy saving goals and should be carefully considered during the early design phases. It can also assist in increasing the longevity of the building s equipment by only turning on and off parts of systems when occupancy demand needs them. A total of six (6) to twelve (12) zones are reasonable for the public schools depending on site orientation and envelope thermal gain / loss, physical layout of the rooms and program spaces, and occupancy schedule.

5.3 Point Naming Standards

5.3.1 Room Numbering

The Architect shall develop the room numbers and room naming standard in collaboration with the DCPS Design Manager and Project Coordinator during the Schematic Design phase of the project.

The following are the recommended room numbering protocol. This should be confirmed with DGS and DCPS on a project by project basis. Some unique situations may require adjustments to this system.

- The first number shall refer to the floor level (1, 2, 3, etc.). For basement levels, use the letter B.
- If the school has been divided into zones by use (academic wing, athletic wing, etc.) the second position should be reserved for the letter representing that zone (A, B, C, etc.)
- The following 2 digits should refer to the room number (00, 01, 02, etc.). Rooms should be numbered sequentially in a movement around the building agreed to by DCPS and the school administration.
- Rooms within larger program suites should use the same number as the main room, with a letter suffix designation to differentiate it (A, B, C, etc.).

Once approved by DCPS, the approved room numbers shall be distributed to the design team for use in schedules, equipment and controls naming. The Architect shall be responsible for keeping the team updated on any changes to room names or numbers.

5.3.2 Point Naming and Tagging

DGS utilizes Project Haystack as its standard for point naming and tagging. Design teams should utilize the Project Haystack website at www.project-haystack.org. Project Haystack and all of its associated intellectual property is managed as an open source project using the Academic Free License (AFL) 3.0. Anyone is free to participate as long as contributed IP is licensed under the

AFL.

5.3.3 Equipment and Controls Naming Standards

DGS utilizes the GSA Data Normalization standard as a basis for its equipment naming. Controls naming should follow the standards outlined in the DGS Unified Controls Specification.

The Controls contractor is required to get final approval and sign off on the equipment and controls naming from DGS Facilities and Maintenance Division and the DGS Sustainability & Energy Division during the submittal review process.

Refer to APPENDIX B and C at the end of this OPR for the referenced standards.

5.3.4 At Closeout

For projects incorporating enteliWEB®, a copy of the architectural floor plans with final building room names has be provided with the Controls Operation & Maintenance (O&M) manuals required for project closeout. Refer to DGS Division 01 specifications for all closeout requirements.

5.4 Emergency Notifications

Emergency notifications for critical systems shall be automatically generated and distributed via text message or other electronic message delivery service to the appropriate DGS and/or DCPS personnel. The following critical alarm notifications shall be provided:

Equipment:	Event:	Point of Contact:
Kitchen Walk-In Units	Power Failure	DGS First Team
Vaccination / Medication Refrigerators	Power Failure	DGS First Team
Sump Pumps	Power Failure	DGS First Team
Roof Leak Detection	Moisture detection	DGS First Team
Elevators	Power Failure	DGS First Team
Emergency Generator	Failure	DGS First Team

5.5 Local HVAC Control

Local HVAC controls for classrooms and offices need to contain easy to understand labels and/or graphics so teachers and staff can operate them without training. They also need to be durable, and mechanically attached to walls and partitions. Readout on the local control device must accurately match the conditions of the space they are connected to. (i.e. a temperature reading of 72 degrees F should match the physical condition of the air temperature in the space.). It is important that the Building Automation System (BAS) program range, and what the local control

can do, should match.
The following spaces should always be controlled only by the BAS:

- Corridors
- Stairwells
- Gymnasium
- Cafeteria
- Natatorium

Corridors, Gymnasiums, Cafeterias, and Natatoriums may contain keyed or otherwise locked / protected override switches.

6. ELECTRICAL SYSTEMS

6.1 General

The District of Columbia is moving towards eliminating all fossil fuel use in public buildings. This means that there will be an ever-increasing demand on a building s electrical service to provide power for HVAC and water heating systems. It is also important that Design Teams check early in design process that the available electrical service to the building is adequate to support all of the building’s electrical needs.

If the electrical service to a site is not sized to support the building loads, PEPCO should be engaged immediately in order to discuss options for a service upgrade.

6.2 Power Monitoring

Metering in the public schools is essential to evaluate the performance of the systems, and to assist with Commissioning, and Net Zero Energy certification efforts. Proper metering also allows the Owner to ensure that billing for different utilities are being properly tracked and distributed to responsible parties.

All meters should be integrated with the eBAS.

6.2.1 Campus Level Metering

Campus Level Metering should be considered for project sites that will have multiple agencies or tenants using the premises, and separate utility billing is required.

Some site amenities, such as Electric Vehicle (EV) charging stations, or recreational pools and splash pads, require separate metering for use tracking and billing.

In some instances, running separate utility services to the site may be preferable to campus level metering. The Design Team should engage DGS during the Concept and Schematic Design phases to discuss the options and decide what makes the most sense for the Owner s billing and tracking needs.

6.2.2 Whole Building Meters

Whole Building Metering should be used for:

- Incoming Electrical Service
- Domestic Water Service
- Gas Service
- On-site Renewables
- Emergency Natural
- Gas Generators

On-Site Renewables: Metering of on-site renewables, such as photovoltaic panels and wind turbines, allows DGS to be able to compare the actual amount of power generation at each site against what is being billed. Metering of renewables should be compatible with the LOCUS software platform which connects via API to meters. On-site renewables that should be metered include:

Emergency Natural Gas Generators: Metering of emergency natural gas generators is a requirement of the net zero energy certification process, to allow for the separate tracking of gas use for emergency purposes versus general building use.

6.2.3 Single-Point Sub-meters

Single-Point Submeters are used by DGS to evaluate the efficiencies and performance trending of specific portions of, or equipment used in, the building s systems. Data from single-point meters should be able to be pulled in the Owner s enteliWEB® platform.

The following components should be sub-metered, with the specified tracking intervals:

- Central Plant Chillers: GPM (Gallons per minute), Supply / Return Water Temperature (Degrees F), BTU per hour at 15-minute interval
- Cooling Tower Make-up Water: GPM at 5-minute intervals and totalized gallons must be stored
- Cooling Tower Blow Down (as required by jurisdiction):Totalized gallons must be stored
- Boilers: BTU per hour at 15-minute intervals
- Geothermal Well Field Generation: BTU per hour at 15-minute intervals
- Domestic Hot Water: Totalized Gallons per day
- Recirculation Pumps: GPM at 15-minute intervals
- Hose Bibs: GPM at 5-minute interval
    - Discuss the need for hose bib metering with DGS prior to including, as this is not typical, but may be required depending on site location and security
- Site Water Features (make-up water): GPM at 5-minute intervals and totalized gallons must be stored for at least a year
- Interior Lighting: kWh used per day, week, month must be stored for at least a year
- Exterior Lighting: kWh used per day, week, month must be stored for at least a year
- Plug Loads: kWh used per day, week, month must be stored for at least a year

6.2.4 Branch Circuit Submeters

Branch circuit sub-metering is required where the Owner desires to track the energy use and performance of either specific areas of the building, or systems across the entire building. The following branch circuit sub-meters should be included:

- Kitchen Electrical
- Building Plug Loads

- Interior Lighting
- Exterior Lighting - Single point sub-meters may be required by DGS to track security, parking, and athletic field lighting separately. Project Teams should coordinate needs with the DGS and DCPS project management teams.
- IT Loads (MDF/IDF) HVAC Loads
- Domestic Water Heating

6.3 Lighting

6.3.1 Lamps

All interior and exterior lighting should be LED.

6.3.2 Locations and Access

Lights in Gymnasiums, Natatoriums, Atriums, and over Auditorium fixed seating are hard to access and provide maintenance issues for DGS. Lifts to reach high bay areas in occupied schools are not always available, so light fixture access for occasional maintenance should be carefully considered in these situations. Whenever the option is available, remote drivers for high bay and difficult to reach lights should be used, with the drivers installed in readily accessible locations.

For pendent fixtures, the following mounting heights should be observed:

- Elementary Schools: minimum of 8’- 6” AFF to bottom of light fixture
- Middle &High Schools: minimum of 9’- 0” to bottom of light fixture

6.3.3 LED Temperature

Lights in the 5000K range are optimal for the majority of school related tasks requiring high levels of focus and concentration.

The ability to tune the color temperature in classrooms to specific tasks and activity can benefit the learning environment. Higher temperatures around 5500K can assist with concentration during testing, and when engaged in math and science activities. Lower temperatures in the 4000K range are recommended during group activities and classroom discussions. Even lower settings, around 3000K, help to calm students down after stimulating activities such as gym, lunch, and recess.

The design team should discuss the potential use of color tuning lighting with DGS and DCPS during the Concept and Schematic Design phases of the project, to determine which program areas could benefit the most from its use.

6.3.4 Lighting Levels

Required average maintained light levels for this project are listed below. For spaces not listed, the current IESNA light level recommendations shall be followed.

- Classrooms: 35 FC at desk level
- Offices: 35 FC at desk level

- Lobbies: 20 FC
- Corridors and means of egress: 20 FC while occupied. Gradual dimming to 10 FC allowed with input from daylight and occupancy sensors.
- Conference rooms: 35 to 50 FC
- Group Toilet Rooms and Locker Rooms: 30 FC
- Mechanical / Electrical Rooms: 35 FC
- Science Labs & Prep Rooms: 50 to 75 FC
- Art Rooms: 50 to 75 FC
- Instrumental Band Rooms: 50 to 75 FC
- Gymnasiums: Elementary / Middle School = 50 FC, High School = 80 FC
- Fitness Rooms: 20 to 30 FC
- Exterior lighting at building entrances, walkways, and parking lots: 2 to 5 FC

6.3.5 Lighting Controls

Central lighting control systems should be universal and non-proprietary. The system should be BACnet compatible, and able to connect to DGS enteliWEB® system. Cellular communication will not be accepted.

Local lighting control systems should be user friendly, with easy to understand words or symbols on the light switch faceplates.

6.3.6 Sequence of Operations Local Lighting Controls:

Space Type:	Main Switch @ Primary Door:	Secondary	Occupancy Control	Specialty
Auditorium House Lights	ON / OFF RAISE/LOWER	N/A	Manual ON, Vacancy Sensor OFF	
Classroom	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Cafeteria	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Conference Rooms	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Gymnasiums **	ON / OFF	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting
Library	ON / OFF RAISE/LOWER	If 2nd door present, include ON / OFF	Manual ON, Vacancy Sensor OFF	Daylight Harvesting

Offices	At Door: ON / OFF RAISE/LOWER	N/A	Manual On / Vacancy Off 15 minutes	Daylight Harvesting
MEP Closets	ON / OFF	N/A	Manual ON, Vacancy Sensor OFF	N/A
Storage (General)	ON / OFF	N/A	Manual ON, Vacancy Sensor OFF	N/A
Toilets Single User	ON / OFF	N/A	Manual ON, Vacancy Sensor OFF	N/A

** Alternative See Central Lighting Controls

6.3.7 Sequence of Operations Central Lighting Controls

All interior lighting shall be turned off in any area that will be unoccupied for more than fifteen (15) minutes, except in corridors, stairwells, and exits as required by DCPS or the building code.

Space Type:	
Auditoriums	As the program requires.
Corridors	Control via time clock, with local key switch override located in corridor. Non-key switches allowed if located in a staff-controlled space (i.e. at Welcome Center desk). Lights should turn on with security alarm signal.
Exterior - Building	Controlled via astronomical time clock with photosensor override
Exterior Fields	Controlled via time clock. Include remote control capabilities.
Exterior - Parking	Controlled via astronomical time clock with photosensor override.
Gymnasium	Control via time clock, with local key switch override located in gymnasium. Lighting for after-hours use and special event will have to be scheduled with the DGS. Alternative see Local Control options.
Locker Rooms	Night Lights with Occupancy Override: Emergency lighting always on 24/7 to provide a minimum average lighting level of 15 FC. Occupancy sensor near entrance turns all lights on. Lights return to night light mode after 15 minutes of no activity.
Toilets Group	Night Lights with Occupancy Override: Emergency lighting always on 24/7 to provide a minimum average lighting level of 15 FC. Occupancy sensor near entrance turns all lights on. Lights return to night light mode after 15 minutes of no activity.

Exterior decorative lighting is defined as lights that are not part of the building s security lighting at building entrances and exits, or illuminating the parking lots. It may be used to accent walkways or plazas, or for accenting landscape features. Decorative lighting should be circuited and programmed so whereas it may all come on at the same time via a time clock, it can be controlled and turned off separately depending on location.

6.4 Emergency Generator and UPS

The following equipment and systems are required to be connected to the emergency generator:

- All emergency lighting
- Classroom electrical lockdown hardware
- Security desk power and data
- Security panel
- Building Access panel
- All receptacles within IDF and MDF closets
- Cooling system for IDF and MDF closets
- MDF closet
- IDF closet (if possible)
- Elevator shaft lighting and receptacles
- Elevator car lighting and HVAC
- Sump pumps
- Kitchen Freezer (Lighting, heater, alarm, Blower coil, Compressor, and Glycol Racks) Kitchen Cooler (Lighting, heater, alarm, Blower coil, Compressor, and Glycol Racks) Health Suite Refrigerator(s)
- BAS Workstation
- Fire Pump (if needed)
- Main Fire Alarm Control Panel
- Generator components (battery heater, service receptacles / lighting, etc.)

6.5 Solar Power

6.5.1 Power Purchase Agreements

The District of Columbia s Net Zero Energy targets have made photovoltaic panels a necessity on all public buildings.

Typically, the cost of procuring and installing PV would be too high for most public school modernization budgets to support. In the District of Columbia photovoltaic panels are provided on DC Public School projects at no cost thanks to Power Purchase Agreements, or PPAs, between the District of Columbia and local utility providers. The design, procurement, and installation of the PV system is handled entirely by a third-party vendor.

6.5.2 3rd Party Photovoltaic Consultant

Since the design and installation of the PV is outside of the scope of the Design-Build team, it is important that the engineers engage with DGS 3rd Party Photovoltaic Consultant early in the design process. The DGS consultant oversees the solicitation process and implementation of DGS photovoltaic projects, and can assist teams in evaluating available rooftop area, assessing the efficiency of proposed panel layouts, and assist in calculating a system predicted energy production.

An energy model must be provided to DGS and their 3rd Party PV consultant at the time of the PPA procurement for their project, especially for any school modernizations that include a net zero energy certification mandate in the RFP.

6.5.3 Rooftop Coordination

There are many items that compete with PV panels for space on a roof, such as HVAC equipment, vent penetrations, drains, and fall arrest anchors. Roof top equipment and penetration should be limited to the greatest extent possible. PV layout should be coordinated around roof drains so as not to impede the flow of water, but to also allow access to the drains for routine maintenance.

If an existing roof is to be reused, the structural engineer should evaluate the existing structure to determine if it can support the added weight of a ballasted PV system. If an existing roof is not capable of bearing the weight, or the total roof area is not adequate to meet the power production offset required, site mounted PV panels can be considered.

6.5.4 Project Responsibilities & Costs

The Design-Build team is required to provide dedicated space within the building for the future PV panels, transformers, and inverters, as well as provide the necessary conduit between the equipment and the PV locations. A dedicated breaker for the PV system should also be included in the main switch panel.

If site mounted photovoltaics are required, the design, engineering, and construction cost of the site structures or trellis required to support the panels is the responsibility of the Design-Build team and must be accounted for in the project s budget. Similar for any secondary framing required to attached photovoltaic panels to building mounted canopy or sunshade structures. The Power Purchase Agreement only covers the cost and installation of the PV panels themselves.

6.6 Execution

6.6.1 Raceways

In all areas without ceilings and exposed to the structure above, all wire management shall be controlled through raceway trays.

6.6.2 Electrical and Network Labeling

All electrical outlets, including those in systems furniture, shall be labeled with corresponding electrical panel and breaker numbers.

All network outlets, including those in systems furniture, shall be labeled with the corresponding closet, patch panel and termination location.

6.6.3 Color Coding

- HVAC controls cabling shall be yellow
- Network cabling shall be blue
- Wireless access point cabling shall be orange

7. PLUMBING SYSTEMS

7.1 Coordination with PV Systems

Although the procurement and installation of the PV system is not part of the project scope for school modernizations, the Design-Build team shall provide proposed photovoltaic panel layouts for review by the DGS 3rd Party Photovoltaic Consultant. The layouts should be carefully considered and coordinated so as not to inhibit the flow of stormwater to roof drains, nor to block maintenance access to main or overflow drains.

7.2 Domestic Water

7.2.1 Efficiency

All water fixtures shall be Water Sense Certified

7.2.2 Controls

The outlet temperatures on domestic-water heaters shall be monitored by the Building Automation System (BAS).

7.2.3 Plumbing Fixtures

Refer to APPENDIX A for Plumbing Fixture Basis of Design Schedule. Plumbing fixtures and accessories shall meet the District of Columbia s accessibility guidelines for public schools where required.

Lavatories

- Multi-station lavatory units are preferred in group toilet rooms over single wall hung units. Preferred number of stations per sink is three (3) whenever possible.

Sinks

- Undermount sinks are preferable. If set in sinks are used, countertop design should account for height of sink rim. ADA measurers height of sink from finished floor to sink rim, not countertop.

Faucets

- Battery powered automatic sink faucets are not acceptable to DGS. The batteries are hard to procure, and therefore do not get replaced frequently. Manual metered faucets eliminate the issue with the batteries, but can be difficult for some smaller children (and adults!) to push to operate. Whenever possible, hardwired automatic faucets should be used.

Water Closets

- Mounting Heights:
  - Pre-K3 and Pre-K4 on-suite toilets: floor mounted with top of seat located 13 inches AFF
  - Kindergarten and 1st Grade toilets: wall mounted with top of seat located 15 inches AFF
  - All other locations other than ADA: Wall mounted with top of seat located 18 inches AFF
  - ADA toilets: per the ADA Guidelines

Urinals

- Waterless urinals shall not be allowed.
- Pint urinals shall not be allowed. The small amount of water utilized is not adequate to prevent buildup in the system, which leads to larger maintenance issues.

Showers

- Design Teams should avoid the use of pre-fabricated shower units and basins. Small-sized ceramic tiled shower basins set into recessed slabs (when possible) are preferred. Carefully coordinate drawings to ensure ADA clearances are met.
- Shower mixing valves shall be fully accessible from inside of the shower stall.

Drinking Fountains

- Drinking fountains should be provided at all major corridors. At ADA fountain locations, design should provide ADA apron below fountain or other acceptable construction that provides cane detection.
- All drinking fountains shall include a bottle filler. Bubblers should be located at all classroom sinks.

Mop Sinks

- Teams should avoid the use of prefabricated mop sinks whenever possible.

7.2.4 Toilet, Shower, and Custodial Accessories

Refer to APPENDIX A for DCPS approved toilet, shower, and custodial accessories.

7.3 Identification

7.3.1 Labels

Identification for equipment and valves shall be visibly located within the room.

7.3.2 Abbreviations

Refer to the APPENDIX for equipment and controls naming standards.

8. PROJECT CLOSEOUT

Refer to the DGS Division 01 specifications for the full extent of all project closeout requirements and procedures.

8.1 Drawings

The following drawings should be provided in the designated DGS Office within each school:

- Laminated 8.5 x 11 MEP equipment schedules with all makes and models listed.
- Laminated 24 x 36 (minimum) MEP floorplans with accurate building room numbers that correspond to all equipment and control schedules.
- Laminated 8.5 x 11 valve schedules with corresponding valve locations Laminated 24 x 36 (Minimum) HVAC sequence of operations

---END of OPR---

APPENDIX A: PLUMBING FIXTURE SCHEDULE

This appendix is intended to be used as reference for basis of design for all DGS projects. Any specifications and design recommendations changes shall be coordinated with the client and/or user agency and DGS.

Multi-station Lavatory Unit

- Basis of Design: Bradley Corporation, Verge LVL Series

Faucets

- Multi-User Restrooms
  - Basis of Design: American Standard Metering Faucets, Centerset Spout
- Single-User Restrooms
  - Basis of Design: Monterrey by American Standard, Two-Handle Centerset Lavatory Faucet

Mop Sinks

- Faucet
  - Basis of Design: Service Sink Faucet by T&S Brass and Bronze Works, with 4 Wrist Action

Toilets

- Pre-K3 and Pre-K4 on-suite toilets:
  - Basis of Design: Baby Devoro FloWise by American Standard, with round front
- Typical Toilet (all other grades/ages):
  - Basis of Design: American Standard Elongated Wall Hung Closet Fixture

Urinals

- Basis of Design: American Standard Washbrook Urinal

Flush Valves

- Pre-K3 and Pre-K4 on-suite toilets:
  - Basis of Design: Sloan Flushometer 111-1.28
- Typical Toilet (all other grades / ages):
  - Basis of Design: Sloan Manual Exposed Flushometer
- Urinals
  - Basis of Design: Sloan Manual Exposed Flushometer

Drinking Fountains

- Interior Drinking Fountains:
  - Basis of Design: Elkay Enhanced EZH20 Bottle Filling Station & Versatile Bi- Level ADA Cooler
- Exterior Drinking Fountains
  - Basis of Design: Elkay Outdoor EZH20 Bottle Filling Station Bi-Level Wall mount LK4409BF, or Elkay Outdoor EZH20 Pedestal mount LK4420BF1U

Toilet, Shower and Custodial Accessories

- Soap Dispenser
  - Basis of Design: ClearVu Bulk Foam Soap Dispenser 9345
- Toilet Paper Dispenser
  - Must accommodate a 9 inch bulk roll (single or double)
  - Basis of Design: Bobrick - 2892

- Paper Towel Dispenser for Pre-K3 and Pre-K4 on-suite restrooms, and classroom sinks only.
    - Must accommodate an 8 inch paper towel roll.
    - Basis of Design: Bobrick B-72860
- Hand Dryers
    - Hand dryers shall be provided at all other locations other than the Kitchen.
    - Located in all toilet rooms except the Pre-K3 and Pre-K4 on-suite restrooms.
    - Basis of Design: Dyson Airblade V
- Partition-Mounted Sanitary Napkin Disposal
    - Double-sided serving two toilet compartments:
    - Basis of Design: Bobrick B-354
- Single-sided
    - Basis of Design: Bobrick B-254
- Surface-Mounted Soap Dish
    - Locate below all liquid soap dispenser to collect drips
    - Basis of Design: Bobrick B-6807 (Satin-finish stainless steel)
- Shower Curtain Rod
    - Bobrick Extra-Heavy-Duty Shower Curtain Rod, B-6047
- Grab Bars
    - Basis of Design: Bobrick Stainless Steel Grab Bars with Snap Flange, B-6806
- Shower Seat
    - Basis of Design: Bobrick Bariatric Folding Shower Seat with Legs, B-918116 Series
- Mop / Broom Holders
    - Basis of Design: Bobrick Utility Shelf with Mop/Broom Holders and Rag Hooks, B-239
- Mirrors in Toilet Rooms
    - Basis of Design: Bobrick Glass Mirror with Stainless Steel Angle Frame, B-290
- Baby Changing Stations
    - Basis of Design: Koala Kare Horizontal Recessed Mounted Stainless Steel Station, KB110-SSRE
- Napkin / Tampon Vendor
    - Basis of Design: Bobrick Recessed or Semi-Recessed Napkin / Tampon Vendor, B- 3706T (Token Operation)
    - Due to changing District code requirements, Design Teams should confirm with DCPS at ti2me of specifying if current DCPS standards require Token or Free operation.

APPENDIX B: EQUIPMENT & CONTROLS NAMING STANDARDS

GSA Data Normalization for Building Automation Systems:

The Project Team should procure a copy of the current GSA Data Normalization document prior to beginning design. A copy may be provided here by DGS when available.

Project Haystack

Design teams should utilize the Project Haystack website at www.project-haystack.org. Project Haystack and all of its associated intellectual property is managed as an open-source project using the Academic Free License (AFL) 3.0. Anyone is free to participate as long as the contributed IP is licensed under the AFL.

APPENDIX C: CONTROLS NAMING STANDARDS

DGS Unified Controls Specification