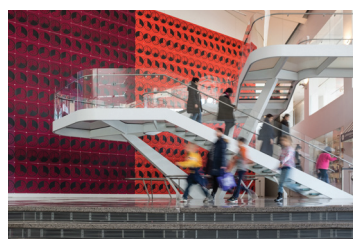


Design Consultant Guide



LETTER FROM THE COMMISSIONER

Dear Colleagues,

Welcome to our new and updated Design Consultant Guide. This is an important tool for working with the New York City Department of Design and Construction to create and renew the public buildings that serve the needs of our citizens.

Since its inception in 1996, DDC has successfully delivered many of the City's most important municipal projects, and has taken a leading role in guiding New York through times of crisis. With these accomplishments comes an increased responsibility to deliver quality projects more effectively and efficiently. In 2019, DDC issued its Strategic Blueprint for Construction Excellence, a detailed plan to streamline the capital construction process at every level. We are inspired and excited to effect this positive change in support of Mayor Bill de Blasio's vision for our City.

Our projects take into account the needs of all New Yorkers, plus the ever-changing needs of the City. Along with our government and industry partners, our policies and practices must also change to ensure that projects are designed and constructed to enhance public safety in the face of coronavirus, climate change and other challenges. But through every hurdle, DDC remains committed to building a sustainable, healthy and equitable urban environment.

A key part of that vision is the creation of meaningful business opportunities for Minority- and Women-Owned Business Enterprises (M/WBEs). Through a focused plan of outreach and instruction DDC has become a top-performing agency in the City's M/WBE program, and has successfully lobbied for State legislation that will further expand prospects for these businesses.

You, our Design Consultants, are crucial partners in this endeavor. Together, we have been charged with achieving the best value for the public by providing excellence in design and construction, a timely process, and a cost-effective product. Successful design is fundamentally collaborative. This Guide seeks to make DDC's expectations clear by providing an overview of our goals on a phase-by-phase basis and detailing related deliverables. We hope the Guide will prove to be a useful resource as we strive to fulfill Mayor de Blasio's abundant vision for New York City's public buildings.

Sincerely,

Lorraine Grillo

Commissioner

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CHAPTER 01

INTRODUCTION

- A. THE DEPARTMENT OF DESIGN AND CONSTRUCTION
- B. THE DIVISION OF PUBLIC BUILDINGS
- C. PROJECT EXCELLENCE
- D. THE PROJECT TEAM
- E. THE DESIGN CONSULTANT GUIDE

A. THE DEPARTMENT OF DESIGN AND CONSTRUCTION

The New York City Department of Design and Construction (DDC) was established in 1996 to provide project management services for the City of New York's capital construction projects. Serving 28 Sponsor Agencies through its two Divisions, Public Buildings and Infrastructure, DDC builds and renovates public buildings, streetscapes, plazas, and subgrade infrastructure.

B. THE DIVISION OF PUBLIC BUILDINGS

Design opportunities throughout DDC's Division of Public Buildings range from major new public buildings to retrofits and upgrades of existing buildings. Regardless of scale or scope, every project represents an opportunity to enhance the public realm and achieve the highest quality of design and construction for the City's public buildings and spaces. The design process is a collaborative effort between the Consultants, the DDC Project Team, the Sponsor Agencies, and Regulatory Agencies, to fully explore programmatic requirements, site conditions, context, budget, and other factors leading to the development of a creative, responsible, and functional design in full compliance with all applicable codes, local state and federal laws, specifications, standards, and project objectives.

As well, our public projects must respond and adapt to the recent global pandemic to ensure public health while ensuring public value. Along with our City agency and industry partners, we have begun to develop best practices and procedural modifications that promote health, safety and welfare for the public in order to mitigate the risk of viral transmission within a facility and/or active construction site.

DDC projects include cultural institutions, libraries, government offices, laboratories, sanitation facilities, emergency shelters, transportation facilities, firehouses, health clinics, senior centers, child care centers, courts, correctional facilities, police precincts, and emergency medical stations. Sponsor Agencies currently include: Department of Cultural Affairs (DCLA), Department of Parks and Recreation (NYC Parks), Brooklyn Public Library (BPL), New York Public Library (NYPL), Queens Library (QL), Department of Environmental Protection (DEP), Department of Health and Mental Hygiene (DOHMH), Office of the Chief Medical Examiner (OCME), Department for the Aging (DFTA), Department of Youth and Community Development (DYCD), Administration for Children's Services (ACS), Agency for Childhood Development (ACD), Department of Citywide Administrative Services (DCAS), Department of Homeless Services (DHS), Department of Consumer Affairs (DCA), Human Resources Administration (HRA), Office of Court Administration (OCA), Department of Transportation (DOT), Taxi and Limousine Commission (TLC), Department of Sanitation (DSNY), Department of Correction (DOC), Fire Department (FDNY), Police Department (NYPD), Department of Information Technology and Telecommunications (DOITT), Department of Education (DOE), Department of Probation (DOP), the Mayor's Office of Criminal Justice (MOCJ), and NYC Emergency Management (NYCEM).

The specific project goals of each Sponsor Agency are served by individual DDC Program Units. The Program Units make up the principal organizational framework of the Public Buildings Division, and are supported by technical, design, budget, and contract processing resources within DDC. The Program Units are directly responsible for managing projects from the initial program requests by the Sponsor Agency through design, construction completion, and acceptance for occupancy. Each Program Unit is headed by a Program Director whose primary responsibilities are to guide and oversee the implementation of a Sponsor Agency's capital construction program.

C. PROJECT EXCELLENCE

The City of New York is committed to achieving excellence in design and construction across its portfolio of public works by delivering quality infrastructure and public buildings that contribute to a thriving, equitable, sustainable and resilient city for all New Yorkers. As part of this commitment, the Department of Design and Construction's Project Excellence program builds on a strong tradition of innovation in architecture and engineering through strategies and practices that balance aesthetics, functionality, cost, constructability, and durability to bring form and meaning to public space.

Project Excellence encompasses all aspects of project delivery, from capital project planning through design, construction, commissioning, and close-out, to ensure on time and on budget delivery of exemplary civic projects. Integrated project delivery practices include enhanced project initiation and management tools, Quality-Based Selection (QBS) and best value procurements, performance evaluation and management, knowledge sharing, and continuing education. Together, these strategies ensure that all capital projects delivered to the City are inspiring, enduring, practical, constructible, and economical.

Achieving Project Excellence requires all team members to engage collaboratively in the capital project delivery process, prioritizing strategies that make responsible use of public funds and offer the best value for the City. DDC's project managers, technical reviewers, and support staff work to guide projects through complex and demanding project delivery processes in partnership with the most creative and experienced design and construction professionals. DDC and our partners share a commitment to Project Excellence in the public realm as characterized by the following overarching concepts:

Project Excellence utilizes the power of design and construction to positively transform our public space, inspiring pride in the people and City of New York. The design of public buildings and infrastructure must be guided by a civic consciousness and social responsibility to provide spaces that promote discourse, exemplify accessible government, and inspire pride in our communities. The design and construction process must reflect a collaborative effort that is inclusive of all stakeholders, including sponsor, partner, and regulatory agencies, and the community.

Project Excellence shapes the city we envision for today and the future by creating enduring and inclusive public spaces. With design and construction of public projects comes the responsibility of shaping the City for generations to come. Dignified, universally accessible, and community-oriented, public spaces must make all New Yorkers feel welcome and valued, comfortable and secure. By thoughtfully responding to surrounding context, including neighborhood character and natural systems, the design must create and reinforce a sense of place that is enhanced by strong connections to existing community resources and mobility networks. The design and construction process must engage relevant stakeholders and experts to consider cultural context and integrate artwork wherever possible in support of meaningful public spaces.

Project Excellence protects the legacy of our public space by carefully considering practical solutions that address the needs of our City. Public projects must be well suited for their intended use and adaptable to future needs. Our public buildings and infrastructure must meet the needs and aspirations of New York City's public agencies as expressed in their individual missions, goals, standards, and requirements. The design must seek a creative balance between functional and programmatic requirements, operational and maintenance protocols, construction practices, and performance and innovation. Sustainable, resilient, durable, and easily maintained, the project must be guided by a holistic view of the capital asset over its expected lifespan. The design must consider solutions to long-term and emergent risks and opportunities, such as changing climate and public health and safety conditions, as well as new technologies and ways of living, working, and connecting.

Project Excellence strengthens the character of our public space by delivering constructible capital projects with safety and integrity. Building New York City requires the ability to execute projects in a safe, effective, and timely manner while maintaining the integrity of the design throughout construction. The design of our public buildings and infrastructure must be represented by complete, comprehensive, and accurate contract documents that are clearly detailed and coordinated across disciplines, and that meet or exceed requirements of code, zoning, accessibility, and local laws. Specifications must be carefully coordinated with drawings and material schedules and be tailored to the requirements of each project. Materials and systems must be proven, readily available, and achievable with local construction practices to minimize lead times, eliminate cost overruns, and prevent construction delays.

Project Excellence supports the value of our public space by employing an economical approach that leverages City resources to build lasting community assets. Design and construction by and for the City requires conscientious attention to schedule, budget, and operational costs to ensure that public funds are well spent, and communities well served. The project must incorporate a life-cycle cost analysis approach and prioritize selection of long-lasting systems and assemblies that are achievable within the allocated budget. Systems must perform to the highest standards of human health, comfort and efficiency, meet or exceed energy requirements, and operate as designed. The project must be calibrated to reduce construction and operating costs and complexity, positively impact the health of people and the environment, and use natural resources wisely. Using City-wide and agency standards and best practices, innovative methodologies, and appropriate technologies, the design must add value and do more with less.

To support Project Excellence, DDC seeks architects, landscape architects, planners, designers, engineers, construction managers, contractors, and design-build teams who are dedicated, responsive, and collaborative, and who possess the management skills necessary to complete work on time and on budget. DDC's partners must have a proven track record of delivering quality projects while resolving complex requirements and navigating unforeseen circumstances. Team-oriented and adept at balancing competing demands, these professionals must go beyond the creation of contract documents to serve as facilitator, mediator, and interpreter, building trust among the many stakeholders throughout the life of a project.

D. THE PROJECT TEAM

The Project Team includes:

1. **THE CONSULTANT TEAM, INCLUDING ALL REQUIRED SUB-CONSULTANTS.**
2. **REPRESENTATIVES OF THE SPONSOR AGENCY.**
3. **THE DDC PROJECT TEAM:**
 - a. The DDC Project Manager, who will act as the main point of contact for the Project Team. The DDC PM will also coordinate communications with the internal DDC Units that support the Consultant and the project including the DDC Project Controls Unit, Office of Environmental and HazMat Services (OEHS), Office of Geotechnical Investigations (OGI), and M/WBE Compliance Unit.
 - b. The Design Liaison, who ensures that the project meets the civic design requirements of Project Excellence and shepherds projects through the Public Design Commission review and approval process.
 - c. The DDC Architecture and Engineering (A&E) Review Team, led by a Team Leader of the appropriate discipline and including Team Members representing each trade as applicable, including Architecture; Structural, Mechanical, Electrical, Plumbing and Civil Engineering; Accessibility; Landscape Architecture; Historic Preservation; Public Art; Sustainable Design; and Commissioning.

- 4. A COMMISSIONING AGENT CONSULTANT, WHEN REQUIRED, UNDER DIRECT CONTRACT TO DDC.**
- 5. A CONSTRUCTION MANAGER, WHEN REQUIRED, UNDER DIRECT CONTRACT TO DDC.**

E. THE DESIGN CONSULTANT GUIDE

DDC undertakes a wide variety of projects in support of its Sponsor Agencies, making each project unique and standardization of project delivery methods a challenge. This Design Consultant Guide outlines qualitative expectations and describes broad requirements that pertain to all projects.

Descriptions of goals and deliverables are intended to help the Consultant, DDC, and Sponsor Agencies understand expectations and evaluate the acceptability of completed tasks. A detailed chapter on Design Criteria is provided to describe the basis of DDC's evaluation of the Consultant's work product.

Many of DDC's design projects are initiated through Requirement Contracts for design services. The Requirements Contract is necessarily generic regarding specific project scopes since the projects to be undertaken are not known at the time of contract initiation. The Task Order will state all the parameters of the specific project and incorporates the Project Objectives (PO) which includes the Scope of Work. All tasks shall be carried out as directed in this Design Consultant Guide unless the Task Order or other written documentation from DDC explicitly states otherwise.

The Guide describes the design criteria of the Agency, the goals, services, and deliverables expected, and necessary approvals and procedures.

In addition to this Guide, Consultants should familiarize themselves with Sponsor Agency design guides, requirements, manuals, specifications, or standards. These should be reviewed to ascertain any potential conflicting goals or objectives. The resolution of conflicts is the responsibility of all parties involved.

CHAPTER 02

OVERVIEW OF THE

DESIGN PROCESS

- A. PROJECT DELIVERY STAGES
- B. PROJECT PLANNING AND INITIATION
- C. PROJECT DELIVERY TRACKS
- D. DESIGN PHASES
- E. DESIGN PHASE PROCESS AND MILESTONES
- F. CONSULTANT SERVICES DURING PROCUREMENT
AND CONSTRUCTION
- G. CONSULTANT OBLIGATIONS

A. PROJECT DELIVERY STAGES

There are four stages in the delivery of capital projects from initiation to the completion of construction:

1) PROJECT PLANNING AND INITIATION

During the Project Planning and Initiation stage, DDC evaluates the capital project scope and budget to ensure the project has adequate funding. DDC develops a baseline schedule template, prepares the specific project scope and requirements, selects the Consultant, acquires funding from the Office of Management and Budget (OMB), registers the task order with the Comptroller, and issues the Notice to Proceed (NTP).

2) DESIGN

a. Documentation

This stage typically includes the Schematic Design phase; Design Development phase, and Construction Documents phase. Design may at times also include a Pre-Schematic phase prior to Schematic Design or at times consist only of a CPSD (Capital Project Scope Development) study. For more information, see Chapter 03: Design and Construction Phase Deliverables.

b. Bid / Award

This phase includes the bid period, selection of the Contractor/s and the registration of construction contract/s. For more information, see Chapter 03: Design and Construction Phase Deliverables.

3) CONSTRUCTION

Construction contracts are awarded either through a competitive bid process, in which the lowest responsible and responsive bidder is selected or through pre-awarded requirements contracts managed by DDC's Job Order Contracting Service (JOCS).

B. PROJECT PLANNING AND INITIATION

The Project Planning and Initiation stage begins when the Sponsor Agency submits a Project Initiation (PI) request, which includes a general description of the project, a summary of the required work, and information on funding. DDC's Front End Planning (FEP) Unit reviews and evaluates the scope and budget to ensure the project is viable.

In order to verify that scope and budget are aligned, DDC's FEP, along with technical support from A&E, conducts a preliminary project investigation to review site constraints, identify requirements for compliance with codes, local state and federal laws, and other City obligations, explore construction logistics and so forth, to demonstrate a design approach that is achievable within the budget. FEP's findings are compiled into a report along with a baseline schedule and the Project Objectives which details the scope of work and identifies the track for design delivery (see Section C in this chapter). Upon initiation of the project, the complete Front End Planning Report will be issued to the Consultant assigned to the project. While not limited to the design solution proposed in the Front End Planning Report, the Consultant will be responsible for evaluating design options that fall within the designated budget.

The Project Planning and Initiation stage includes the identification of the key members of the DDC Project Team, including the Front End Planning Program Executive, the Project Manager, the A&E Team Leader, and the Design Liaison. The DDC team discusses the project in detail while taking into consideration various regulatory pathways as well as design services procurement options based upon project scope, schedule and budget. All decisions made during this stage are vetted by DDC's Strategy Board.

Upon acceptance of the project for initiation by Strategy Board, the Design Liaison coordinates with DDC's Agency Chief Contracting Officer (ACCO) to procure design services. For all projects, large and small, Consultants are invited to attend a site visit to become familiar with the site and scope of work. The design procurement process requires Consultants to identify how they will meet M/WBE participation goals established for the project.

Simultaneously, the Project Manager prepares a Certificate to Proceed (CP) request for submission to OMB to obtain funding approval for the project and subsequently prepares the Agreement, which includes the FEP Report and Project Objectives, for submission to the Comptroller to register the contract. Upon approval of the CP, selection of a Consultant, and registration of the Task Order, a Notice to Proceed (NTP) is issued and a design kick-off meeting is scheduled by the Project Manager.

C. PROJECT DELIVERY TRACKS

1) PROJECT TRACKS AND TYPES

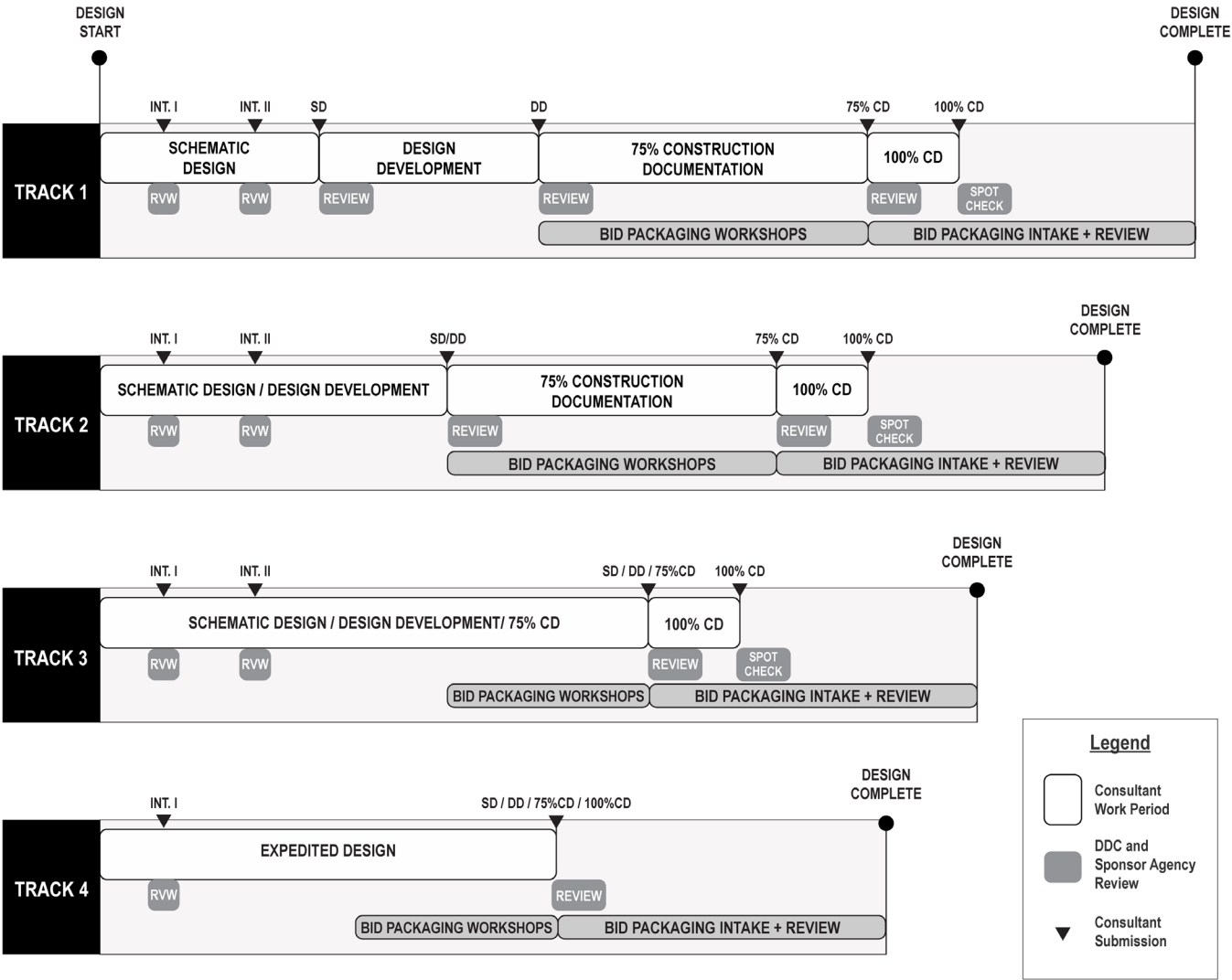
Projects follow one of four project delivery tracks according to the type of work and level of complexity. The project track, will be identified in the Project Objectives (PO).

- a. **Track 1:** includes new construction, major renovations, and additions. Track 1 encompasses all phases, which include Pre-Schematic Phase (optional), Schematic Design, Design Development, 75% Construction Documents phase, and 100% Construction Documents phase.
- b. **Track 2:** includes complex building system upgrades involving more than one system, such as building envelope or HVAC system reconstruction/rehabilitation. It has a combined Schematic Design and Design Development Phase, 75% Construction Documents Phase, and 100% Construction Documents phase.
- c. **Track 3:** includes simple building system upgrade projects. It includes Schematic Design, Design Development and 75% Construction Documents combined into a single phase, followed by 100% Construction Documents Phase.
- d. **Track 4:** is for projects with very limited scope. In this very expedited track, Schematic Design, Design Development, 75% and 100% Construction Documents are combined into a single phase.
- e. **Capital Project Scope Development (CPSD):** studies are sometimes required to enable the City to identify advanced portfolio planning, project scope and cost prior to capital commitment. CPSD services may be requested for any type of City project including but not limited to buildings, structures and facilities, site work, etc. A CPSD study may also include large-scale portfolio planning, master planning, space programming, design standards and technical research. Since the extent of each CPSD will vary, design services will be specific to the nature of the project and may include such items as the investigation of existing conditions, analysis of regulatory pathways, analysis of zoning and code, analysis of the Sponsor Agency's operational requirements and programming, as well as the study of design

alternatives to promote efficiency and control costs. This study concludes with a report by the Consultant and a review by DDC. No construction phase services are included in this type of project.

2) REQUIRED PHASES BY PROJECT TRACK

The chart below is a general illustration of requirements for various project types in the Division of Public Buildings. Project Objectives are provided for each project which describe project-specific requirements, and obligations of the design professionals. They identify which phases and submissions will be required, including any noted as optional.



D. DESIGN PHASES

The Design Phases can be configured differently depending on the scope of the project. If the project requires preliminary services, such as site selection or program definition, the Project Objectives (PO) will call for a Pre-Schematic phase. Otherwise, a typical project will consist of three phases that build upon each other: Schematic Design, Design Development, and Construction Documents. Deliverables for each phase can be found in Chapter 03: Design and Construction Phase Deliverables. All submissions shall be made in accordance with the project schedule; see Chapter 04 for details. The goals of the Design Phases for most projects are as follows:

1) PRE-SCHEMATIC DESIGN

A Pre-Schematic phase may be required prior to Schematic Design when an investigation is necessary to clarify the programming requirements, or other specific uncertainties must be resolved before Schematic Design can begin. The goal of Pre-Schematic Design is to establish a defined scope of work acceptable to all stakeholders to transition into Schematic Design without ambiguity related to the basis of design. The Pre-Schematic scope may include programming, or limited investigations relative to site analysis/selection and shall be accompanied by associated cost estimates. The phase concludes with a report for review. For information on requirements of the DDC Design Reviews, see the information in section E.5 of this Chapter.

2) SCHEMATIC DESIGN

In the Schematic Design Phase, the Consultant conducts research and produces design options for meeting the Sponsor Agency's needs as stated in the PO. The goal is to establish an integrated design direction, that synthesizes approaches towards zoning, life safety, accessibility, sustainability, resiliency, and energy code compliance. At the discretion of DDC, additional services of an investigative nature may be incorporated into Schematic Design instead of having a separate Pre-Schematic phase. If required, such services will be described in detail in the PO.

The Consultant begins the design process by investigating existing conditions, identifying opportunities and constraints inherent in the site, the program and/or the building type, and the intended operation of the building, and establishing design parameters in dialog with the Sponsor Agency and DDC. The Consultant explores spatial and material responses to the Project Objectives. By the mid-point of the phase, the Consultant shall present no fewer than three concept options, or more if required, to fully explore applicable design alternatives, including all major building systems. The Consultant shall lead a presentation of these options for the stakeholders, comparing the relative costs, advantages, and disadvantages of all aspects of each option. Based on this presentation, a consensus toward a preferred scheme should emerge. The preferred scheme shall then be developed more fully for the final Schematic Design submission.

This phase normally includes two interim submissions for DDC review. The Interim Submission I is an Investigation Report and the Interim Submission II is the Design Options Report (including engineering alternatives in narrative format and cost estimates for each option). The review of the Schematic Design Interim Submissions occurs without stoppage of the Consultant's work.

As is the case with all Consultant deliverables, the Project Team will review the submission and generate written comments, which must be addressed and resolved by the Consultant in the advancement of the project. For information on requirements of the DDC Design Reviews, see the information in section E.5 of this Chapter. The Schematic Design phase concludes with a submission consisting of a Schematic Design Final Report, including engineering narratives and a cost estimate.

Conceptual (for new buildings or major renovations) or Preliminary approval from the Public Design Commission (PDC) and/or Landmarks Preservation Commission (LPC), depending on which is applicable, is required prior to the commencement of the Design Development phase. For more information, see Chapter 10, Regulatory Approvals.

3) DESIGN DEVELOPMENT

In the Design Development Phase, the Consultant shall continue the design process, advancing the design presented at the Schematic Design Final Report. The Consultant is expected to validate, develop, and refine the project, including all design elements, building systems, materials, details, equipment, maintenance and operational requirements, and both initial and life-cycle costs. The Consultant must demonstrate that all decisions are justifiable on the basis of cost and value. Any open issues regarding zoning, code compliance, and neighboring property access should be resolved during the Design Development phase. If determinations from DOB are required, the Consultant must obtain written responses prior to the final Design Development submission. The Consultant shall modify the design as required to remain within the project budget. The Consultant shall notify DDC if they believe that the project scope cannot be achieved within the approved budget, but this does not relieve the Consultant of their responsibility to deliver a project that adheres to the budget. At the end of the Design Development Phase, all major design decisions are made final.

This phase concludes with a submission consisting of a Design Development Report (including updates and development to the contents of the Final Schematic Design Report), architectural and engineering drawings, engineering calculations, outline specifications, and a cost estimate. For information on DDC reviews, see the information in section E5 of this Chapter.

4) CONSTRUCTION DOCUMENTS

During this phase, the Consultant prepares final Construction Documents, including drawings and specifications, for regulatory approval and public bidding or award to a pre-qualified contractor under DDC's Job Order Contracting Services (JOCs). There are two submissions during this phase: one at 75% CD and one at 100% CD. In addition to the drawings, a cost estimate, engineering calculations and specifications are required for review by DDC at the 75% and 100% submissions.

Final submissions to PDC and LPC must be made during this phase. Submission to the DOB is required prior to the 75% CD submission. Any objections from the Plan Examiner should be resolved prior to the 100% Submission, or submitted as a required deliverable.

DDC construction contracts are awarded through a sealed competitive bid process, in compliance with State and local laws, through which the project is awarded to the lowest responsive and responsible bidder. It is not permissible for the Consultant to collaborate with the contractors to develop design intent prior to the bid. Therefore, the Consultant is advised that the success of the bid and award process, as well as the construction process itself, can be greatly enhanced through their efforts to produce bid documents that are clear, complete, and thoroughly coordinated.

Delegated Design is not permitted except as expressly authorized by the Commissioner in writing.

E. DESIGN PHASE PROCESS AND MILESTONES

Every Design Phase shares the following basic organizational structure:

1) KICK-OFF MEETING

Every project begins with an official Kick-Off Meeting. The Kick-Off Meeting is attended by the Consultant, sub-consultants, Sponsor Agency representatives, the DDC Project Team (see Chapter 01, paragraph D) and additional DDC team members as may be required. At this meeting important project requirements shall be discussed, including but not limited to:

- a. Requirements of the Agreement.
- b. Identification of responsibilities, expectations, contact information, and establishment of protocols for all stakeholders.
- c. Project Intent and Goals, including, but not limited to:
 - 1. Project Scope (as defined in the PO)
 - 2. Commissioning. See Chapter 07: Commissioning.
 - 3. Sustainable Design and Resiliency goals. See Chapter 08: Sustainability and Resiliency.
 - 4. Percent for Art, if applicable. See Chapter 09: Percent for Art.
- d. Sponsor Agency standards, if applicable
- e. Budget
- f. Site Data, including information about site surveys and borings
- g. Hazardous Material Testing
- h. Schedule. See Chapter 04: Project Controls.
- i. Thereafter, all the following phases will commence with a kick-off meeting that will lay out the expectations for that phase.

2) PROGRESS MEETINGS

Bi-weekly progress meetings, held at DDC, shall be conducted throughout all phases. These meetings are expected to be constructive exchanges of information and ideas to advance the project. The DDC Project Manager schedules progress meetings and workshops. Meetings and workshops shall be indicated on the Consultant's schedule and may include issues such as programming, landscape, site conditions, engineering systems, historic preservation, sustainability, active design, accessibility, cost estimating, design value, technical specialties, specifications, and permits and approvals. Additional meetings may be required with the Community Board or group, LPC, PDC, and the Sponsor Agency.

- a. The Consultant must prepare draft minutes for distribution to the attendees within three days of the meeting or workshop. Once comments have been received from attendees, the Consultant must issue the final minutes to the Project Manager. When recording minutes,

the Consultant shall number each meeting consecutively and record the date, place, and attendees. The minutes shall include the agenda, all items discussed, conclusions, and questions for resolution.

- b. Unresolved issues must continue to appear in the minutes until they are resolved. The party responsible for the resolution of open issues, the date the resolution is due, and the actual date of resolution shall also be noted. Similarly, corrections and approvals of minutes shall be recorded.
- c. An updated Progress Schedule shall be provided to the Project Manager at each bi-weekly meeting. See Chapter 04: Project Controls.
- d. Direction informing major project goals and constraints shall be recorded in the Owner's Project Requirements (OPR). See Chapter 03: Design and Construction Phase Deliverables.

3) PRESENTATIONS

Throughout each phase, the Consultant shall make presentations to the Project Team to identify issues, present options, demonstrate progress, etc. Public presentations may also be required. The Consultant shall coordinate with the DDC Project Manager and Team Leader concerning all materials and information to be included in the presentation documents. Sub-consultants shall attend per phase requirements outlined in Chapter 03: Design and Construction Phase Deliverables.

4) SUBMISSIONS

Each of the phases requires a submission of drawings, data, reports, calculations and material samples along with other relevant documents (see Chapter 03: Design and Construction Phase Deliverables for the base deliverables which may be supplemented by the Project Objectives.) The Consultant will submit their deliverables to the Project Manager, who will distribute them as required to the various DDC Units, as well as the Sponsor Agency.

5) DESIGN REVIEW COMMENTS

Following each submission, the Design Review Team, Project Manager and Sponsor Agency shall conduct a thorough review of the deliverables and provide the Consultant with written comments. While written responses are not required for any discipline other than Commissioning, the Consultant is required to thoughtfully resolve all review comments in the development of the project, addressing the spirit of the comments as well as the specific issues. The Consultant shall attend a comment review meeting to facilitate the resolution of any open design issues and comments. The Consultant may present additional drawings, specifications or data as required for clarification or resolution of outstanding design issues or comments. Notwithstanding any of the above, the Consultant shall proceed to the next phase according to the Project Schedule. Any corrections shall be made concurrently to the work needed to keep the project on schedule with no additional time allowed.

The DDC review will be conducted utilizing collaborative, cloud-based software, such as Bluebeam, available to the Consultant team as a free download. The Consultant is required to utilize the system in the design review process.

6) 75% CD, 100% CD AND BID PACKAGING REVIEW

At the commencement of the Construction Documents phase, DDC will initiate Bid Packaging workshops with the Consultant. For more information, see Chapter 05, Bid Packaging Requirements.

- a.** Upon submission, the 75% CDs, including both drawings and specifications, are reviewed by the A&E Review team and/or the Construction Manager to ensure that the project requirements are fully detailed and clearly communicated. Review comments will be provided as per Design Review section E.5 in this Chapter. At this stage, the technical specifications are reviewed for accuracy, completeness, and coordination with the drawings. Upon successfully resolving all open issues, the Consultant shall submit the 100% CD documents in compliance with all comments for a final spot check.
- b.** The PM will forward the final technical specifications, cost estimate, and other documents, referred to collectively as the Bid Package, to the Bid Packaging Unit for review (see Chapter 05: Bid Packaging Requirements). The technical specifications are reviewed for compliance with contract language requirements, coordination with other components of the Bid Package, and format. The Consultant shall modify the documents as required to comply with comments from the DDC Bid Packaging team review.
- c.** Once all review comments from the DDC Bid Packaging review team have been resolved, Construction Documents are transmitted to DDC ACCO. DDC Law reviews the documents for compliance with applicable law. The Consultant shall revise the documents as directed. Upon satisfactory completion of all such revisions, DDC will deem the documents to be acceptable for bid and designates final acceptance. DDC must approve 100% Construction Documents as-to-form prior to advertisement of the bid.

F. CONSULTANT SERVICES DURING CONSTRUCTION

1) BID AND AWARD

During this phase the Consultant shall interpret plans and specifications when requested by DDC in response to inquiries by prospective bidders and prepare and issue all necessary addenda, amendments, and drawings required for the clarification of plans and specifications. Such documents shall be issued through DDC. The Consultant shall also attend Pre-Bid Meetings to answer questions from bidders and to assure that all parties clearly understand the intent of the Contract Documents. Pre-Bid Meetings are held at the project site to ensure that all bidders become familiar with existing conditions. Agenda items include highlights of the contract emphasizing any unusual work.

Once bids are received, the Consultant shall assist in the analysis and evaluation of bids and within three calendar days of the bid opening make written recommendations and reports on the disposition of bids and the award of Contracts. The Consultant shall also assist in the review and evaluation of special experience qualifications of the contractors and/or subcontractors proposed by the Prime Contractors.

The Consultant is required to attend a Pre-Award Meeting with the Contractor(s), the Sponsor Agency representative and members of the DDC Project Team. At the Pre-Award meeting, the Consultant shall answer questions and provide additional support and analysis in the understanding of the intent of the Contract Documents.

Consultant services during this phase include attendance of bi-weekly job-site meetings; site visits and issuance of Field Inspection Reports; review of submittals including shop drawings, samples, cut sheets and mock-ups; review of schedules of items and costs; interpretation of Contract Documents and related clarifications by drawings issued as Bulletins; review of Contractor coordination drawings; resolution of design errors or omissions; issuance of the construction punch list; LEED certification as applicable; and revision of documents as necessary to obtain sign off documentation from the Department of Buildings. For more information, see Chapter 10: Regulatory Approvals.

G. CONSULTANT OBLIGATIONS

1) GENERAL

At all times throughout the design process, it is the Consultant's responsibility to maintain the project schedule and adhere to the approved project budget. If the Consultants believe the project is underfunded, they must so advise DDC in writing. If the scope of work is to be modified, DDC will advise the Consultant in writing. The Consultant shall study the implications of such changes and advise DDC in writing of any resulting impacts on the project budget and schedule. If the Consultant is directed to proceed with the modified scope, the budget and schedule will be adjusted accordingly.

Despite the DDC review protocol, the Consultant retains complete responsibility for the quality of the documents and compliance with building code, as well as local state and federal law.

2) DESIGN VALUE

The Consultant shall deliver a design that is within the approved budget allocation for the project. The Consultant must evaluate life-cycle, operational and maintenance costs for the overall project, as well as all major systems. The Consultant must demonstrate that alternatives have been considered for all major systems and materials, and that the final options selected are as economical as possible. For more information, see Chapter 04: Project Controls.

3) BID DOCUMENTS

The City's ability to successfully bid, award, and build the Consultant's work is contingent upon a commitment to produce clear and complete bid documents. Drawings and specifications must conform to DDC's standards, many of which are legally prescribed. The Consultant shall take care in the preparation of specifications. Specifications will not be accepted if incomplete or uncoordinated, if they contain sections not specific to the project, or contain language not in conformance with DDC requirements. The Consultant is advised to clarify these requirements as necessary with its specification writers, to review the specifications carefully, and to expeditiously deliver all required specification revisions to the DDC Project Manager.

4) CONSTRUCTION AND CLOSE-OUT

The Consultant shall provide timely and proactive responses during the construction phase to ensure documentation on file with the Department of Buildings is kept up to date with any changes made in the field so that the project may be properly closed out in a complete and efficient manner.

5) PERFORMANCE EVALUATIONS FOR DESIGN CONSULTANT EVALUATIONS

Consultants will be evaluated at the completion of all project milestones, or as needed, based on their ability to provide quality products and services on time, within budget, and in conformance with contractual requirements. Performance evaluations serve to provide Consultants with feedback on their performance throughout the lifespan of a project and DDC with a record of performance for all Consultants providing design services. DDC will review previous performance evaluations when evaluating proposals for new projects and consider the past performance of a vendor in its selection.

6) PUBLICITY/AWARDS/PRESS

- a.** Consultant (and their employees, sub-consultants, subcontractors, etc.) shall not issue any press release or other public announcement (on any social media platform or outlet) or otherwise make any public statements, written or oral, without the prior written consent of DDC.
- b.** If any media outlet (including blogs) reaches out to the Consultant (and their employees, sub-consultants, subcontractors, etc.), the Consultant will immediately contact the appropriate person at DDC (DDC's Public Information Officer) and will not respond until DDC has approved in writing.
- c.** If the Consultant is interested in seeking an award on a DDC project, the Consultant shall first get DDC's written permission and agree to work with DDC's Public Information Officer on how the application and/or nomination may be presented.
- d.** Consultant will not include photographic or artistic representations of the design of the DDC project in Consultant's promotional or professional materials, on any website, social media platform, or outlet, without prior written consent from DDC.

CHAPTER 03: DESIGN & CONSTRUCTION PHASE DELIVERABLES

- A. PROJECT DELIVERABLES
- B. GENERAL INFORMATION

A. PROJECT DELIVERABLES

DDC has identified a detailed list of the Consultant's deliverables by phase in support of the design process and goals outlined in Chapter 02: Overview of the Design Process. The deliverables that follow are considered the baseline for a complete and comprehensive submission. All deliverables shall be developed in accordance with the detailed design criteria provided in Chapter 06: Design Criteria. Project Objectives (PO) will be issued to the Consultant for their specific project and made part of the Contract. The Project Objectives will define the project's scope and may further refine the deliverables, as applicable, for both typical capital projects and Capital Project Scope Development (CPSD) projects.

1) CAPITAL PROJECT DELIVERABLES

a. Pre-Schematic Design Deliverables

i. Pre-Schematic Design Report

The Pre-Schematic Design Report shall contain descriptive data and graphics in support of recommendations made concerning the project. The Report will serve as a record in support of project decisions. The Report shall contain:

1. Executive Summary
2. Site Analysis
The site analysis, if required by PO for site selection, indicates assets and constraints of the site, including those determined by legal, zoning, code, location of all existing structures on adjacent properties, and accessibility requirements as well as physical, ecological, and historical characteristics.
3. Space Program
Note the functions, space allocations, occupancy, staff, visitors, and size of new facilities. The report shall list usable net area and gross area tabulations, complete for each of the functional requirements of the proposed project. The net area tabulations shall be indicated for all distinct program spaces.
 - a. Space standards and requirements as provided by Sponsor Agency
Determination and listing of space requirements for all program spaces including special uses, common use functions, and building services.
 - b. Adjacencies and Flow Diagrams
Indicate the required circulation patterns and physical relationships of both internal and external activities.
 - c. Programmatic Inventory and Use
Of all existing spaces, indicating anticipated growth or diminishment of use, adjacency of work space requirements, special purpose areas, facilities to be shared, support areas, and building service requirements.
 - d. Master Plan Report (if required by PO)
See Topic: 2. Capital Project Scope Development (CPSD) Deliverables, Sub-Topic: e. Master Plan for information needed for master plans.
4. Pre-Schematic Cost Estimate (see Chapter 04: Project Controls)

CHAPTER 03: DESIGN & CONSTRUCTION PHASE DELIVERABLES

A. PROJECT DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

b. Schematic Design Deliverables

5. Schedule

The Consultant shall update the detailed project schedule as approved after the Kick-Off Meeting (see Chapter 02: Overview of the Design Process). The schedule must remain current during each phase and include any new relevant details.

6. Progress Meeting Minutes

b. Schematic Design Deliverables

i. Schematic Design Interim Submission I: Investigations

In order to create buildings and projects of enduring value to the city and its citizens, delivered on-time and on-budget, it is critical that the Consultant fully understand the site, existing conditions (including the condition of the existing building, if applicable), the program and the sponsor agency's operational requirements, code and zoning requirements, and any other issue that may influence the design and impact costs. Prior to developing design options, the Consultant shall engage in a series of investigations and analyses, described below, intended to bring all such issues to the attention of the Project Team such that informed decisions can be made.

1. Site and/or existing building analysis

- a. The Consultant shall study the site and the surrounding areas to determine the suitability of the site for the proposed work. The Consultant shall note, in particular, whether the nature of existing development on any adjacent lots would create impacts or constraints on the project. Similarly, the Consultant should indicate whether possible future development on adjacent lots could impact the project. Impacts may include underpinning, access for maintenance, access for egress, added construction costs, etc.
- b. At a minimum, the Consultant shall prepare an inventory of site plantings, subsoil conditions and soil bearing capacities, off-site and on-site views, existing site amenities, and constraints for site development.
- c. The Consultant shall identify the types, functions, and uses of other facilities proximate to the site and identify any potential conflicts or areas of concern.
- d. The Consultant shall identify all means of site access, including pedestrian, vehicular, parking, service, etc. and note the location, type, and distance to all forms of public transportation.
- e. A report shall be included regarding the existence of all underground fuel tanks, for heating oil, diesel fuel, and gasoline, describing their condition, age, and the code requirements for testing. The report shall provide recommendations for removal and/or replacement of tanks and contaminated soil.

2. Americans with Disabilities Act (ADA) and Accessibility Analysis Narrative (the "ADA Analysis Narrative" or "Narrative"): The Consultant shall provide a narrative that demonstrates compliance with the 2010 ADA Standards for Accessible Design (or the current ADA Standards for Accessible Design), Chapter 11 of the NYC Building Code regarding accessibility, including the ADA Path of Travel obligations associated with alteration work, and all other applicable laws, rules, and regulations (collectively, the "Accessibility Standards" as defined in Chapter 06, Section F). The Narrative shall address the entirety of the project and shall be updated at each phase as the project develops. If the Consultant finds that such obligations for compliance with the ADA or the NYC Building Code create additional project scope, they must so advise DDC in writing per Chapter 02, section G.

3. Zoning Analysis: Demonstrate compliance with NYC Zoning Resolution, including but not limited to setbacks, height limitations, etc. and identification of any required or recommended variances or Mayoral Zoning Override.

4. Probes: See Chapter 06: Design Criteria, Section C: Structures and Soils. Probes may be required for both site, building, exterior and interior renovations of all DDC projects.
5. Building Code Analysis: Demonstration of compliance with the NYC Building Code including a building characteristics, construction classification, occupancy, accessibility, egress compliance, fire separation, energy code requirements, live load requirements, etc. Identify potential needs for clarification or determinations from DOB.
6. Filing Strategy: Identify applicable pathways to DOB approval. Identify all Authorities Having Jurisdiction (AHJ).
7. Summation of opportunities, constraints, adjacencies, operation, and maintenance.
8. Identify any phasing or staging requirements, including the need for swing space and related operational requirements.
9. Sustainable Design (see Chapter 08: Sustainability and Resiliency).
10. Resilient Design (see Chapter 08: Sustainability and Resiliency).
11. The Consultant shall submit Schematic Design Interim I: Investigations Report to DDC for review by the Project Team.

ii. Schematic Design Interim Submission II: Options

The Design Options study allows the Project Team to explore and compare various approaches, testing each to weigh benefits, expose flaws, and challenge assumptions. Even when the range of viable approaches is narrow, this process is critical. While three options are required, the Consultant should not limit this study to three if additional ideas warrant exploration; likewise, the team should not waste time on options with little merit simply to satisfy this requirement. Ultimately, the Consultant is expected to deliver a design that meets the city's needs and satisfies the objectives stated in the Agreement. The study of alternative approaches, conducted collaboratively with the entire Project Team, ensures that the most efficient and cost effective solutions are adopted.

1. Blocking and stacking, massing, and site planning diagrams identifying key relationships, efficiencies, design opportunities and constraints for each option.
2. Diagrams, narratives, or other means of indicating how each option is in conformance with zoning requirements, building code, Accessibility Standards, in particular the ADA Path of Travel requirements, and other site and building constraints.
3. Outline plans, elevations, and sections for each option indicating surrounding context.
4. The Consultant is required to prioritize options that do not create impacts on existing structures on adjacent properties and, similarly, do not create potential impacts on the project due to possible future development on adjacent properties. See item 1.b.i.1.a. The siting of buildings on or in proximity to property lot lines should be avoided; where such is unavoidable, the Consultant must advise and consult with the Project Team and DDC Law prior to committing to any such scheme.
5. For projects involving building envelopes, alternative facade and fenestration treatments are to be provided.
6. Engineering narratives for each system proposed including usage, concepts, materials requirements, noise control, licensed operating personnel needed, building energy management systems, and life cycle costs (note that these may be applicable to multiple options).

CHAPTER 03: DESIGN & CONSTRUCTION PHASE DELIVERABLES

A. PROJECT DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

b. Schematic Design Deliverables

7. Preliminary engineering calculations for each option.
8. Project cost estimates for each option.
9. Recommended sustainable and resilient design features for each option (see Chapter 08: Sustainability and Resiliency).
10. The Consultant shall submit the Schematic Design Interim II: Options Report to DDC for review by the Project Team.
11. Evaluation of Design Options: The Consultant shall analyze the advantages, disadvantages, annual owning and operating costs for each alternative design scheme. The Consultant shall present and submit a report which includes requirements, restrictions, costs, advantages, and disadvantages of each scheme. Recommendations shall be made to DDC and the Sponsor Agency for review and approval.
12. Percent For Art: If applicable, this process will be introduced during Schematic Design for inclusion in the evaluation of alternative schemes. Refer to Chapter 09: Percent for Art.

iii. Schematic Design Final Report

The report shall include the documentation of the previously submitted Investigation and Options Interim Reports as appendices. The body of the report shall include:

1. Statement of Project Objectives, including a narrative of the Owner's Project Requirements (OPR) and the Basis of Design (BOD).
 - a. Owner's Project Requirements (OPR): While developing the preferred scheme, the Consultant shall record the primary design objectives and the rationale behind them in the OPR. This document should clearly outline the project goals and the intended operation of the building, including project scope, building use, occupancy information and schedules, budget constraints, energy efficiency goals, verifiable performance criteria, and operations and maintenance requirements. It must address all systems impacted by the project.
 - b. Basis of Design (BOD): The Basis of Design explains how the proposed design will meet the requirements and expectations outlined in the OPR. It shall describe the selected systems and explain anticipated facility operation. The BOD shall document the rationale for the design, including codes and standards, direction from the Sponsor Agency, concepts, calculations, design methods, and software used. The BOD shall include a history of revisions to the project, explaining the reasons for changes throughout the project phases.
2. Documentation and analysis of existing conditions, including building systems. Provide narrative descriptions of the following; existing site infrastructure, adjacent structures and related underpinning requirements, existing building structural system and condition, electrical, mechanical, and plumbing systems, fire alarm and/or fire protection systems, and security systems.
3. Building code and zoning analysis including a proposed filing strategy.
4. ADA and Accessibility Analysis: The ADA Analysis Narrative, as defined at paragraph 1.b.i.2 above, shall be updated as required to reflect the Preferred Scheme and shall include diagrams, narratives, and other means of indicating how each option is in conformance, as per paragraph B.ii.2 above, also updated as required.

5. Documentation and analysis of program requirements.
6. Preferred Scheme: Presentation of the recommended design, including analysis of site, architectural and engineering concepts and suitability to program requirements.
7. Site Design: Provide description of site concept plan including ground conditions, storm water management and utility access. Where applicable, an arborist should identify all trees and plant specimens known to be host species of invasive pests, identify invasive plant species, and requirements for street trees.
8. Circulation Study: A diagrammatic circulation study showing how horizontal and vertical circulation is accommodated. The circulation study will include an analysis of ADA Path of Travel requirements, accessible routes and means of egress, a vertical transportation analysis and recommendations for the number of elevators, or escalators, type of elevator systems, and control systems.
9. Sustainable Design (see Chapter 08: Sustainability and Resiliency).
10. Resilient Design (see Chapter 08: Sustainability and Resiliency).
11. Percent for Art (see Chapter 09: Percent for Art).
12. Structural, HVAC, Fire Protection, Electrical and Fire Alarm, and Plumbing narratives.
13. Preliminary heating and cooling calculations; calculations on a square footage basis are acceptable in the Schematic Design Phase.
14. Underpinning
The Consultant should avoid design solutions that require underpinning of neighboring properties or structures. If the Consultant believes that the Project Objectives cannot be achieved without underpinning, the Consultant must obtain written permission from the Commissioner to proceed with any scheme that requires underpinning. The Consultant shall include such written permission in the Schematic Design Final Report. Failure to timely notify the Commissioner of underpinning may result in project delays.
15. New utility service requirements shall be described. Connection or service upgrade requests to utilities shall be submitted (including load letters and preferred point of entry for new utilities).
16. The Consultant must determine if acoustical design is required, including supplemental acoustical testing report and analysis as indicated in the HVAC Design Criteria.
17. Schedule
The Consultant shall update the detailed project schedule as approved after the Kick-Off Meeting (see Chapter 04: Project Controls). The schedule must remain current during each phase and include any new relevant details.
18. Phasing of Construction
The Consultant shall provide a narrative description and diagrams for proposed phasing and staging. The need for swing space shall be identified.
19. Project Meeting Minutes
All meeting minutes, including bi-weekly progress meetings, shall be provided as an appendix to the Schematic Design Report.

CHAPTER 03: DESIGN & CONSTRUCTION PHASE DELIVERABLES

A. PROJECT DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

b. Schematic Design Deliverables

iv. Drawings

Schematic Design documents shall illustrate the resolution of the program requirements and shall be dimensioned and scaled, showing floor-to-floor heights and room sizes. The Consultant shall demonstrate the design's appropriateness in terms of economic, functional, and aesthetic factors.

1. Site Plan

As required by the nature of the project, a site plan shall be fully labeled and shall indicate materials, physical features and site furnishings, major grading, utilities, property or project limit, easements, buildings or structures on and adjacent to the project, and plantings.

2. Floor Plans

Floor plans shall be prepared for all floors within the scope of the project. Floor plans shall indicate all program spaces. Corridors, stairs, elevators, exits, mechanical chases, and compliance with Accessibility Standards, shall be evident.

3. Roof Plan

Roof plans shall indicate, at a minimum, the stormwater drainage features, all roof-mounted equipment, and skylights. Top of roof and top of parapet elevations shall be indicated. Requirements for Local Law 92-94 shall be identified.

4. Exterior Elevations and Sections

Exterior elevations and building sections shall indicate fenestration, entry, access, site features, and materials.

5. Engineering Drawings

Engineering drawings shall indicate structural, HVAC, fire protection, electrical and fire alarm system, and plumbing systems, indicating path of services, locations of stacks and risers, and equipment service room space requirements. Drawings shall indicate point of entry for utility company services and connections to available services on site. In addition, HVAC/Fire Protection engineering drawings shall indicate the following:

- a. System types, capacities, and zoning
- b. Location and spatial layout of major equipment
- c. Main ductwork routing
- d. Site utilities: Conceptual design solutions for on-site utility systems and off-site utility work

6. Existing Conditions Drawings

Existing conditions shall be surveyed by the Consultant. Drawings for all affected areas within the project scope shall show areas and elements requiring demolition, salvage, protection, impact upon design, neighboring property access, and integration with the proposed design. Drawing sets with photographs of existing conditions in lieu of survey drawings are not acceptable. However, photographs may be submitted alongside acceptable survey drawings.

7. Key Plans

Key plans shall adequately describe the project location and orientation.

8. Axonometric Drawing and Perspectives

Axonometric drawings, perspectives, and other sketches shall be prepared as necessary to fully illustrate and document all major elements of the design and massing.

v. Study Models

Study models will show three-dimensional volumes and proportions and, when necessary, the contextual relationship to surrounding buildings and streetscape. Study models are of importance in the design and evaluation of new buildings, building additions and significant renovations.

vi. Cost Estimate

(See Chapter 04: Project Controls).

vii. Presentation Documents

Various presentation documents are required by the PDC, Sponsor Agency and other regulatory agencies during the Schematic Design phase; see Chapter 10: Regulatory Approvals. In addition, presentation materials needed to resolve open design issues, including models and sketches, may be requested by the DDC Project Manager. Photographs of models and presentation materials will be submitted to DDC upon request.

c. Design Development Deliverables

Deliverables for Design Development shall advance the work of the Schematic Design Final Submission and shall be organized in accordance with DDC requirements for Single or Multiple Construction Contracts (see General Information section in this Chapter). Drawings must be coordinated between disciplines and organized according to trade. They must include developed site plans, floor plans, elevations, building and wall sections, material selections and finishes. Outline specifications, engineering calculations, and a Cost Estimate shall be included. The Consultant shall submit documents for design review by DDC, the Sponsor Agency, the Commissioning Agent, if applicable, and all Regulatory Agencies as required. Design Development deliverables include the following:

i. Design Development Reports shall have:

1. Project fact sheet with information including, but not limited to, net and gross area, block and lot number, zoning district, Community Board, Council District, and street address. List all applicable codes and laws, design guidelines, or other standards.
2. An executive summary including descriptive text, implementation schedule, design calculations, design criteria and a log of meeting minutes. The executive summary shall identify and explain any differences between the scope of work described in the Agreement and the submitted design.
3. Zoning and building code analysis updated as required to reflect design development, to include:
 - a. Zoning Data including diagrammatic resolution of urban design requirements.
 - b. Historic district including location within and limits of the district, as applicable.
 - c. Construction classifications, number of stories, occupancy classification, fire protection of the structural elements, overall building area and area by floor, building height, etc.
 - d. Life safety plans indicating egress paths, travel distances, occupant loads, fire rated enclosures, corridor widths, exit door and stair capacity, etc.
4. ADA and Accessibility Analysis: The analysis as per paragraph 1.b.i.2 above, shall be updated as required to reflect the development of the design and shall include diagrams, narratives, or other means of indicating how each option is in conformance, also updated as required.

CHAPTER 03: DESIGN & CONSTRUCTION PHASE DELIVERABLES

A. PROJECT DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

c. Design Development Deliverables

5. Narrative descriptions of each building system.
6. Drawings to appropriate scale and photographs, as required.
7. Material selections for interior and exterior.
8. Hazardous materials narrative indicating probability or known extent of hazardous materials and necessity for abatement.
9. Outline specifications carefully coordinated with project scope and intent, as well as design criteria for all trades (see Chapter 05: Bid Packaging Requirements).
10. Cost Estimate in CSI format
See Chapter 04: Project Controls
11. Renderings or Perspectives - or photographs of renderings and models, when required by the Agreement.
12. Finalized Owner's Project Requirements (OPR) and Basis of Design (BOD). The Consultant shall update these throughout this phase to reflect ongoing decisions. The Sponsor Agency must approve the final OPR.
13. Project Meeting Minutes
All meeting minutes, including bi-weekly progress meetings, shall be provided as an appendix to the Design Development Report.

ii. Site Plan

Site plan shall include:

1. Current topographic and boring survey performed by DDC based on the approved boring plan generated by the Consultant.
2. Site Layout Drawing shall describe the entire site within the property lines, as well as sidewalks and other access ways outside of the lot lines as established by DDC. It shall be fully labeled and based on a surveyed point of beginning.
3. Project Limit Line, indicating the extents of the work area, and all areas outside the project boundary.
4. Scale shall be 1"=20'-0" unless otherwise approved by the DDC Project Manager.

iii. Architectural Floor Plans

The information on the architectural floor plans shall include but is not limited to:

1. Dimensions including room sizes, maneuvering clearances, and room areas, etc.
2. Building lines, property lines and column grids.
3. Functional units as programmed in the Agreement, or as approved in the Pre-schematic or Schematic Design Phases.
4. Material indications as per conventional graphic standards indicating all new construction. New construction should be graphically distinct from existing construction to remain.
5. Built-in Furniture and Equipment shall be indicated on all plans in order to confirm required egress and accessibility.

6. Finished Floor Elevations shall be indicated at every location where the floor elevation changes, such as at top and bottom of stairs, landings, and ramps. Floor elevations shall also be indicated for the floor level in general.
7. Integration of artwork if participating in Percent for Art.
8. Fire ratings of walls, partitions, ceilings, shafts, roofs, and structural elements such as columns and slabs.

iv. Area Calculations

Calculations for area and building volume shall be prepared in accordance with DDC definitions of net and gross area below. Net square feet, gross square feet, floor to floor height, and gross cubic feet shall be indicated for each program space and subtotaled for each floor. Building totals shall also be included for each category.

1. Gross Area measured to the outside of the building walls, in square feet.
2. Net Area is the cumulative usable space within the partitions of each programmatic area. Not included are access and service spaces, shafts, wall thicknesses and structural elements.

v. Architectural Reflected Ceiling Plans

Architectural reflected ceiling plans shall include as applicable:

1. Light Fixtures at ceilings and walls.
2. Air Supply Diffusers and Return Grilles.
3. Ceiling Heights at every location where the ceiling elevation changes.
4. Materials.
5. Keying in of all building section and detail markers.

vi. Architectural Exterior Elevations and Building Sections

Architectural exterior elevations and building sections shall include:

1. Exterior Elevations of all vertical exterior surfaces.
2. Longitudinal and transverse Building Sections.
3. Site Features such as walls, fences, trees, artwork, street furniture, and adjacent structures.
4. Materials, fully annotated.
5. Finish Floor Elevations on building sections and elevations in coordination with plans.
6. Floor-to-Floor Heights on building sections.
7. Finished Grades on all elevations and building sections in coordination.

vii. Typical wall sections for each exterior wall type, including foundations and roof assemblies.

CHAPTER 03: DESIGN & CONSTRUCTION PHASE DELIVERABLES

A. PROJECT DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

c. Design Development Deliverables

vii. Partition types, detailed and cross-referenced to floor plans.

ix. Preliminary Door Schedule

At a minimum indicating dimensions, operation, fire rating, and material.

x. Interior Elevations

Interior elevations or perspectives and axonometric illustrations shall include:

1. Interior Elevations, developed, if requested, into one-point perspective sketches to illustrate how all the elements and surfaces are coordinated, and how the ceiling, walls, and floor interface.
2. Axonometric Illustrations, if requested, will detail sections through complicated connections and material intersections.
3. Materials including trim, window treatment, registers, controls, textures, and colors.
4. Built-in Furniture and Equipment indicating layout, configuration, and material.
5. Room Designations.
6. Vertical Dimensions, floor elevations, and floor-to-ceiling heights.

xi. Interior Design Drawings

Interior design drawings shall indicate the following:

1. Floor Plans fully dimensioned with component systems, furniture layouts, and equipment layouts.
2. Laboratory Equipment.
3. Kitchen Equipment.

xii. Furniture and Equipment

When directed in the Task Order, Project Objectives, or by the DDC Project Manager, the Consultant shall be responsible for various tasks regarding the selection of furniture, as listed below. Only the preliminary layout of furniture is included. If directed or required by the Agreement, the Consultant shall also perform the following tasks:

1. Preliminary Layout Drawings:
The Consultant shall prepare preliminary furniture layout plans to illustrate a conceptual understanding of the function of each room as per Sponsor Agency requirements. Layouts for systems furniture shall be prepared with manufacturer's templates. The plans shall incorporate all loose furniture, systems furniture, built-ins, and equipment and shall demonstrate compliance with egress and accessibility requirements.
2. Furniture Cost Estimate:
The Consultant shall provide a preliminary cost estimate for all furniture. The estimate shall identify the vendor, item description, order number, quantity, and the costs.
3. Furniture Selection:
The Consultant is responsible for selection of furniture.

4. Coordination of Not-in Contract (NIC) Items:
The Sponsor Agency is responsible for specifying and purchasing equipment such as photocopy machines, fax machines, and computers. It is the responsibility of the Consultant, however, to verify that all such equipment fits within the designated space, and to provide for mechanical, electrical, telephone service, and any other physical need for the operation of these items. Such items should be labeled NIC in the drawings.

xiii. Graphic Design and Wayfinding preliminary concepts.

Preliminary concepts as applicable.

xiv. Vertical Transportation Drawings

1. Key Plans indicating all areas of work.
2. Floor Plan of elevator machine room showing all elevator control equipment, power equipment, and mechanical equipment.
3. Lobby and machine room plans.
4. Riser Diagram indicating elevator installation, floors, elevator travel, and openings.
5. Elevations and Sections of elevator cab.
6. Sketches for controls such as call buttons.
7. Demonstrate compliance with Accessibility Standards.

xv. Models

A presentation model is required for all new buildings and additions if indicated in the Agreement.

1. Models shall be complete in scope, detail, and color selection.
2. Models shall be titled with the names of the project, the Consultant, the Sponsor Agency, and DDC.

xvi. Renderings

The Consultant shall submit, if required by the Agreement, perspective renderings and other presentation materials suitable for reproduction. These renderings and other presentation materials belong to DDC and shall be used at public meetings, in publication, and on the DDC website.

1. Renderings shall be titled with the name of the project, the name of the Sponsor Agency, and DDC Division of Public Buildings.
 - a. Digital files are also required and may be transmitted electronically
 - b. A signed release form shall accompany all renderings and photographs

xvii. Material Boards

1. Exterior Materials
As required by DDC, PDC and the LPC. Boards shall clearly show the relation of all new and existing exterior materials and finishes.
2. Interior Materials
As required by DDC and the LPC. Boards shall clearly show the relation of all new and existing interior materials and finishes.

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xviii. Outline Specifications

Outline specifications must conform to all DDC requirements for format, content, and completeness. Guidelines issued to the Consultant pertaining to legally prescribed language must be followed precisely. DDC's technical and legal teams will review the specifications thoroughly; revisions required by either team must be prepared and submitted expeditiously. Failure to do so on the part of the Consultant will delay the City's ability to initiate the bid phase. The Consultant's commitment to responding to all such requests with urgency is both required and expected. For all information on specifications, see Chapter 05: Bid Packaging Requirements.

xix. Landscape Architectural/Civil Engineering Drawings

Landscape architecture drawings, urban design and site development plans shall include:

1. Site removals and demolition plan identifying materials for reuse or recycling. Any invasive pest host species plants requiring pruning or removal must be indicated. Disposal protocols are mandated by New York State Department of Agriculture Markets (NYSDAM). Removal of invasive plant species may also be required.
2. Exterior paving including sidewalks, driveways, yards, curbs, and curb cuts.
3. Adjacent structures including walls, fences, railings, and buildings, including number of stories.
4. Landscaping including plantings and street trees. When street trees are in pavement include tree pit material, ground cover, and planting.
5. Grades to show the surface flow characteristics of the site. Indicate spot grades at entrances, property lines, walls, stairs, drain inlets, and major changes in site slope.
6. For new and existing buildings, indicate number of stories, clearance from building lines, finish floor elevations, building footprint, and overhangs.
7. Encroachments on site and all easements.
8. Show all basic surface and subsurface utilities, including drainage, lighting, electrical, water, irrigation, site utility systems, equipment, fixtures, controls, and any subsurface structures.
9. Integration of artwork as applicable.
10. A full planting list with Latin botanical names, common names, sizes and root containment types, assets, and constraints. This plant schedule must comply with the most current recommendations from the NYSDAM and NYC Parks regarding invasive pests and species or hosts.
11. All proposed site-related details, including site related structures and furnishings, their footings, foundations, and reinforcement. Include pertinent drainage structures, pavements, lighting, signage, other relevant materials, and all dimensions and finishes.

12. Sections and elevations of such key elements as fences, walls, gates, site furnishings, and significant new plantings. These must be coordinated with the appropriate architectural drawings. Buildings shall be represented only with their volumes, windows, doors, omitting details unnecessary to site design.
13. Builders Pavement Plan shall be initiated at this phase if required.
14. Stormwater Management design calculations and drawings.
15. Erosion and Sedimentation Control Plan shall be included to prevent soil erosion, sedimentation of sewer systems, and airborne dust pollution during construction.
16. Demonstrate compliance with Accessibility Standards.

xx. Structural Engineering Submission

The design documents shall consist of the following information:

1. Calculations
 - a. The Consultant shall submit a comprehensive set of structural design calculations, arranged in a logical sequence, with sheets properly numbered, labeled and indexed, clearly explaining all assumptions made and references to codes where applicable. Include any working drawings that may be required for proper documentation, showing detailed stress analysis of critical component parts of the foundations and the superstructure members. The set shall consist of the original design notes, or a suitable reproduction thereof, made by the structural engineer.
 - b. For any computer-generated results, submit the input data and the results together with all pertinent program materials required to understand the output. A narrative of the input and results for computer-generated calculations for the recommended structural concept should be contained in the calculations as well.
2. Narrative
 - a. Consultant shall provide a list of all applicable codes, design guidelines or other accepted standards, and the geotechnical report prepared by the Consultant (including soil investigation data and foundation recommendations).
 - b. Provide a written description of the structural systems to be used on the project (including foundations, substructure, superstructure, lateral force resisting systems, exterior cladding support, etc.). Provide sufficient technical detail and information to fully describe these systems for engineering review purposes.
 - c. Material Information
 - i. Concrete: Provide basic material properties for concrete to be used for all the structural elements. Include compressive strength, entrained air content, maximum aggregate size, allowable w/c ratios, unit weight or aggregate type, and anticipated admixtures, etc. Pozzolans shall be used to substitute for cement to the maximum extent possible.
 - ii. Reinforcement: Provide the ASTM material designations for the type of rebar to be used. Provide the type and dosage of structural synthetic fibers to be used for shrinkage and temperature stresses.

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- iii. Joints: Provide information on the type and spacing of all expansion, contraction and construction joints.
 - iv. Masonry: Provide ASTM designations for the types of masonry units and mortar to be used on the project, such as bricks, CMU, etc.
 - v. Steel: Provide the ASTM material designations for the steel to be used on the project. Itemize by the AISC shape as applicable, including material types, grades and sizes.
 - vi. Steel Deck: Provide basic information for the type of deck to be used, including profile and depth, ASTM material designation, span conditions, coatings, and method of attachment. Indicate areas where shoring of the metal deck will be required.
 - vii. Wood and Engineered Wood Products: Provide the grade and species for all products in addition to their design requirements, spacing, and any special treatments required (pressure treated, fire resistance, etc.). Identify the type of sheet goods (OSB, plywood, etc.) in addition to their thicknesses and locations for use.
- d. Structural Loading Information:
The following information and its source shall be provided in an easy to understand tabular format.
- i. Dead and live loads for all floors and roof.
 - ii. Snow load including: Flat roof snow load (P_f), snow exposure factor (C_e), snow load importance factor (I) and thermal factor (C_t).
 - iii. Wind loads: Basic wind speed, wind importance factor (I), wind exposure (C), internal pressure coefficient ($G C_{pi}$) and wind pressures for components and cladding.
 - iv. Earthquake loads: Seismic importance factor, occupancy category, mapped spectral response accelerations (S_s and S_1), site class, spectral response coefficients (S_d , S_{d1}), seismic design category, basic seismic force resisting system, response modification factor (R), system over strength factor (Ω_o), deflection amplification factor (α), redundancy coefficient (ρ) and analysis procedure used for design.
- e. Building Performance Basis of Design:
- i. Maximum allowable drift criteria.
 - ii. Maximum floor and roof live load deflections
 - iii. Floor flatness and levelness numbers.
 - iv. Maximum allowable horizontal and vertical deflection for members supporting exterior cladding and materials.
 - v. Floor vibration criteria.
- f. Proposed methods of corrosion protection, if applicable.
- g. The fire rating assumed for design of structural components.
- h. Special reports such as Geotechnical, Geological Hazard, and Blast Design reports and analyses, if applicable.
- i. Outline specifications for concrete, structural steel, metal deck and earthwork shall be submitted.
- j. A description of any deviations from the structural systems as approved in the Schematic Phase.

3. Drawings

The drawings submitted shall consist of a set that is developed from the approved scheme submitted at the Schematic Phase. The design and the structural systems shall have been developed and defined in accordance with the following:

- a. The design shall have been completed for the loads tabulated in the loading data.
- b. For rehabilitation projects, all structural work shall be shown on separate structural framing plans and detail drawings independent of architectural drawings.
- c. At a minimum, the drawings shall include the following information:
 - i. Demolition drawings, along with support of adjacent structures, as applicable.
 - ii. Foundation Plans indicating:
 1. All footings and/or pile caps with major sections and details referenced.
 2. The allowable soil bearing pressure for footings and the acceptable bearing strata for deep foundations.
 3. Footing/pile cap elevations.
 4. Major foundation sections and details indicating type, size, reinforcement and pertinent waterproofing details. Provide footing schedules with representation for grade beam and pile cap details, as applicable.
 5. All structural slabs and slabs on grades to be detailed with proper subgrade compaction and necessary waterproofing details.
 6. All necessary supports for cladding (such as brick shelf, embedded plates, anchors, etc.), as applicable.
 7. Typical elevator and sump pit details.
 8. Slab-on-grade construction and contraction joints shall be shown in a separate plan.
- d. Drawings shall clearly indicate the new members and the existing to remain and/or to be modified.
- e. Where underpinning is required:
 - i. Consultant shall show on plan, and on the sections, the extent and details of any underpinning that may be required.
 - ii. All relevant information of the adjacent foundations shall be shown. This information must have been confirmed by probes, test pits or other methods as necessary.
 - iii. Typical underpinning details shall be shown for information.
- f. Framing Plans shall indicate the following:
 - i. Building expansion joints.
 - ii. Elevations, sizes, thickness and layout of all structural components (such as slabs, beams, columns, trusses, etc.)
 - iii. All slab edges, opening and penetrations shall be located and dimensioned.

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- iv. Lateral load resistance system shall be clearly defined. Elevations of the lateral system shall indicate all applicable forces acting on the lateral system.
- v. Column schedule.
- vi. Weights and locations of major mechanical equipment and their supporting systems.
- g. Consultant shall provide major typical details for structural components and their connections.

xxi. HVAC and Fire Protection Submission

The design documents shall consist of the following:

1. Calculations and Energy Analysis
 - a. Updated heating and cooling load calculations.
 - b. Breakdown of individual peak space loads and ventilation loads.
 - c. A summary of simultaneous peak loads for equipment selection.
 - d. Psychrometric calculations for HVAC systems at full and partial loads (partial loads at 25%, 50%, and unoccupied periods).
 - e. Updated energy consumption calculations and analysis.
 - f. Water consumption calculations and analysis of make-up water for HVAC systems.
 - g. Fire protection water supply calculations, including water supply flow testing data.
 - h. Fire pump calculations, where applicable.
 - i. Preliminary hydraulic calculations.
 - j. Water reserve calculations for sprinkler system.
 - k. Smoke control calculations, where applicable.
 - l. Stairway pressurization calculations, where applicable.
 - m. Updated fuel consumption estimates.
2. Narrative

A written narrative describing the mechanical system and equipment selection including:

 - a. Indoor and outdoor design conditions for all spaces. Indicate occupied, 24-hour, and unoccupied conditions.
 - b. Temperature and humidity level to be maintained in each space.
 - c. Provide a dew point analysis at design conditions.
 - d. Ventilation rates, dehumidification, and pressurization criteria for all spaces. Indicate occupied, 24-hour, and unoccupied conditions.
 - e. Equipment capacities, weights, sizes, sound power, and power requirements.
 - f. Description of the air-side and water-side systems and the associated components including operating characteristics, ranges, and capacities, spaces served, and special features.
 - g. Description of control strategy and sequence of operations for all spaces. Indicate occupied, 24-hour, and unoccupied conditions.

- h. Noise control evaluation for projects that incorporate new or replacement of exterior mechanical/electrical equipment, as required to comply with NYC noise control requirements.
 - i. Corrosion protection for underground metallic piping, if required by the Geotechnical Report.
 - j. Updated fuel and utility requirements.
 - k. Building fire suppression systems.
 - l. Smoke control system(s), where applicable.
 - m. Fire pump selection and ancillary equipment.
 - n. Special fire protection systems (e.g., kitchen extinguishing system), where applicable.
 - o. A description of any deviations from the HVAC and fire protection systems as approved in the Schematic Design Phase.
 - p. Outline specifications.
3. Drawings
- Note: Drawings submitted (site plan, floor plans, flow diagram, and control diagrams) shall indicate new systems and existing systems to remain and/or to be modified. Submitting photographs in lieu of drawings showing existing systems is not allowed. However, photographs may be submitted in addition to drawings of existing systems. The drawings submitted shall consist of:
- a. Demolition drawings, as applicable.
 - b. Site Plan
 - c. HVAC Floor Plan(s):
 - i. Single line piping and ductwork schematic layout — with preliminary sizes indicated.
 - ii. Vertical risers, shafts, stacks, and chimneys.
 - iii. Drawings must show:
 - iv. Interior zone terminal air units.
 - v. Perimeter zone terminal units.
 - vi. Zoning.
 - d. Quarter-inch scale drawings of mechanical equipment room(s) showing all mechanical equipment, ductwork, and piping, including equipment access and service requirements in plans, elevations, and sections.
 - e. Roof plan showing all roof-mounted equipment and access to roof.
 - f. Single line schematic flow and riser diagram(s):
 - i. Air, water, and steam riser diagrams.
 - ii. Airflow quantities and balancing devices for all heating/cooling equipment.
 - iii. Flow/energy measuring devices for water and air systems for all cooling, heating, and terminal equipment. Flow diagrams shall be provided for new systems and existing systems being modified.
 - g. Automatic control diagram(s):
 - i. Control flow diagrams showing all sensors, valves, and controllers (analog and digital).

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- ii. Sequence of operations for all systems that describes the control sequences during occupied, 24-hour operations, and unoccupied conditions.
- iii. Control diagrams shall be provided for new BMS systems and for new and existing systems when inter-phasing with new BMS system.
- h. Schedules:
Provide schedules of major equipment that includes chillers, boilers, pumps, air handling units, terminal units, cooling towers, and all equipment required for 24-hour operation.
- i. Air terminal devices.
- j. Air balance relationships between spaces.
- k. Fire protection floor plan(s) showing:
 - i. Equipment spaces for fire protection systems (e.g. fire pump, fire command center).
 - ii. Fire protection water supply lines and fire hydrant locations.
 - iii. Standpipes and sprinkler risers.
 - iv. Zoning.
 - v. Location of special fire protection requirements (kitchens, computer rooms, etc.)
 - vi. Existing equipment.
- l. Riser diagrams for sprinkler system.

xxii. Electrical Engineering Submission

The design documents shall consist of the following information:

1. Calculations:
 - a. Load calculations.
 - b. Calculations for lighting, power, and equipment summary.
 - c. Power density analysis for lighting in each area.
 - d. Pertinent design calculations.
 - e. Emergency power design calculations, if applicable.
 - f. Life-cycle cost analysis of luminaire/lamp system and associated controls.
2. Narrative
A written narrative describing the electrical and low voltage systems and equipment selection including:
 - a. Description of alternative power distribution schemes:
 - b. Compare the advantages of each approach. Include the source of power, most economical voltage and metering.
 - c. Proposed power distribution scheme:
Provide a detailed description and justification for the selected scheme.
Address special power and reliability requirements, including emergency power and UPS systems, as applicable.

- d. Proposed lighting systems:
 - i. Describe typical lighting system features, including fixture type, layout, and type of controls.
 - ii. Describe special spaces, such as lobbies, auditoriums, dining rooms, and conference rooms.
 - iii. Describe exterior lighting scheme.
 - iv. Describe lighting control scheme and daylighting.
 - v. Describe the energy usage of the lighting system.
 - vi. Describe interface with BMS system, if applicable.
 - vii. Methods proposed for energy conservation and integration with BMS system, if applicable.
 - viii. Engineering analysis for demand limit controls.
 - e. Utility company available short circuit at the service entry point.
 - f. Fire Alarm System:
 - i. Describe building fire alarm systems.
 - ii. Interface of fire alarm system with BMS and security systems.
 - iii. Review of building for compliance with life safety requirements and building security requirements.
 - g. Description of each proposed signal system:
 - i. Description of proposed security systems' features and intended mode of operation.
 - ii. Proposed zone schedule.
 - iii. Proposed card access controls, CCTV assessment, and intrusion protection system, if applicable.
 - h. Proposed telecommunications infrastructure:
Systems proposed for infrastructure and cabling to accommodate the communication systems.
 - i. Code criteria.
 - j. A description of any deviations from the electrical systems as approved in the Schematic Phase.
 - k. Outline specifications.
3. Drawings
- The drawings submitted shall consist of:
- a. Demolition drawings, if required.
 - b. Drawings submitted (site plan, floor plans, single line diagram, and riser diagrams) shall indicate new systems and existing systems to remain and/or to be modified. Submitting photographs in lieu of drawings showing existing systems is not allowed. However, photographs may be submitted in addition to drawings of existing systems.
 - c. Electrical Service Room Plan and elevation of service entrance equipment and other electrical equipment, such as panel boards and fused switches.

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- d. Site Plan:
 - i. Proposed site distribution for power and communications, proposed service entrance and location of transformers, generators, and vaults, etc.
 - ii. Proposed location of electrical service room, telephone service, property lines, manholes, hand-holes, duct banks for power, telephone, and cable television. Coordinate electric service room location and anticipated points of entry.
- e. Floor Plans:
 - i. Proposed major electrical distribution scheme and location of electrical rooms and closets and communications closets.
 - ii. Equipment spaces for fire alarm panels and fire command center.
 - iii. Proposed major routing of major electrical feeder runs, bus ducts, communication backbone systems, and security systems.
 - iv. Plan layouts of electrical rooms, showing locations of major equipment, including size variations by different manufacturers.
 - v. Lighting layouts of typical rooms and spaces.
- f. Single line diagram of the building power distribution system.
- g. Motors and motor control center(s) locations.
- h. Typical power wiring – lighting, power, and controls.
- i. Site lighting and site electrical outlet systems, ISO foot-candle curves.
- j. Riser diagram for fire alarm system.
- k. Single line diagram of signal system including telephone, data, security, public address, and others.
- l. Security system site plan.
- m. Proposed locations for CCTV, duress alarm sensors, and access controls for parking lots.
- n. Security system floor plans:
- o. Proposed locations for access controls, intrusion detection devices, CCTV and local panels.
- p. Building grounding system.
- q. Lightning protection system.

xxiii. Plumbing Engineering Submission

The design documents shall consist of the following information:

- 1. Calculations and water analysis.
 - a. Water consumption calculations and analysis, including make-up water for HVAC systems, domestic water consumption, and water consumption for irrigation.
- 2. Narrative.

A written narrative describing the plumbing system and equipment selection including:

 - a. Updated description of plumbing system, including domestic cold and hot water, sanitary and storm drainage, and irrigation systems.

- b. Evaluation of alternate sources for reheating of domestic water (solar or heat recovery).
 - c. A description of any deviations from the plumbing systems as approved in the Schematic Phase.
 - d. Outline specifications.
- 3. Drawings

The drawings submitted shall consist of:

 - a. Demolition drawings, if required.
 - b. Drawings submitted (site plan, floor plans, single line diagram, and riser diagrams) shall indicate new systems and existing systems to remain and/or to be modified. Submitting photographs in lieu of drawings showing existing systems is not allowed. However, photographs may be submitted in addition to drawings of existing systems.
 - c. Site Plan:
 - i. Outside services exiting or entering the building and means of stormwater detention or retention.
 - ii. Related appurtenances, such as catch basins, inlets, manholes, and pipe routing.
 - iii. Fuel dispensers and fuel storage tanks, where applicable.
- 4. Plumbing floor plan(s):
 - a. Proposed building zoning and major piping runs.
 - b. Locations of proposed plumbing fixtures and equipment, including: tanks, sewage ejectors, sump pumps, interceptors, meters, backflow preventers, hose bibs, hydrants, water booster pumps, hot water heaters, hot water circulation pumps, stormwater storage tanks with all required pumps and filters.
 - c. Piping material and related equipment for the various systems.
 - d. Roof and site drainage and all related penetrations, drains, water retention, and typical details.
- 5. Systems schematics and flow diagrams.
- 6. Riser diagrams for the various systems.

xxiv. Hazardous Materials Survey Documents

The Consultant is responsible for providing adequate documentation to DDC's Office of Environmental and HazMat Services (OEHS) unit so that the extent of project scope can be fully understood.

DDC's OEHS unit will then provide the Consultant with an environmental survey and report for the Consultant's use to be incorporated into the Construction Documentation. OEHS's work product includes the following:

- 1. Accessible Hazards

A preliminary survey of the project site noting existing environmental conditions and properly defining the limits of accessible suspect hazards that may be disturbed, altered, demolished, or affected by the proposed work. Such environmental hazards may include, but are not limited to, asbestos building materials, lead-containing paints, PCBs from electrical transformers, underground storage tanks, and similar conditions.

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2. Inaccessible Hazards

Identification and location of any inaccessible suspect-hazards and arrangements for exploratory probes, physical penetrations, sample collection, and analytical tests to determine whether suspect-hazards are present within the boundaries of the scope of work.

3. Assessment

A comprehensive environmental survey and hazard assessment, with a subsequent formal report, to determine the presence and location of hazardous materials and/or environmental conditions. The survey report will document the materials and conditions found and expected to be impacted by the scope of construction. The report shall include the following information:

- a. A brief discussion of the services provided.
- b. An inventory of environmental hazards including, but not limited to, asbestos, lead, soil contamination, PCBs, mold and biological hazards, or similar environmental concerns.
- c. A written assessment of all hazards including cost of abatement or remedial work.
- d. Drawings or sketches showing approximate locations where samples were collected.
- e. An estimate of the quantities and conditions of the hazards identified in the survey.
- f. A summary of all samples, analyses, chains of custody, and laboratory certifications.
- g. Diagrams, photographs, sketches, drawings, etc., as necessary to document the conditions.

xxv. Commissioning

See Chapter 07: Commissioning

xxvi. Sustainable Design

See Chapter 08: Sustainability and Resiliency

xxvii. Resilient Design

See Chapter 08: Sustainability and Resiliency

xxviii. Percent for Art

See Chapter 09: Percent for Art

xxix. Detailed Cost Estimate

Include an index, or narrative, showing cost comparisons for alternative systems and materials. See Chapter 04: Project Controls for further information.

d. Construction Document Deliverables**i. Introduction**

While the 75% CD submission is required, the review period is not a stopping point in the development of the Construction Documents; it is expected that the Consultant will continue to further develop the documents while under review. The Bid Packaging process shall commence with the CD Phase Kickoff (see Chapter 05: Bid Packaging Requirements).

The 100% CD submission should be a complete, coordinated, and checked set of construction documents fully communicating the Consultant's design intent. The A&E review of the 100% CD submission will be a spot check.

Specifications must conform to all DDC requirements for format, content, and completeness. Guidelines issued to the Consultant pertaining to legally prescribed language must be followed precisely. DDC's technical and legal teams will review the specifications thoroughly; revisions required by either team must be prepared and submitted expeditiously. (See Chapter 05: Bid Packaging) Failure to do so on the part of the Consultant will delay the City's ability to initiate the bid phase. The Consultant's commitment to responding to all such requests with urgency is both required and expected.

The Bid Set is a formal turnover of complete documents ready for bid.

ii. 75% Construction Document Deliverables**1. Regulatory Approvals**

All correspondence, applications, objections, approvals, findings, test results, etc. received to date shall be submitted with the documents for review. The Consultant shall submit a status report on all required submittals to the DDC Project Manager showing actual submittal dates, approvals received, and any unresolved issues including any objection issued by the regulatory agency. The Consultant shall file the project with the Department of Buildings prior to the 75% CD submission. Refer to Chapter 10: Regulatory Approvals for additional information.

2. Drawings – General

All drawing submissions, including the work of all required disciplines, shall represent a minimum of 75% completion of the final Construction Documents set. The drawing set shall be coordinated with no room for unreasonable additional interpretation. The drawings indicated below represent DDC requirements for review, and do not constitute any limitation on the documentation required to properly contract the construction of the project or limit the Consultant's liability for errors and omissions. The drawing submission shall meet the following requirements:

- a. For multiple contract construction projects, the documents shall clearly indicate separation of contract work among the various contracts. See Chapter 05, Section D: Methods of Procurement.
- b. Use the same names, room numbers, gridlines, column designations, match lines, and drawing orientation throughout the construction drawings for all disciplines and specialties.
- c. All Special Inspections and Progress Inspections shall be identified on the title sheet or sheets for all trades.

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- d. The design shall meet the latest code provisions for resisting earthquakes. Specify or show details for anchoring and supporting equipment.
 - e. NYCECC energy analysis and supporting documentation shall be provided per DOB requirements for all applicable work.
 - f. ADA and Accessibility Analysis: Analysis shall be updated as required to reflect the development of the design.
 3. Technical specifications shall be developed to a minimum 75% level of completion for every involved project discipline. For all information on specifications see Chapter 05: Bid Packaging Requirements.
 4. Architectural Documents

The Architectural and Interior Design Documents as detailed under Design Development deliverables, shall be further developed consistent with a minimum 75% level of completion. Contents shall include but not be limited to:

 - a. General Notes Sheet includes General Conditions and DOB notes, project scope, zoning analysis, code analysis, including occupancy and construction classification data and egress plans as applicable. ADA and accessibility compliance diagrams.
 - b. Phasing/Staging Plans as applicable.
 - c. Site Survey as provided by DDC to be incorporated in the Consultant's documents.
 - d. Demolition and selective removals plans showing all required removals, extents, limits, and protection.
 - e. Site Plan including property line, lot and block, adjacent properties and streets, etc.
 - f. Floor and roof plans, including column grid and dimensions.
 - g. Building sections and exterior and interior elevations as applicable, with materials shown.
 - h. Detailed wall sections and enlarged details.

Wall sections shall indicate all wall assemblies, building conditions, insulation materials, ratings, assemblies, and characteristics complete in all details. Indicate fire ratings of walls, partitions, ceilings, shafts, roofs, and structural elements such as columns and slabs. Adjacent construction shall be indicated for complete context.
 - i. Reflected Ceiling Plans showing all light fixtures, exit signs, air supply diffusers and return grilles, sprinkler heads, and smoke detectors, etc. Material and level changes shall be indicated.
 - j. Door, Window, and Finish Schedules, at a minimum.
 - k. Graphic Design and Wayfinding schedules and details.
 - l. Vertical Transportation Plans layouts, details, and sections as applicable.
 - m. Furniture Layouts.
 5. Sustainable Design Documents (see Chapter 08: Sustainability and Resiliency)
 6. Resilient Design Documents (see Chapter 08: Sustainability and Resiliency)

7. Vertical Transportation Documents

For projects involving vertical transportation, the documents shall include but not be limited to:

- a. Floor Plans of all equipment such as controllers, main disconnect switches, motor generator sets, inter-communication equipment, ventilation, and air-conditioning equipment.
- b. Riser Diagrams
Indicating elevator installation, floors covered, all stop distances, total travel distance, buffer, and door openings.
- c. Car Details
Provide details for internal finishes, construction of car, emergency exits, lighting (including emergency lighting), handrail, exhaust fan, flooring, and all accessory equipment.
- d. Detail Drawings of hall buttons, lanterns, and car operating panel.
- e. Emergency Recall
- f. Shaft, footing, and structural calculations.
- g. Sections and Details for elevator shaft, elevator door head, sill, jambs, etc.
- h. ADA and accessibility compliance.

8. Landscape Architecture Documents

Landscape Architecture Documents shall include but not be limited to:

- a. Site Plan with major grade elevations, land contours, materials, and dimensioned locations of primary site features.
 - i. Builder's Pavement Plan
 - ii. Planting Plan
 - iii. Protection and Removals Plans
 - iv. Site Materials Plan
 - v. Details of all site design elements
 - vi. Site demolition and removals plan
 - vii. Elevations of adjoining buildings and foundations
 - viii. Site grading shall indicate existing and new grade elevations and land contours, at appropriate intervals, adjacent to the building and around the site. Elevations shall be given in feet with decimals to the nearest 1/100th. Provide storm drainage plan.
 - ix. Site Lighting and Site Electrical Plan
 - x. Site Irrigation Plan
 - xi. ADA and Accessibility compliance

9. Civil Engineering as applicable including but not limited to:

- a. Utility connections
- b. Site grading
- c. Storm water management
- d. Pavement and curb details
- e. Builder's Pavement Plan

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A. PROJECT DELIVERABLES

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10. Structural Documents

The Structural Documents shall consist of the following information:

a. Calculations

- i. The calculations as outlined in the Design Development (DD) Phase shall be updated and completed to 75% Construction Documents. Calculations shall reflect any changes, revisions, clarifications, or additional information as a result of DDC Design Review Comments and recommendations, and all regulatory agency approvals.
- ii. Whenever a figure is obtained from some other page of the calculations, refer to that page number in parentheses next to the figure used in the calculation.
- iii. Provide sketches showing framing plans with dimensions and grid lines, freebody/force diagrams in support of the calculations. Refer to drawing numbers where the calculated items are shown on the drawing: for example, structural sizes, connection details, etc.
- iv. The structural calculations shall include, but not be limited to:
 1. Gravity loads
 2. Lateral loads
 3. Foundations
 4. Thermal loads, where significant
 5. Vibration propagation
 6. Progressive collapse
 7. Supports for non-structural elements, including mechanical and electrical equipment on the roof and in equipment rooms, louvers, and other penetrations.
 8. Steel connections
 9. Blast analysis

b. Drawings

- i. Demolition or removal plans, where applicable.
- ii. Full set of structural construction drawings including, but not limited to:
 1. Drawings must be fully dimensioned, noted and detailed for bidding and construction.
 2. Basic wind speed, miles per hour, wind importance factor, building category, wind exposure, and the applicable internal pressure coefficient must be indicated.
 3. Foundation, Floor, and Roof Framing Plans.
 4. Structural sections, details, and elevations.
 5. Type and strength of all structural materials.
 6. Design Soil Bearing Value and pile type and capacity – soil bearing pressure and lateral earth pressure must be indicated.
 7. Bottom elevations of all footings, estimated pile lengths, and underpinning requirements.

8. Joints

Provide a plan clearly indicating and dimensioning all construction, control, and contraction joints.

9. Design Live Load

- a. Load criteria for all floor live loads, roof live load, roof snow load, wind load, earthquake design data, and special loads must be shown on drawings.
- b. Live load reduction of the uniformly distributed floor live loads, if used in design, must be indicated.

10. Required construction procedures.**11. Special shoring or bracing requirements.****12. Seismic design criteria, such as seismic use group, special response coefficients S_D s and S_{D1} , site class, basic seismic-force-resisting system, design base shear, and analytical procedure must be indicated, and any additional information required by NYC Building Code.****13. Soil Boring Plan and soils analysis, provided by DDC and incorporated into the drawing set.****14. Boring logs, provided by DDC and incorporated into the drawing set.****15. Blast-resistant requirements, if applicable.****16. Indicate the codes and standards used to develop the project.****iii. Schedules**

Schedules for foundations, columns, walls, beams, slabs, and decks, as applicable.

iv. Structural Details

All typical details must be shown on the drawings.

1. Sizes, locations, and details of major structural elements and their connections, including equipment supports and site structures, base plates and anchor bolts, camber, shear stud types, and lengths.
2. Location and details of all construction, control, and expansion joints.
3. Substructure waterproofing details – show extent of waterproofing and water-stop systems.
4. Details for anchorage of building system equipment and non-structural building elements (may be shown on mechanical, electrical, or architectural drawings, as applicable).

11. HVAC and Fire Protection Documents

The HVAC/Fire Protection documents shall consist of the following information:

a. Calculations and Energy Analysis

- i. Heating and cooling load calculations.
- ii. Systems pressure static analysis at peak and minimum block loads for occupied and unoccupied conditions.

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A. PROJECT DELIVERABLES

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- iii. Building pressurization analysis for peak and minimum block loads for occupied and unoccupied conditions.
- iv. Acoustical calculations for peak and minimum block loads for occupied conditions.
- v. Sound level calculations.
- vi. Flow and head calculations for pumping systems for peak and minimum block loads for occupied conditions.
- vii. Final selection of equipment and cut sheets of selected equipment.
- viii. Psychrometric calculations of the selected HVAC systems at full and partial loads (partial loads at 25%, 50%, and unoccupied periods).
- ix. Energy consumption calculations and analysis.
- x. Fuel consumption estimates.
- xi. Sizing of fuel storage and distribution system.
- xii. Sizing of vibration isolators for mechanical equipment.
- xiii. Water consumption calculations and analysis of make-up water for HVAC systems.
- xiv. For any fire modeling generated results, submit a copy of the input data and all pertinent program material and assumptions required to understand the output and the analysis. A narrative of the input and results must be part of the calculations.
- xv. Fire protection water supply calculations, including water supply flow testing data.
- xvi. Fire pump calculations, where applicable.
- xvii. Water reserve calculations for sprinkler system.
- xviii. Smoke control calculations, where applicable.
- xix. Stairway pressurization calculations, where applicable.
- b. Narrative
A written narrative describing the final mechanical system and equipment selection including:
 - i. Indoor and outdoor design conditions for all spaces. Indicate occupied, 24-hour, and unoccupied conditions.
 - ii. Ventilation rates, dehumidification, and pressurization criteria for all spaces. Indicate occupied, 24-hour, and unoccupied conditions.
 - iii. Equipment capacities, weights, sizes, sound power and power requirements.
 - iv. Psychrometrics of HVAC systems.
 - v. Description of the air-side and water-side systems and the associated components, including operating characteristics, ranges, and capacities, and spaces served and special features.
 - vi. Description of the control strategy, specific operating and sequence of operations for all spaces. Indicate occupied, 24-hour, and unoccupied conditions, and required interlocking for each system.

- vii. Analysis report related to acoustic design compliance.
 - viii. Noise control methods for projects that incorporate new or replacement of exterior mechanical/electrical equipment, as required to comply with Local Law 113 of 2005 (Noise Control Code).
 - ix. Fuel and utility requirements.
 - x. Description of any deviation from the HVAC and fire protection systems as approved in the Design Development Phase.
- c. Specifications
Completely edited version of each specification section to be used on the project. (see Chapter 05: Bid Packaging Requirements)
- d. Drawings
The drawings submitted shall consist of the following:
- i. Demolition drawings, as applicable. Indicate all existing systems to be demolished.
 - ii. HVAC Floor Plan(s) showing all components of all systems, including room-by-room duct distribution, diffuser, and register locations. Fully describe existing systems and/or integration of existing or new system:
 - 1. Double line piping and ductwork layout criteria.
 - 2. Show interior zone terminal air units.
 - 3. Show perimeter zone terminal units.
 - 4. Show locations of automatic control sensors (e.g. temperature, relative humidity, CO₂, etc.).
 - 5. Refrigerant pipe routing to and from interconnected pieces of equipment shall be sized and shown on the HVAC plans. Indicate all filter dryers, solenoid valves, strainers, pressure relief valves, flexible connections, receivers, and sight glasses.
 - iii. Roof Plan showing all roof-mounted equipment and access to roof.
 - iv. Mechanical details:
 - 1. Quarter-inch scale drawings of mechanical equipment room(s) showing all mechanical equipment, ductwork, and piping, including equipment access and service requirements in plan, elevations, and sections.
 - 2. The Consultant shall clearly indicate the manufacturer's required access space or tube-pull space for all mechanical equipment criteria.
 - 3. Provide installation details of each equipment type used on the project.
 - 4. All valves must be shown. Indicate locations where temperature, pressure, flow, contaminant/ combustion gases, or vibration gauges are required, and if remote sensing is required.
 - 5. Mechanical room piping, and ductwork layout must be double line. All ductwork and piping 3" diameter and larger located in mechanical equipment rooms are to be indicated to scale.

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6. Sections

If the mechanical equipment room contains multiple pieces of equipment, provide at least two sections to show the elevations of all equipment, piping, ductwork, and structural supports. Scale for sections to be 1/4" = 1'-0" or larger. Ductwork to be shown in double line drawing.

7. Mechanical Equipment Room

a. Additional sections

Where mechanical equipment units, ductwork and piping are located in tight spaces, sufficient sections shall be developed to show elevations of all equipment, piping, ductwork, and structural support. All sections to be 1/4" = 1'-0" or larger.

b. Composite drawings

For equipment rooms, congested corridors, and all areas involving the work of more than one trade, provide composite sections showing all new and existing equipment and conditions.

8. All dampers – both fire dampers and volume control dampers – must be shown. Ductwork ahead of the distribution terminal must be indicated in true size (double line).

9. Single line schematic flow and riser diagram(s):

a. Water flow quantities and balancing devices for all heating/cooling equipment.

Provide complete schematic flow diagrams for all systems, both new and existing to be modified, showing all necessary equipment and valves. Systems include steam, chilled water, condenser water, hot water, fire protection, and fuel oil.

b. Airflow quantities and balancing devices for all heating/cooling equipment, air-handling, air-conditioning, and exhaust systems. The Consultant shall indicate all automatic controls, dampers, temperature sensors, control valves, return/relief air routing, and maximum and minimum air quantities for supply, return, and relief air. Provide control system legend.

c. Show location of all flow/energy measuring devices for water and air systems for all cooling, heating, and terminal equipment, and their interface with the BMS.

d. Refrigerant piping schematic flow diagrams.

e. Flow and riser diagrams shall be provided for new systems and existing systems being modified.

10. Automatic control diagram(s):

a. Control flow diagrams showing all sensors, valves, and controllers (analog and digital inputs for controllers, front end equipment, and system architecture).

- b. Diagrams to show control signal interfaces, complete with sequence of operation of all heating, ventilating, and cooling systems during occupied, 24-hour operations, and unoccupied conditions.
- c. Control diagrams shall be provided for new BMS systems and for new and existing systems when inter-phasing with new BMS system.

11. Schedules:

- a. Provide schedules of equipment that include chillers, boilers, pumps, air-handling units, terminal units, cooling towers, and all equipment required for 24-hour operations.
- i. The Consultant shall submit equipment schedules with basic equipment design parameters completed to indicate type, capacity, and zoning of systems.
- b. Air terminal devices.
- c. Provide schedules for fire protection and other special systems.

12. Air balance relationships between spaces.**13. Full set of fire protection construction drawings indicating branch sprinkler piping and head locations.****14. Fire protection details (all typical details must be shown on the drawings).**

- a. Life safety stairway pressurization fans.
- b. Fire pump configuration.
- c. Anchorage of underground fire protection water supply lines.
- d. Standpipe riser.
- e. Installations of waterflow switches and tamper switches.
- f. Sprinkler floor control valves, sectional valves and test assembly.
- g. Non-water-based fire extinguishing systems (e.g. wet chemical).
- h. Special fire protection systems (e.g. kitchens, computer rooms, etc.)

15. Riser diagrams for sprinkler system.**16. Coordinate with electrical power requirement for HVAC equipment, requirements and location of duct smoke detectors, fire and smoke dampers, fire alarm, and fan shut-down.****17. Identifications:**

All air-handling units shall clearly identify all coil sections, filters, access locations, and the mixing plenum. The location and weight of all equipment shall be indicated. Indicate openings, penetrations, and support.

18. Energy compliance drawings, COMcheck.

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A. PROJECT DELIVERABLES

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12. Electrical Documents

The Electrical documents shall consist of the following information:

- a. Calculations
 - i. Load calculations.
 - ii. Emergency power calculations, including generator calculations and starter loads, where applicable.
 - iii. Illumination level and lighting power calculations.
 - iv. Lighting power densities.
 - v. Short circuit calculations.
 - vi. Provide short circuit calculations for all affected points in the distribution system. Indicate AIC ratings of incoming service, panelboards and overcurrent protective devices. Indicate short circuit values on appropriate points of the single line diagram.
 - vii. Provide voltage drop calculations for all affected points in the distribution system. Indicate voltage drop values on appropriate points of the single line diagram.
 - viii. Where applicable, submit a protective device coordination study indicating selective coordination between the service switch or circuit breaker and the distribution switches and/or the switchboards, and downstream of the switchboard.
 - ix. Arc Flash Study.
- b. Specifications
 - i. Completely edited version of each specification section to be used on the project.
 - ii. Lighting fixture schedules may be bound into the specifications.
 - iii. Lighting control schedules and zoning schedules may be bound into the specifications or shown on the drawings.
- c. Drawings

All projects shall have separate electrical plans for demolition, lighting, power, and low voltage (including fire alarm, telecommunications, and data systems). The drawings submitted shall consist of:

 - i. Demolition Plans, if required.
 - ii. Site Plan:

Indicate service locations, manholes, hand-holes, duct banks for power, telephone, cable television, and site lighting.
 - iii. Floor Plans:
 1. Show lighting and power distribution (both on normal and emergency power), communications raceway distribution, and locations of fire alarm devices and annunciator panels.
 2. Floor plans shall show detailed layout of major conduit runs to eliminate conflicts and interference with other trades.
 3. All home runs shall be shown and properly indexed as to number and size of conduit, wires and destination.

- iv. Riser diagrams and/or single line diagrams:
 - 1. Single line riser diagram of primary and secondary power distribution shall include: normal power, emergency power, and UPS. Single line power riser diagram shall include distribution panels and downstream panelboards, major mechanical equipment, emergency panels, and transformers.
 - 2. Single line diagram for fire alarm system.
 - 3. Single line diagram of signal system including: telephone, intercom, data, security, public address, and other systems shown on the drawings.
- v. Lighting fixture details with details of construction and mounting support.
- vi. Control Wiring Diagram, where necessary
- vii. Details of underfloor distribution system
- viii. Layout of electrical equipment spaces drawn to scale
 - 1. Show all electrical equipment; include scaled detailed elevations of substation transformers, main switchboards, distribution panelboards, and disconnect switches within the electric service rooms.
 - 2. Schedule for switchgear, switchboards, unit substations, motor control centers, and panelboards. Schedules shall include circuit destination, load in volt-amperes, overcurrent setting, load summary, connected, spare, and demand load.
 - 3. Grounding diagram
 - 4. Lightning protection system
 - 5. Site lighting and site electrical outlet systems, ISO foot-candle curves
 - 6. Drawings submitted (site plan, floor plans, single line diagram and riser diagrams) shall indicate new systems and existing systems to remain and/or to be modified.
 - 7. Complete phasing plan (if required) for additions and alterations
 - 8. Security system site plan:
 - a. Final locations for all security devices and conduit runs
 - b. Security system floor plans:
 - c. Layout of all security system devices
 - 9. Building grounding system
- d. Utility company letters (electric, telephone, CATV, etc.) and utility company responses, including service layouts
- e. A description of any deviations from the electrical systems as approved in the Design Development Phase.

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A. PROJECT DELIVERABLES

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13. Plumbing Documents

The plumbing documents shall consist of the following information:

a. Calculations

- i. Include entire building, including drainage calculations and hot water heating calculations.
- ii. Water supply calculations, including pressure.
- iii. Sanitary waste sizing calculations.
- iv. Water consumption calculations and analysis, including make-up water for HVAC systems, domestic water consumption, and water consumption for irrigation.

b. Narrative

- i. Description of plumbing system, including domestic cold and hot water, sanitary and storm drainage, and irrigation systems.
- ii. A final evaluation of alternate sources for preheating of domestic water (solar or heat recovery).
- iii. A description of any deviations from the plumbing systems as approved in the Design Development Phase.
- iv. Letters to respective utility company load letters, DEP site connection proposal, hydrant flow test results and any approval and/or utility room approved layouts.

c. Specifications

Completely edited version of each specification section to be used for the project.

d. Drawings

The drawings submitted shall consist of the following:

- i. Demolition drawings, if required.
- ii. Drawings submitted (site plan, floor plans, single line diagram and riser diagrams) shall indicate new systems and existing systems to remain and/or to be modified.
- iii. Site Plan:
 1. Connections
 2. Location of storm and sanitary sewers, connection to existing sewers, pertinent inverts, size and location of means for stormwater detention or retention, water services, domestic and fire, and the location of gas service, integrated with existing systems, indicated on the site plan and coordinated with floor plans.
 3. Grade elevations.
 4. Provide grade elevation of catch basins, manholes, and drains.
 5. Gasoline and diesel systems.
 6. Fuel dispensers and fuel storage tanks, where applicable, including details and notes.

iv. Plumbing floor plan(s):

1. Plumbing layout and fixtures, equipment and piping; large scale plans should be used where required for clarity.
2. Location and size of all roof drains, standard or interior piping for storm, sanitary, cold water, hot water, circulating, gas, fire standpipe, or removed systems or elements indicated on separate plans.
3. Size and capacity indicated for all oil separators, hot water storage tanks, sump pumps, sewage ejectors, and house pumps, circulating pumps, stormwater detention tanks, suction tank, and stormwater tanks.

v. Systems schematics and flow diagrams.

vi. Riser diagrams for waste and vent lines.

vii. Riser diagrams for domestic cold and hot water lines.

viii. Riser diagrams for all other systems (gas, fuel, etc.)

ix. Schedule: Plumbing fixture schedule.

14. Hazardous Materials Bid Documents

Unless otherwise determined by DDC, all Hazmat removal design work required will be performed through DDC OEHS (Office of Environmental and HazMat Services); documents will be provided to the Consultant. The Consultant shall be responsible to review and coordinate the Hazmat survey abatement scope with the project work scope and identify related or affected project scope items. The Consultant shall incorporate the documents within the construction documents and coordinate with other required work.

15. Sustainable Design

See Chapter 08: Sustainability and Resiliency

16. Resilient Design

See Chapter 08: Sustainability and Resiliency

17. Cost Estimate

See Chapter 04: Project Controls

18. Bid Packaging

See Chapter 05: Bid Packaging Requirements

iii. 100% Construction Documents Deliverables

1. Regulatory Approvals

At this stage of the project all submissions to DOB and other regulatory agencies and utility companies should be completed. All correspondence, approvals, findings, and test results shall be submitted with the documents for review and record. The Consultant shall submit a final status report on all required submittals to the DDC Project Manager showing actual submittal dates, approvals received, and any unresolved issues, including any objections issued by the regulatory agency.

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A. PROJECT DELIVERABLES

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2. General

All submissions, including drawings and all required disciplines, shall show a minimum of one hundred (100%) percent completion, coordination and shall include the following requirements:

- a. Commissioning specifications. See Chapter 07: Commissioning.
- b. Final NYCECC energy analysis, COMcheck, and Calculations
- c. Project Schedule including construction. See Chapter 04: Project Controls.
- d. Indicate all phasing and Sponsor Agency requirements.

e. Long Lead Time Items

The Consultant shall prepare a separate list of all items that require early procurement. These long lead time items, which may significantly impact project duration and coordination, shall have previously been discussed during project design.

- f. ADA and Accessibility Analysis: Analysis shall be updated as required to confirm the full compliance of the completed design with the Accessibility Standards.

3. Technical Specifications

Technical specifications shall be developed to a 100% level of completion for every involved project discipline. The specifications shall reflect any changes, revisions, clarifications, or additional information as a result of DDC review comments and recommendations, and all regulatory agency approvals.

- a. For all information on specifications see Chapter 05: Bid Packaging Requirements.

4. Construction Documents

The Construction Documents shall be completed to 100%. Documents shall reflect any changes, revisions, clarifications, or additional information and/or details as a result of DDC review comments and recommendations, and all regulatory agency approvals.

5. Commissioning

See Chapter 07: Commissioning

6. Sustainable Design

See Chapter 08: Sustainability and Resiliency

7. Resilient Design

See Chapter 08: Sustainability and Resiliency

8. Percent for Art

See Chapter 09: Percent for Art

9. Regulatory Approvals

The Consultant shall file and prepare applications to DOB and other applicable governing agencies during the construction documents phase. Provide copies of all submitted regulatory agency applications. A complete set of construction documents shall be submitted at the 100% Construction Documents submission

to DDC bearing the stamps of approval and be accompanied by all necessary applications, certificates, or permits of all utilities and NYC, NYS, and Federal Agencies having jurisdiction over any phase of the work, not limited to DOB. Where approvals have been received and changes were subsequently made prior to bid affecting the work covered by the approvals, the Consultant shall resubmit and receive approval for the revised work.

See Chapter 10: Regulatory Approvals

10. Hazardous Materials Bid Documents

The Consultant shall be responsible for reviewing and coordinating abatement scope with the project work scope and incorporating documentation provided by DDC OEHS into the Final Construction Documents.

11. Final Cost Estimate

See Chapter 04: Project Controls

12. Addendum to General Conditions

See Chapter 05: Bid Packaging Requirements

e. Bid Document Deliverables

i. Summary of Deliverables

After approval of the Construction Document drawings, technical specifications, and the Addendum to the General Conditions, the Consultant shall deliver electronic copies of drawings, specifications, and estimates in DDC approved format for permanent DDC records with the bid document submissions.

ii. Construction Documents

1. Drawings Format

Full size drawings shall be on reproducible media as directed by the Project Manager. They shall conform to the approved deliverables identified in the 100% Construction Documents.

2. Conformity with Comments

Drawings shall fully conform to 100% Construction Document Review Comments by DDC.

3. Sign and Seal

Include identification, professional seals and signatures of the Consultant and any sub-consultants on all drawings to meet the requirements of Article 27-157 of the New York City Administrative Code.

4. Approvals

Submit original of all drawings or documents bearing stamps of approval by each regulatory agency, including but not limited to DOB, LPC, and PDC.

iii. Specifications

For all information on technical specifications see Chapter 05: Bid Packaging Requirements.

Electronic file of final cost estimate in DDC approved format shall be submitted.

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A. PROJECT DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

f. Bid and Award Deliverables

g. Construction Administration Services

f. Bid and Award Deliverables

i. Summary of Deliverables

During the period of bid advertisement and analysis, the Consultant shall prepare the following, as necessary:

1. Addenda

Addenda drawings and specifications shall be produced by the Consultant as required in response to Contractor questions and requests for information arising during the Pre-Bid Meeting or as otherwise necessary for the clarification of the Bid Documents. The Consultant shall submit all addenda, including drawings and specifications, to the DDC Project Manager and the DDC A&E Unit for review and approval. The DDC Project Manager will inform the Consultant of all format requirements, including the specific addendum number.

2. Filing and Signature

The Consultant shall sign and seal all necessary drawings. Drawings which need to be filed with, or presented to, regulatory agencies, including, but not limited to, the NYC DOB, shall be prepared and filed by the Consultant. The Consultant shall send regulatory agency approvals to the DDC Project Manager. Changes that require approval by the Landmarks Preservation Commission will be filed by DDC. Changes that require approval by the Public Design Commission will be filed by the Consultant at the direction of the DDC Public Design Commission Liaison.

3. Bid Tabulation Analysis

The Consultant shall attend the Bid Opening and review the Bid Tabulation available at the end of the Bid Opening to assist in discovering any bid anomalies.

4. Issue for Construction Set

The Consultant shall assemble and submit a complete set of Construction Documents that incorporates all addenda, RFI responses, sketches.

g. Construction Administration Services

i. Basic Services During Construction

1. Field Inspection Report

- a. The Field Inspection Report shall be issued monthly at a minimum.
- b. The content of the Field Inspection Reports is essential to assuring the quality of the construction work being installed. Detailed observations on current work, field conditions, connections, clearances and Contractor capability will assist the DDC Construction Project Manager in quality control efforts. The Field Inspection Report is the vehicle by which the Consultant is empowered to assure that ongoing construction work complies with the design intent, details, and specifications, which form the basis of the Contract Documents.
- c. The Field Inspection Reports are to be prepared by members of the Consultant team who are thoroughly familiar with the project.
- d. The Field Inspection Reports are to be submitted in writing to the DDC Construction Project Manager within five working days of the site visit. This will enable the DDC Construction Project Manager to address the issues identified in the reports at the next project site meeting.

- e. The Field Inspection Reports shall be signed and sealed by the appropriate Registered Architect, Professional Engineer or Registered Landscape Architect.
2. Bi-Weekly Job Site Meetings and Minutes
- a. Consultant Meeting Attendance

To facilitate completion of the work according to the standards of quality and the schedule set by the Construction Documents, the Consultant is required to attend all project meetings. Sub Consultants, as deemed necessary by the DDC Construction Project Manager, are also required to participate in the relevant portions of such meetings. These include the Construction Kick-off (Pre-Construction) meeting, job site meetings held every two weeks, and all meetings relating to the design.
 - b. Purpose of the Meetings

At the job site meetings the progress of the work is reviewed and the work coordinated between the various Prime Contractors. Attendees identify and confirm the next scheduled activities of work and eliminate, if possible, potential delays due to deliveries, field conditions, staffing or swing space conflicts.
 - c. Meeting Minutes

The DDC Construction Project Manager, or CM when applicable, will prepare and distribute the bi-weekly job site meeting minutes within three working days of the meeting. Copies shall be distributed to all meeting attendees and others as identified. The DDC Construction Project Manager, or CM, will prepare the meeting agenda and conduct the job site meetings.
3. Review of Shop Drawings, Samples, Cuts and Mock-Ups
- The Consultant shall receive shop drawings, samples, cuts, and mock-ups directly from the Contractor for review and approval. The Consultant shall review, approve, and distribute submittals per procedures described in the General Conditions. If applicable, submittal review shall be coordinated with the Commissioning Agent, as described in Chapter 07: Commissioning Section of this Guide.
- a. Submittal Requirements (See Chapter 05: Bid Packaging, Section C)

The Submittal Requirements shall be presented to the Contractor at the Construction Kick-off (Pre-Construction) Meeting. Contractors shall be responsible for filling in the item submission dates and the delivery dates for approval by the DDC Construction Project Manager.
 - b. The Consultant shall receive copies of the Contractor prepared approved schedules for the submission of shop drawings and samples and shall review these lists every two weeks. The Consultant shall review and direct modifications if required. Updated copies shall be submitted to the DDC Construction Project Manager.
 - c. The Consultant shall ensure that the updated copies of the approved schedules for shop drawings and samples shall include all information necessary to indicate progress on processing submitted to the DDC Construction Project Manager.
 - d. Listed information shall include the names of subcontractors, the titles of shop drawings and the due dates in accordance with the approved schedules. These include dates of issue, receipt, checking, return for correction, resubmission and final acceptance, along with other pertinent information.

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A. PROJECT DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

g. Construction Administration Services

- e. The Consultant shall act promptly and systematically to check all shop drawings, materials samples, and items exhibited in mock-ups to determine if the submittals are in accordance with the Contract Documents and specifications.
 - f. Sheeting, Bracing and Underpinning.
The Consultant shall review all necessary documentation for sheeting, bracing and underpinning.
 - g. Indicate Necessary Changes:
 - i. The Consultant shall indicate in writing on all submittals the changes necessary to conform to the Contract Documents and specifications within ten working days of the submittal. Responses by the Consultant shall be to both the submitter and the DDC Construction Project Manager.
 - ii. The Consultant shall make no changes to the design or changes causing additional cost or project duration without prior written approval from DDC.
 - h. LEED Submittals (see Chapter 08: Sustainability and Resiliency)
4. Review of Schedules of Items and Costs:
The Consultant shall promptly examine, recommend adjustments to, or indicate approval of, the schedules of items and costs submitted by the Contractor. This will allow DDC to establish a reasonable basis for subsequent partial payments to Contractors.
5. Recommendation of sub-contractor Qualifications:
The Consultant shall review the credentials of the proposed sub-contractors for compliance with the special experience requirements.
6. Interpretation of Contract Documents:
- a. Clarification/ Requests for Information (RFI)
The Consultant shall interpret Contract Documents, provide clarifications, and make recommendations, by drawing and in writing.
 - b. Prepare Supplementary Drawings
The Consultant shall promptly prepare any supplementary drawings that may be necessary for clarifying the contract documents.
 - c. Sealed and Signed
Supplementary drawings are to be sealed and signed by the Consultant or the sub-consultant, as appropriate, and shall issue revised or supplemental drawings to DDC as a Bulletin. All such issuances shall be recorded in a log by the Consultant.
 - d. Obtain Required Approvals
The Consultant shall obtain any approvals for supplementary drawings as necessary from applicable regulatory agencies and utilities.

7. Review of Contractor Coordination Documents
 - a. The Consultant shall review the Contractor's coordination documents and promptly report in writing to the DDC Construction Project Manager on issues relating to meeting the project schedule and achieving the quality of work specified in the Contract Documents.
 - b. The Consultant shall systematically monitor the progress of all construction work scheduled and promptly report to DDC any conditions that may cause delays in the completion of the work.
8. Resolution of Design Errors or Omissions
 - a. The Consultant shall promptly submit to DDC any necessary correspondence, supplementary or revised drawings, specifications, negotiated cost estimates and any other documentation or coordination material to resolve design errors or omissions.
 - b. Upon approval of the required changes in the contract documents by DDC, the Consultant shall promptly provide to the Contractors all the documentation necessary to execute the work as revised.
9. Installation of Furniture and Equipment
 - a. Site Visit

The Consultant shall conduct a site visit to survey the conditions at the site along the full path of the delivery, two weeks prior to the scheduled delivery. The Consultant shall identify problems such as unfinished ceilings, unpainted walls, and missing electrical work.
 - b. Efficient Furniture Installation

DDC must be notified immediately by the Consultant if there are any conditions which will prevent efficient furniture installation.
 - c. Room Furniture Layouts

The Consultant shall provide copies of individual room furniture layouts. These shall be posted, prior to delivery, at each respective room entrance.
 - d. Location of all Furniture and Equipment

The Consultant shall verify that all furniture and equipment is placed in the correct room and in the proper location as per contract room plans.
10. Construction Punch List

At Substantial Completion the Consultant shall participate in the preparation of Construction Punch Lists. The Consultant shall submit a list of items for the Punch List to the DDC Construction Project Manager within ten working days of the request of such a list. This list of items shall be based on a final site visit and Field Inspection Report, and on any unresolved problems that have been the subject of earlier reports or job site meetings. The Construction Punch Lists, prepared by the Consultant, the Contractor, and the DDC Construction Project Manager, will be compiled at a job site meeting and shall be part of the minutes of that meeting.
11. LEED Certification (see Chapter 08: Sustainability and Resiliency)

2) CAPITAL PROJECT SCOPE DEVELOPMENT (CPSD) DELIVERABLES

a. Interim Reports

The Consultant shall submit interim reports for review in graphic and descriptive form. As many interim reports shall be generated as may be reasonably required in the conduct of the study to effectively represent the effort and to obtain an approval from the DDC Front End Planning Program Executive representing acceptance by the Sponsor Agency, the A&E Review Team, and others as necessary.

b. Report Preparation

The Consultant should submit data for comments as directed by the Sponsor Agency, which also must approve the data before the Consultant prepares the final report.

c. Final Report

i. The Final Report shall contain:

1. Summary of Requirements
2. Graphic and Descriptive Documentation
3. Site Development Assets and Constraints
4. Space Requirements
5. Alternative Schemes
6. Order of Magnitude Construction Cost Estimate – for each alternative.
7. Project Schedule
8. Risk Assessment

ii. The Final Report should describe the required analyses and conclusions:

1. Existing Conditions Survey and Documentation
2. Zoning Analysis
 - a. Identify relevant issues.
 - b. Provide massing diagrams showing all height, set-back, and sky exposure plane requirements.
3. Building Code
 - a. Identify all applicable codes, local, state and federal laws, including demonstrating compliance with the Accessibility Standards.
 - b. Identify building and space occupancy groups, construction classifications, egress requirements, fire separation requirements, energy code and other applicable code requirements.
 - c. Identify code requirements for live loads, ventilation, fire protection, light levels, emergency lighting and power, plumbing fixtures, environmental noise levels, etc.
 - d. Identify the applicability of local, state and federal environmental and regulatory processes and permits.

4. Site Analysis and Analysis of Existing Conditions
5. Space Programming and Planning
6. Anticipated Growth or Diminishment
7. Work Space Standards
8. Special Purpose Areas
9. Building Service Areas
10. Adjacencies and Work Flow Diagrams
11. Furniture and Equipment
12. Programmatic Inventory and Use
13. Engineering Requirements
14. Service Requirements
15. Sustainable Design Requirements (see Chapter 08: Sustainability and Resiliency)
16. Active Design Requirements
17. Risk Assessment

d. Master Plan

If the Agreement for a study calls for the generation of a Master Plan, the Consultant shall develop an accompanying Master Plan Report to include:

- i. Scope of Study: A Master Plan may encompass not only building design and construction, but also environmental, ecological, regional, land use, economic development, traffic, and community issues as well.
- ii. Multi-Disciplinary Approach: Because of the comprehensive, long-term nature of a Master Plan's scope, the approach to and implementation of the Master Planning process must be multidisciplinary throughout its duration. In addition to the standard design professionals, Master Planning may require sub-consultants from such specialized fields as historic preservation, demography, sociology, traffic and transportation, urban planning, environmental planning, and economic development.
- iii. Inventory and Analysis: Master Plans shall examine a project's ecological, microclimatological, urban design, historical, zoning, and regulatory characteristics, as well as the concerns of pertinent community-based groups and jurisdictional entities as they relate to the project site and any existing or proposed structures. Beyond these requirements, Master Planning requires broad data collection and evaluation to assess the long-term impacts such data would have upon the ultimate planning and design recommendations to be generated. Master Planners shall conduct their inventory to best synthesize data into planning and design issues. These issues must then be prioritized to guide recommended development options.
- iv. Programming: The Master Plan will investigate the known and anticipated growth needs of the Sponsor Agency in the years to be covered by the Master Plan.

- v. Further Development: After inventory, analyses, issue identification and prioritization, and the development of various proposals, the Consultant, the Sponsor Agency, and DDC will choose to pursue one recommended option. This option will be developed to document every phase of the multi-year plan, and will include a program for Phase One, and possibly Phase Two of the plan, based on available funding.
The structure of the Master Plan shall be in the following order:
 - 1. Executive summary
 - 2. Existing conditions inventory
 - 3. Analysis of inventoried data
 - 4. Identification of planning and design issues
 - 5. Prioritization of planning and design issues
 - 6. Recommended planning and design options
 - 7. Programming
 - 8. Development phasing
 - 9. Phased costs
- vi. Progress Meeting Minutes.

B. GENERAL INFORMATION

1) **REPORT FORMAT REQUIREMENTS**

The Consultant shall prepare and submit printed copies of each required report to DDC unless otherwise specified in the Agreement. Reports shall also be submitted as a PDF digital file.

a. Report format requirements include:

- i. Binding with a back and front cover
- ii. Clear organization with a Table of Contents
- iii. Executive Summary
- iv. Project fact sheet with information including net and gross area, block and lot number, zoning district, Community Board, Council District, and street address. List all applicable codes, design guidelines, or other standards.
- v. Descriptive text, implementation schedule, design calculations, cost estimates, and a log of meeting minutes.
- vi. Illustrations, drawings to appropriate scale and photographs, as required.
- vii. Provide 2 hard copies of reports, estimates, and calculations.

2) DRAWING INFORMATION**a. Project Drawings**

Drawings shall meet the applicable requirements of the New York City Administrative Code.

b. Building Information Modeling (BIM)

DDC requires the use of Building Information Modeling (BIM) to deliver projects. The application of BIM to DDC projects shall be governed by the "DDC BIM Guidelines", a separate document (that can be found on DDC's website) to be used in conjunction with this Guide. BIM models shall be provided to the Project Manager at each design phase for New Construction or Major Renovation project types.

c. Computer Aided Design (CAD)

In some cases, Consultants may be allowed to prepare project Drawings using a Computer Aided Design (CAD) drawing system acceptable to DDC. Hand-drawn design drawings and sketches normally prepared during Pre-Schematic Design or Schematic Design are acceptable exceptions.

d. Submission and Utilization of Digital Drawing Files

Consultant shall furnish CAD drawing and BIM model files in addition to any prints or PDFs required at the end of each design phase, when submitting documents for bidding or when otherwise required to do so by DDC. Provisions shall be made for automatic quantity take-offs to be derived directly from the BIM models and CAD drawing files. These shall be used to prepare final estimates.

e. Ownership of Documents

All BIMs, CAD files, and documents shall be the property of DDC, and should be maintained as record documents by the DDC Project Manager for each project. Please refer to the BIM Guidelines for additional information on roles, responsibilities, use and requirements.

f. Provide 5 hard copies at 1/2 size.**3) DRAWING STANDARDS****a. Standard Sheet Sizes**

Drawings shall be on sheets sized 24x36 inches, with minimum borders of two inches on the left side to allow for binding and half inch on the right side, top, and bottom. Other sheet sizes will be permitted if required by specific project needs and approved in writing by DDC.

b. Contract Indicated by Letter

Drawing numbers shall be consecutive within each discipline or contract and be prefixed by the letter indicating the discipline or contract to which the drawings are applicable in accordance with DOB requirements.

c. Addenda Drawings

Addenda drawings are to be issued before bids are received and are to be numbered consecutively within each discipline or contract.

d. Supplementary Drawings

Supplementary Drawings are issued after bids have been received and are to be numbered consecutively within each discipline or contract.

e. Addenda and Supplementary Drawings

Addenda and supplementary drawings shall bear the notation, "PRELIMINARY- NOT FOR CONSTRUCTION", prior to inclusion in the Contract Documents.

f. Drawing Formats

Drawing formats are available from the DDC Project Manager and Team Leader. Use DDC Standard Title Sheet on all sets of Design Drawings and use DDC Standard Title Block on all Design Drawings.

g. Legends

Legends shall accurately depict graphic symbols used on the drawing to the same scale and weight.

4) EXISTING CONDITIONS DRAWINGS

a. Consultant's Responsibility

Unless otherwise indicated in the Agreement, the Consultant shall:

- i. Provide Existing Conditions Drawings of all parts of the building to be affected by the proposed work. Field measurement and probing the building may be necessary.
- ii. Review Existing Conditions Drawings prepared by others and provide a statement with regard to their adequacy and accuracy, verifying with field measurements and probes if necessary.
- iii. Reconcile Existing Conditions Drawings with other documents listed in the Agreement, or issued by the DDC Project Manager., and prepare a statement with respect to their correlation.
- iv. Augment Existing Conditions Drawings prepared by others, to provide a complete set to meet the stipulations of the Agreement and the Code.
- v. Existing Conditions Drawing with photographs of existing conditions in lieu of reconciled and augmented actual existing conditions drawings are not acceptable. Photographs to enhance the existing condition drawings are welcome.
- vi. One complete set of Existing Conditions drawings on a thumb/flash drive in CAD format or image of printed drawings reviewed and found to be accurate. Provide architectural existing conditions drawings as master set to all sub-consultants.

b. Tree Survey and arborist report.

5) FORMS AND GRAPHICS

a. DDC Forms and Graphics

The Consultant is required to use DDC's standard title blocks, graphics, and blank forms referred to in the preceding sections. To obtain these items, and for additional information about their use and requirements, contact the DDC Project Manager.

6) INFORMATION FOR CONSULTANTS**a. Correspondence**

Unless the Consultant is specifically directed otherwise, all correspondence shall be:

- i. Addressed to:
(Name of Project Manager)
Public Buildings Division
Department of Design + Construction
30-30 Thomson Avenue
Long Island City, New York 11101
- ii. Captioned with:
FMS (or CAPIS) ID Project Number
Project Title and Location Contract Number Correspondence Subject

b. Telephone

The agency telephone number is 718-391-1000. All staff at DDC can be reached with this number.

7) DIVISION OF RESPONSIBILITY FOR MULTIPLE CONTRACTS**a. Electrical Work Associated with HVAC And Fire Protection**

- i. The Electrical Contractor shall furnish and install the power wiring to starters, motors and in-sight disconnects
- ii. The HVAC/Fire Protection Contractor shall furnish, and the Electrical Contractor shall install, unless integral with the equipment, all starters and disconnects.
- iii. Furnishing and Installation of all control devices and all control and interlock wiring for equipment furnished under the HVAC/Fire Protection Contract shall be by that Contractor, including any power required for any control device. This power is to originate from a four circuit panel in each mechanical equipment room. If there is no electric panel in the room, the Electrical Contractor is to furnish and install this panel.
- iv. The Electrical Contractor is to provide a feed terminating in a junction box or disconnect. The HVAC/Fire Protection Contractor is to do all wiring from the junction box or disconnect to the boiler.
- v. Where the Electrical Contractor is to do power wiring to specific equipment, details of that electrical work are to be shown on the electrical drawings.
- vi. Motor Control Centers may be furnished by either the HVAC/Fire Protection Contractor or preferably the Electrical Contractor, but they must be installed and wired by the Electrical Contractor, except for external control wiring, which shall be installed and wired by the HVAC/Fire protection Contractor.
- vii. Sprinkler systems, including flow and temper switches are to be furnished and installed by the HVAC/Fire Protection Contractor. The Sprinkler Alarm Panel, and all wiring is to be furnished and installed by the Electrical Contractor and must be shown on the Electrical Drawings.

b. Electrical Work Associated with General Construction or Plumbing

- i. Power and control wiring for electrical equipment furnished under General Construction or plumbing contracts is to be furnished and installed by the Electrical Contractor and must be shown on the Electrical Drawings.
- ii. Luminous ceilings are to be furnished and installed by the Electrical Contractor.
- iii. Lighting fixture supports shall be furnished by the Electrical Contractor and installed by the General Contractor.

c. Elevator Work

- i. The Elevator Disconnect near the machine room entrance, including the feeder and the controller, shall be provided by the Electrical Contractor. All other related elevator electrical and control work is to be provided by the elevator sub-contractor.
- ii. The Electrical Contractor is to provide an electrical outlet box and telephone junction box at the midpoint of the elevator shaft. The telephone junction box is to be connected with empty conduit to the nearest telephone strip box.

d. Standpipe and Sprinkler Responsibilities

- i. The Plumbing Contractor is to provide water service for the sprinkler, standpipe and combined standpipe /sprinkler systems, from the main up to and including the first Outside Stem and Yoke (OS&Y) valve and the detector check valve.
- ii. The Plumbing Contractor shall provide the standpipe system, including the fire pumps, but not the sprinklers.
- iii. The HVAC and Fire Protection Contractor is to provide the combined sprinkler/standpipe system and the separate sprinkler system from the detector check valve, including the fire and booster pumps. This work does not include the water service up to and including the detector check valve that is to be provided by the Plumbing Contractor.
- iv. The Electrical Contractor is to provide all related wiring.
- v. Coordinate all requirements with DDC as these requirements relate to union jurisdiction in New York City.

e. Fuel Tanks

- i. The HVAC and Fire Protection Contractor shall furnish and install the fuel tanks, associated piping and miscellaneous controls for heating oil or emergency generators.
- ii. The Plumbing Contractor shall furnish and install all equipment for gasoline or diesel fuel dispensers.
- iii. The Electrical Contractor is to provide power for any required pumps.
- iv. The General Contractor, HVAC/Fire Protection or Plumbing Contractor is to provide for excavation, gravel, backfill, support pads and manhole access. A determination as to which Contractor shall do the work is to be made by DDC in conjunction with the Consultant.

f. Contractor Responsibility

Each Contractor is to perform all necessary rigging, cutting and patching, excavation and backfill for the work of their Contract, unless otherwise specifically noted on the plans and specification by the Consultant.

g. Access Doors

Access doors are to be furnished by the respective trades for installation by the Contractor for General Construction.

CHAPTER 04: PROJECT CONTROLS

- A. INTRODUCTION
- B. PROJECT SCHEDULE
- C. CONSTRUCTION COST ESTIMATING

A. INTRODUCTION

The Design Consultant is responsible for adhering to the approved project schedule and budget. The Design Consultant will identify in advance and gain DDC approval of any variance from the approved project schedule and budget. The Design Consultant will comply with the requirements found in this chapter addressing (B) Project Schedule, and (C) Construction Cost Estimating, along with the corresponding sections in DDC's Project Controls Guideline.

B. PROJECT SCHEDULE

The Design Consultant will receive a copy of the Integrated Project Schedule developed during Front End Planning by DDC to represent the total project duration from Initiation to Closeout, including the Design Phase, DDC Legal Review, which occurs after Bid Packaging Approval, the Bid and Award period, and the Construction Phase.

1) DESIGN PROJECT SCHEDULE

The Design Consultant is responsible for developing and maintaining the Design Project Schedule, which includes the Design Schedule, the Design Schedule Narrative, and the Risk Register. The Design Project Schedule will be updated and presented at every bi-weekly meeting and submitted for review monthly.

As part of each biweekly design meeting, the Design Consultant will provide the current schedule, identify upcoming activities, and clearly indicate any area where there is schedule slippage, or risk of delay. Should delays or schedule slippages be caused by the Design Consultant, DDC may require the Design Consultant to produce a recovery schedule and add additional resources to the project until the original Baseline dates are achievable once more.

The Design Schedule establishes target milestone dates and durations. The Design Schedule shall capture all design deliverables as defined in Chapter 03 and the Project Objectives. Consultants shall develop the schedule using the Critical Path Method (CPM) and industry standard project scheduling software; and may be required to develop the schedule using DDC's enterprise scheduling system. The Design Schedule shall be developed following the Association for the Advancement of Cost Engineering (AACE) Scheduling Best Practices, and will conform to the following:

a. Design Schedule

The Design Schedule shall separate the Design phase into the different subphases according to the assigned Project Delivery Track for the project, including: Pre-Schematic Design (PSD), Schematic Design (SD), Design Development (DD), 75% Construction Documents (75% CD), and 100% CD (including Bid Package approval). The Design Schedule shall also include:

- i. All activities with realistic durations occurring within each subphase, for the preparation and development of each of the design deliverables required of the project scope.
- ii. Field visits, surveys, investigations, probes and monitoring, material testing, hazardous material testing, and/or site analyses that must be performed for the development of the design deliverables.
- iii. All associated review activities and approvals related to each of the design deliverables by project stakeholders, including the sponsor agency and DDC A&E, CM (if applicable), and DDC Bid Packaging Unit.

- iv. All permitting and regulatory approvals required from outside agencies and entities (e.g., PDC, LPC, NYC DOB, FDNY, NYC DEP, Parks, Con Edison, etc.)
- v. All scheduled Design Progress Meetings and Milestone Submissions.
- vi. Critical decision-making that would impact construction schedule, such as phasing, swing space, etc.
- vii. Impacts to the design completion milestone date due to approved modifications to the original project scope as authorized by the DDC Program Unit. All such impacts must be differentiated from original project scope schedule activities.
- viii. Any additional activities as required by the DDC PM.

b. Design Schedule Narrative

The Design Consultant shall provide a monthly Schedule Narrative detailing the project scope, schedule milestones and explanation of variances between the baseline and forecasted milestone dates, changes to the project scope, and any risks or issues that may impact the project schedule. The monthly report shall also include the updated Design Consultants project-specific Risk Register.

c. Risk Register

A risk register is a formal record of identified risks, typically including additional summary information such as description, risk manager, risk owner, risk assessment, response strategy for treatment and control of the risk, and risk status. The Risk Register must also account for risks associated with project costs. See Section C.2.a. below.

d. Submission and Acceptance

The Design Consultant shall submit an electronic preliminary Design Project Schedule (native file in the format required by DDC) for review by DDC within fourteen (14) CCDs of Design NTP. DDC will provide comments on the Design Schedule Baseline within fourteen (14) CCDs. The Design Consultant must incorporate these comments into the baseline and resubmit within seven (7) CCDs. DDC will review this submission and, if acceptable, will establish these documents as the Design Schedule Baseline.

e. Updates

Once accepted by DDC, The Design Consultant shall update the Design Project Schedule monthly, using the last Friday of the month as the data date, and submit to the DDC PM/Project Team for review.

- i. Updates shall be provided to DDC in electronic native file format (as will be required by DDC) and modified based on project changes and per comments received by DDC's Project Team or DDC Project Controls.
- ii. The update will show the actual start date, actual completion date, and the percent complete of each activity. It will also include revised projections for future dates.

2) CONSTRUCTION SCHEDULE DURING DESIGN (CSDD)

For projects not supported by Construction Management services during design, the Design Consultant shall be responsible for the production of a Construction Phase schedule. This schedule, known as the Construction Schedule During Design (CSDD) will accurately represent the logical sequence and duration of the presumed Contractor's schedule. CSDD shall have a Schedule Narrative that provides details to the development of the schedule, to the extent that they are known during design, including:

- a. Overall period of performance of construction until Substantial Completion
- b. Assumptions made in the development of the schedule (e.g. construction phasing, sequences and constraints)

The CSDD and Schedule Narrative must align with the Design Consultant's cost estimate for each design phase. The schedule shall be developed following the Association for the Advancement of Cost Engineering (AACE) Scheduling Best Practices, according to the restrictions and constraints that the Contractor will be held to. Additionally, it shall conform to the following requirements:

- a. The CSDD must include the project Milestones required by DDC including:
 - i. Construction Notice to Proceed.
 - ii. Interim construction milestones.
 - iii. Construction Completion.
 - iv. Project Closeout.
- b. The intent is for the CSDD to progressively become more comprehensive with completion of each of the subphases of Design. Using AACE's 37R-06 "Schedule Levels of Detail – As Applied in Engineering, Procurement, and Construction," as a reference, the Design Consultant will be responsible for a CSDD deliverable that meets the following requirements during each subphase:
 - i. Schematic Design: The Design Consultant shall be responsible for the development of a Level 1 Schedule.
 - ii. Design Development: The Design Consultant shall be responsible for the development of a Level 1 or 2 Schedule, as directed by DDC.
 - iii. 75% Construction Documents: The Design Consultant shall be responsible for the development of a Level 2 or 3 Schedule, as directed by DDC.
 - iv. 100% Construction Documents:
 - 1. The Design Consultant shall be responsible for the development of a Level 2 or 3 Schedule, as directed by DDC.
 - 2. The Design Consultant shall develop the CSDD such that it will determine the overall duration to be used in the Construction Contract under Schedule A, and will be used by DDC during the review of the Contractor's submitted Preliminary and Baseline Construction Schedules.

C. CONSTRUCTION COST ESTIMATING

The Consultant shall maintain an accurate and up-to-date accounting of estimated construction costs. Detailed cost estimates shall be submitted at each phase of work in a format compliant with DDC requirements and at an appropriate level of development as indicated in Chapter 03: Design and Construction Phase Deliverables. The DDC Standard Construction Cost Estimate Template will be provided by the DDC Project Manager and is accessible via the DDC website.

Throughout the course of the project the DDC Project Manager will facilitate a series of Cost Estimating Workshops in which the Project Team and the Consultant's Cost Estimator shall participate. During these workshops, the Project Team will establish values for project-specific factors that impact cost but may not be reflected in the design documents. These include Overhead and Profit, Construction Contract Allowance, Bid Contingency, etc. as referenced in the DDC Standard Construction Cost Estimate Template. Initial values for these factors are included in the Front End Planning Report and must be verified and updated as needed throughout the course of the project. The Consultant should document these values and any revisions to them as may occur in the Basis of Estimate (BOE) submissions required in each phase.

2) CONSTRUCTION COST ESTIMATE CLASSIFICATION

The table below illustrates the characteristics of the construction cost estimate as it evolves through each relevant stage of design:

AACE Cost Estimate Classification	Maturity Level of Design Deliverables	Methodology	Expected Accuracy Range
Class 5	FEP - Front End Planning / Pre-Schematic Design	SF factoring, parametric models, judgement or analogy	L: -20% to -30% H: +30% to +50%
Class 4	SD - Schematic Design	Parametric models, assembly driven models	L: -10% to -20% H: +20% to +30%
Class 3	DD – Design Development	Semi-detailed unit costs with assembly level line items	L: -5% to -15% H: +10% to +20%
Class 2	50% - 75% Construction Documents	Detailed unit cost with forced detailed take-off	L: -5% to -10% H: +5% to +15%
Class 1	100% CD	Detailed unit cost with detailed take-off	L: -3% to -5% H: +3% to +10%

a. Class 5 Estimates

Factored or parametric model methodology can be an effective way to obtain rough cost estimates when limited design information is available typically during front end planning. It is typically a high-level unit-cost comparison utilizing historical cost data as a benchmark (e.g. cost per square foot for similar projects). Draw upon the estimator's experience with similar facilities and adjust for known project complexities and size or capacity differences.

b. Class 4 Estimates

Parametric models or assembly driven models can be used, typically during the schematic design stage. For example, the estimate may contain composite costs for each major element (e.g. cost per square foot for finishes, MEP, and structure).

c. Class 3 Estimates

Semi-detailed unit costs with assembly-level line items introduce composite unit costs for the various aspects of the project, typically during the design development stage of design.

d. Class 2 Estimates

Detailed unit cost with forced detailed take-off can be used when sufficient design detail is available to determine material take-offs for some project elements, typically at construction document design stage. Utilize a forced takeoff to determine quantities when the design is still missing a detailed material count (e.g. utilizing average pound per square foot for reinforcing steel in a concrete slab).

e. Class 1 Estimates

Detailed unit cost with detailed take-off can be used when sufficient design detail is available to determine material take-offs for all project elements, typically at the Construction Documentation design phase.

For more detailed information about the estimate classification system, please reference the Association for the Advancement of Cost Engineering (AACE) International Recommended Practice RP-56R-08 "Cost Estimate Classification System – As Applied for the Building and General Construction Industries."

2) DEVELOPING THE COST ESTIMATE

a. Cost Estimating Workshops:

Prior to the development of the first Cost Estimate for the project, the Project Team should communicate the overall output expectations and review the cost estimating process and methodology. Discussions should include the project scope and the documents that have been included with the cost estimate. The discussions and workshops should be ongoing throughout the Design phase and may also include:

- i. Key design features and potential cost-driving items not explicitly identified within the design documents.
- ii. Gap analysis that details the expected level of scope definition, including specific discipline completion percentages.
- iii. Risk Register.
- iv. Relevant historical cost data.
- v. Specific areas of change since the previous estimate.

- vi. Revisions made to the design specifically to address overruns identified in previous estimates.
- vii. Data sources, like labor, materials, and escalation.
- viii. Estimator's understanding of market conditions impacting bid costs.
- ix. Level of scope definition to ensure appropriate estimate class and range of accuracy.
- x. Class of cost estimate.
- xi. Work Breakdown Structure (WBS) requirements subject to approval by DDC. For multi-scope projects, separate the estimates by scope. For example, a roof replacement and boiler replacement occurring in the same building require separate estimates.

DDC will review and approve the WBS. DDC may also provide the estimator with historical data that can be useful when preparing the cost estimates. Such data can include prior bid variance analysis and range of contingencies, overhead and profit, and escalation typically adopted in cost estimates of prior projects.

b. The Cost Estimate must be based on the following at a minimum:

- i. Project scope description and Work Breakdown Structure (WBS) requirements, if any.
- ii. Current versions of construction documents and specifications.
- iii. The Risk Register.
- iv. Equipment lists as well as mechanical, electrical, and plumbing (MEP) requirements
- v. Vendor quotes, where applicable.
- vi. Design Gap Analysis: A Gap Analysis should be developed and provided to the Estimator by the Design Consultant. A Gap Analysis is an evaluation of the design documents against the approved scope. It identifies areas of the design that require further development, as well as elements that will be required but have not yet been designed.
- vii. Project schedule, including the construction phasing plan.
- viii. Existing field conditions that might require demolition or protection, but that are not shown on the drawings.
- ix. Associated costs for coordination with the city's other vendors for items excluded from the construction contract. This includes any services or equipment provided by others and not included in the estimate. Examples could include furniture, fixtures, and equipment; telecommunications; audiovisual; specialized equipment; security systems; and third-party-provided items like electrical transformers and meters.
- x. Site logistics plans showing probable Contractor field trailer locations, laydown areas, access/congestion issues, traffic/road closure requirements and other relevant information.
- xi. Project requirements for phasing, working around current occupants, swing space, special security restrictions, after-hours work shifts, and project impacts on adjacent property owners.
- xii. Geotechnical information, including borings, anticipated levels of groundwater, and specialty needs like vibration, stress, or settlement monitoring.

- xiii. Environmental reports regarding lead, asbestos, contaminated soil, and other potentially hazardous materials.
- xiv. Unique design features or constraints, such as work on a landmark building, custom features, and materials from specialty or overseas suppliers. Assumptions on logistics cost impacts, including fees and permits for trucking large components, components that can be fabricated offsite, equipment requiring cranes for installation (e.g., rooftop HVAC units).
- xv. Safety considerations, which may include unusual PPE requirements, areas requiring use of confined space procedures, working in a lead dust environment, proximity of pedestrians and adjacent occupants, noise and dust control, and requirements for special safety training.
- xvi. Listings of expected allowances, both for field change orders and for project-unique allowances, such as for Con Edison service connection fees. Include an explanation detailing why these allowances are not treated as line items estimated by quantities or quotes.
- xvii. If available, recent actual bids for similar jobs and completed scope job costs.
- xviii. Results of any constructability or biddability reviews that identify efficiencies or local customs that should be implemented, as well as assessment of final incorporation of reviews into the documents.
- xix. A list of any value engineering efforts and lists of any analysis of alternates.

3) COST ESTIMATE DELIVERABLES

The cost estimate submittal should conform to the DDC Standard Construction Cost Estimate Template including the basis of estimate and the cost estimate submittal checklist. Submit the estimate in hard copy form (5 copies) and in an editable electronic format. Microsoft Excel is an acceptable format, utilizing a DDC-provided standard template provided.

The project cost estimate shall be submitted in accordance with the following:

a. Design Value and Options

The Consultant shall deliver a design that is within the approved budget allocation for the project. The Consultant must evaluate life-cycle, operational and maintenance costs for the overall project, as well as all major systems. The Consultant must demonstrate that no less than three alternatives have been considered for all major systems and materials, and that the final options selected are as economical as possible. The Consultant shall submit a report documenting this analysis as part of the Basis of Estimate.

b. Basis of Estimate (BOE)

The BOE Report is the cost estimating deliverable used to document the project scope, pricing basis, allowances, assumptions, exclusions, cost risk opportunities, and any deviations from standard practices. A BOE provides concise supporting documents for records of agreements made between the estimator and other project stakeholders. The BOE should allow a full understanding of the estimate, independent of any other supporting documentation.

c. Format and Methodology

The estimate shall follow the most current 6-digit CSI format and must be fully coordinated with the project specifications. Each item in the estimate must correlate to a specification section: every spec section must correspond to the appropriate line item(s) in the estimate.

The estimate should include, but is not limited to, the following fields: CSI number, line item description, and quantity. Class 3 to Class 1 estimates should separate unit costs and total costs into labor, material, and equipment.

While developing the estimate, apply cost-estimating methodology in a manner that agrees with the level of design detail available. When providing cost estimates, expert judgment is key to accurately predicting cost.

d. Final Submission

Refer to Chapter 05: Bid Packaging Requirements.

4) COST IMPACT FACTORS**a. Design Contingency**

The Consultant should utilize Design Contingencies, as needed in their professional judgement, to ensure that the estimate produced at each stage of development accurately represents the cost of the project. The Consultant should indicate in the Basis of Estimate either the aggregate Design Contingency used or itemized design contingencies per major specification division. In general, the Design Contingency amount should be identified by the Consultant, and decrease as the design progresses and areas of uncertainty are resolved.

b. General Requirements (Division 1)

The Consultant shall include an estimate of General Requirements, which include all costs that are not direct construction costs but are associated with the specific project. This includes all general condition items typically identified in the contract. General requirements should be project-specific and itemized to include at a minimum (refer to DDC Standard Construction Cost Estimate Template for itemized list):

- i. Costs for on-site Contractor and non-direct labor personnel like superintendents and project engineers.
- ii. Costs for field trailers, temporary restrooms, Contractor parking, site security, and trash disposal.
- iii. Costs for equipment not directly tied to a specific direct construction operation. For example, a tower crane needed for multiple trade use would be in general requirements, but a crane needed by the HVAC sub to lift mechanical equipment to the roof would be included in direct costs. Hoists for construction personnel and material would also be included in general requirements.
- iv. Costs for compliance with safety requirements, including job site orientation, PPE, and testing required to ensure conditions stay within required parameters when working with materials like lead dust or silica dust.
- v. Costs for typical General Contractor (GC) roles such as job site cleaning, snow removal, temporary heating, and dust control.

- vi. Costs for insurances such as Builder's Risk and Public Liability.
- vii. Building Information Modeling (BIM), shop drawing, and coordination costs for GC and sub-contractors.
- viii. Commissioning costs for GC and sub-contractors.
- ix. Costs for permits and fees.
- x. Cost for inspections, surveys, and other processes.

c. Overhead and Profit

The Consultant shall include an estimate of Overhead and Profit, which reflects the Project Team's assumptions for the amount the bidder will add to cover their operational costs and expenses. This cost does not include overhead costs assignable under General Requirements.

d. Cost Escalation

The Consultant shall include an estimate of annual escalation costs. The Cost Escalation includes inflation based on reference to various economics publications (RS Means, Engineering News Reports, etc.) and shall be calculated to the midpoint of the approved construction schedule. DDC typically recommends 4.5% per year as a standard rate of escalation. The Project Team may specify a different rate for the project, subject to approval, and shall provide rationale for any such rate in the Basis of Estimate (BOE).

The cost factors listed above (items 4.a-4.d) constitute the basis for the Consultant's Design Fee. Items 5.a-5.c below include additional project budget considerations carried "below the line" to be developed collaboratively by the Project Team and reviewed regularly at the Cost Estimating Workshops.

5) ADDITIONAL PROJECT BUDGET CONSIDERATIONS

a. Bid Contingency

The Consultant shall include bid contingency in the estimate to account for the successful bidder's risk exposure during construction not captured elsewhere. It reflects the bidder's evaluation of risk associated with the project, including risk transferred to the Contractor per DDC's contract terms and conditions. Bid contingency may include the following risks:

- i. Extended time lapse between contract award and Notice to Proceed, which increases escalation risk to bidders.
- ii. Uncertainties related to site logistics and project schedule delays.
- iii. Bidder's evaluation of challenges unique to DDC contracting, including anticipated delays in payments, change orders, and contract close-out.

The project Risk Register and Gap Analysis form the basis of calculating Bid Contingency. Bid contingency may be allocated by CSI Division.

b. Construction Contract Allowances

The Consultant shall include Construction Contract Allowances to estimate the amount that bidders will be directed to include in their bids. Construction Contract Allowances cover the cost of known but undefined contract work requirements, e.g., possible fees from Con Edison or NYC Parks. It also covers anticipated field conditions encountered that are different from the scope definition and specific areas of work difficult to quantify at time of bid, e.g., asbestos abatement, HazMat, mold, etc. Construction Contract Allowances are not intended for scope changes.

c. Construction Contingency

The Consultant shall include Construction Contingency to budget for anticipated cost growth in a project during construction due to unanticipated changes. This amount should also be adjusted to address the cost of unforeseen changes that were not addressed by Construction Contract Allowances. It also covers unique features that make determining final quantity or scope difficult. The amount assigned to Construction Contingency must exclude all items included in Construction Contract Allowances.

The DDC Project Manager will account for Consultant Design fees, CM fees, Commissioning fees, Special Inspection services and other soft costs in their overall project budget, and these items should not be included in the Construction Cost Estimate.

CHAPTER 05: BID PACKAGING REQUIREMENTS

- A. INTRODUCTION
- B. BID PACKAGE COMPONENTS
- C. ORGANIZING, FORMATTING AND PRESENTING
THE BID PACKAGE
- D. METHODS OF PROCUREMENT
- E. DDC SPECIFICATION REQUIREMENTS
- F. CONSULTANT WORK SESSIONS
- G. DDC OFFICE MASTER SPECIFICATIONS

A. INTRODUCTION

The Bid Packaging team is responsible for reviewing DDC Public Buildings' technical specifications and all other bid documents for compliance with a set of stringent legal requirements for public projects. These requirements differ significantly from those of any other public or private entity, and as such the Consultant must follow the special requirements in this chapter completely and thoroughly.

Compliance with DDC Bid Packaging technical specifications requirements is MANDATORY.

Failure to comply with these requirements will be reflected in the Consultant's performance evaluation and will affect the issuing of payments.

It is essential that the Consultant prepare documents that are complete, fully coordinated, and free from ambiguities or inconsistencies. The Consultant is obligated to:

1. **Comply with all DDC and New York City requirements for bid document formatting;**
2. **Coordinate between the specifications and the various schedules in the Addendum to the General Conditions;**
3. **Review all documents, including those produced by sub-consultants, prior to submission to DDC to ensure that all the criteria listed below are met.**

Bid Documents are created by the systematic evolution of Design Documents into legally formatted, biddable and contractually executable drawings, specifications and other supporting documentation, required for the procurement of capital projects. Bid Documents include the Bid Drawing Set and the Bid Package. The Bid Drawing Set includes all Drawing Sheets signed and sealed by the Consultant, formatted in the standard DDC format. Coordinate with DDC PM for latest version of Drawing Sheet template. If the project scope includes Asbestos Abatement, Consultant shall incorporate the corresponding HazMat Drawings, available from the DDC PM and provided by DDC's Office of Environmental and HazMat Services (OEHS), see Chapter 06: Design Criteria for more information. The Consultant is also responsible for providing a Bid Drawing Set Title Page to be signed by DDC.

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B. BID PACKAGE COMPONENTS

The Bid Package comprises the Bid Drawing Set and three distinct Contract Volumes:

1) VOLUME 1: BID BOOKLET, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- a. MWBE Requirements
- b. Proprietary Items List
- c. Special Experience Requirements (SER)
- d. Bid Form
- e. Bid Breakdown (formatted by DDC from Consultant's cost estimate)
- f. Pre-Award process
- g. Project Reference Forms
- h. Construction Employment Report
- i. Bid Opening and Pre-Bid Walkthrough Dates

- 2) VOLUME 2: STANDARD CITY CONTRACT DOCUMENTS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:**
 - a. PLA (Project Labor Agreement)
 - b. Information for Bidders
 - c. Standard Construction Contract
 - d. Prevailing Wage Schedule
 - e. DDC General Conditions

- 3) VOLUME 3: TECHNICAL REQUIREMENTS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:**
 - a. Addendum to the General Conditions
 - b. Technical specifications Table of Contents
 - c. Technical specifications
 - d. Appendix items as applicable (Geotechnical Report, LEED Checklist, etc.)

C. ORGANIZING, FORMATTING, AND PRESENTING THE BID PACKAGE

The following is a list of deliverables required by the Consultant for the final Bid Package. While several of these components will be needed prior to design completion, the final, formatted version will be necessary for bid. It is mandatory that the Consultant review all Bid Package deliverables and their corresponding formats (coordinate with DDC PM for latest versions), to facilitate a timely transition from Schematic Design and Design Development into Construction and Bid Documents.

1) ADDENDUM TO THE GENERAL CONDITIONS

a. Format

The Addendum to the General Conditions must be written in the standard DDC format. (Coordinate with DDC PM for latest version.) This document must be delivered to the DDC PM as follows:

- i. One editable Word document;
- ii. One printed, black and white, double-sided, unbound document, 8 ½" x 11" sheets only.

b. Description

The Addendum to the General Conditions is required for all Bid Packages. The DDC General Conditions, which includes all Division 1 General Requirements sections, are included with every competitively bid project. Generally, the DDC General Conditions documents are not to be edited by the Consultant. If customization of the General Conditions is needed for a specific project, the Consultant must review the DDC General Conditions and use the Addendum to the General Conditions to revise or supplement the General Conditions articles for project-specific conditions.

- i. There are two versions of the Addendum to the General Conditions:
 - 1. Addendum for Single Contracts
 - 2. Addendum for Multiple Prime Contracts (Wicks Contracts)

- ii. The Consultant shall be provided with an editable Word document template of the DDC Addendum to the General Conditions. (Coordinate with DDC PM for latest version of the General Conditions and the Addendum to the General Conditions.) This document has highlighted fields which contain instructions to the Consultant for preparing each section. Only the highlighted areas of the document are to be edited, and the highlighted instructions shall be deleted for the final revised document.
- iii. The Addendum to General Conditions includes applicability of sections related to the DDC General Conditions, as well as Schedules A-E corresponding to the project scope. The Consultant must fill out the following Schedules as per instructions given in the Addendum to General Conditions, and noted below:
 - 1. Schedule A
The Consultant shall prepare Schedule A, which provides information on contract Requirements, such as contract duration, liquidated damages, retainage, etc.
 - 2. Schedule B
The Consultant shall prepare Schedule B, Warranty from Manufacturer, which lists Warranties that are included in the Consultant's specifications. The Consultant shall provide a list of the specifications sections for the material or equipment for which a warranty is required and include the length of the warranty period as specified.
 - 3. Schedule C
The Consultant shall provide a complete list of all Contract Drawings, including HazMat Drawings provided by DDC OEHS, if applicable.
 - 4. Schedule D
Requirements for electrical motor equipment may be included in the specifications. If applicable, the Consultant shall complete Schedule D as appropriate for the project.
 - 5. Schedule E
The Consultant shall prepare Schedule E (Separation of Trades) for Multiple Prime Contracts (Wicks) only. The Consultant shall review the specifications and the DDC General Conditions for each of the items listed on Schedule E and shall ensure that the correct information has been entered for each separate contract.

3) COST ESTIMATE

a. Format

The Consultant's Cost Estimate must be written in the standard DDC format. (Coordinate with DDC PM for latest version.) This document must be delivered to the DDC PM as follows:

- i. One editable (unlocked) Excel document;
- ii. One printed, black and white, double-sided, unbound document, 8 1/2" x 11" sheets only

b. Description

The Consultant's Cost Estimate will be required for all Bid Packages. The Consultant's Cost Estimate shall be used as a basis for the Bid Breakdown to be filled out by bidders at the time of bid. Thus, the estimate must correspond exactly to the rest of the Bid Package documents (specifications, proprietary items, etc.) and include line items for all items in the project scope (See Chapter: 04 Cost Estimating).

4) UNIT PRICE SCHEDULE

a. Format

If the Project Team determines that a Unit Price Schedule shall be required for a specific project, the Consultant must fill out a Unit Price Schedule template in standard DDC format. (Coordinate with DDC PM for latest version). This document must be delivered to the DDC PM as follows:

- i. One editable (unlocked) Excel document.
- ii. One printed, black and white, double-sided, unbound document, 8 ½" x 11" sheets only

b. Description

A Unit Price Schedule may be required for some Bid Packages. Although the final bids shall be lump sum, a unit price schedule may be used to supplement the cost estimate. The Unit Price Schedule shall be for additional work only and is typically used for items with unknown quantities at the time of bid (such as for façade restoration or excavation work). If a Unit Price Schedule is to be used in a project, it will be a standalone document in Volume 1. The Consultant shall not include references to unit prices within the technical specifications.

5) PROPRIETARY ITEMS

a. Format:

If the Project Team determines that Proprietary Items shall be required for a specific project, the Consultant must fill out a Proprietary Items Cost template in standard DDC format, as well as provide a justification for such items. (Coordinate with DDC PM for latest version). These documents must be delivered to the DDC PM as follows:

- i. One editable Word document of Proprietary Items Cost template.
- ii. One printed, black and white, double-sided, unbound document of Proprietary Items Cost template, 8 ½" x 11" sheets only.
- iii. One PDF document of Proprietary Items justification, on Consultant's letterhead.
- iv. One printed, black and white, double-sided, unbound document of Proprietary items justification, 8 ½" x 11" sheets only.

b. Description:

Proprietary Items may be required for some Bid Packages. The use of sole-source proprietary items is not the default option, and the use of proprietary items will only be entertained when the Consultant has exhaustively determined that there are not three acceptable equivalent products available and that the product cannot be sufficiently described with a performance specification. Although New York City Procurement Policy Board rules do not permit specifying proprietary items, under limited circumstances, if required for specific project conditions, proprietary items may be required. All proprietary items must be approved in advance by DDC ACCO. Written justification must be provided early in the design process by the Consultant and/or the entity requesting the proprietary item(s). The Consultant shall provide the Proprietary Items Cost template in standard DDC format, as well.

- i. The Consultant must first fill out the Proprietary Items Cost template, which shall list the product and manufacturer, the related specification section, and the material cost of the product. Labor/ installation costs are not included in proprietary allowances. The material allowance given on this template must match exactly in cost and in description to the Consultant's Cost Estimate.

- ii. Additionally, the Consultant, often in conjunction with the Sponsor Agency, must compose a justification for the Proprietary Item(s), on their office letterhead, which states why a particular manufacturer is required for the project. Proprietary Items are most often justified for upgrades or modifications to existing systems (such as a Roof or Fire Alarm), or as part of a system-wide standard required by the Sponsor Agency. Proprietary Items shall not be approved for preferred products.
- iii. The DDC PM shall submit the Proprietary Items Cost template and justification for review by the Bid Package Unit, and subsequently coordinate approvals with DDC ACCO. Upon submittal of all documentation, proprietary item request may either be approved or denied.
- iv. If Proprietary Items are approved, proprietary specification sections must include only one sole-source manufacturer within Part 2: Products, and the text "no substitutions." However, the remainder of the sections must be generic, and performance-based. Proprietary cut sheets from manufacturers are not allowed in the Bid Package (even for approved proprietary items).
- v. If Proprietary Items are not approved, specification sections which are not approved for proprietary items must include three manufacturers and the text "or approved equal".
- vi. If the design is based on a particular manufactured product, the Consultant may include the language "Basis of Design." The use of Basis of Design does not relieve the Consultant from identifying two additional manufacturers that offer comparable products based on the performance criteria described in Part 2: Products, and must not be used solely to indicate a preference.

6) SPECIAL EXPERIENCE

If the Project Team determines that Special Experience Requirements shall be required for a specific project, the Consultant must provide a justification for such requirements. (Coordinate with DDC PM for sample). This document must be delivered to the DDC PM as follows:

a. Format

- i. One PDF document of Special Experience Requirements justification, on Consultant's letterhead.
- ii. One printed, black and white, double-sided, unbound document of Special Experience justification, 8 1/2" x 11" sheets only.

b. Description

Special Experience Requirements (or SER) may be required for some Bid Packages. Although New York City Procurement Policy Board rules do not permit specifying experience requirements exceeding three years, under exceptional circumstances if required for specific project conditions, special experience may be required. All Special Experience Requirements must be approved in advance by DDC Law and DDC ACCO. Written justification must be provided early in the design process by the Consultant.

- i. The Consultant shall assist the DDC Project Team in the specification of SER for the Contractor and/or sub-contractors and for all highly specialized trades, as well as for any specialized manufacturer. When finalized and approved, these requirements shall become part of the Bid Package. During the Bid and Award phase, the Consultant shall assist in the review and verification of the special experience qualifications submitted by the Contractor and/or proposed sub-s. Qualifications for the Prime Bidder(s) shall be determined at the time of bid; qualifications for sub-contractors and manufacturers shall be after award.

- ii. The Consultant, often in conjunction with the Program Unit, must compose a justification for the Special Experience Requirements, on their office letterhead, which states why a particular sub-contractor or manufacturer will need specialized experience for the project. SER is often justified for warranty requirements (such as for a Roof Installer), for historic experience (such as for a Mason on a landmark building), or for situations uniquely based on the project scope. Specific Contractors or sub-contractors may not be specified; however, Contractor or sub-contractor qualifications may be specified if approved.
- iii. There are several categories of Special Experience, and the Consultant must identify which category is required in their justification. Refer to the DDC Technical Specifications Instructions (TSI) for additional information and the standard levels of special experience.
- iv. The DDC PM shall submit the SER justification for review by the Bid Package Unit, and subsequently coordinate approvals with DDC Law and DDC ACCO. Upon submittal of all documentation, the request for Special Experience Requirements may either be approved or denied.
- v. If SER is approved, the "Special Experience Requirements" page in Volume I of Bid Booklet shall indicate all applicable requirements. Refer to DDC TSI for additional information.

7) COMMISSIONING SPECIFICATIONS

a. Format

If the Project Team determines that a Commissioning Agent shall be required for a specific project, DDC shall retain a Commissioning Agent (CxA) to provide corresponding specifications (see Chapter 07: Commissioning). Consultant must coordinate with the DDC PM and the CxA to incorporate their specifications into the technical specification set. These documents must be delivered to the DDC PM within the specifications as follows:

- i. One single, combined original PDF document, included with the technical specifications, and
- ii. One printed, black and white, double-sided, unbound combined document, included with the specifications, 8 1/2" x 11" sheets only.

b. Description

Consultant must incorporate and review Commissioning specification sections for format issues; in some instances, the Consultant may need to correct the issue date or insert a blank page to the end of a section. Technical information within the specifications provided by the CxA should not be modified.

The Consultant shall ensure that the Commissioning specification sections are represented in the Table of Contents and in the Consultant's Cost Estimate as well.

8) ASBESTOS AND/OR HAZMAT SPECIFICATIONS

a. Format

If the Project Team determines that Asbestos specifications shall be required for a specific project, the DDC PM shall provide the corresponding Asbestos specifications, from DDC OEHS, to the Consultant. Consultant must incorporate these specifications into the technical specification set. These documents must be delivered to the DDC PM within the specifications as follows:

- i. One single, combined original PDF document, included with the technical specifications, and
- ii. One printed, black and white, double-sided, unbound combined document, included with the specifications, 8 1/2" x 11" sheets only.

b. Description

Asbestos and/or other HazMat specifications may be required for some Bid Packages. Hazmat work includes, but is not limited to, asbestos abatement, lead abatement, petroleum storage, and handling equipment abatement and the lawful disposal of other hazardous materials regulated by Federal, State and City environmental protection authorities. DDC OEHS will conduct probes at pre-selected locations on the project site and determine what is required for bid.

Most commonly, asbestos specifications will be included in the Bid Package. Asbestos specification sections are typically required if the project involves any amount of demolition work. Prior to the submission of Bid Documents, Consultant must incorporate and review Asbestos specification sections for format issues; in some instances, the Consultant may need to insert a blank page to the end of a section or remove sections not applicable to the project. Technical information within the specifications provided by DDC OEHS should not be modified.

- i. The Consultant shall ensure that the Asbestos specification sections are represented in the Table of Contents and technical specifications as follows:
 1. If the Project is a Single Contract, including demolition, and asbestos has not been found, include:
 - a. 028013 Allowance for Incidental Asbestos Abatement for General Construction Work.
 2. If the Project is a Single Contract, including demolition, and asbestos has been found, include:
 - a. 028013 Allowance for Incidental Asbestos Abatement for General Construction Work.
 - b. 028213 Asbestos Abatement.
 3. If the Project is a Multiple Prime Contract (Wicks), including demolition, and asbestos has not been found, include:
 - a. 028013 Allowance for Incidental Asbestos Abatement for General Construction Work,
 - b. 220013 Allowance for Incidental Asbestos Abatement for Plumbing Work.
 - c. 230013 Allowance for Incidental Asbestos Abatement for HVAC Work.
 - d. 260013 Allowance for Incidental Asbestos Abatement for Electrical Work.

CHAPTER 05: BID PACKAGING REQUIREMENTS

C. ORGANIZING, FORMATTING, AND PRESENTING THE BID PACKAGE

4. If the Project is a Multiple Prime Contract (Wicks), including demolition, and asbestos has been found, include:
 - a. 028013 Allowance for Incidental Asbestos Abatement for General Construction Work.
 - b. 028213 Asbestos Abatement.
 - c. 220013 Allowance for Incidental Asbestos Abatement for Plumbing Work,
 - d. 230013 Allowance for Incidental Asbestos Abatement for HVAC Work, and
 - e. 260013 Allowance for Incidental Asbestos Abatement for Electrical Work.
- ii. Additionally, the Consultant shall ensure that the Asbestos specification sections are represented in the Consultant's Cost Estimate as follows:
 1. Include the Allowance for Incidental Asbestos Abatement on the Summary Page after all markups. (For Multiple Prime Contract Bids, include all four Allowances per trade). Costs shall be as noted in Allowance for Incidental specification section(s) available from the DDC PM and provided by DDC OEHS.
 2. Include Asbestos Abatement, if applicable to the project. Costs shall be as noted in Asbestos Report, available from the DDC PM and provided by DDC OEHS.

9) GEOTECHNICAL REPORT

a. Format

If the Project Team determines that a Geotechnical Report shall be required for a specific project, the Consultant must provide said report. The report may either have been done previously or will need to be conducted during the design phase. This document must be delivered to the DDC PM as an Appendix to the specifications as follows:

- i. One single, combined original PDF document, included with the specifications, and
- ii. One printed, black and white, double-sided, unbound combined document, included with the specifications, 8 1/2" x 11" sheets only.

b. Description

A Geotechnical Report may be required for some Bid Packages, if the project requires extensive excavation or is located on a unique and possibly contaminated site, or for other reasons determined by the Project Team. Ensure that the Geotechnical Report is noted in the Table of Contents as an Appendix Document.

D. METHODS OF PROCUREMENT

1) SINGLE CONTRACT BID VS. MULTIPLE CONTRACT BID

Bids may be procured as either Single Contract or Multiple Contract Projects. Consultant shall coordinate with DDC PM to determine how the project will be procured to prepare the appropriate documentation. It is imperative that the Consultant and Project Team establish how the project is procured early in the design phase, to avoid potential delays to the schedule later.

The following table lays out which projects can be bid as Single Contract, and which projects must be bid as Multiple Contract:

Question 1: Is the project located on city-owned property?			
Yes: Bid as Project Labor Agreement (PLA)		No: Bid as Wicks Law	
Question 2 (PLA): What type of project is this?		Question 2 (WICKS): Does the project cost exceed \$3 Million?	
Renovation:	New Building:	Yes:	No:
Bid as RENOVATION PLA: Format all documents as one single contract.	Bid as NEW CONSTRUCTION PLA: A Feasibility Study shall be required to establish the applicability of project to the PLA. Determination should be established prior to the Construction Document Phase to avoid delays. Format all documents as one single contract.	MULTI-CONTRACT WICKS: Format all documents as 4 separate contracts as follows: Contract #1: General Construction Contract #2: Plumbing Contract #3: HVAC & Fire Protection Contract #4: Electrical	REVISED (SINGLE CONTRACT) WICKS: Format all documents as a single contract Note: DDC Policy requires all projects with estimated costs equal to or above \$2.5 million to bid as Multi-Contract, in case bids come in higher than expected.

- a. The first factor in determining whether the project shall be bid as Single Contract or Multiple Contract is the location. If the project is located on City-Owned property, the project may use the Project Labor Agreement (PLA) and thus, bid to a Single Contract, as long as the cost of project exceeds \$250,000 and meets the criteria below.

- b.** There are currently two types of Project Labor Agreements:

i. The PLA for Renovation

If the project involves the renovation of an existing building or structure, the project shall be bid using the PLA for Renovation.

ii. The PLA for New Construction

If the project consists of building an entirely new structure, the project may be bid using the PLA for New Construction, assuming that the Project Team has conducted a Feasibility Study that has been approved by DDC Law.

Whereas renovation projects can use the PLA automatically, new construction projects must first be approved for PLA (and subsequently, for Single Contract) bid.

- c.** If a project is located on Non-City-Owned property, it cannot be bid using the PLA, and must be bid using Wick's Law, which separates out the four major trades (General Construction, Plumbing, Mechanical and Electrical Work).

i. There are 2 types of Wicks Law Projects:

1. Revised Single Contracts

Used for projects whose total budget will be less than \$3 million.

2. Multiple Contract Projects

The threshold is \$3 million; however, if a project is estimated to cost at least \$2.5 million, it is anticipated that the bids may come in at or above \$3 million. As such, it is recommended for projects estimated to cost at least \$2.5 million to anticipate bidding to Multiple Contracts.

- d.** The DDC Project Manager and Team Leader will establish with the Consultant if the project shall be prepared as a Multiple Contract Project or a Single Contract Project. For Multiple Contract Projects, or where applicable, adherence to Wick's Law requires that the Consultant prepare separate sets of drawings and cost estimates for four or more contracts. The specifications shall be inclusive of all contracts but may reference the four separate Prime Contractors. The specifications and Table of Contents shall organize the sections as per separate contract. (Coordinate with DDC PM for latest version of drawing and table of contents for multiple prime contract projects). These documents, unless directed otherwise by DDC PM, shall be organized as follows:

- i.** Contract #1: General Construction work, including site work and vertical transportation.
- ii.** Contract #2: Plumbing work, including standpipe system, if required.
- iii.** Contract #3: Heating, Ventilating, Air Conditioning, and Fire Protection work, including sprinkler systems, as well as combined standpipe system, if required. Note: The sprinkler system work, which is part of Contract No. 3, shall be shown and detailed on drawings separate from all other work within that contract.
- iv.** Contract #4: Electrical work, fire alarm, data & telecommunications systems, A/V systems.

2) OPEN COMPETITIVE BID VS. PRE-QUALIFIED LIST BID

Bids may be procured to either the general public (as an open competitive bid) or to a select group, or list, of Pre-Qualified bidders. The Consultant shall coordinate with the DDC PM to determine how the project will be procured in order to prepare the appropriate documentation.

- a. Bids procured to the general public may require additional special experience requirements for the prime bidder(s). Special Experience Requirements, as noted earlier in the chapter, must be approved by DDC Law and DDC ACCO, and the Consultant shall be required to provide appropriate justification.
- b. Bids procured to a Pre-Qualified List (PQL) of bidders will take the place of special experience requirements for the prime bidder(s). Since the bidders here have already been vetted and approved to work on City projects, the Bid and Award Phase may be significantly shorter. Pre-Qualified Lists may be for work on roofs, landmark buildings, or general construction projects (or others as may be applicable). The DDC PM, working with the Project Team and Consultant, shall decide which PQL is applicable to their specific project.
- c. In order to bid to a PQL, the DDC PM must seek approval from DDC ACCO. At this time, the DDC PM may require certain documents from the Consultant, including the cost estimate and detailed project description.

E. DDC SPECIFICATION REQUIREMENTS

Review all Bid Package contents in Section B. Bid Package Components.

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1) SPECIFICATIONS AND TABLE OF CONTENTS

a. Technical Specification Instructions

It is the Consultant's responsibility to download, review and comply with the requirements in the latest version of DDC's Technical Specification Instructions (TSI), which can be found on the Publications page of DDC's website.

b. Format

All technical specifications- and their corresponding Tables of Contents- must be formatted in the standard DDC format and comply with all requirements of this section. (Coordinate with DDC PM for latest version). Specification sections developed from sources other than the DDC Office Master will not be accepted, unless approved in advance by the Deputy Director of Bid Packaging. The specifications must be delivered to the DDC PM as follows:

- i. One single, combined original PDF document printed directly from the OMS software, and
- ii. One printed, black and white, double-sided, unbound combined document, 8 1/2" x 11" sheets only.
- iii. Fully edited specifications accessible within the e-Specs software.

c. Table of Contents

The Table of Contents is an important document that shows DDC what items are to be covered in technical specifications and who in the Consultant's team is responsible for them.

d. Description

Technical specifications (and their corresponding Tables of Contents) will be required for all Bid Packages. At any time, there may be a need to take out one specification section from the full set. Therefore, ensure that all specification sections are formatted individually and double-sided; the end of one section must not share a page with the beginning of the next section. If a specification section ends on an odd number of pages, include a blank sheet at the end with the text "This Page Intentionally Left Blank."

- i. The specifications must be formatted per the most current CSI, 6-digit layout and include the proper header, footer, and contract language permitted in accordance with DDC standards. All submissions shall include an issue date, which must be updated for each resubmission. This shall apply to all pages of all sections of the specifications and Table of Contents.
- ii. The specifications must be inclusive of all items in the construction contract; however, items which are not capitally eligible shall be omitted. These items include (but are not limited to) maintenance agreements, movable furniture, spare parts, and so on. Coordinate with DDC PM for full list of eligible and non-eligible scope items.
- iii. All Division 1 General Requirements sections correspond to the DDC General Conditions, which shall be included in Volume 2 as a reference for bidders with all contracts. As a result, Consultant must not include any Division 1 specification sections.
- iv. Similarly, all contract-related language (regarding payments, indemnification, bidding procedures, etc.) shall be included in Volume 2 as a reference for bidders with all contracts. Specifications are to be technical in nature; Consultant must review and be knowledgeable of the Standard Construction Contract and the Information to Bidders by coordinating with DDC PM for latest version.
- v. All specifications must include performance information for products, and all sections that call out manufactured products must include at least two additional manufacturers that offer comparable products, followed by the term "or approved equal." They must comply with governmental and legal requirements regarding public procurement. They include, without limitation, the Competitive Bidding Laws of the State of New York, the NYC Procurement Policy Board, Rules of the City of New York, and the DDC General Conditions. To ensure compliance, it is essential that Consultants prepare specifications that are clear, accurate, and in accordance with the criteria set forth below. Accordingly, specifications shall:
 1. Permit maximum competition
 2. For Multiple Prime Contracts (Wicks), permit the separate, competitive sealed bidding of each prime construction trade.
 3. Clearly describe the City's requirements without favoritism toward any Contractor, supplier, or manufacturer, or to a supplier's goods and/or services.
 4. Emphasize functional or performance criteria. Requirements establishing the significant qualities related to type, function, in-service performance, physical properties, as well as other special features and requirements must always be clearly described in Part 2 of the specifications. Because DDC awards contracts to the lowest responsible bidder, it is important that functional/performance specifications are tightly written using acceptable commercial standards to help ensure the quality of the job.
 5. Unless approved in advance by DDC ACCO, sole-source proprietary items are not permitted.

vi. Nomenclature

Incorrect nomenclature from the private sector or other government entities is not acceptable for documents submitted to DDC. The following are some common errors and the proper replacements, refer to the Technical Specifications Instructions (TSI) for additional nomenclature and terminology editing guidance.

1. City of New York

References to "Owner" (or other agency or authority) as an entity should read "City of New York" for all matters related to property and payments.

2. Commissioner

References to "Architect," or "Engineer" should read "Commissioner." References to "Owner" for verification, certification, selection, approval, etc. should read "Commissioner."

3. Engineering Services

References to "Delegated Design" should read "Engineering Services." Note that all shop drawings and other submittals must be reviewed and approved "by the Commissioner". The Consultant must remain the Designer of Record (Architect of Record and/or Engineer of Record) and the Contractor's engineer may not assume that responsibility. Specifications where Engineering Services are specified must provide all required design criteria such that the Contractor's Engineer is not required to make any design assumptions. Engineering Services provided must meet all the requirements of the NYC Codes, rules, procurement requirements, and regulations.

4. Authorities Having Jurisdiction (AHJ)

References to "Authority" or "Authorities Having Jurisdiction" must be revised to the applicable Code, Standard, Entity, Department, or Agency.

- vii.** Moreover, the Consultant must ensure that all specification sections are fully edited and relevant to their specific project. The Consultant is responsible for all specification information submitted including those produced by its sub-consultants. Do not include references to sponsors, clients, items or sections that are not applicable to the scope of the project at hand. It is imperative that, prior to submitting the specifications, the Consultant inspect all documents for adherence to all DDC requirements, completeness, and accuracy.

F. CONSULTANT WORK SESSIONS

The Consultant and sub-consultants responsible for writing technical specifications shall attend regular sessions with the Bid Packaging team starting at the CD Kickoff. Those sessions shall occur bi-weekly or as mandated by the DDC Bid Packaging team. During these work sessions, drafts of all technical specifications shall be submitted for review as directed by the DDC Bid Packaging team. For more on Constructability Review, Sign-Off, and Final Acceptance of Construction Documents and the Bid Package, see Chapter 02: Overview of the Design Process.

G. DDC OFFICE MASTER SPECIFICATIONS

As directed, the Consultant and all sub-consultants shall utilize DDC's Office Master Specifications (OMS) system, a commercial software tool with DDC cloud-hosted project storage designed to generate project-specific technical specifications in compliance with DDC's requirements. DDC will provide the Consultant team with access to the system including log-in credentials, training materials, and technical support. All required software will be available as a free download. The Consultants shall comply with the requirements in the latest version of DDC's Technical Specification Instructions (TSI) which is fully coordinated with OMS.

CHAPTER 06: DESIGN CRITERIA

- A. ENVIRONMENTAL AND GEOTECHNICAL ENGINEERING
- B. DEMOLITION
- C. STRUCTURES AND SOILS
- D. SITE CIVIL ENGINEERING
- E. ARCHITECTURE
- F. ACCESSIBILITY
- G. LANDSCAPE ARCHITECTURE
- H. STRUCTURAL ENGINEERING
- I. MECHANICAL ENGINEERING
- J. ELECTRICAL ENGINEERING
- K. PLUMBING ENGINEERING
- L. FIRE PROTECTION
- M. HISTORIC PRESERVATION

A. ENVIRONMENTAL AND GEOTECHNICAL ENGINEERING

1) INTRODUCTION

The design process must respond to environmental concerns and the project design must incorporate measures to mitigate adverse environmental impacts whenever feasible. The environmental review process for any project will address rules and regulations established by the NYC Department of Environmental Protection (DEP), NYS Departments of Health and Labor, and applicable United States Environmental Protection Agency (EPA), and Occupational Safety and Health Administration (OSHA) standards. While most environmental issues within buildings undergoing renovation are associated with the presence of asbestos-containing materials (e.g.; spray-on fireproofing, pipe insulation, and vinyl asbestos tiles) other hazards may be present. Examples of these include: lead based paint, polychlorinated biphenyls (PCBs), and biological contaminants (such as mold and pigeon droppings). Excavated soils may contain volatile organic compounds (VOCs), toxic metals, or other contaminants from past hazardous materials disposal practices.

DDC's Office of Environmental and HazMat Services (OEHS) and the Office of Geotechnical Investigations (OGI) has developed a strict set of special experience qualifications for Environmental Consultants and sub-contractors. In the case where DDC does not provide environmental services, the Consultant may be responsible for obtaining the services of a qualified firm or individuals licensed or certified to perform hazardous materials investigations in NYC. Any firm selected to provide such environmental services requires approval by DDC OEHS/OGI before they can participate in the project. When DDC provides environmental services, the Consultant is expected to support and cooperate with the Agency's efforts.

On projects for which the Consultant is responsible for obtaining these environmental services, they shall meet the standards described below.

2) ASBESTOS-CONTAINING MATERIALS (ACM)

a. Investigator Survey

All buildings scheduled for construction/renovation, including recently constructed buildings or newly renovated areas, must be surveyed by a NYC Investigator to identify the presence or absence of ACM which could be impacted during construction/renovation.

b. Abatement in Contract Drawings

With limited exceptions, contract documents shall include abatement of all ACM that can reasonably be expected to be disturbed by construction activities.

c. Outside Construction Area

When inspecting for asbestos or preparing abatement contract documents, consider areas that may be impacted outside of the immediate construction area, nearby restricted access areas, and abatement phasing requirements.

d. Historical Reports

Historical asbestos survey reports have been compiled on a building-by-building basis. DDC OEHS maintains files of prior asbestos survey reports and must be contacted by the Consultant prior to any survey work.

3) LEAD-CONTAINING MATERIALS

a. Protect Workers

The Consultant is advised that lead-containing materials have the potential to adversely impact the health of construction workers and others located adjacent to the work area. As such, appropriate precautions shall be specified, including OSHA Safe Work Practices.

b. Identify Waste in Bid Documents

Lead-containing materials to be disposed of may be designated as a hazardous waste. The Consultant will be responsible for identifying any lead waste disposal requirements and noting them in the bid documents.

c. Note Potential Lead Release in Bid Documents

The Consultant shall be responsible for identifying any construction tasks that could result in releases of lead for which the Contractor may become responsible and for noting them in the bid documents.

d. Regulations on Child Occupancy

In buildings that would be considered "child-occupied", the Consultant will be responsible for developing lead control procedures in conformance with the appropriate federal and state requirements. The sub-consultants responsible to perform such work shall be EPA Lead-Safe Certified in accordance to the Lead Paint Renovation, Repair and Painting (RRP) Rule. Any work of that nature being performed in child-occupied facilities must be done by an EPA Certified Renovator or by workers trained by and supervised by a Certified Renovator.

4) OTHER HAZARDOUS MATERIALS

a. Site Contamination

Performing construction in areas of known site contamination is likely to increase project costs significantly by adding follow-up environmental investigation and reporting. In the design phase, the Consultant must review existing environmental due diligence reports and other historical records to ascertain whether other contaminants may be present and to review and coordinate the hazardous material construction documents provided by DDC to assure they adequately address handling, removal, and disposal of those materials. DDC OEHS has had experience with such issues and may be consulted for assistance in developing specifications and coordinating with regulatory agencies.

b. Waste Management

Failure to adequately identify hazardous waste streams, use approved waste transporters, or use approved waste disposal facilities may expose the City to long-term liability and/or result in costly change orders. The Consultant shall ensure that all applicable hazardous waste rules and regulations are fully understood and addressed in specifications and contract documents.

c. PCB-Containing Materials

Oil-filled electrical equipment (transformers, bushings, capacitors, cooling and insulating fluids, contaminated soils, etc.) may pose a long-term liability to the City and are subject to existing EPA and state regulations. The presence of such materials must be identified before or during the Design Development phase and the Consultant shall provide appropriate guidance for handling and disposal.

d. Underground Storage Tanks

Underground storage tank systems (USTs) can threaten the environment and pose a long-term liability for the City. State and federal regulations concerning USTs must be followed. The Consultant shall identify the presence of all USTs that may be impacted by the construction work and include appropriate specifications in the contract documents.

e. Other Environmental Issues

The Consultant is responsible in the design phase for identifying any other additional environmental issues that may be created by the construction.

B. DEMOLITION

1) INTRODUCTION

Demolition of a building at any facility has ramifications beyond just the removal of the structure. Demolition of structures is regulated by DOB, DEP, and FDNY depending on the nature of the work.

2) HAZARDOUS MATERIAL TESTING

- a.** Buildings to be demolished must be surveyed for the presence of hazardous materials, particularly asbestos and lead.
 - i.** Asbestos: DEP oversees and inspect asbestos abatement activities throughout the City, whether conducted independently of or in association with demolition activities. The structure to be demolished **MUST** be surveyed to determine the presence of asbestos containing materials (ACM).
 - ii.** Lead: Test for the presence of lead in all anticipated locations (paint, pipes, batteries, flashing, etc.). If lead is encountered in any samples of paint, it would be considered prudent to include a statement in the documents to assume that **ALL** painted surfaces contain lead.

NOTE: It is not the intention to complete lead abatement prior to, or separate from, the demolition. Rather, the information relative to lead, when present, should be included so the Contractor can plan for the handling and disposal of lead contaminated materials in accordance with the guidelines of other applicable regulations.
 - iii.** PCB's: Test all liquid filled power transformers. Also, test ballasts in fluorescent light fixtures.
 - iv.** Site: A review of the building's prior function will provide insight regarding the types of site testing that may be required for a reasonable and prudent investigation (i.e. pesticides in a Grounds Building, heavy metals in a waste water treatment plant, soil around a flaking, lead painted water tower.)
 - v.** Oils: Used oil and hydraulic oils in elevator equipment and shafts must be collected and properly disposed of prior to demolition.

- vi. **Miscellaneous Materials:** Most buildings to be demolished are in a deteriorated condition and have been abandoned or neglected for an extended period. Many have become “warehouses” for surplus furniture, supplies, and materials of uncertain origin. All such materials must be identified, including a description for their removal and disposition.
- vii. **Mercury:** Test potential mercury containing devices (i.e., airflow/fan unit controls, appliances, electronics, button cell batteries, plumbing, security systems, etc.).
- viii. **Containers of Unknown Waste:** Classify contents and methods of disposal.

3) DEMOLITION

- a. In addition to demolition procedures, the following must be considered when preparing the contract documents:

- i. **Salvageable Materials**

- 1. Determination of what items, if any, the Facility wants to be salvaged.
 - 2. Identification of items which will be removed by the Facility prior to demolition.
 - 3. Identification of items to be removed by the Contractor and turned over to the Facility.

- ii. **Utilities**

- 1. Determination must be made relative to utilities serving the structure to be demolished or affected by its removal. The work required for each individual utility must be specified (cut and plug, remove, abandon, etc.).
 - 2. In general, utilities serving a structure to be demolished should be terminated at the nearest manhole, valve, pole, etc. and totally removed for five feet outside the structure. Termination shall include removal of wiring from abandoned conduits, and capping or plugging of piping and conduits at both ends.
 - 3. Buried heating and fuel storage petroleum tanks should be removed.

- iii. **Site Access**

- All issues or restrictions related to accessing the demolition site and measures to be taken for protection of facility population or general public must be identified.

- iv. **Scope of Work**

- The demolition method should not be specified unless ABSOLUTELY necessary. Identification of specific restrictions (such as no burning, no explosives) should be included. The intention is to get the building removed at the lowest cost.

- v. **Foundations**

- Determining the procedure for removal of foundations and backfilling basements frequently presents the largest challenge in preparing demolition contracts. The intended re-use of the site is often a major determining factor and should be reviewed with the Sponsor Agency early on.

- In general, exterior foundation walls should only be removed two feet below proposed Finish Grade. Interior building walls are to be removed to the level of the lowest basement floor, and basement floors need only be broken up for drainage purposes.

vi. **Backfilling**

If the demolition site will be returned to a landscaped area, the basement can typically be backfilled with masonry and concrete demolition debris. If a new building will be constructed on the site, such backfill should probably be avoided. However, the ultimate responsibility for critical backfilling should be placed on the new Building Contractor, NOT the Demolition Contractor.

vii. **Recycling**

In general, the market will determine which materials in the debris stream will be recycled. However, to comply with the spirit of good sustainable design, it is a best practice to recycle. Demolition debris should be identified, and its disposition specified whenever practicable.

C. STRUCTURES AND SOILS

1) **PROBES**

When appropriate the Consultant shall develop and submit a plan for probing and testing existing structures. This plan shall indicate location, quantity, methods of probing and testing, as well as the objectives of the probes.

a. **Timing**

Where probes are necessary to clarify existing conditions, the Consultant shall request them at the Pre-schematic phase or at the Schematic Design phase if a Pre-schematic is not performed. Probing existing structures shall be performed not only to resolve technical uncertainty, but also to avoid delays and uncertainty during construction operations.

b. **Number of Probes**

The number, locations, and extent of probes should be determined to provide sufficient understanding of existing conditions and to provide design solutions. The Consultant is required to be present when these probes take place to note the conditions on site and direct the Contractor.

c. **Probing and Testing Report**

A detailed inspection report on the findings of the approved Probing and Testing Plan shall be submitted to DDC. It will include location, photographs, dimensional data, sketches, and any other material necessary to support the findings. The Consultant shall analyze the probes and propose solutions based on their findings.

2) SUBSURFACE INVESTIGATION

In addition to providing for a suitable foundation solution, the Consultant is expected to use best professional judgment and experience to determine a soil exploration program that will reasonably clarify soil related work. The Consultant is responsible for the geotechnical analysis and engineering of the project.

a. Office of Geotechnical Investigations (OGI)

At the earliest project stage, the Consultant shall consult through the DDC Project Manager with the DDC OGI to determine a preliminary number of borings, their location, and other required investigations. Contact with the OGI shall be maintained throughout site exploration. The Geotechnical Section shall be represented at the Design Kick-off Meeting.

b. Site Visits

All projects that require excavation and foundation work will be visited at the start of Pre-Schematic or Schematic Design by the Consultant's Structural Engineer or Geotechnical Engineer. This site visit is a contractual obligation. Based on the project requirements and as result of this field visit the program of soil exploration shall be initiated.

c. Soil Exploration Program

The soil exploration program should enable the determination of the optimal foundation solution as well as the reduction of uncertainty during construction. DDC does not place a maximum limit on the number of borings to be taken. The number and type of investigations should be based on reasonable economic and engineering decisions and in accordance with the NYC Building Code.

d. Additional Borings

When the Consultant finds that the preliminary borings are not sufficient to provide information for design and construction, additional borings shall be ordered as soon as possible to prevent any potential delay to the project schedule.

3) NUMBER OF BORINGS

The Consultant shall be responsible for the preparation of boring location drawings and for the selection of any specimen soil samples for analysis by laboratory testing. As a minimum, the number of borings shall meet the requirements of the NYC Building Code and shall be determined by the Consultant. To manifest its intent of obtaining better soil information, DDC established the additional minimum conditions listed below:

a. Quantity

The minimum number of borings for a new project shall be four.

b. Maximum Distance

The maximum distance between two adjacent borings shall be one hundred feet.

c. Additional Borings

Where footings bear on rock, one additional boring will be taken for every three borings required by the NYC Building Code. For sites where a previous building was demolished, take two additional fifteen-foot-deep borings.

d. Building Code

The relaxation in number of borings allowed by Chapter 18, Section 1802.4, of the NYC Building Code shall not be applied or accepted.

4) FIELD CREW DECISIONS

DDC Geotechnical Section employees will monitor borings and classify soils. DDC has the latitude to perform additional borings whenever in our judgment, field conditions so require. The conditions listed below require additional borings.

a. Near Surface Footing

For proposed near surface footings, where two consecutive borings show fill levels differing by more than six feet, an additional boring halfway between the initial borings shall be performed.

b. Extreme Conditions

For every boring that did not reach its intended depth due to extreme conditions, two additional borings shall be performed.

5) WATER LEVEL

a. Update Information

For sites where there are sufficient existing borings, water level information older than ten years shall be updated.

b. Measurement Intervals

For sites near bodies of water, the water level shall be measured three times at intervals of approximately four weeks. For other sites it is required to have two readings spaced four weeks apart.

6) ADJACENT FOUNDATIONS

a. Information

Information on neighboring footings can be obtained by exploratory pits. Funds for such pits are provided by the individual projects. DDC has probing requirement contracts that can be used for this purpose.

b. Research

The Consultant is responsible for conducting research at the Building Department to obtain information on existing adjacent buildings. If necessary, assistance may be requested from the Permits and Approvals Unit of DDC.

b. Site Visit

During the site visit the Consultant team shall attempt to visit basements of adjacent buildings.

D. SITE CIVIL ENGINEERING

1) INTRODUCTION

Site civil engineering systems and equipment shall be designed and engineered. Local regulations must be followed without exception in the design of systems that have a direct impact on utility systems. These include storm water collection, sanitary sewers, storm sewers, water lines, gas lines, electrical and communication lines.

2) GENERAL

- a.** The purpose of the Civil and Site Guide is to describe DDC standards for the design and implementation of site, civil, and environmental engineering projects.
- b.** Consultant shall obtain and become familiar with the Sponsor Agency's project request and the project scope of work. Identify all required trade assists.
- c.** The scope of work shall be verified and clarified as needed with an initial site visit with the Sponsor Agency and Project Team, as required.
- d.** Comply with all applicable NYC and industry codes and standards. Identify codes and standards early in the design process.

3) SITE ANALYSIS

- a.** A site inventory and analysis, including an on-site investigation, shall be carried out prior to any design effort.
- b.** Mechanical and Electrical Rooms in Areas Prone to Floods:
 - i.** Mechanical and electrical equipment rooms must be located 3 ft. above the level of the 500-year flood plain.
 - ii.** Do not locate mechanical, electrical and communication room in a basement or sub-basement.

4) PHYSICAL SECURITY

Manholes must be secured from unauthorized access using tamper-proof bolts.

5) SITE UTILITIES

- a.** During site design, the location and coordination of utilities (water, sanitary sewer, electricity, gas, communications, etc.) must be coordinated with other site design features and finalized.
- b.** Coordination with Service Providers:
 - i.** The Consultant is responsible for coordinating the utility design with local utility companies and/or other service providers.
 - ii.** The Consultant is to verify the utility systems have sufficient capacity and reliability to meet the building design requirements.
 - iii.** DDC will negotiate rates and connection charges with utility companies, where applicable.

c. Utility Location

- i. The Consultant must ensure that utility elements, such as electrical transformers, emergency generators, backflow preventers, and meters, are easily accessible by the utility companies.
- ii. Design utility lines to avoid street trees, large trees, and significant planting areas. Locate utility lines so that future maintenance and repair will not damage trees and plantings. Storm drainage pipes should be located in unpaved areas where possible.
- iii. Water lines should be located in the unpaved area behind curb lines or under sidewalks. Minimize locating water lines under streets, drives, or other areas where access is severely limited. Do not place main water lines under foundations or within the building footprint.
- iv. Locate sanitary sewer lines in unpaved areas where possible. Follow code requirements on separation of water and sanitary sewer lines.
- v. Manholes must not be located in the main pedestrian walkways, plazas, or entry courts.

d. Site Mechanical and Electrical Distribution Systems

- i. See Mechanical Engineering, Electrical Engineering and Plumbing Engineering sections in this Chapter for the requirements for site distribution systems.

e. Water

- i. Consultant to follow the regulations of NYC DEP. The service connection between building and public water lines must be coordinated with DEP. The service connection must be placed in a secure enclosure to prevent unauthorized access and potential contamination. Requirements for water meters and backflow preventers are in the Plumbing Engineering Section.
- ii. The building Automation System (BAS) must monitor all water meters and record water usage.
- iii. Consultant to consider loop-fed systems with multiple water connections for large buildings or campuses; install dual-feed systems if required by code for the building occupancy.
- iv. The water supply system must be capable of supplying the required water flow for fire protection in accordance with NFPA 24.

f. Sanitary Sewer

- i. Consultant to follow the regulations of NYC DEP.
- ii. Separate storm drains from sanitary sewers within the property limits.
- iii. Provide cleanouts 5 feet from the building on all service lines. Service lines should enter the main at a manhole. Provide drop manholes if the service line does not enter at the invert.
- iv. In areas where no public sewers exist, use of septic tanks and leach fields is acceptable. Install the septic systems in accordance with code. Locate septic systems where they can be expanded to meet future needs of the discharge system; unless otherwise required by the Sponsor Agency, plan for a 50% larger system.

g. Storm Drainage

- i. Design the storm water system as required by DEP. Use gravity flow for all storm drain systems.

- ii. Where possible, locate storm drainage pipes in unpaved areas; offset inlets from main trunk lines to prevent clogging.
- iii. Rainwater not collected for reuse from the building roof drainage system must be discharged into the storm drain.
- iv. Storm Water Runoff Requirements:
 - 1. The site design must manage storm water runoff.
 - 2. The Consultant must conform to DEP requirements for storm water management. The Consultant must obtain any required DEP approvals for the storm water management plan.

h. Storm Water Pollution Prevention Plan (SWPPP)

- i. Where required, a storm water pollution prevention plan will need to be developed. The construction activity will determine the components of the SWPPP. A SWPPP may include the following components:
 - 1. Erosion and sediment control plan.
 - 2. Post construction storm water management controls.
 - 3. The Consultant shall prepare the initial SWPPP with all permanently installed stormwater measures and preliminary controls for construction measures.
- i. See Chapter 08: Sustainability and Resiliency for additional site civil information and requirements.

E. ARCHITECTURE

1) ARCHITECTURAL DESIGN

The Consultant shall strive to create a design that is responsive, welcoming, accessible, engaging, inspiring, and exceeds the requirements of code compliance while remaining efficient, secure, and functional. Public work offers the best opportunity for Project Excellence to enrich the lives of all New Yorkers.

2) URBAN DESIGN

The Consultant shall consider such factors as building placement, massing, street and block typography, urban space and form, historic fabric, neighborhood character, microclimate, public infrastructure, access, and relationship to adjacent buildings and outdoor spaces. All designs shall reflect previously approved master plans wherever applicable.

3) SITE DESIGN

The Consultant shall analyze programmed site issues, pedestrian and vehicular circulation, adjacent off-site conditions, existing site conditions, flood plains, programming, zoning regulations, community needs, and environmental considerations. The Consultant shall take into consideration subsurface conditions based on site visits, borings, probes, and surveys.

a. Flood Plain

The Consultant shall investigate and determine the actions necessary for the design to fully meet the requirements for construction within a flood plain if applicable. Factors such as floor level, access, configuration, structural system, utility connections, materiality, and functionality, among others, must be in conformance with FEMA guidelines and NYC Codes including NYC Climate Resiliency Design Guidelines. See Chapter 08, Section B, for more information on Resiliency.

4) EXISTING CONDITIONS

The Consultant shall conduct a thorough investigation of existing site conditions. The creation of existing condition drawings, as related to the work, is expected as part of basic services. All field measurements are the responsibility of the Consultant. A property survey indicating property limits, dimensioned building footprint, setbacks, elevations at entry points, site features, spot elevations of land, utilities, etc., will be provided by DDC.

5) ENTRY

The Consultant is encouraged to investigate required security in the design of entries, and to balance these needs with the desire for public facilities to appear welcoming. Unsecured recessed entries are generally not acceptable. To improve air quality and reduce cleaning costs, recessed full width walk-off mats at main building entrances are strongly recommended.

6) ACTIVE DESIGN INITIATIVE

The Department of Design and Construction supports active design principles. Consultants are asked to design using active design strategies that promote occupant health. Such strategies include providing opportunities for incidental exercise, such as the use of communicating stairs to travel between floors. The Consultant is encouraged to integrate a main circulation stair that is visible from and accessible to the main entrance, bicycle racks, staircases with art, views and daylighting, and other active design elements where feasible.

7) NATURAL LIGHT

Glare-free or controlled natural light should be maximized in all occupied spaces. Controlled natural light improves the indoor environment and with occupancy sensing lighting controls, and reduces energy costs. The Consultant is expected to use appropriate low-e coatings for increased energy efficiency in insulating glass for all exterior windows and skylights.

8) SKYLIGHTS

Utilize skylights when site constraints or programming preclude exterior-wall glazing.

9) EXTERIOR CLADDING AND MATERIALS

The Consultant shall use materials that are cost effective, durable, easily maintained, and appropriate to the context of the project site. For renovations and additions, the qualities of the new exterior materials shall compliment or match the existing materials when appropriate. The Consultant shall also refer to Section H in this Chapter: Structural Engineering.

10) GRAFFITI

Sponsor Agencies may require sealants to protect against graffiti. When specifying sealants, the Consultant shall evaluate the risks of long-term damage to materials, particularly masonry historic structures and landmarks. Knowledge of prior coatings on the building is required, as are material samples with and without proposed sealants. Only non-toxic sealants shall be specified (see Chapter 08: Sustainability and Resiliency).

11) INTERIOR MATERIALS

Finish materials shall not adversely affect the health of workers or occupants. Health considerations shall extend to the material's production, off-gassing during installation, and environmental pollution engendered by the disposal process. Projects shall incorporate the specification language referenced in this guide.

a. Flooring

When budgetary and maintenance conditions allow, flooring from renewable resources such as linoleum, rubber, clay, or cork, and materials with high recycled content are encouraged. Vinyl composition tile (VCT) is discouraged.

b. Carpeting

For health and maintenance reasons carpeting is discouraged. Alternative flooring should be considered wherever suitable, and in those situations where carpet must be used, carpet tile is preferred.

12) INSULATION

The entire building envelope shall be carefully detailed to provide continuous insulation, eliminate thermal bridging, and prevent condensation and trapped moisture within wall and roof assemblies. The use of spray-in cellulose or cementitious foamed-in-place products is encouraged as an alternative to fiberglass batts. To protect air quality, loose fiberglass insulation shall never be used within air plenums or in airshafts.

13) MECHANICAL, ELECTRICAL, AND SERVICE SPACE REQUIREMENTS**a. Space Requirements**

The dimensions of mechanical and electrical equipment rooms must be based on the dimensioned layout of all required equipment. All mechanical rooms, including central plant equipment rooms, must have enclosures designed to minimize noise transmission.

b. Access

- i. To facilitate mechanical equipment access, maintenance, removal and replacement, an elevator stop should be provided to serve all levels housing HVAC equipment.
- ii. Stairways should allow for safe transport of mechanical equipment and components. Ship's ladders for access to the roof are not encouraged.
- iii. Design of service areas should preclude the need for hatchways. Do not install equipment that requires maintenance below a raised floor.
- iv. In mechanical equipment rooms and service areas a minimum of 7 ft. clearance should be maintained under all ductwork and piping for maintenance purposes.

c. Vertical Clearances

Mechanical equipment rooms must have clear ceiling heights not less than 12 ft, if allowable in existing conditions. Catwalks with stairways must be provided for all equipment (including cooling towers) that cannot be maintained from floor level. Where maintenance requires the lifting of heavy parts 100 lb. or more, hoists should be installed.

d. Horizontal Clearances

Mechanical and electrical equipment rooms must be configured with clear circulation aisles and adequate access to all equipment. These rooms should have adequate doorways, clear floor space, areaways, and staging areas to permit the replacement and removal of equipment without the need to demolish walls or relocate other equipment.

e. Equipment Placement

- i. The arrangement of mechanical and electrical equipment in equipment rooms must consider the future removal and replacement of all equipment.
- ii. All mechanical equipment must be installed at least 5 ft. above the 100-year flood plain elevation.
- iii. Do not locate equipment with motors greater than ½ HP overhead, where it will be difficult to operate and maintain. Install equipment with motors larger than 3 HP in mechanical equipment rooms.

14) SECURITY

a. Security Plan

If required, the Consultant shall create a security plan for the building. This may include specific elements such as providing electrical for CCTV.

b. Window Protection

Sponsor Agencies may require the use of security measures on windows to guard against window vandalism and break-ins. The Consultant is encouraged to explore an improved aesthetic for these applications using new materials, technologies, and strategies to meet the Sponsor Agency's need for security.

c. Blast Resistance

Blast resistance and higher than normal security measures are of importance for certain DDC projects. These may include courthouses, police precincts, and structures providing emergency services. Detailed programmatic requirements will be addressed for such projects in the Task Order, Project Objectives, Sponsor Agency program, or subsequent directives.

15) GRAPHIC DESIGN

- a. The Consultant shall prepare clear graphics for orientation, building and room identification, space usage, capacity (for public assembly spaces), and egress, in the absence of a graphic design package determined by the Sponsor Agency.
- b. Where applicable, the Consultant shall include signage in the building's elevator lobby that promotes stair use.

16) NEW OR INNOVATIVE TECHNOLOGY DESIGN FEATURES AND PRODUCTS

When proposing new or innovative technology design features or products, the Consultant shall analyze and compare initial cost and long-term operating costs and maintenance requirements in comparison to industry standard products and practices. Minimizing maintenance is always encouraged and expected.

17) MAINTENANCE MANUAL

For designs incorporating new or innovative technology and or complex or unusual materials, assemblies, or systems, a written manual and schedule shall be prepared by the Consultant for the Sponsor Agency users and submitted at the completion of construction, in addition to typical required maintenance staff training.

18) COORDINATION

The Consultant shall coordinate the work of all disciplines necessary to complete the project. In general, DDC projects are organized by trade. The construction will either be bid as a single contract or if subject to Wick's Law as multiple contracts as determined by DDC. Consequent coordination of documentation around separate Prime Contractors for General Construction, HVAC/Fire Protection, Electrical, and Plumbing is of special importance.

F. ACCESSIBILITY

- 1)** The Consultant is responsible for the design and construction of projects so that the building and/or site is readily accessible to and usable by individuals with disabilities. The Consultant is responsible for complying with all applicable local, state and federal requirements, including but not limited to, the accessibility requirements set forth in Chapter 11 of the NYC Building Code and its associated Technical Reference Standard ICC A117.1-2009, and the 2010 ADA Standards for Accessible Design (the "2010 ADA Standards") as well as all other requirements included in the Accessibility Standards, as defined in section c. below. The Consultant is encouraged to utilize United States Access Board Guidelines, whenever possible, as an additional design resource. Conformance with only one code or standard does not fulfill the obligation of the Consultant. Where there is a conflict or inconsistency between the requirements, the Consultant will ensure compliance with the more restrictive requirement. Obtaining approvals and permits from the Department of Buildings or any other City agency does not waive the Consultant's obligation to ensure the project's design and construction is compliant with all applicable local, state and federal accessibility requirements.

a. Scoping

The Consultant shall review the scope of work provided in the Project Objectives and analyze the scoping provisions and triggers within the NYC Building Code and 2010 ADA Standards to ensure the design fully meets these accessibility requirements accordingly. The compliance of the design and its documentation shall be monitored during all design and construction phases. All new buildings must be fully accessible, to the extent established by such codes and standards. When altering existing buildings, the Consultant is responsible for verifying that the scope of work in

the PO fully addresses the requirements of the NYC Building Code or 2010 ADA Standards, and must notify DDC in writing of any potential omissions or conflicts. The Consultant shall determine whether ADA Path of Travel (28 CFR 35.151(b)) is triggered by any alteration to a primary function area. If an area containing a primary function has been altered without providing an accessible path to that area, and subsequent alterations of that area, or a different area on the same path, are undertaken within three years of the original alteration, the total cost of alterations to the primary function areas on that path of travel during the preceding three-year period shall be considered in determining whether the cost of making that path accessible is disproportionate. The Consultant shall also determine whether the building must be fully accessible due to a change in the dominant occupancy/use, or based on the value of the alteration, as outlined in NYC Building Code Sections 1101.3.1 and 1101.3.2. Once the required level of accessibility is determined, the Consultant is responsible for proper execution of the technical requirements.

b. Technical Requirements

The Consultant is responsible for ensuring all building components are designed and constructed in compliance with Accessibility Standards, as required by the project scope. The Consultant is advised to provide adequate construction tolerances to ensure ordinary construction inaccuracies do not result in a non-compliant built condition.

c. Accessibility Standards

To ensure capital construction projects are readily accessible to and usable by individuals with disabilities, and to prevent the unlawful discrimination based on disability, the term 'Accessibility Standards' used throughout this document shall mean the following:

- i. The New York City Construction Codes, including Chapter 11 of the NYC Building Code;
- ii. Accessible and Usable Buildings and Facilities, ICC A117.1 2009 Edition;
- iii. NYC Charter §224.3, regarding induction loop systems;
- iv. The Americans with Disabilities Act, 42 U.S. Code §12101 et seq. and regulations implementing Title II of the Americans with Disabilities Act, 28 CFR §35.101 et seq., with particular regard to §35.151 "New construction and alterations," and including, but not limited to, path of travel requirements associated with alteration work;
- v. The 2010 ADA Standards for Accessible Design for State and Local Government Facilities Title II, with particular regard to §104.1, concerning construction and manufacturing tolerances;
- vi. Section 504 of the Rehabilitation Act, 29 U.S. Code §794, and implementing regulations;
- vii. United States Access Board issued accessibility guidelines;
- viii. The New York State Human Rights Law, Executive Law §291 et seq., with particular regard to §296(2)(c);
- ix. The New York City Human Rights Law, Administrative Code §8-101 et seq., with particular regard to §8-107(15); and
- x. The Fair Housing Act, 42 U.S. Code §3601 et seq., as amended by the Fair Housing Amendments of 1988, and implementing regulations at 24 CFR Part 100.

G. LANDSCAPE ARCHITECTURE

1) LANDSCAPE CONDITIONS

The Consultant's work shall demonstrate a thorough analysis of the functional relationships of site program elements, pedestrian and vehicular circulation, adjacent off-site uses and conditions, existing site characteristics and constraints, environmental considerations, maintenance, and subsurface conditions based on site visits, borings, probes, and surveys.

a. Plant Selection

Plants shall be selected based on the conditions of the site such as soil characteristics, moisture, temperature extremes, acidity, wind, and light, as well as their resistance to invasive pests or pathogens. The use of native and drought tolerant plant material is encouraged.

b. New York City Department of Parks and Recreation Review

When the NYC Department of Parks and Recreation (NYC Parks) has jurisdiction over a project site and for all street tree plantings, the landscape design must be reviewed and approved by NYC Parks, as directed by DDC.

c. Arborist Report

The Consultant shall engage an arborist to undertake an inspection of all trees 4" and greater on the project site and produce a report detailing the species, condition, expected lifespan, required maintenance, and if any infestation of invasive pests or pathogens exists. The inspection area shall extend out from the project site approximately fifty feet at campus locations. Street trees are to be included in the scope. The inspection and report shall be performed during the Schematic Design Phase.

2) SIDEWALKS, PARKING AREAS, AND ROADWAYS

Projects may require either new or repaired street sidewalks, curbs, parking areas, driveway aprons, curb cuts or roadway pavements. The Consultant is advised to confirm with the DOB at an early stage whether a Builder's Pavement Plan (BPP) application will be required. Non-standard sidewalks require PDC and DOT approval.

- a. The extent of impervious surfaces shall be minimized, and tree cover over paved surfaces shall be maximized. Porous pavement and pavements with a high solar reflectivity index (SRI) are desirable when budget and site conditions allow.
- b. Tree plantings and vegetated areas are encouraged in all parking areas to provide both "green" infrastructure and shade for the pavement.
- c. Sidewalks, parking areas and roadways shall comply with Accessibility Standards.
- d. In certain zones, parking lots shall also comply with NYC Zoning Resolution 37-90 requiring perimeter landscaping in lots exceeding 18 stalls.

3) DRAINAGE

All surface storm water runoff shall be collected on site. Connection to City storm or combined sewers shall conform to current DEP regulations. Surface grading shall provide for drainage away from buildings. Reduce runoff by minimizing impervious surfaces; consider "green infrastructure" such as green roofs, enlarged tree pits, and bioswales; consider "gray infrastructure" such as blue roofs, porous pavement, rain gardens and below-grade stormwater storage and infiltration. See Plumbing Engineering section in this Chapter for additional drainage requirements.

4) **PLANTINGS**

Plants may include lawns, trees, shrubs, ground covers, climbing plants, and seasonal plantings. Plants shall have well-established roots at time of planting. All plantings shall conform to the Grade A ANSI standards of nursery stock, be free of pests and diseases, contain no broken branches, weeds or deleterious material and shall not arrive on project site dried out.

a. Street Trees

Projects shall provide for new or replacement street trees. Street trees shall be selected from the current NYC Parks street tree species list. Approval for street trees is required from NYC Parks and from DDC. Tree pits shall comply with all current NYC Parks requirements.

b. Maintenance Manual

For substantial planting designs, a written manual and schedule shall be prepared by the Consultant for the Sponsor Agency users and submitted at the completion of construction.

c. Invasive Plant Species, Pathogens, and Pests

Site design and site construction must conform to all regulations regarding control of invasive plant species, pathogens, and pests. For the current list of permitted, prohibited, and restricted plants, contact NYC Parks Central Forestry and Horticulture Division at <http://nyc.gov/parks>.

5) **SITE FURNISHINGS**

Site furnishing may include benches, tree guards, railings, bicycle racks, fences, gates, waste bins, light fixtures, signage, kiosks, art installations, trellis work, and play equipment. Lighting in street rights-of-way to conform to DOT Street Design Manual.

a. Fences

The design of site fencing should be appropriate to the building and the surrounding context. For historic buildings, restoration or replication of original fencing and gates shall be considered, subject to current code requirements.

b. Playgrounds

Playground and resilient play surfacing design shall meet the requirements and guidelines of the Sponsor Agency, the United States Consumer Products Safety Commission (CPSC), ASTM F1487, F1292-17a, and the NYC Building Code. Safe fall-zones shall be provided. Playground design shall comply with Accessibility Standards.

c. Indoor/Outdoor Bicycle Parking

Secure bicycle parking shall be provided in compliance with applicable zoning and building code requirements. This parking shall be in view of building security personnel.

6) **IRRIGATION**

- a.** When required by the Agreement, irrigation shall be provided sparingly for initial establishment, maintenance, cleaning, and watering of plantings.
- b.** Hose bibs are preferable and shall be provided at spacing that allows a one-hundred-foot-long hose to reach all parts of the site without crossing entrance approaches.
- c.** Use non-potable water wherever feasible.

- d.** Irrigation using groundwater or stormwater, treated, stored, and distributed per DEP regulations is encouraged.
- e.** The irrigation system shall be designed to provide water to plants only when needed. Use rain sensors or soil moisture sensors to prevent unnecessary watering. Avoid overspray onto paved surfaces. Drip irrigation systems are preferred.
- f.** Install all major components in protected, accessible locations. Provide freeze sensors as required. Irrigation controllers and remote sensing stations must be placed in vandal-proof unobtrusive locations and protected from freezing.
- g.** Install quick coupling valves throughout the system so that hoses can be connected to the system. Locate drain valves to permit periodic draining of the system.
- h.** Provide irrigation water meter separately from domestic water meter. Backflow prevention must be installed.
- i.** Provide automatic controls so watering can be scheduled at night or in the early morning to reduce water losses from evaporation. Use zoned irrigation systems so that different areas can be watered at different times.
- j.** Irrigation systems must be provided with a Smart Controller that incorporates an on-site rain or moisture sensor that automatically shuts the system off after a predetermined amount of rainfall or sensed moisture in the soil.
- k.** Specify training on proper operation and maintenance of the irrigation system for the appropriate facilities staff.

7) WATER FEATURES

The use of water features, unless of very low water usage or using recycled water, should be reserved for places of high civic importance only. Water features where there may be public contact with the water may only utilize potable water supply and must be filtered and treated. When proposing decorative fountains and pools, the Consultant shall identify the required maintenance, safety, water consumption, shut down, cost of operation, and winter season issues.

8) SITE LIGHTING

- a.** The Consultant shall provide for outdoor lighting and electrical power systems and building illumination where required. Generally, unobtrusive lighting designs and luminaire placement is preferred. Site luminaires should complement and be integrated with other site elements. Place luminaires to reduce glare and light pollution. Provide fixture lamping, color and durability information, and catalog cuts for selection when specifying site lighting. Neutral white illumination is preferred. Luminaires must be resistant to vandalism and easily replaceable. Consider photovoltaic site lighting in lieu of hard wired where cost-effective.
- b.** Full cut-off fixtures and other technologies and methods that reduce nighttime light trespass are strongly preferred. Where feasible, using a larger number of shorter, more closely spaced, lower wattage fixtures are preferable to using a smaller number of higher, widely spaced, high wattage fixtures. For more information see Electrical Engineering section in this Chapter.

9) RECYCLED MATERIALS

The use of recycled materials is encouraged where practical. Where feasible, recycle demolished and removed material, salvage existing topsoil, and transplant existing plant material.

10) EASE OF MAINTENANCE

Maintenance considerations shall be integrated into the design process, such that landscaped areas can be maintained in a cost-effective and efficient manner. Anticipated maintenance shall not exceed the ability of the Sponsor Agency to adequately maintain the landscape.

11) PLANT TAGGING AND FIELD SERVICES

Plant tagging by the Consultant is an additional service that includes the following:

a. Tagging of Plant Materials

The Consultant shall engage the services of a licensed Landscape Architect to select, tag with DDC seals, and supervise the planting of all plant materials. All individual plants shall be balled and burlapped or container-grown stock. Representative samples of ground cover grown in flats shall be inspected and tagged at the nursery before such plants are prepared for shipment. All plant materials shall be inspected for signs of invasive pest infestation prior to shipment. Any infestation must be immediately reported to the New York State Department of Agriculture and Markets (NYSDAM).

b. Inspections of All Plantings

In addition to supervising the planting operations, the Landscape Architect hired by the Consultant shall inspect the final planting and notify DDC when it is appropriate to accept the planting and initiate the guarantee. Inspections of all plantings shall be made by the Landscape Architect engaged by the Consultant throughout the maintenance and guarantee period, and sufficiently early so that replacement plants may be planted in the appropriate planting season. The Landscape Architect is to identify for replacement all plants found to be unhealthy or infested by invasive pests. At the expiration of the guarantee period the Landscape Architect shall notify DDC as to whether or not the Contractor should be released from further obligation.

c. Preparing a Maintenance Report

The Landscape Architect shall prepare a report for DDC indicating whether the Contractor is complying with the maintenance portion of the Contract and recommending actions required. Note that the planting acceptance and release are independent from acceptance of the general construction work. The report shall be prepared at a time appropriate to the planting installation, as determined by the DDC Resident Engineer.

d. Preparing a Maintenance Schedule

The Landscape Architect shall prepare a written and graphic maintenance schedule and manual for all final project planting materials. Upon the approval of the manual, the Consultant shall submit the original to the DDC Resident Engineer. For each type of plant, the schedules and manual shall identify the requirements for irrigation, fertilization, pruning, weeding, cultivating mulching, lawn care, seasonal plantings, plant replacement, pest control and disease control.

H. STRUCTURAL ENGINEERING

1) INTRODUCTION

All work requiring structural design must be designed by the structural engineer. The work shall be in accordance with the latest NYC Building Code and all currently approved local laws. All structural design shall be performed in accordance with the latest Design Consultant Guide and methodologies. Steel and concrete design shall be based on the latest edition of the AISC and ACI codes referenced in the NYC Building and all codes referenced therein including:

- a. ASCE 07 - Minimum Design Loads for Buildings and other Structures.
- b. ASCE 11 - Guidelines for Structural Condition Assessment of existing Buildings

2) GENERAL CRITERIA

a. Structural Integrity

Both foundation and superstructure systems shall be designed to meet all structural integrity, strength, serviceability and appearance criteria as defined by code. Serviceability criteria includes deflections, drift, vibrations, and progressive collapse as applicable. The design shall ensure durability by means of crack control, resistance to corrosion, water tightness, fire-resistance etc.

b. Coordination

The Structural Engineer shall coordinate his work with all other trades. All major openings through primary structural members such as walls, floors, roofs, beams etc. shall be fully dimensioned in the plans. Criteria for the layout and details of small penetrations to be done in the field may be provided in the typical details. No new or additional openings through any structural member may be made in the field without the written authorization of the EOR.

c. Economy

While meeting all criteria for strength and serviceability, the design is expected to optimize the use of material and be economical.

d. Probes and Other Investigations

The Consultant shall request and locate all borings, probes, and other exploratory studies as required for the design. For additional information regarding probes and subsurface conditions; see Structures and Soils: Section C in this Chapter.

e. Fire Protection

The Structural Engineer shall collaborate with the Architect on the design and specification of proper fire protection of all materials and structural components specified in the structural design.

f. Construction Tolerances

The Construction Documents shall indicate specific tolerances for all structural components used in the project, which shall be in accordance with ACI 117, AISC Code of Standard Practice and other national standards.

g. Thermal breaks

Where proposed by the architect, the structural engineer shall coordinate his details to incorporate the thermal breaks.

h. Other Codes

At the direction of DDC, the requirements of the NYC Building Code may be supplemented by more stringent provisions found in other building, design and material codes relevant to the project.

i. Calculations

The Consultant shall submit a comprehensive set of structural design calculations, including any working drawings or sketches that may be required for their proper supplementation. If analysis software is used for design DDC may request the submission of analysis models as part of the review process.

All calculations/design notes shall be arranged in a logical sequence, with sheets sequentially numbered and properly indexed. The calculation package will include, but not be limited to:

- i. Design load parameters
- ii. Building model indicating reactions from major loading combinations such as gravity, wind, seismic etc.
- iii. Sample calculations of major structural components showing clearly the loads and load combinations used for the design of the members.
- iv. Calculations for buildings located in flood areas must include flood design load parameters.

j. Progressive Collapse

Designs that facilitate or are vulnerable to progressive collapse must be avoided. Consultants may apply static and/or dynamic methods of analysis to meet this requirement. In recognition that a larger-than-design explosive event may cause a partial collapse of the structure, new facilities with a defined threat must be designed with a reasonable probability that, if local damage occurs, the structure will not collapse or be damaged to an extent disproportionate to the original causer.

k. Alterations in Existing Buildings and Historic Structures

Alteration requires ingenuity and imagination. It is inherently unsuited to rigid sets of rules, since each case is unique. It is recognized that total compliance with standards may not be possible in every case. Where serious difficulties arise, creative solutions that achieve the intent of the standard are encouraged.

3) FOUNDATION DESIGN

a. Foundation Type

The Consultant shall evaluate the boring data provided by DDC to determine the most suitable and economical type of foundation. The foundation shall be properly designed, detailed, and specified on the structural drawings and specifications.

b. Geotechnical Report

The Consultant shall issue the boring location plan at an early stage of the design (Pre-Schematic/ or Schematic), if applicable. See Structures and Soils section in this Chapter for additional

Information. Unless otherwise noted, the Geotechnical report, including the recommendations and the borings may be provided to the Consultant by DDC.

In cases where these are not provided, the Consultant shall engage a Geotechnical Consultant to obtain this information.

c. Underpinning

Where the project is located adjacent to existing structures, the Consultant shall make every effort to avoid or minimize the need for underpinning. If underpinning is found necessary, the following recommendations shall be adhered to:

- i. Where underpinning may be required, the Consultant shall notify the Project Manager at the Pre-Schematic phase or, if a pre-Schematic phase is not performed, at the Schematic Design phase to contact the adjacent property Owner and coordinate all issues associated with underpinning.
- ii. The Consultant shall identify on their plans the extent of foundations that require underpinning and provide generic underpinning details and instructions.
- iii. The design of the underpinning is the responsibility of the Contractor and must be designed by a Professional Engineer, licensed in the State of New York, and retained by the Contractor. The drawings must be signed and sealed by the Structural Engineer.
- iv. The Consultant shall review the underpinning for its impact on the new and existing construction and for conformance to their recommendations.
- v. The Contractor is solely responsible for monitoring during construction, the conditions of the adjacent buildings and other structures affected by the underpinning.
- vi. Underpinning shall be identified and listed as a special inspection.

d. Ground Water

The Consultant shall evaluate the ground/flood water conditions indicated in the Geotechnical report. If subsurface waterproofing is required, these details shall be shown on the architectural drawings, coordinated, and schematically shown on the structural drawings

e. Settlement

The foundations shall be designed to minimize overall as well as differential settlements. For utility lines where such settlement could have detrimental effects on facility operations, health, and safety, the settlement criteria must be more stringent. This is to be coordinated by the Consultant with other trades, as applicable.

f. Unsuitable Soils

Where the existing soils are not suitable for supporting a slab on grade, such floor systems shall be structurally framed and supported on foundations or on properly compacted controlled fill.

g. Pile Driving

The effect of pile driving operations on adjacent properties shall be taken into consideration during design. Pile types not mentioned in the NYC Building Code shall be specified only after appropriate design analysis is performed and approval from the DOB is obtained. DOB determination is required prior to Design Development Phase kick-off.

h. Vibrations and monitoring

The Consultants shall advise on the requirements for monitoring the structure and any affected structures in the vicinity and provide relevant guidance in the notes or on the drawings.

4) LOADS

The structural drawings shall clearly indicate all the load criteria vertical and lateral loads for which the structure has been designed. Dead, live, equipment and all other applicable loads shall be listed in a tabular form for each floor of the building.

5) EXTERIOR CLADDING AND MASONRY

The Structural engineer shall provide cladding design loads necessary for the design of the exterior building envelope to the architect. The structural engineer shall also provide the architect with relevant building deflections necessary for the design of cladding details and shall recommend location of the expansion and construction joints.

The Consultant is responsible for the strength and code compliance of all masonry elements, including brick, block, stone, and mortar. Attachment and reinforcement of masonry components, especially parapets, shall be clearly detailed on the drawings. Special structural investigations shall be conducted on landmarks and landmark quality structures.

6) BUILDING MATERIALS

All building materials and construction types acceptable under the Building Code are allowed. However, special consideration should be given to materials that have inherent ductility and are better able to respond to load reversals (i.e. cast-in-place reinforced concrete and steel construction). Careful detailing is required for material such as pre-stressed concrete, precast concrete, and masonry to adequately respond to the design loads.

7) SEISMIC DESIGN

New structures and additions to existing buildings shall be designed to conform to the seismic design requirements as outlined in the latest NYC Building Code and other applicable code references. The structural Engineer shall collaborate with other Consultants to ensure that architectural, mechanical, and electrical components as well as non-building structures are satisfying the requirements of ASCE.

a. Critical Infrastructure

Special consideration shall be given to the design of essential facilities (Structural Occupancy/ risk Category III & IV such as police, fire, and emergency medical services and emergency management).

b. New Additions

Enlargements and new building additions shall be subject to seismic provisions as outlined in TPPN #4/99.

c. Existing Buildings

Evaluation of existing buildings shall be in accordance with the provisions of ASCE/SEI 31-03. If an existing building is required to meet the requirements of the NYC Seismic Code, the retrofit work shall conform to the NEHRP guidelines (FEMA 273) and the provisions of ASCE/SEI 41.

d. Seismic Upgrade for Historic Buildings

- i. Historic buildings should meet the same life safety objectives as other buildings while preserving historic spaces and features to the greatest extent possible. Any decision made to preserve essential historic features must not result in a lesser seismic performance than that required by "Standards of Seismic Safety for Existing Buildings"
- ii. Where deficiencies in the attachment of elements of structures, non-structural components, and equipment pose a life safety risk, they must be prioritized and those elements with the greatest life safety risk strengthened first to meet current standards.

e. Existing Parapets and Exterior Walls

Parapets that are entirely rebuilt, and any complete floor to floor reconstruction of an exterior wall, must include all reinforcement and anchorage as required by the seismic code.

8) CONCRETE

a. Concrete Strength

Structural concrete shall have a minimum compressive strength of 4000 psi at 28 days.

b. Durability

The latest ACI durability guidelines for concrete shall be specified and followed. All concrete exposed to weather or soils shall be air entrained.

c. Concrete Specification

The concrete specification shall indicate the optimal quantities of water, cement, aggregates and admixtures, along with acceptable levels for slump and air content.

d. Reinforcement

Epoxy coated reinforcing bars shall be specified for all concrete foundations and other structural elements subject to water and chloride penetration, such as in garages and firehouse apparatus floors.

e. Joints

A plan shall be provided clearly showing the dimensions and details for all concrete control joints.

f. Slab on Grade

The Consultant shall design, detail, and adequately specify all new slabs on grade to minimize or eliminate cracking and curling. Structural Synthetic Macro-Fibers should be used as a substitute for welded wire fabric reinforcement to minimize cracking in concrete from both plastic shrinkage and temperature shrinkage. The design shall meet the requirements of ACI 360 R, Design of Slabs on Grade, and other applicable guidelines.

g. Pozzolans in Concrete

Use pozzolans in concrete in accordance with ACI 318 Chapter 4. See Chapter 08: Sustainability, and Resiliency.

h. Waterproofing

In flood prone areas or structures near ocean/sea, all concrete that can be exposed to the elements shall have an integral waterproofing compound added to it. Manufacturer shall issue warranty on all integral waterproofing compounds.

9) **MASONRY**

a. Field Investigation

- i. Existing Masonry Field Investigations:
- ii. The Consultant shall perform field investigations and conduct exploratory assessments of the unknown conditions to verify existing conditions.
- iii. Probes and invasive testing shall be done as required to determine the extent of project scope. Testing of mortar and masonry may be warranted to determine physical properties, application, and the availability of materials. The Consultant shall engage a Contractor during the Design Phase to assist with building access, destructive and non-destructive testing and masonry restoration.

b. Technical Resources

- i. **Brick Masonry Design:**
The Consultant's masonry design should follow the recommendations of the Brick Industry Association (BIA)
- ii. **Concrete Masonry Design:**
The Consultant's concrete masonry design should follow the recommendations of the National Concrete Masonry Association (NCMA).
- iii. International Masonry Institute (IMI) provides technical assistance and resources for brick and concrete block design.

c. Interdisciplinary Coordination

- i. The Structural Engineer and Architect shall coordinate the structural steel frame, column, beam and bracing sizing and locations with the adjacent exterior masonry wall to minimize penetrations into the masonry cavity. Plan and section details should indicate continuous rigid insulation and continuous air/moisture barrier construction (where applicable).
- ii. Lintels are to be provided over openings and shall be designed to support loads above and account for the width of the opening. Coordinate opening placement with the structural engineer as to not impact the structural design capacity of shear walls and load bearing walls. Where steel lintels are used, they shall be hot dipped galvanized. Lintels and flashings shall be detailed to indicate weeps, mortar net and flashing end dams.

d. Moisture Management

- i. Water migration through exterior masonry structures exposed to rain should be anticipated. Water can migrate through joints between the mortar and the masonry units due to bond separation, voids, and cracks. Water migration can also occur due to absorption through the masonry units and mortar. Exterior masonry cavity wall construction must address water penetration into the wall system.
- ii. Consultant shall consider control of moisture migration, vapor drive, and air movement in the design of exterior masonry veneer walls. The air cavity behind the veneer allows water to flow down to the base flashing and out through the weeps.
- iii. Continuous air barriers are mandated in the Energy Conservation Construction Code of New York City.

- iv. A combination air and moisture (water-resistive) barrier should be used between the masonry veneer and the exterior face of the back-up wall. The air and moisture barrier material shall be continuous, durable and be able to withstand construction exposure and air pressure differentials which can be caused by wind, stack effect and mechanical systems to be effective. Spray-on products and application is preferred for concrete masonry back up walls. Show locations on the wall details including penetrations such as conduit, utility services, ducts, piping, windows and doors that must be sealed.
- v. The Consultant shall determine the need for a vapor retarder by reviewing the NYC Energy Conservation Construction Code and performing a dew point analysis. Vapor retarders shall be considered for use on projects with high internal moisture generating spaces.
- vi. The Consultant should select a material that can serve multiple functions to control air, moisture and vapor when required. This selection and control is dependent on the physical properties of the material. Consult with product manufacturers for proper usage, placement and detailing.

e. Cavity Wall Air Space and Insulation

- i. Cavities exceeding the code maximum will require analysis / calculations to be performed for the tie anchors.
- ii. Cavity walls are designed not only to guide any moisture occurring in the cavity to move downward to the flashing and weep vents, but also to allow a certain flow of air throughout the cavity. Recommend providing a 2-inch minimum clear drainage cavity (not including the insulation) to be effective, to allow for proper construction of the wall, and to minimize mortar fins, droppings and bridging.
- iii. Clearly indicate insulation attachment method either mechanically or adhered to masonry backup. Friction fitting rigid insulation between horizontal reinforcement is not an acceptable solution.

f. Flashing

- i. Consultant shall show flashing details for installation for lapping / sealing, terminations and end dams, inside corners and outside corners (either field formed or prefabricated), wall to roof line, base flashing and copings. Isometric or 3D drawings shall be used to convey proper detailing.
- ii. Where the flashing is not continuous, such as over and under openings in the wall and on each side of vertical expansion joints, the ends of the flashing should be extended beyond the jamb lines on both sides and turned up into the head joint at least 1 in. at each end to form a dam.
- iii. Provide weep vents and mortar net at all wall flashings.

g. Movement Joists

- i. Consider material movement and differential movements. Both brick and concrete masonry experience repeated thermal movements when exposed to warm and cold temperatures. Brick also expands under moisture variations. Proper joint design along with proper joint locations is necessary to accommodate these movements. Therefore, the Consultant shall locate horizontal and vertical expansion joints and control joints on drawing elevations and provide large scale details.

ii. Expansion Joints:

1. Expansion joints are typically required for exterior masonry construction. Consultant drawing elevations shall locate joints at corners, offsets, and other changes in wall plane; changes in wall construction; and at regular spacing typically 20 to 30 feet on center maximum, depending on the units.
2. Guidelines for accommodating expansion of masonry can be found in the technical resources noted above.
3. Locate relief angles / shelf angles joints on elevations and provide details.
4. Relieving angles shall be hot dipped galvanized and continuous and around corners including at columns. Isometric or 3D drawings shall be used to convey inside and outside corner angle detailing.
5. When lipped brick is detailed at shelf angles to reduce the horizontal soft joint, coordinate detail with structural engineer for masonry bearing area on the shelf angle's horizontal leg. Specify special shape lipped brick and do not allow field cut brick.

iii. Crack Control:

1. Interior concrete masonry walls are typically reinforced with joint reinforcement for shrinkage control. Depending on the size and spacing of the reinforcement, the spacing of control joints will vary. Control joints are required in all concrete masonry walls.
2. Guidelines for accommodating expansion of masonry can be found in the technical resources noted above.

h. Quality Assurance /Quality Control

i. Pre-Installation Meeting:

1. Consultant should ensure that a pre-installation meeting is specified and that their attendance at this meeting and any mock-up reviews are included during the construction phase. This meeting should not take place until all masonry submittals have been approved.
2. Consultant shall discuss grouting and reinforcing when specified on a project, especially when used for security walls. Grout slump shall be between 8"-11" (pourable). Low lift grouting (4-5 feet) shall be specified to allow better flow around obstacles and allow inspectors better opportunity to observe the cavity before and during installation of grout. Grouted walls require Special Inspections per NYC Building Code. The Consultant's structural engineer shall fill out TR-1 Statement of Special Inspections for grouted walls, shear walls and seismic reinforcement.
3. A Masonry Pre-Construction Meeting Agenda should be tailored to the specific project conditions.

ii. Wall Mock-Up:

1. The Consultant shall provide sufficient detailing in the wall mock-up drawing and specifications so that the Contractor will accurately construct building elements in the same construction sequence proposed for the building and as shown in the contract documents. The mock-up panel should contain all elements such as: precast sills, steel lintels, window unit, movement joints, ties and anchors, joint reinforcement, grouting, flashings including laps and end dams, Mortar Net, weep holes, sealants, cavity insulation, air and moisture retarders, brick and concrete masonry bond pattern, texture and color, and mortar of the correct color and strength. It is also prudent to include inside and outside corners.
2. The Consultant shall visit the project site to review the mock-up work. Resolve any problems inherent in the construction process and agree to on an example demonstrating the finished construction. The mock-up shall establish the level of quality and is the standard by which the buildings wall construction is judged.
3. The mock-up must be approved prior to start of masonry work on the building.

iii. Inspections:

1. Inspections should be provided for security walls to ensure integrity.
2. Special Inspections should be provided when required by building code.
3. Regular inspections should be provided to verify conformance to the contract documents.
4. Periodic site observations should be provided by the Consultant.
5. The Consultant shall discuss participation in the various types of inspections noted above with the PM and EIC.

10) STEEL**a. Shop Drawings & Connection Design**

- i. The contract documents shall show sufficient information for the preparation of shop drawings. The drawing shall indicate all design forces required for connection design.
- ii. Nonstandard connections are to be fully detailed by the Structural Consultant.
- iii. Connections shall satisfy all requirements of the Code of Standard Practice for Steel Buildings and Bridges.

iv. Weldability

The Consultant shall require weldability tests for all existing steel that might have been manufactured prior to 1920.

v. Levelling Plates

Leveling plates between the foundations and column base plates will not be allowed.

11) FLOOD MITIGATION

Floodplain management must be accounted for when formulating or evaluating any land use plans and must be correlated with the degree of hazard. Proposed buildings and structures within a flood hazard area shall be programmed and designed in accordance ASCE 24, "Flood Resistant Design and Construction" provisions, and the most current New York City Building Code, Appendix G, Flood Resistant Construction. Structural system damage and continuity of operations are the metrics of performance for this characteristic.

- a. Baseline: Buildings must be located above the 100-year base flood elevation + 2 feet. Critical Action facilities must be elevated above the 100-year base flood elevation + 3 feet, or the 500-year flood elevation, whichever is higher. Structure below the design flood elevation shall be designed in accordance with ASCE 24 provisions.
- b. Tier 1 High Performance: This designation addresses a perceived increased level of flood risk and decreased allowable impact compared to Baseline. The building structural system shall be designed for higher performance and increased resiliency in resisting flood conditions associated with a 500-year flood event. The structure shall be designed for loads from the 500- year floor event. This performance level anticipates cleanup, drying and minor building repairs following a 500-year flood event.
- c. Tier 2 High Performance: This performance level is governed by criteria specified for building structure resistance to flood demands. Risks associated with man-made flood hazards (dam, levee, and floodwall failure hazards) must be considered as a separate item where applicable under a site-specific assessment and where high performance is desired.

12) STRUCTURAL CONDITION RATING

While performing observations and inspections in course of work on the project, Consultant should identify any unsafe or potentially unsafe conditions which require priority repair and recommend safety measures as required. It is the responsibility of the Consultant to demonstrate professional due diligence when addressing safety concerns for the structure and its components even if it is outside the project scope.

13) ANCHORING SYSTEM

For all post-installed anchors, the design shear and tension capacities shall be provided. If required, the Consultant shall specify field testing of anchors to confirm their capacities. Anchors exposed to the elements shall be galvanized or stainless steel.

14) DEMOLITION

For all additions, extensions and renovations requiring partial demolition of an existing structure, the Consultant shall review the Contractor's demolition drawings for their impact on the long-term stability of the structure. In special cases where the demolition work may affect the overall structural integrity of the existing building the structural engineer shall prepare demolition drawings outlining temporary stability measures, sequencing, etc.

15) TEMPORARY STRUCTURES

The Consultant is responsible for reviewing the Contractor's shop drawings for the installation of temporary structures or equipment.

I. MECHANICAL ENGINEERING

1) INTRODUCTION

The purpose of this design criteria is to convey general "basis-of-design", standard of quality, and DDC preferences as they relate to building HVAC and Fire Protections systems design. Specific Sponsor Agency and facility preferences shall be revealed through each Consultant's investigations on the project.

HVAC systems and equipment shall be designed and engineered. All work shall comply with Code and utility requirements. Energy and water conservation is a requirement of all mechanical systems. All Mechanical Engineering Drawings are to be coordinated with all disciplines; mechanical systems shall be designed to avoid inappropriate juxtaposition with other utilities. The services of specialty sub-consultants shall be made available when required by the nature of the work.

2) GENERAL

- a. Mechanical systems must be designed to support the performance objectives defined for the project's program requirements.
- b. The Consultant must select and design an HVAC system that meets the performance criteria noted under 'HVAC Performance Characteristics' below and is optimized for the building type and program requirements.
- c. Maintainability, efficiency, and reliability are prerequisite requirements for public buildings.
Accessibility - The design and installation of all mechanical systems and equipment must allow for their access, service, repair, and eventual removal and replacement, including major system components such as boilers, chillers, cooling towers, pumps and air-handling units. Comply with the manufacturer's recommended clearances around installed equipment, unless otherwise directed by the Sponsor Agency.
- d. The design engineer shall acquire at the project's outset a minimum working knowledge of the project intent, scope and extent of HVAC and Fire Protection work. This activity may also require coordination with designers from one or more trades.
- e. The initial scope and extent of HVAC and Fire Protection work shall be verified by visiting the project site and further communicating with the PM and the designated Team Leader.
- f. The engineer shall identify the HVAC and Fire Protection systems, equipment, materials, and any specialized professional services or systems required to execute the project.
- g. All applicable New York City and industry codes and standards invoked by the codes must be recognized early in the design stage so that they can be referred to whenever required throughout the project's design phases.
- h. The Design Engineer shall show that the latest "green building" solutions have been incorporated and/or considered in the design consistent with the project's established Project Objectives, LEED or sustainability goals or requirements.

- i. Perform HVAC calculations according to ASHRAE recommendations for system designs wherever applicable. The calculations will be required for review at the initial design phase. They should be preserved as part of the record of design.
- j. The HVAC Engineer shall coordinate with the project structural engineer in the Schematic phase to determine the seismic design requirements for the project.
- k. All ductwork and piping penetrations into different fire or smoke zones shall be protected with appropriately rated (fire or smoke) dampers and/or sealing compounds.
- l. Coordinate the HVAC equipment location with all the architectural and engineering trades right from the project outset.
- m. Avoid using equipment with CFC based refrigerants.
- n. Identify through testing the existence of asbestos, and other hazardous materials in the work area during the Schematic Phase. Coordinate abatement scope of work and procedures with DDC OEHS unit via the project PM.
- o. Generally, use the ASHRAE symbol list for all sketch and drawing representations.
- p. Final equipment choice shall be the result of a best value assessment which considers function, materials, features, O&M issues, costs and project budget.

q. Equipment Capacities/ Peak and Part-Load Performance

The design must achieve the peak and part-load performance objectives associated with the project program requirements. Installations for which DDC and/or the Sponsor Agency requires 100% plant capacity redundancy will be designed so that the plant capacity will remain at 100% in the event of loss of one unit. For all other installations, utilize modular boilers or chillers for base peak and part-load operation. All equipment capacities and redundancies shall be reviewed during Schematic Design and Design Development and must be approved prior to proceeding with Construction Documents.

r. Equipment Location

HVAC systems and equipment shall be integrated into the architectural design for both exterior and interior locations. In general, HVAC equipment shall not be visible from the street. All roof and outdoor locations for equipment must be installed to applicable Sponsor Agency's Agency security standards and the Noise Control Code. For interior equipment, consideration must be given to aesthetic compatibility with the spaces and noise levels. For mechanical room space and equipment placement requirements, refer to Section E. Architecture, in this Chapter.

s. Equipment Schedules

Heating elements and fin-tube schedules shall include length and capacity. Cooling equipment schedules shall include physical size, performance and capacity. Mechanical equipment schedules shall indicate motor brake horsepower, motor horsepower, voltage, phases, frequency, manufacturer and model number.

t. Sustainability

Balancing occupant comfort and fresh-air ventilation with effective energy conservation, water conservation, and other measures of mechanical system sustainability can only result from an integrated design approach. For more information, see Chapter 08: Sustainability and Resiliency.

3) APPLICABLE CODES AND STANDARDS

An analysis shall be made of all applicable codes and standards, local laws, and regulatory agency requirements as they pertain to the provision of a complete system HVAC for the project. This will include seismic restraint and energy codes as required. At a minimum, the Consultant shall design the mechanical systems to meet the following:

- a.** NYC Building Code
- b.** NYC Mechanical Code
- c.** NYC Fuel and Gas Code
- d.** NYC Electrical Code
- e.** NYC Fire Code
- f.** NYC Local Law 86 of 2005, See Chapter 08: Sustainability and Resiliency for more.
- g.** NYC Local Law 113 of 2005 (Noise Code)
- h.** NYC Energy Conservation Code
- i.** NYC Green Building Laws that are codified in the City Charter, Administrative Code and other rules. See Chapter 08: Sustainability and Resiliency for more.
- j.** Regulations of the New York State Department of Environmental Conservation Code
- k.** NYC Department of Environmental Protection (DEP) regulations, rules and guidelines.
- l.** All applicable rules, regulations and requirements of Federal, State and Other Authorities having jurisdiction and local utility companies having jurisdiction
- m.** The following reference standards of the NYC and NYS codes, as adapted, including but not limited to:
 - i.** American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE), All latest Standards and Handbooks
 - ii.** Sheet Metal & Air Conditioning Contractors' National Association, Inc. (SMACNA) Standards.
 - iii.** National Fire Protection Association (NFPA) Standards.

4) THE DESIGN OF MECHANICAL AND OTHER HVAC SYSTEMS SHALL COMPLY WITH ALL LOCAL LAWS AND REQUIREMENTS.

- a.** See Chapter 08: Sustainability and Resiliency for further information.

5) EXISTING CONDITIONS

a. Surveys

The survey shall record all equipment and conditions, including the age and condition of all heating and cooling equipment such as boilers, AC units, fans, piping, insulation, and the operating results achieved through their use.

b. Existing Systems Assessment

For existing systems, the Consultant shall assess the HVAC equipment, and where necessary, propose recommendations to obtain an efficient and safe operating condition.

6) EQUIPMENT CONNECTIONS

a. New Equipment Connected to Existing System

For existing buildings, the report shall state if the new equipment installation is connecting to an existing system, and, if so, whether the existing equipment is to be refurbished before the new connections are made.

b. Schedule of Equipment to be Overhauled

For existing equipment to be overhauled or replaced, the Consultant shall make a complete schedule of all HVAC equipment. The schedule will list working condition, requirements for repair, and appropriate remaining potential useful life.

7) ALTERATIONS IN EXISTING BUILDINGS AND HISTORIC STRUCTURES

HVAC work in alteration projects should seek to meet the standards described in this section for new projects. Compliance with all HVAC design criteria is required whenever feasible.

a. Equipment/Systems Replacement

Equipment/systems aged 20 years and older, or beyond their useful service lives, should be evaluated for possible replacement with new systems designed to meet the proposed usage of the facility. Remodeling must make building systems become more flexible; renovation and rehabilitation designs must satisfy immediate occupancy needs as well as anticipate additional future changes. Parameters of reuse and disruption of service must be clearly specified in Construction Documents. The result of these projects should be enhanced performance, not equipment replacement alone.

b. Objectives of Alteration Projects

The objectives of HVAC design will differ for three basic types of alteration:

- i. Refurbishment of an area within a building, such as a floor or suite, should seek to satisfy the new requirements within the parameters and constraints of the existing systems. The smaller the area in comparison to the overall building, the fewer changes to existing systems should be attempted.
- ii. Major renovation of an entire structure provides the opportunity to significantly upgrade the mechanical, electrical, and communication systems. The upgraded mechanical services should achieve performance close to that of systems that would be designed for a new building, within the obvious limits of available physical space and structural capacity.
- iii. Work on a designated landmark or landmark quality property shall be guided by criteria provided by the DDC Historic Preservation Office, including the latest updates of published guidelines, standards, and rules pertaining to historic preservation. Reuse of historic HVAC system elements is permitted only with approval from DDC A&E unit. See below Historic Preservation section in this Chapter for additional information.

c. Guidelines for HVAC Work in Historic Buildings

It is important to anticipate how the system will be installed, how damage to historic materials can be minimized, and how to minimize the visibility of the system within the restored or rehabilitated space.

- i. Design HVAC systems to avoid impacting other systems and historic finishes, elements, and spaces. Select system types, components, and placement to minimize alterations to significant spaces. In spaces previously altered, design systems to allow historic surfaces, ceiling heights, and configurations to be restored.
- ii. To the greatest extent possible, ensure that space is available to maintain and replace equipment without damaging significant features. Select components that can be installed without dismantling historical window or door openings.
- iii. Place exterior equipment where it is not visible, particularly from public streets. Recess equipment from the edge of the roof to minimize visibility from grade. Alternatively, consider creating a vault for easier access to large mechanical equipment. If equipment cannot be placed out of sight, specify equipment housings or screens in harmony with existing building and site elements.
- iv. Locate equipment with care for weight and vibration. Some older building materials and construction assemblies cannot accept the same stresses as newer construction.
- v. If new ceilings are to be installed, ensure that they do not block any light from the top of existing windows or alter the appearance of the building from the exterior. Original plaster ceilings in significant spaces, such as lobbies and corridors, must be retained to the extent possible and modified only as necessary to accommodate horizontal air distribution. Use soffits and false beams only where necessary to avoid the need to reduce ceiling heights.
- vi. In buildings containing ornamental or inaccessible ceilings, piping and ductwork should be routed in furred wall spaces or exposed in the occupiable building area. However, exposed piping and ductwork can be considered in historic industrial buildings with open plan, high ceilings, and tall windows.
- vii. If new vertical distribution ductwork or piping is required, it should reuse or be located adjacent to existing shafts.
- viii. Retain decorative elements of historic systems where possible. Ornamental grilles and radiators and other decorative elements should be retained in place. Refurbishing and continuing to use functioning historic systems, such as steam heating, should be considered.
- ix. Retain elements of the original system where a new system cannot be totally concealed or would be historically inappropriate. For example, reuse existing radiator enclosures for modern heating and cooling units, rather than adding another type of system that would require the addition of ceilings or other non-original elements.
- x. Select temperature and humidity setpoints that do not accelerate the deterioration of historical building materials.
- xi. When the project involves a designated individual landmark or building within an historic district, follow the relevant Landmarks Preservation Commission rules and guidelines for HVAC and rooftop work.

8) HVAC PERFORMANCE CHARACTERISTICS

Sustainability is integral to any HVAC design and is accomplished by integrating the performance characteristics listed below through a design methodology involving all Consultant team members. For more information, see Chapter 08: Sustainability and Resiliency.

a. Program Compliance

All Sponsor Agencies' program requirements for HVAC design must be met. The design shall comply with the Sponsor Agency's Agency design standards and the user's needs.

b. Thermal Comfort and Humidity Requirements

The HVAC systems shall be designed in accordance with NYC ECC (Ref. Std. ASHRAE 55) and the following table. Other criteria may be substituted only with DDC approval.

- i. Outside design conditions will be based on Code and/or as per Sponsor Agency requirements and as follows:

Outside Design Conditions	
Summer	Winter
85° F - 95° F DB 71° F - 75° F WB 7.5 MPH wind	50° F - 15° F DB 15 MPH wind

- ii. Indoor design conditions will be based on Code and/or as per Sponsor Agency's Agency requirements and as follows:

Type of Area	Summer		Winter	
	DB	RH	DB	RH
Habitable and Occupied Spaces	75° F	40-60 %	72° F	40-60 %
Locker Rooms	75° F	–	75° F	–
Electrical Closets	75° F	–	75° F	–
Storage Areas	75° F	–	75° F	–
Lobbies, Atriums, Corridors, and Circulation Areas	75° F		75° F	
Mechanical/ Electrical Rooms	75° F	–	75° F	–
Elevator Machine Rooms	75° F	–	75° F	–
Emergency Generator Room	75° F	–	75° F	–
Computer and IT Rooms	75° F	50%	75° F	40%
Telecommunication Rooms	75° F	50%	75° F	40%
Stairwells	75° F	–	75° F	–

c. Ventilation

The Consultant shall evaluate whether a ventilation system as recommended by the ASHRAE method of design is more energy efficient than a system conforming to Code. To provide for such a determination during Schematic Design, the Consultant shall clearly identify the impact on heating and cooling loads, and initial and operating costs of conforming to the ASHRAE recommendations. DDC shall review all calculations related to ventilation including but not limited to, compliance with NYCMC Table 403.3 and section 403.3.2. DDC shall review the Consultant's recommended system, including outdoor air quantities, prior to proceeding with Design Development.

d. Air Quality

To provide health and comfort of the building occupants, design the mechanical system to meet the requirements of the Code or an approved method of engineering analysis

- i. Filtration – Air filtration must be provided in every air-handling system. Air handling units must have the capability to pre-filter and final filter (as required), each located at the cooling and heating airstreams.
- ii. Contaminant Control – The ventilation and exhaust systems must prevent occupant exposure to noxious and harmful levels of indoor air contaminants. This includes but is not limited to: Carbon Dioxide, Carbon Monoxide, Formaldehyde, Ozone, Particulates, and Radon.
- iii. Pressurization Control – Unless otherwise required, for specialty occupancies, to reduce the infiltration of unconditioned outdoor air, the ventilation system must continually provide positive pressure in the perimeter zones with respect to outdoor air pressure.
- iv. Occupant Controls – Limit the size of thermostatically controlled zones to provide tenants with more direct control over their thermal comfort and to reduce impacts of variable loads to tenants. System zoning shall be defined by the requirements of occupancy schedule, energy conservation and back-up capability. Off hours operations should reset the control sequence to energy conserving conditions.

e. Interior Noise Control

Limit occupant exposure to excessive mechanical noise and vibration. Any equipment generating indoor noise shall meet the requirements of the NYC Codes and applicable Reference Standards and Maximum Noise Criteria (NC) indicated in the table below:

i. Consultant's Responsibility

The Consultant is responsible for providing for acoustical design services and testing, as required, to assure that the mechanical systems perform within the guidelines set forth by ASHRAE in the "Recommended Indoor Design Goals for Air Conditioning System Sound Control". If, in the opinion of DDC, the Consultant does not have adequate noise control experience or expertise in-house, DDC reserves the right to direct the Consultant to engage an approved acoustical Consultant to perform the required design services.

ii. Special Use Areas

Special attention shall be paid to certain special areas which require sound isolation and minimized cross-talk.

iii. Maximum Noise Criteria (NC):

Space	Max Noise Criteria (NC)
Office Space (confidential speech privacy)	30
Office Space (normal speech privacy)	35
Open Plan Office	40
Meeting Rooms	25
Auditorium	25
General Circulation/ Lobby Area	40
Courtrooms, judges' chambers, jury rooms, prisoner consulting rooms, and prisoner detention areas:	Noise transmission to and from areas requiring confidentiality must be attenuated to meet the acoustics requirements in the Design Consultant Guide and the Sponsor Agency's Agency Design Standards.

iv. HVAC Ductwork and Fan Noise

The ductwork design must address airborne equipment noise, and vibration, duct-borne fan noise, airflow-generated noise, and duct-borne crosstalk noise.

1. Duct noise control must be achieved by controlling air velocity and/or using sound attenuators such as duct silencers.
2. Acoustically lined ducts may only be used (in addition to duct silencers) if the usage of duct silencers alone fails to provide acceptable noise levels or if space constraints preclude the sizing of the ducts to provide low velocity levels. If fiberglass duct lining is used, it shall be covered with an antimicrobial coating and sealed with an acrylic polymer. Fibrous materials must not be exposed to the airstream.
3. Where possible, all volume dampers and VAV boxes shall be located 5 to 10 duct diameters downstream/upstream of the volume control device inlets and outlets, with a minimum distance of 2 ft.
4. Ceiling diffusers and ceiling return grilles shall not be provided with opposed blade dampers when a lay-in acoustical ceiling or gypsum ceiling equipped with access doors is provided. Each ceiling diffuser and ceiling return grille shall have a dedicated accessible volume damper installed in its branch. Ceiling diffusers and ceiling return grilles shall only be equipped with opposed blade dampers (in lieu of branch volume dampers) when it can be demonstrated that space constraints preclude the installation of branch volume dampers. Wall supply and return registers may be equipped with opposed blade dampers in lieu of branch volume dampers if access cannot be provided for branch volume dampers.
5. Consultant shall determine the maximum CFM allowed for non-fan-powered boxes. Non-fan-powered boxes (conventional) shall be utilized as the standard. Custom air conditioning units shall be provided with integral acoustically lined plenums on the return and supply sides. Plenums shall be double-walled and lined with rigid fiberglass boards that shall not erode. Inner walls shall have perforations to absorb the sound energy.

6. Use acoustical lining or external wrapping on the ductwork to impede fan-generated noise immediately outside of any mechanical room wall.
7. Acoustic lining in the supply and return air ductwork in courtrooms, judges' chambers, conference rooms and similar spaces is permitted provided that fibrous materials are not exposed to the airstream
8. If linear supply diffusers are used, their integral plenums shall be provided with factory applied internal acoustical lining.

v. HVAC Equipment Vibration

Design to prevent propagation of vibration to the building structure shall follow the requirements of the ASHRAE Applications Handbook, Sound and Vibration Control. In addition, the entire mechanical installation, including all exterior and roof mounted equipment, air cooled chillers, air cooled refrigerant condensers, cooling towers, fans, and air-handling units, shall meet all noise control requirements of the Code and DEP.

1. All rotating equipment in the building must be isolated. Inertia bases must be provided for reciprocating and centrifugal chillers, air compressors, all pumps, axial and centrifugal fans.
2. Isolators must be specified by type and by deflection. Specifications must be worded so that isolation performance becomes the responsibility of the equipment supplier.
3. Consultant shall determine if factory provided isolators sufficiently attenuate the vibration considering the flexibility and nature of the floor or structural roof. If it is determined that the factory provided isolators are insufficient, the Consultant shall specify the required field erected vibration isolators (stiffness, static deflection, etc.) and indicate them on the Construction Documents. A vibration analysis shall be submitted for review.
4. Flexible duct and piping connectors shall be provided at equipment joints. All ductwork connections to equipment having motors or rotating components must be made with a 6 ft. length of flexible connectors. Use airtight flexible connections at the inlet and at the outlet of all air handling units, supply and exhaust fans, and at other locations where duct and piping connect to vibration isolation equipment.
5. All ductwork within the mechanical room or serving courtrooms must be supported with isolation hangers.
6. Ducts and pipes must also be isolated as they penetrate shafts and chases. All openings for ducts and piping must be sealed.

vi. HVAC Piping Vibration

Spring/neoprene isolation hangers are required for all piping in mechanical rooms and adjacent spaces, up to a 50 ft. distance from vibrating equipment.

1. In mechanical rooms, the pipe hangers closest to the equipment must have the same deflection characteristics as the equipment isolators. Other hangers must be spring hangers with $\frac{3}{4}$ in. deflection.
2. Positioning hangers are required for all piping 8 in. and larger throughout the building. Spring and rubber isolators are required for piping 2 in. and larger that is hung below noise-sensitive spaces.

3. Floor supports for piping must be designed with spring mounts or rubber pad mounts.
4. Anchors and guides for vertical pipe risers must be attached rigidly to the structure to control pipe movement. Flexible pipe connectors must be designed into the piping before it reaches the riser.
5. Channel supports must be provided to support multiple pipes and heavy-duty steel trapezes.
6. Hanger and support schedules must specify the size, type, location, and manufacturer's number.

vii. Interior Acoustical Design Compliance Report

If required, the Consultant shall prepare a report on acoustical design compliance addressing the possible need for the following (including but not limited to):

1. Usage of sound traps or acoustical lining upstream and downstream of the air handlers and air conditioning units.
2. Mounting of rooftop equipment on dunnage (in lieu of curb mounting).
3. Usage of integral elbow type sound attenuators in the supply and return air plenums of the air conditioning units.
4. Usage of elbow type sound attenuators connected to the return grilles.
5. Locating the units over non-critical spaces where possible (e.g., corridors, storage rooms, etc.).
6. Usage of 16-gauge reinforced steel ductwork both upstream and downstream of the air handlers and air conditioning units.
7. Usage of performance based acoustical lining material in lieu of standard 1 in. thick lining.
8. Running commercial rooftop unit ductwork externally on the roof.
9. Enclosing ducts within gypsum construction.
10. Providing acoustic noise barrier walls around the rooftop units.
11. Providing floating slabs.
12. Usage of VAV boxes with better 'ADC Testing' or, as an alternative, lowering the nominal maximum flow of 1200 cfm per fan-powered VAV box based on box location.
13. The possible acceptability of exceeding the nominal maximum flow of 1200 cfm per fan-powered VAV box.
14. Usage of gypsum suspended ceilings with adhesively applied acoustical ceiling tiles in lieu of lay-in suspended ceilings.
15. Usage of double layer gypsum suspended ceilings in lieu of lay-in suspended ceilings.

f. Exterior Noise Control

The design and installation of new or replacement mechanical/electrical equipment on City owned facilities or properties, and the modification of existing fixed mechanical/ electrical equipment, when located outside of the building – in a yard, court, on a roof, or where the equipment opens to the exterior of the building – shall be subject to the requirements of the Noise Code and DEP noise control regulations.

i. Objectives

The Consultant shall provide a proactive design approach, to assure compliance with the Code. It shall be the goal of the Consultant to specify manufactured equipment with the least available sound output and/or with sound mitigating accessories.

ii. Outdoor Noise Propagation

In the development of HVAC design, the Consultant shall take into consideration the effects of outdoor noise propagation from the site property to nearby "sensitive receiver" properties and make recommendations for the further evaluation of existing noise conditions at the site and/or the selection of Noise Control Measures (NCM) designed to adequately address Code requirements.

iii. Exterior Acoustical Design Compliance Report

Where further evaluation is required, the Consultant shall perform a project site condition acoustical assessment and submit an Acoustical Design Compliance report to DDC. The report shall be included in the Consultant's project contract deliverables. As part of the report, the Consultant shall:

1. Determine whether an Acoustical sub-consultant will be required to perform the evaluation, and, if approved by DDC, retain the services of an Acoustical sub-consultant with qualifications and experience as set forth in the rules of the Department of Environmental Protection (DEP).
2. At project initiation, perform an initial walkthrough inspection and evaluation to identify location and distance from the project site of any potential line of sight sound receptor location that may be affected by the proposed work, particularly "sensitive receiver" properties.
3. Establish and document existing baseline ambient noise level conditions, advise DDC of any observed sound produced by existing exterior equipment that exceeds Code threshold, and request from DEP a history of violations and/or complaints.
4. Prepare and submit an acoustical analysis of the maximum resultant sound pressure levels resulting from the proposed work, including noise level testing data and manufacturer's equipment operating performance documentation.
5. Confirm that the proposed system design will comply with Code, identify an alternative design approach, or recommend supplementary noise control measures (such as compressor sound blankets, ultra-quiet fans, unit lagging, external silencers, and sound barriers) that will limit acoustical energy propagation beyond the site property limits to Code compliant levels.
6. Specify the required Noise Controlled Inspections to be performed by the testing agency of the operating noise level (ambient, directional) after new or replacement of exterior mechanical equipment is installed.

7. Define the maximum permissible rooftop unit and air-cooled packaged chiller sound power levels for each unit and reflect these dB values in the Unit specifications for the project. The maximum sound power levels shall comply with Code requirements and shall be based on specific project conditions such as the nature of unit mounting (curb or dunnage), deck construction, noise reduction coefficient of suspended ceiling, ductwork routing, ductwork acoustical lining, sound trap attenuation characteristics, etc.

iv. Noise Control Measures

Air handlers and air conditioning units shall be provided with the following if identified in the Acoustical Design Compliance Report:

1. Condenser fans with low rpm ultra-quiet fan.
2. Internal isolation of all rotating components if acceptable considering the floor or roof flexibility.
3. Insulation of void spaces within roof curbs (where curbs are used in lieu of dunnage).
4. Condenser fan attenuators.
5. Acoustically lined double walled outdoor air intake, condenser air intake, and exhaust air hoods.
6. Individual acoustical jacket/sound cover/blanket for each compressor.

v. Limitations on Noise Control Measures

Any proposed supplementary noise control measures shall include consideration of the following:

1. Required clearances to equipment for airflow, heat transfer and maintenance access.
2. The physical and structural limitations of equipment apparatus housing and building construction assembly elements (roof, parapet, wall) for supporting accessory sound barrier assemblies.
3. Aesthetic limitations for arranging sound barrier assemblies.

g. Energy Efficiency

Although the HVAC system uses energy to heat, cool and ventilate the building, many of the loads that create the need for heating and cooling are not generated from the HVAC components. Lighting design, fenestration, envelope design, solar orientation, equipment loads, and tenant activity all affect the loads that must be controlled by the HVAC system. Effective energy conservation can only result from an integrated design approach. The HVAC system must be designed to address the building loads in the most energy efficient manner possible.

h. Conservation of Water

Design the HVAC system to conserve the use of domestic water (as required by the NYC Plumbing Code and local laws, see Chapter 08: Sustainability and Resiliency for more information)

i. Operation and Maintenance

i. Accessibility

Design installation of equipment so that it can be safely and easily inspected and maintained. Comply with the manufacturer's recommended clearances around installed equipment, unless otherwise directed by the Sponsor Agency's Agency.

ii. Operability

The sequence of operation for the control systems must be clearly described and properly documented. The HVAC system design should simplify control and minimize the need for overly complex control systems.

iii. Reliability

Design the HVAC system so that equipment failures and normal maintenance have minimal impact on the users. Failure of one piece of equipment should not negatively impact large portions of the building. Install piping and valves so that different combinations of equipment can be used during replacement and overhaul. Equipment components, spare parts, and materials should be readily available, and the equipment should be serviceable, repairable by resources available locally.

iv. Recapitalization

DDC often upgrades HVAC systems in large buildings in phases over many years while parts of the building are occupied. The system's design should consider how equipment elements will be replaced in the future. Vertical and horizontal distribution should allow parts of the system to remain in operation and zones of the building to be occupied during equipment replacement.

j. Longevity

Public buildings have a longer life expectancy than most commercial office buildings; many buildings are over 50 years old and are expected to continue in service for decades to come. HVAC systems are expected to have extended service lives. They will be used by many different tenants, operated by many different maintenance providers, and modified many times over the life of the building. Selection of robust, reliable, energy efficient equipment that can be reliably operated over the long term is required.

9) HVAC DESIGN CRITERIA

a. Outdoor Design Criteria

Outdoor air design criteria must be based on weather data tabulated in the latest edition of the ASHRAE Handbook of Fundamentals and outside design conditions noted under 'HVAC Performance Characteristics' above

Include the following on the concept through the construction drawings:

- i.** Ventilation schedule which includes (for all spaces in the project) room number, room name, and use, floor area, number of occupants, outside air per ASHRAE 62.1 2013 Ventilation Rate Procedure, actual supply air, return air, outside air and exhaust air.
- ii.** Building Pressurization table.

b. Indoor Environmental Criteria

i. Temperatures and Relative Humidity

Indoor design temperature and relative humidity requirements noted under 'HVAC Performance Characteristics' above must be maintained in the occupied zone. The Relative Humidity (RH) within areas where artwork is stored or displayed, or where building materials and furnishings are likely to be damaged by changes in moisture content, as defined in the Scope of Work, must be maintained in accordance with the Sponsor Agency requirements.

ii. Indoor Air Quality

The ASHRAE Standard 62.1, latest NYC MC and ECC, Ventilation Rate Procedure or an approved engineering analysis must be used as the basis for design. In addition, compliance with the following maximum levels of continuous occupant exposure to contaminants during full-load and part-load conditions must be demonstrated at each phase of the design:

1. Carbon Dioxide (CO₂): Not to exceed 1000 ppm absolute within zone or 600 ppm differential with outdoor ambient air.
2. Carbon Monoxide (CO): Not to exceed 9 ppm.
3. Formaldehyde (HCHO): Not to exceed 0.05 ppm.
4. Ozone (O₃): Not to exceed 0.05 ppm.
5. Particulate Matter: Not to exceed 15 g/m³ for particles less than 2.5 m (PM_{2.5}), and not to exceed 50 g/m³ for particles less than 10 m (PM₁₀).
6. Radon (RN): Not to exceed 4 picocuries/liter.

c. Envelope Load Criteria

i. Heat and Moisture Transfer

ii. The elements and components of the building envelope design must comply with the heat transfer requirements of the code.

iii. Building Pressurization

As required by code, the following areas must be kept under negative pressure relative to the surrounding building areas: Toilets, Showers, Locker rooms, Custodial spaces, Mail rooms, Battery charging rooms and Kitchen areas. Additional areas may be required by NYS Health Code and Sponsor Agency requirements to operate under negative pressure.

d. Internal Load Criteria

i. Occupancy Load

Occupancy loads must be determined as follows:

1. Determine Estimated Maximum Occupant Density Load, Persons per 1,000 SF (persons/sq. ft.) from the occupancy schedule of the Sponsor Agency's Agency's Design Standards, ASHRAE Standards and NYC MC.
2. In the event this information is not available, use the occupancy density values in the Code.

3. For dining areas, auditoriums, and other high-occupancy spaces, occupancy densities must represent the number of seats available.
4. Sensible and latent loads per person must be based on expected levels of activity and representative of values stated in accepted industry standards (i.e., the latest edition of ASHRAE Handbook of Fundamentals).

ii. Equipment Power Densities

1. Evaluate internal heat gain from all appliances-electrical, gas, or steam. Base the rates of heat gain from equipment on the manufacturer's data and mechanical design criteria.
2. Coordinate internal heat gain from equipment with the electrical power design, the electrical load analysis and the estimated receptacle demand load outlined in Section B-9 Electrical Engineering in this Chapter.

iii. Lighting Power Densities

Coordinate heat gain from electric lighting systems with the electric lighting design and based on the Electrical Design Criteria.

e. HVAC Zoning Criteria

i. Thermostatic Zoning Design Criteria

Interior Thermostatic control zones must not exceed 1500 sq. ft. per zone for open office areas, or a maximum of three offices per zone for closed office areas. Perimeter thermostatic control zones must not exceed 300 sq. ft. or one column bay width and must be no more than 15 ft. from an outdoor wall along a common exposure. Each corner office and conference room must be on a separate zone.

ii. Air Handling Unit Zoning Criteria

Air handling units must be selected to serve areas with similar functions and operating hours.

iii. Ventilation Load Criteria

Outdoor air ventilation for the thermostatic control zones must be in accordance with code and the load of the ventilation air quantity must be calculated based on the outdoor design Dew Point and Coincident Dry Bulb temperatures. Full-load and part-load calculations must be conducted as required in the submission requirements and must include the impacts of heat recovery equipment.

iv. Diversity

Where applicable, a diversity factor will be determined and applied for loads at the air-handling units, based on simultaneous peak loads of the thermostatic zones served by each air handler. Central Plant equipment must be designed based on maximum occurring whole-building simultaneous peak load.

v. HVAC Load Calculation Method

The HVAC load calculations must be performed using accepted methods such as ASHRAE Handbook of Fundamentals Cooling Load Temperature Difference (CLTD) method, Heat Balance (HB) Method, Radiant Time Series (RTS) method, or Transfer Function method (TFM), developed for the analysis of heating and cooling loads in

commercial buildings. The method of analysis must be capable of calculating each zone's peak heating and cooling loads as well as the whole building simultaneous peak load. Variables including solar gains through fenestration, internal gains from occupants, including latent heat for cooling purposes, internal gains from lighting and equipment, outside air loads (sensible and latent) from ventilation and infiltration, and heat and moisture gains or losses through fenestration, walls, floors, and roofs shall be incorporated in the method of analysis. The heating load calculations must be done without credit for lighting equipment, occupants and other sources of internal heat gains. The HVAC load calculations must clearly indicate additional safety factors included in the analysis for review/approval by the applicable Sponsor Agency.

vi. HVAC Load Calculation Report

Provide HVAC load calculations at each design phase as required in the submission requirements. The HVAC load calculations report must include all input and output used in the heating and cooling calculation program. The report must also include zone peak heating and cooling loads results and whole-building simultaneous peak load, air-handling unit coil selections, and psychometric charts that show the complete cycle of all the processes in the HVAC system.

f. Energy Analysis Criteria

i. Performance Goals

A building energy analysis must be performed at each phase of the design to demonstrate that the building design meets or exceeds the code and the energy performance goals established for the project.

ii. Methodology

The compliance methodology must be in accordance with code, and in accordance with the project's submission requirements.

1. The optimization of envelope and massing must be completed during the Schematic Design. Systems and sub-systems must be finalized during Design Development. The energy analysis done for the construction documents must use actual design parameters.
2. Each analysis must be based on the actual parameters and values defined in the project's program requirements and not simply on defaults assigned by the simulation program. Such requirements shall include the operational program for each day of the week and holidays, the number of required HVAC zones, part-load performance curves for mechanical equipment, capacity and efficiency corrections curves for mechanical equipment, and the use of airside and waterside economizers, heat recovery, and/or automatic control systems, if applicable. Any variations in the input summary must be documented.
3. Simulation must be based on 8,760 hours per year, with hourly variations in occupancy, lighting power, miscellaneous equipment power, vertical transportation, thermal mass effects, and thermostat setpoints.
4. The simulation program must be a computer-based program for the analysis of energy in buildings. Use one of the following public domain or commercial software programs: Energy-Plus, Trane Trace 700, Carrier HAP, Elite.

iii. Reports

The energy analysis report for each phase of design must include a narrative describing how the project's energy goals are to be achieved. Include a statement of the expected error in the energy analysis.

iv. Additional Energy Analysis Requirements

Energy Analysis Requirements beyond the methodologies prescribed in the Energy Code may apply. See Chapter 08: Sustainability and Resiliency for more information.

10) COMMON HVAC COMPONENTS

Generally, the HVAC system will consist of a central system, a distribution system and a terminal control system (Building Automation System [BAS]).

a. General Requirements

- i. Where feasible and as otherwise required, all central plant equipment shall be selected to provide efficient part-load operating performance. The term "central plant" refers to systems that are located within the building in designated equipment areas such as chiller or boiler room.
- ii. All central plant equipment must have Direct Digital Control (Ddc) self-contained controls that have the capability to interface with the Building Automation System (BAS).
- iii. All central plant equipment with electric motors must have the capability to interface with metering devices for determining energy consumption data and reporting the data to the BAS.

b. "Green" Central Plant Systems

i. Ground-Source and Water-Source Heat Pumps

The geotechnical survey and test wells (see Structures and Soils section in this Chapter) shall establish the feasibility of using a ground-source or water-source heat pump system. Refer to the DDC Geothermal Heat Pump Systems Manual for more information.

ii. Thermal Storage

Ice on coil thermal storage systems must include prefabricated tanks with glycol coils and water inside the tank. The tank must be factory insulated and the vendor must guarantee its capacity and performance. Other types of thermal storage systems may be considered.

iii. Renewable Energy Alternatives

Where feasible, solar thermal, photovoltaic, geothermal, wind, bio-waste, and biogas systems shall be investigated and may be proposed if supported by Life Cycle Cost analysis. DDC has a strong interest in demonstrating the feasibility of net-zero and near-net-zero City facilities. See Chapter 08: Sustainability and Resiliency.

iv. Combined Heat and Power (CHP)

Based on an analysis of the coincidental power and thermal loads, an on-site CHP system may be considered if the site baseline thermal load can be served continuously from the generation of onsite power. The Life Cycle Cost (LCC) analysis must include all expected service and overhaul costs.

v. Combined Heat and Cooling (Absorption Chillers)

Where a suitable source of building or utility thermal energy is available, an absorption refrigeration system may be proposed if supported by Life Cycle Cost (LCC) analysis. Systems that make use of surplus heat from industrial processes, solar thermal systems, or the onsite generation of heat and/or power (see CHP above) are encouraged. Short distances between major system components are required.

c. Air Handling Units

- i.** Identify in the drawings the equipment and access sections comprising the packaged AHU.
- ii.** Choose the package construction (single or double wall, insulation) and fan type (FC, BI, Airfoil, etc.) that results in acceptable performance and noise levels. Units shall be ARI certified and UL listed.
- iii.** Make sure air velocities through sections and coils are as recommended by the equipment manufacturer.
- iv.** Make sure there is available space and service clearance for piping coils, drains, and traps.

v. AHU Capacities

Where possible, air handling units shall be sized such that a Refrigeration System Operating Engineer is not required to be on site to facilitate flexible zone control, particularly for spaces that involve off-hour or high-load operating conditions.

vi. Outdoor Air Intake Locations

The placement and location of outdoor air intakes must comply with the Code. Intakes must be located as high as practical on the roof or wall. Outdoor air intakes must be ducted directly to the AHU cabinet; the equipment room must not be used as an outdoor air intake plenum.

vii. Temperature and Airflow Control

Psychometric process charts must be prepared for each AHU application, characterizing full-load and part-load operating conditions for all processes in the system, in accordance with this Guide. AHU/coil designs must ensure that conditioned space temperatures and humidity levels are within acceptable range, per program requirements and the indoor design conditions noted above.

viii. Limitation of Supply Air Temperature

Comfort HVAC systems with supply air dry bulb temperatures below 50F are not permitted. Supply air must be no lower than 50F dew point temperature to prevent condensation on the duct surfaces.

ix. Supply, Return, and Relief Air Fans

- 1.** The performance of the fans must be tested in accordance with AMCA Standard 210. Fans must be selected based on the system power and sound requirements for full-load and part-load conditions. Fan motors must be sized so they do not run at overload anywhere on their fan operating curves. A Variable Frequency Drive (VFD) (where required) must be provided for each fan motor and located within the mechanical equipment room for the AHU. Fan systems shall be designed such that failure of the fan will not result in significant impacts on the performance of the building HVAC system. Where compliance with NYC Energy Conservation Code is required, metering devices for determining energy consumption data for each fan motor must be provided that can transmit the data to the central BAS.

2. In general, choose a fan to operate within its stable region and safely within the maximum speed and static pressure range.

x. Cooling and Heating Coils

Select finned-tube cooling coils to ensure that the coils can be cleaned. Dehumidifying coils must be selected to prevent water droplet carryover beyond the drain pan at design conditions. All hot water heating and chilled water cooling coils must be copper tube and copper finned materials. Equipment and other obstructions in the air stream must be located sufficiently downstream of the coil so that it will not come in contact with the water droplet carryover. Cooling coils must be selected at or below 500 fpm face velocity to minimize moisture carryover. Heating coils must be selected at or below 750 fpm face velocity.

xi. Drains and Drain Pans

Drain pans must be made of stainless steel, adequately sloped and trapped to ensure drainage. Overflow connections must be provided and connected to the sanitary or storm line in accordance with Code.

xii. Filters and Filter Sections

Incorporate the proper filtration and monitoring system for the application. Air filtration must be provided in every air handling system. AHUs must have a pre-filter and a final filter, each located upstream of the cooling and heating coils.

1. Install a filter / filter rack assembly with filters having a MERV (Minimum Efficiency Reporting Value) of 11.
2. Differential pressure gauges and sensors must be placed across each filter bank to allow quick and accurate assessment of filter loading as reflected by air-pressure loss through the filter, and the sensors must be connected to the BAS (where applicable).
3. Where occupancy requirements or building functions are likely to generate airborne particles, vapors, or gases that result in concentrations exceeding those noted above ("HVAC Performance Characteristics"), special air filters or air cleaning components must be provided for the supply and return air or dedicated and localized exhaust systems must be used to contain these contaminants.

xiii. Make-up Air for Exhaust Fans

Provide make-up air source for each exhaust fan.

xiv. 100% Outdoor Air Application

For 100% outdoor air applications, the face-and by-pass design is considered safer against freeze-up.

- xv.** Consider heat recovery for installations with large exhaust volumes.

d. Air Systems and Equipment

- i. Ventilation for Acceptable Indoor Air Quality shall be achieved as per ASHRAE Standard 62. Consider air flow measurement and/or demand control ventilation via CO₂ measurement.
- ii. In general, design the ducted air distribution and exhaust systems using the equal friction method. Industrial ventilation, however, should be done using the constant velocity method. Low pressure/velocity design should be followed.

- iii. Except for special applications (raised floor computer rooms, etc.) it is preferred to use ductwork, instead of plenum, for air distribution (supply and return) in a space/facility.
- iv. The fresh air intakes and exhaust shall be located so as not to introduce pollutants to the inhabited space. Furthermore, size the louver/grille for reduced air velocity to minimize noise, pressure loss, and rain/snow carryover through the intake. Incorporated drains at the building and AHU intakes.
- v. Choose the size, shape, fitting/accessories, material composition, and layout of the ductwork that best fits the application and minimizes the friction loss, as well as the overall system noise level. Generally, design the ductwork per the latest SMACNA standards. Avoid ducts featuring high aspect ratios.
- vi. Roof mounted intakes, fans, and AHU, shall be preferably set on minimum 12" high curbs.
- vii. Humidification and dehumidification are not pursued for normal applications. Specialty spaces like asset storage or computer room spaces may require such systems.
- viii. The air filtration system may be integral with the equipment. The level of filtration must satisfy the requirements of the application.
- ix. Room terminal units:
 - 1. Determine the type of equipment to be used, (VAV box, unit ventilator fan coil, etc.) based on the application, i.e. design conditions, fresh air requirements, HVAC loads, and installation limitations.
 - 2. At facilities with difficult to balance hydronic systems, piping the terminal unit with 3-way valves is preferable.
 - 3. Choose the unit's fan (s), accessories, and control options that result in acceptable noise level and overall space comfort.
 - 4. For correctional facilities, design and install additional safety options per that agency's requirements.
- x. **Variable Air Volume (VAV) Terminal Units**
 - 1. VAV terminal units must be certified under the ARI Standards 880 Certification Program and must carry the ARI seal. If fan-powered, the units must be designed, built, and tested as a single unit including motor and fan assembly, primary air damper assembly, and any accessories. VAV terminal units must be pressure-independent-type and selected to provide the airflow rate required for the full-load thermal capacity of the zone and for the noise requirements for the space.
 - 2. Evaluate the application and/or benefit of using VFD(s) with a (30%) minimum VAV setting. High efficiency inverter duty motors are required on variable speed applications.
- xi. **Fan-Powered Terminal Units**
 - 1. Fan-powered terminal units must have Electrically Commutated Motors (ECM) for speed control to allow continuous fan speed adjustment from maximum to minimum, as a means for setting the airflow.
 - 2. Fan-powered terminal units must have a filter/filter rack assembly with the filters having a MERV (Minimum Efficiency Reporting Value) of 11 as defined in ASHRAE Standard 52.2. Filters must be sized at 500 fpm maximum face velocity.

3. The return plenum box for a fan-powered terminal unit must be a minimum of 24 in. in length and must be double walled with insulation between the walls, or contain at least one elbow where space allows.
4. For interior zones, re-heat coils are not permitted in VAV terminal units except for areas below the roof or on the floors above unheated exposed spaces. Fan-powered terminal units may have hot water heating coils used for maintaining temperature conditions in the space under partial-load conditions.

xii. Fan Coil Units

Fan coil units must be certified under the ARI Standards 880 Certification Program and must carry the ARI seal. For perimeter spaces, four-pipe fan coil units must be equipped with cooling and heating coils with copper tubes and aluminum fins, filters, internal condensate drain, and overflow drain pan. For interior spaces, two-pipe fan coil units for cooling only are permitted. Installation of fan coil units above ceilings should be avoided. Fan coil controls must use three-speed motors. Two-way control valves must be used wherever variable-speed water flow devices are used in the system.

xiii. Air Distribution Accessories:

1. Design and install the supply grilles, registers, or diffusers in each space to result in acceptable draft conditions, noise level, and system air pressure drop.
2. For the return or exhaust application, design and install the grille, register, or diffuser to minimize noise and air pressure drop.
3. For correctional and similar type facilities, follow the agency-specific guidelines.

xiv. Fans:

1. Determine the type of fan (power roof ventilator utility fan, centrifugal in-line, propeller fan, etc.) that best fits the application.
2. Size the supply or exhaust system's static pressure using the equal friction method.
3. Choose the fan to operate in its safe region and safety below its maximum speed and static pressure point.

xv. Kitchen Ventilation:

1. Design and install the kitchen exhaust hood, ductwork, exhaust fan, make-up air system, and fire protection system per NFPA (96, 70, 17, 13, 12), manufacturers' printed recommendations and local codes.

xvi. Ductwork:

1. Design duct and accessories according to the latest SMACNA recommendations, unless otherwise required by the particular application or project.
2. Incorporate volume dampers in duct branches for system balancing.

e. Hot and Chilled Water Systems and Equipment

i. Piping System:

1. Generally, design the system using a constant pressure drop (of maximum 4 feet per 100 feet of piping, average about 2.4 feet), providing the fluid velocity is within acceptable limits (about 10 FPS maximum).

2. Unless the system is constant flow reverse return, only control valves that perform well under varying upstream pressure conditions should be considered.
3. Consider use of flow control valves, flow balancing valves, and Generally, design the system using a constant pressure drop (of maximum 4 unless the system is constant flow reverse return, only control valves that consider use of flow control, flow metering accessories, as required by the application.
4. Incorporate isolation valves so that all equipment and instruments attached to the system may be easily serviced or replaced.
5. Evaluate the piping system's expansion and show all provisions for anchoring, guiding, and compensation on the drawings.
6. Provide air vents with all piping systems.
7. Include a backflow preventer with any hydronic system connected to a potable water system.
8. Insulate, support, and pitch the piping system.
9. Design the water treatment system as required by the application.
10. Provide valve capped branches to facilitate future system modifications

ii. Pumps:

1. Consider any extra fouling that may be present after years of operation of the hydronic piping and equipment when estimating the system's total pressure head.
2. Choose the type of pump (in-line, base mounted, split case, etc.) that best suits the application.
3. Pipe the pump installation to include isolation valves, suction "Y" strainer, suction and discharge pressure gauges, and adequate suction piping length or suction diffuser.
4. Consider using VFD, vibration isolators, and flexible piping connections as required by each application.

iii. Hydronic Heat Exchangers/Convectors:

1. Choose the type of exchanger (shell-and-tube, plate-and-frame, etc.) that best fits the application.
2. Size the unit according to the manufacturer's recommendations.
3. Pipe the exchanger with isolation valves, temperature and pressure gauges, two- or three-way valve and controls that best fit the hydronic system and application.

iv. Terminal Units (Fan-Coil, Unit Heater, Finned Tube Radiation, etc.):

1. Design, pipe, and install the terminal unit based on the space load, application, and manufacturer's instructions.

f. Motors

Motors that are ½ HP and larger must be three (3) phase.

g. Controls for HVAC Components

- i. Each AHU, fan-powered VAV terminal unit, fan coil unit, boiler, hot water pump, chiller, cooling tower cell, waterside economizer, chilled water pump, or combination of pumps must have a Ddc (BACnet or LonTalk) self-contained controller capable of being interfaced to the Building Automation System (BAS). Each piece of equipment must have a metering device for transmitting energy and water consumption data to the BAS and, if applicable, a current-sensing device for transmitting fan and/or pump motor energy consumption data to the BAS.
- ii. Integrate the control hardware and software to protect against component freeze-up and allow for optimum operating cycles, including “free cooling” (whenever justifiable) and fire/smoke control.

h. Circulation Systems

All hydronic circulation systems must be designed for variable flow, in accordance with the code and as otherwise required.

11) PRIMARY HEATING SYSTEMS

a. General

In general, to conserve energy, electric heating coils and electric boilers are not recommended.

b. Hydronic Heating Systems

The following types of hydronic heating equipment are acceptable: fan coil units, convectors, radiators, baseboard units, finned-tube radiation, radiant flooring, radiant ceiling panels, unit heaters, cabinet heaters, air source and water source heat pumps.

- i. The system shall preferably be two-pipe forced circulation hot water, zoned as required, with each zone having its own circulating pump or other means of providing independent control for each exposure and occupancy. Provide stand-by pumping capacity.
- ii. Provide thermostatic control valves for each interior and perimeter control zone. Install valves on hydronic units so that they can be easily calibrated, maintained and replaced.
- iii. If piping is installed under raised floors, provide moisture-detecting devices connected to the BAS and self-priming floor drains, to prevent flooding and excessive loading of the raised floor cavity.
- iv. Radiant heating is permitted in ceilings or embedded in the floors of perimeter zones, in ceilings of interior zones that are below the roof, and in the floors above unheated exposed spaces. Radiant (hot water) heating systems may be overhead or under-floor type. Electric radiant heating is only permitted for small, remote areas.

c. Low Temperature Hot Water Heating

Low temperature systems shall be designed with the lowest working pressure suitable for the system and a maximum temperature limitation of 200°F. Supply temperatures and the corresponding temperature drops for space heating hot water systems must be set to best suit the equipment being served. Total temperature drop must not exceed 300°F. The temperature drop for terminal unit heating coils must be 200°F. The design water velocity in piping must not exceed 8 fps, or the design pressure friction loss in piping systems shall not exceed 3 ft. per 100 ft., whichever is smaller, but not less than 4 fps.

d. Low Pressure Steam Heating (below 15 psi)

Burners shall be natural gas or dual fuel (natural gas or no. 2 oil). Using one or two pipe system arrangements, steam shall be supplied to radiators, convectors, or fan coil units; give up its heat to the space; and shall return via condensate piping or vacuum pumps to a feed water receiver which pumps the condensate back to the boiler.

e. Boilers

Boiler systems must be provided with but not limited to expansion tanks, water treatment, and air separators, as required. Boilers must be installed in a dedicated mechanical room with all provisions made for breaching, flue stack, and combustion air, as noted above.

i. General

Where feasible and as otherwise required, central heating plant equipment such as steam boilers, hot water boilers, deaerator/condensate return units, plate frame/ shell/ tube heat exchangers, fuel oil handling equipment, hot water pumps, and vacuum pumps shall be selected to provide efficient part-load operating performance.

System design shall include modulating combustion equipment and variable air water flow capability.

- ii. It is preferred to design the heat generating plant with more than one boiler. When two boilers are chosen, size each boiler at about 75% of the heating load. For three boilers, each units IBR rating should be about 50% of the load.
- iii. Choose the type of boiler (cast iron, dry-base, scotch marine, water tube, etc.) based on the application (working pressure and temperature, fuel used, construction material, draft type, low emissions, condensing or not, etc.), efficiency requirements, and the dimensional constraints of the boiler room.
- iv. Choose the fuel(s) to be used based on local availability, cost, and environmental constraints.
- v. Design the boiler controls, piping and valves, and its fuel train per NFPA 85 requirements. Specify high turn-down ratio for applications with widely fluctuating loads.
- vi. Estimate the boiler's induced draft requirements for sizing the exhaust duct, induced draft fan (if required), forced draft system (if required), and chimney. Design larger HP induced (and forced) draft fans preferably with VFD.
- vii. The boiler water may have to be softened to about 7.0 pH and/or chemically treated before it is introduced and/or returned into the boiler feed system. Design the water softening and chemical treatment systems, manual or automatic, as required for each application.
- viii. Whenever a liquid (glycol) solution is used as a heat transfer fluid, make sure it is environmentally acceptable and approved by DEP.
- ix. For hot water boiler systems, the expansion tank and water circulating pump(s) shall be preferably placed up-stream of the boiler.
- x. The hot water GPM/velocity through the boiler should be within the manufacturer's acceptable limits.
- xi. Design the low-pressure steam boiler with gravity return system using the Hartford Loop return piping scheme.

- xii.** For larger plant installations and at the request of the Sponsor Agency, a SCADA system may be considered.
- xiii.** The hot water boiler circulating pump, or steam boiler condensate pump or feed water pump, should be designed preferably with stand-by pump and VFD.
- xiv.** For steam humidification applications, the water to the steam generator may be softened but not chemically treated.
- xv.** For high pressure steam boilers, design the generator and storage tank according to the manufacturer's instructions.
- xvi.** Specify company field advisor to do operational and performance tests as required for boiler acceptance.
- xvii. Modular Units**

Where feasible, boilers for hydronic heating applications shall be modular units, with efficiencies that comply with Code. The modular units must be packaged, with all components and controls factory preassembled. Controls and relief valves to limit pressure and temperature must be specified separately.
- xviii. Boiler Sequence**

Boilers must be piped to common heating water header with provisions to sequence boilers online to match the load requirements. All units must have valving to provide isolation of offline units without interruption of service.
- xix. Gas and Fuel Oil Trains**

Boiler gas trains and fuel oil systems must be per Code. Installation of gas piping shall be per NYC Fuel and Gas Code.
- xx. Dual Fuel Burners**

Where applicable the Consultant shall, during Schematic Design, investigate the feasibility of providing dual fuel burners for all new boiler equipment and for existing boilers with burners to be replaced.
- xxi. Renovation Projects**

For renovation projects, boiler selection shall be determined based on space access conditions, type of space heating equipment, available fuel type, energy efficiency, and simplicity of operation. The Consultant shall analyze standard or modular type boilers depending on the building use, initial and operating costs, and Sponsor Agency preference. The Consultant shall fully coordinate requirements prior to final selection. The use of alternate space heating systems shall also be analyzed as an option to direct replacement.
- xxii. Chimney and Vents**

Chimney and vents selection shall be based on boiler requirement, distance and location.
- xxiii. Domestic Water Heater**

Domestic water heater requirements are described in Section B-10 Plumbing Engineering in this Chapter.

f. Finned Tube Radiation

Hot water finned-tube radiation must have individual zone thermostatic valve, actuator, temperature sensor, and zone control device capable of connecting to a self-contained microprocessor that can interface with BACnet or LonTalk Ddc BAS (where applicable).

g. Hot Water Piping and Pumps

Pumps must be of a centrifugal type and must generally be selected to operate at 1,750 rpm and at 80% to 85% pumping efficiency. Both partial-load and full-load performance must be shown on the pump curve, and the specified pump motors must not overload throughout the entire range of the curve. The number of primary hot water pumps must correspond to the number of boilers, and a standby pump must be designed to supply any of the circuits. Variable volume pumping systems are required for all secondary piping systems. Pumps for each boiler group must be arranged with piping, valves, and controls to allow each boiler group to operate independently of the other boiler groups.

h. Freeze Protection

Anti-freeze agents manufactured specifically for HVAC systems can be used to protect hot water systems from freezing where coils or extensive runs of piping are exposed to weather, or where heating operations are intermittent. Freeze protection circulation pumps must be provided along with polypropylene glycol. Heat tracing is not acceptable for systems inside the building. Glycol solutions must not be used directly in boilers, because of corrosion caused by the chemical breakdown of the glycol. The water makeup for the glycol system must be provided with an inline water meter to monitor and maintain the proper percentage of glycol in the system. Provisions must be made for drain down, storage, and reinjection of the glycol into the system.

i. Heat Recovery Equipment (Enthalpy or Sensible)

Heat recovery equipment must operate at a minimum of 70% efficiency at winter and summer outdoor design conditions. Filters having a MERV of 10, as defined in ASHRAE Standard 52.2, must be provided in all heat recovery equipment. Filters must be sized for 500 fpm maximum face velocity. The type of heat recovery equipment may be selected from the following alternatives:

i. Sensible Heat Recovery

1. Plate frame heat exchangers.
2. A runaround-type heat pipe system with olenoid valve control to operate under partial-load conditions.
3. A cross flow, air-to-air (z-duct) heat xchanger. Z-ducts must be constructed entirely of non-corrosive sheet metal.
4. Sensible heat-wheels with variable-speed drives for controlling the temperature leaving the unit.
5. A propylene glycol runaround coil with control valves and a pump for part- load conditions. The runaround coils, if selected, must be installed at the exhaust or relief discharges from the building and at the outdoor air intake into the building.

ii. Total Heat Recovery

Enthalpy wheels must have a minimum purge area of 2% and variable-speed drives for controlling the enthalpy leaving the unit.

j. Oil Storage for Heating

The parameters of each oil storage project must be reviewed and approved by DDC and the Sponsor Agency prior to proceeding with the Construction Documents phase. The Consultant shall review fuel storage space limitations and budget constraints during Schematic Design. Design for buried fuel tanks and related ancillary equipment such as piping and cathodic protection shall be based on manufacturer's data for either double wall steel or double wall fiberglass tanks. Consultant may substitute steel tanks for fiberglass or fiberglass tanks for steel. Oil storage for heating shall be sufficient for a one-month supply, unless otherwise required by the Sponsor Agency, and shall be designed per Code including the latest NYC Department of Environmental Protection (NYCDEP) regulations and NYS Department of Environmental Conservation (NYSDEC) Petroleum Bulk Storage Requirements and all other applicable codes.

12) PRIMARY COOLING SYSTEMS

The cooling system shall include chillers, chilled water, and condenser water pumps; cooling towers; piping; and piping specialties.

a. Hydronic Cooling Systems

The following types of hydronic cooling systems are acceptable: fan coil units, fan powered VAV units with cooling coils, air-source and water-source heat pumps, unit ventilators, active chilled beams, floor mounted induction units, and combination hydronic heating/cooling systems.

- i. The chilled water system must have a design supply water temperature between 400F and 450F.
- ii. For HVAC systems that primarily use fan coil units, the temperature differential must be between 150F and 200F.
- iii. For HVAC systems that primarily use air handling units, the temperature differential must be between 150F and 200F.
- iv. Design water velocities must not exceed 8 fps.
- v. Pressure drop must not exceed 3 ft. per 100 ft. of pipe.

b. Chillers

- i. Design the chiller plant using redundant chiller units, budget permitting. Choose high efficiency units, Energy Star rated (where available), featuring a "green" refrigerant.
 - 1. Depending on the application and with the manufacturer's agreement, consider using VFD with the compressor motor.
 - 2. For year-round operation, design for low ambient conditions.
 - 3. Size the chilled water and condenser water pumps so as the water velocities in the evaporator and condenser tubes are within the chillers' acceptable limits.
 - 4. Evaluate need for chemical treatment of the chill water and condenser water systems.
 - 5. Design refrigerant detection and purge ventilation of the MER/chiller room. Provide detection and purge exhaust originating at maximum 18" above finished floor for heavier-than-air refrigerants.
 - 6. When retrofitting a chiller with a "green" refrigerant, check the new operating pressures, against the existing chiller components' (valves, fitting, pressure vessels, etc.) design parameters.

7. When designing a split DX (condensing unit – air handler evaporator coil) system, ensure that the relative installed height and distance between the condensing unit and evaporator unit meet the manufacturer's requirements. If possible, place the condensing unit at a lower level than the evaporator.
 8. For the split DX system, consider using hot gas by-pass for capacity control, especially with 100% outdoor air. For larger systems, choose multi-step compressors.
- ii. All required auxiliaries for the chiller system must be provided, such as expansion tanks, heat exchangers, water treatment, and air separators, as required.
 - iii. Chiller system design shall include variable air, water and refrigerant flow capability with modular equipment selection.
 - iv. Chiller efficiencies for full-load and part-load operations must be in accordance with NYC Energy Conservation Code.
 - v. For chilled water systems of 500 tons and larger, centrifugal chillers must be used. Below 500 tons, reciprocating compressor, scroll, and rotary screw chillers are permitted. Below 65 tons, air cooled chillers are permitted. Variable frequency compressors or head pressure control, if used, must be demonstrated on a Life-Cycle Cost basis.
 - vi. Install Chillers with centrifugal compressors utilizing frictionless magnetic bearings for oil free operation, integral variable frequency drives and high-speed drive technology, wherever possible.
 - vii. Chillers must be piped to a common chilled water header with provisions to sequence chillers online to match load requirements. Each chiller must have an automatic shutoff valve.
 - viii. Chiller condenser piping must be equipped with recirculation/bypass control valves to maintain incoming condenser water temperature within the chiller manufacturer's recommended minimum set point.
 - ix. The design of refrigeration machines must comply with DEP regulations and Federal EPA Clean Air Act.
 - x. CFC refrigerants are not permitted in new chillers. Commonly used refrigerants such as HCFC-123, HFC-134a, and HFC-410a are acceptable.
 - xi. Provide isolation valves at each cell as well as the equalization piping of multi-cell towers to allow full servicing of a cell while the remainder of the system remains operational.
 - xii. Chillers must be easily accessible for internal inspections and cleaning. Refrigeration machines must be equipped with isolation valves, fittings, and service apertures as applicable for refrigerant recovery during servicing and repair, as required by EPA Clean Air Act.
 - xiii. BACnet or LonTalk microprocessor-based controls must be used. The local control panel must have self-diagnostic capability; integral safety control; and set point display with run time, operating parameters, electrical low voltage and loss of phase protection, current and demand limit control, and output/input - COP (Coefficient of Performance - input/output kw/tons) information.
 - xiv. Specify company field advisor services in sufficient quantity to address start-up, commissioning tests, and personnel training on major equipment.

c. Cooling Towers

Cooling tower basins and housing must be constructed of stainless steel. Wind and seismic design must be incorporated. If the cooling tower is located on the building structure, vibration and sound isolation must be provided. Cooling towers must be equipped with makeup and blowdown meters, conductivity controllers, and overflow alarms.

- i. Cooling Tower Unit shall be ARI rated. Multi-cell tower installations are preferred for redundancy/backup and load matching.
- ii. Each chiller must have its own matching cooling tower or cell, and condenser and chilled water pump. Multiple cooling towers must have equalizing lines and the necessary automatic control valves for individual chiller/cooling tower operation.
- iii. "Typical" piping arrangements for multi tower installations will minimize, but not eliminate, the need for flow balancing.
- iv. Cooling towers must be elevated to maintain required net positive suction head on condenser water pumps and to provide 4 ft. minimum clear space beneath the bottom of the lowest structural member, piping, or sump, to allow for reroofing or other building maintenance access beneath the tower. Cooling towers must have ladders and platforms for ease of inspections and replacement of components.
- v. Design for either Induced or Forced Draft cooling towers, whichever best fits the application.
- vi. The tower shall incorporate design options that ensure a life expectancy that matches the chiller's. Freeze protection should also be included with year-round applications. Some systems can feature a remote tower sump located within a heated mechanical space, eliminating the need for freeze protection at the cooling tower basins.
- vii. The cooling tower design parameters (water temperatures, pressure, flow rates) should match those of the associated chiller. Some care should be taken to assure that the manufacturers' minimum and maximum flows for the chiller and towers are compatible under all anticipated operating scenarios.
- viii. Induced Draft cooling towers must be provided with multiple-speed or variable- speed condenser fan controls. Induced draft towers must have a clear distance equal to the height of the tower on the air intake side to comply with air velocity requirements of the manufacturer.
- ix. Multiple-cell towers and isolated basins are required to facilitate operations, maintenance, and redundancy. The number and capacity of cells must match the number and capacity of chillers. Supply piping must be connected to a manifold to allow for any combination of equipment use. Variable-speed pumps for multiple cooling towers must not operate below 30% of rated capacity.
- x. Multiple towers must have equalization piping between cell basins. Equalization piping must include automatic isolation and shutoff valves between each cell to control water flow only over those towers that are in use. The piping arrangement, strainer and filter placement must provide for removal of accumulated solids and sediments from the system. Cleanouts for sediment removal and flushing from basin and piping must be provided.

- xi. Depending on water quality, consider incorporating chemical treatment and/or water-to-water heat exchanger in the tower system's design.
- xii. Design the piping system and size the cooling tower water pump and piping system to minimize loosening and ejection of the unit's water spray nozzles.
- xiii. Special consideration must be given to de-icing cooling tower fills if they are to operate in subfreezing weather. A manual shutdown for the fan must be provided. If cooling towers operate intermittently during subfreezing weather, provisions must be made for draining all piping during shutdown periods, using indoor drain-down basins. Cooling towers with waterside economizers that are designed for year-round operation must be equipped with basin heaters. Condenser water piping located above grade and down to 3 ft. below grade must have heat tracing.
- xiv. A fan vibration switch with a manual reset should be considered to compel physical inspection of the towers by facility maintenance staff.
- xv. Tower bypass piping may be desired to allow cold weather chiller system start-ups.

d. Economizers

Airside economizers shall be provided as per Code. Waterside economizers must be piped in parallel and sequenced with chillers online to match the load requirements. They must have automatic control and shutoff valves.

- i. Plate heat exchangers, designed and manufactured specifically for use as water-side economizers, must have a 200F approach between the (entering) condenser water and (leaving) chilled water temperatures. The waterside economizer must provide 420F chilled water at the heat exchanger and must have a dedicated pumping system. Cooling towers used for the waterside economizer cycle must have complete freeze protection and be capable of operation at design winter conditions.
- ii. BACnet or LonTalk microprocessor-based controls must be used. The local control panel must have self-diagnostic capability, integral safety control, and set point display.

e. Chilled Water and Condenser Water Piping and Pumps

Pumps must be centrifugal type and must generally be selected to operate at 1,750 rpm and 80% or greater pumping efficiency. Both partial-load and full-load performance must be shown on the pump curve, and the specified pump motors must not overload throughout the entire range of the curve. The number of primary chilled water and condenser water pumps must correspond to the number of chillers and a standby pump must be provided for each chilled water and condenser water circuit. Variable-volume pumping and variable-speed drives are recommended.

f. Freeze Protection

Propylene glycol manufactured specifically for HVAC systems must be used for freeze protection. The concentration of antifreeze must be kept to a practical minimum because of its adverse effect on heat exchange efficiency and pump life. The water makeup for glycol systems must be provided with an inline water meter to monitor and maintain the proper percentage of glycol in the system. All coils exposed to outside air must be provided with freeze protection thermostats and control cycles. Provisions must be made for drain down, storage, and reinjection of the glycol into the system.

13) DECENTRALIZED COOLING (DX) AND HEATING - LIGHT COMMERCIAL & COMMERCIAL CATEGORIES

- a.** Design decentralized systems with one or more individual HVAC units, each with an integral refrigeration cycle, heating source, and direct or indirect outdoor air ventilation. Components are factory-designed and assembled into package that includes fans, filters, heating source, cooling coil, refrigerant compressor(s), controls, and condenser. The typical HVAC units shall include, but not limited to the following, serviced by refrigerant R-407 C or R-410A:
 - i.** Air-cooled heat pump systems
 - ii.** Water-cooled heat pump systems
 - iii.** Multiple-unit variable-refrigerant-flow (VRF) systems
 - iv.** Light commercial split systems
 - v.** Self-Contained (floor-by-floor) systems
 - vi.** Outdoor package systems
- b.** Performance characteristics vary among manufacturers, for a particular kind and capacity of unit. All characteristics shall be carefully assessed to ensure that the equipment performs as needed for the application.
- c.** Use self-contained units, including rooftop units, with multiple compressors to control refrigeration capacity. Factory integrated variable speed compressors can be specified for close control.
- d.** Generally, combine multiple packaged-unit systems for perimeter spaces with a central all-air or floor-by-floor system to provide better humidity control, air purity, and ventilation than packaged units alone. Air-handling systems may also serve interior building spaces.
- e.** Design air-source heat pump providing cooling and heating with the provision for electric heater for heat during defrost cycles and high heating demand that cannot be met by the heat pump alone or as add on sharing the air distribution system with warm-air furnace in extremely cold weather with refrigerant circuit turned off.
- f.** Provide heat rejection equipment (ground source or cooling tower) and heat source (ground source or boiler) for water-source heat pump systems via central piping system.
- g.** Include heating in a package unit, if required, by providing natural gas heat exchangers or electric heat coils. Heat can be turned on or off in stages to meet zone demands.
- h.** Design must consider noise generated by packaged unit's compressors, fans, or both. Units mounted on roofs should not be located above sound-sensitive spaces, such as conference rooms or close to residential buildings. It should be checked to ensure the noise from the equipment meets sound level requirements. Design shall conform to Noise Code and DEP noise control regulations.
- i.** Decentralized units require electric and/or gas to each location. Design must consider building type and installation costs in addition to the HVAC system cost.
- j.** Design applicable air or water-side economizers. Provide return/exhaust fans for air side economizers.

14) AIR DISTRIBUTION

a. General Design Requirements

For dedicated zones of control, Constant Volume (CV) systems are acceptable. For multiple zones of control, separate Variable Volume (VV) systems are required.

- i. Use diffusers and registers in lieu of grilles for supply air.
- ii. Use sheet metal ductwork only; do not use fiberglass ductwork.
- iii. Use external thermal duct insulation in lieu of internal insulation.
- iv. Turning vanes shall comply with SMACNA's HVAC Systems duct design standard.
- v. Use quadrant opposed blade dampers for balancing in lieu of splitter dampers. All supply and return branch ductwork shall be provided with opposed blade dampers.
- vi. Provide motorized dampers at each exterior wall louver, at each roof penetration for HVAC units, and in lieu of backdraft dampers.
- vii. Locate all duct smoke detectors, fire and smoke dampers on plans. Provide fire dampers adjacent to each intake louver, gooseneck, and penthouse.
- viii. Provide complete firestopping details.
- ix. Use ten-gauge black iron for kitchen range hood exhaust ductwork. Ductwork connections shall be welded. Provide required duct insulation as per Code.
- x. Review security requirements with Sponsor Agency. For security applications, use framed security bars for HVAC openings or ducts 6" or larger in any dimension.

b. System Layout

Both overhead and underfloor air distribution systems are acceptable.

- i. Install air distribution system equipment such as ducts, balancing dampers, fire/ smoke dampers, filters, fans, VAV boxes, heating/cooling coils, humidifiers, condensable materials drain pan/traps, sound attenuation devices and other treatment/control devices in accessible overhead/underfloor locations.
- ii. When using VAV heating and cooling systems, horizontally zoned AHUs for each floor are preferred, located on the floor they serve, the floor above, or the floor below depending on site/building constraints. Where ducted returns are feasible and/ or as otherwise required, return air from a given floor must be ducted directly to the AHU serving that floor.
- iii. The use of mechanical rooms as return air or relief plenums is discouraged.
- iv. Un-ducted supply is allowable only in data processing centers.

c. Under-Floor Air Distribution

Where feasible consider a fully ducted under-floor air distribution (UFAD) system or displacement ventilation system. Equipment such as air-handling units, VAV boxes, or other equipment that require maintenance, are not permitted below a raised-access floor. Under-floor systems are not permitted in courtrooms, restrooms, cafeterias, kitchens, laboratories, loading docks, mail rooms, or detention areas.

d. Air Delivery Devices

Air is to be supplied through diffusers or registers mounted in ceilings, sidewalls, sills, or floors. Air is to be returned or exhausted through grilles, slots, and other openings located in sidewalls and ceilings.

- i. Adequate space ventilation requires that the selected diffusers effectively mix the total air in the room with the supplied conditioned air.
- ii. The locations of the air delivery devices and the ranges of their outlet airflow rates must be selected to ensure that the Air Diffusion Performance Index (ADPI) values remain above 80% during all full-load and part-load conditions, and below the specified noise level to achieve the background noise criteria, in accordance with the test procedures specified in Appendix A of ASHRAE Standard 113
- iii. Variable air volume (VAV) terminal units or constant air volume (CAV) terminal units, including series-type-fan-powered VAV terminal units, may be used. Ceiling diffusers or booted-plenum slots must be specifically designed for VAV air distribution if used.
- iv. Booted plenum slots must not exceed 4 ft. in length unless more than one source of supply air is provided.

e. Sizing of Ductwork

Energy consumption, security, and sound attenuation shall be major considerations in the routing, sizing, and material selection for air distribution ductwork.

- i. The negative pressure outside air and return air ductwork with lower velocities will be designed at lower friction rate as compared to positive pressure supply and exhaust ductwork.
- ii. Air supply, return, and exhaust ductwork must be sized using accepted industry duct sizing practices. Pressure drops must not exceed 0.1 inch w.c. for every 100 ft.
- iii. Supply, return, and exhaust air ductwork must be sized to limit the design static pressure to values that will minimize fan power, consistent with functional requirements of the zones being served.
- iv. When noise generation is a controlling factor, design air velocities must not exceed the values shown in the table below.

Recommended Air Velocities for Supply, Ducted Return, and Exhaust		
	Controlling Factor-Noise Generation	
	Main Ducts	Branch Ducts
Space/ Application	fpm	fpm
Private Offices, Conference Rooms and Libraries	1200	800
Theaters and Auditoriums	800	400
General Offices	1500	1000
Cafeterias	1800	1200

- v. Sizes, pressure, and seal classification of all ductwork must be identified, labeled and specified in the Construction Documents as per SMACNA standards.

f. Plenum and Ducted Return Air Distribution

- i. All multi-floor-type return air risers must be ducted.
- ii. No more than 2,000 cfm should be collected at any one return register.
- iii. The maximum horizontal distance from the return air register in the farthest zone in a plenum to a return duct is 50 ft.
- iv. For areas where special conditions or noise criteria are to be met, such as auditoriums, judge's chambers, and courtrooms, return air must be ducted from each return air register.
- v. Where fully ducted return systems are used, consider placing return grills low in walls or on columns to complement ceiling supply air.
- vi. Return air ducts in a ceiling plenum below the roof must be insulated.
- vii. Return air ducts in unconditioned space in hung ceiling (not used as return air plenum) shall be insulated complete with vapor barrier.

g. Testing of Air Distribution Systems

Air distribution systems must be tested twice for leakage; during the construction process, before the installation of insulation and after all connections to terminal units, air delivery and return devices, and return air and exhaust air fans have been made.

h. Louvers

Door louvers or a door undercut shall be provided for each room being exhausted or ventilated, except where positive pressure must be maintained. Use a door undercut for less than 75 cfm and a door louver for 150 cfm or greater. All outdoor louver designations shall indicate gross and net free area. Exterior louvers, including outdoor air intake louvers and fan discharge louvers, should be positioned to deter potential vandalism.

i. Humidification

Where humidification is necessary, electronic or steam-to-steam generators must be used to produce atomized hot water, clean steam, or ultrasound vapor.

- i. All equipment and steam dispersion piping associated with humidification equipment must be stainless steel.
- ii. Humidifiers must be centered on the air stream to prevent stratification of the moist air.
- iii. When steam is required during summer seasons for humidification or sterilization, a separate clean steam generator must be provided and sized for the seasonal load.
- iv. Makeup water for direct evaporation humidifiers must originate directly from a potable source. Chemically treated water must not be used for humidification. Humidifiers must be designed so that microbiocidal chemicals and water treatment additives are not emitted in ventilation air.
- v. Each humidifier must have a Ddc (BACnet or LonTalk) self-contained controller that is capable of being connected to the BAS. Each humidifier must have a metering device for transmitting energy and water consumption data to the BAS.

15) SPECIAL PURPOSE AREA HVAC SYSTEMS

Special use areas such as atriums, laboratories, kitchen/cafeterias, process rooms, computer and server rooms, elevator machine rooms, fire pump rooms and fire command centers and the following special purpose areas may require dedicated air handling units, separate from all other air handling units in the building, with individual controls to condition these spaces as required. The energy requirements for these special areas can be significant and must be included in the building energy analysis. Some of these areas require positive or negative air pressurization relative to adjacent areas. Pressurization design strategy shall consider the effects of the building envelope and mechanical, riser, and elevator shafts.

a. Lobbies and Entrance Vestibules

Consultant shall evaluate pressurization requirements to control infiltration and contaminant intrusion into the building. Radiant floor cooling is not permitted in these types of areas.

b. Areas of Refuge

Where required by the program or the Sponsor Agency, areas of refuge for emergency conditions (anti-terrorism, civil defense, and fire emergency smoke control) must be provided with dedicated AHUs, connected to emergency power to maintain positive air pressure relative to surrounding spaces.

c. Public Assembly Spaces

In general, assembly spaces shall be heated with ventilation air tempering as well as space heating and cooled with all-air variable volume zoned gas-fired DX air conditioning.

- i. Carbon Dioxide occupancy sensors shall be provided, as required (except for cafeterias served by a combination/kitchen unit).
- ii. Relative humidity shall be maintained at 40-60% (+/-2%) during occupied periods. Return duct humidity sensors shall be utilized during occupied periods. Space humidity sensors shall be utilized during unoccupied periods.
- iii. Auditoriums must have dedicated air handling units. The use of economizer cycles must be determined.

d. Conference Rooms

Each conference room must constitute a separate thermostatically controlled zone. The outdoor air ventilation rate for each conference room must be designed in accordance with the NYC Mechanical Code.

e. Courtrooms

Each Courtroom must have its own dedicated AHU, if applicable, and must be provided with a minimum of three thermostatic zones.

f. Kitchen/Cafeteria Areas

A separate AHU must be provided for the kitchen whenever makeup air from adjacent spaces is inadequate to meet kitchen exhaust and pressurization requirements. In general, combined cafeteria/kitchen areas are to be designed with a single air handling unit with supply and return fans, economizer dampers, self-contained DX cooling, hot gas reheat (where applicable) and modulating gas-fired duct furnace heating.

i. **Kitchens and Dishwashing Areas**

Kitchens with cooking ranges, steam kettles, ovens, and dishwashers must be provided with dedicated make-up air and exhaust hoods for exhaust systems.

ii. **Pressurization**

Kitchens must maintain negative air pressure relative to adjacent areas. The operation of the kitchen exhaust systems must not affect the pressure relation between the kitchen and surrounding spaces.

iii. **Air Handling Unit**

The AHU shall operate in several modes: unoccupied, occupied-cooking, and occupied-non-cooking. During occupied mode, air shall be returned to the AHU solely from the cafeteria area, while air from the kitchen shall be exhausted as indicated above. Makeup air for the kitchen exhaust fans shall be supplied by the AHU via supply diffusers and a transfer grille in the wall above the ceiling between the cafeteria server and kitchen.

iv. **Sensors**

During unoccupied mode, a space temperature sensor and space relative humidity sensor(s) in the cafeteria shall control the AHU. During occupied mode, a temperature sensor and relative humidity sensor mounted in the return duct shall control the AHU.

v. **Supply Air**

Since the AHU's total outside air intake ventilation rate must satisfy the cafeteria and kitchen requirements, this rate shall never drop to less than the kitchen's requirements.

vi. **Diffusers and Grilles**

Ceiling diffusers and wall grilles shall be spaced to avoid air stagnation and stratification and to provide a maximum of 40 fpm air impingement velocity when the air moves past occupants, to comply with ASHRAE 55. Standard diffusers shall not be used in the immediate area of the kitchen exhaust hood to maximize the capture and containment of cooking grease laden vapors/odors and minimize effluent spillage.

vii. **Exhaust**

Cooking appliance products of combustion and cooking operation contaminants must be discharged directly from the building to outdoor air using kitchen ventilation systems involving exhaust hoods, grease ducts, and makeup air systems where required. Commercial kitchen equipment applications constructed in compliance with UL 710 must be served by a Type I hood. Grease ducts must be constructed in accordance with all requirements. Both supply air and makeup air must be exhausted through the hood. The velocity of the exhaust air must comply with applicable NFPA 96 requirements.

viii. **Energy Conservation**

To reduce the fan HP requirements for energy conservation, cafeteria supply and return fans and air distribution ductwork shall be designed for 1.5 inch of w.c. external static pressure for supply air, and 1.0 inch of w.c. external static pressure for return air. Where feasible or as required, both supply air and makeup air should be supplied and exhausted through the kitchen heat recovery system.

ix. Prohibited Equipment

Exposed cabinet heaters, unit heaters, fan coil units, or any other ceiling suspended heating and/or cooling apparatus shall not be installed inside the kitchen area.

g. Indoor Mail Rooms, Loading Docks, Receiving/Shipping Areas, and Warehouses

A separate dedicated AHU must be designed for each of these spaces. These spaces must be maintained at negative air pressure relative to adjacent spaces. Overhead radiant heating or unit heaters shall be provided for spaces featuring large openings (e.g. garages, loading docks).

h. Enclosed Vehicle Garages

As required by Code, vehicle garage exhaust fans must be activated based on carbon monoxide sensors within the garage. Carbon monoxide sensors must also be in all floor areas where vertical shafts penetrate the garage areas. Outdoor air intake and exhaust locations shall comply with the requirements of the Code.

i. Firing Ranges

A firing range must be provided with a dedicated air handling system capable of continuous operation, isolated from other building systems. Heating and cooling supply air must be delivered to the area along and behind the firing line for occupant comfort and to maintain a positive pressure in this area relative to down range and target areas. Powered exhaust air must be extracted from down range and target areas in sufficient quantity to remove smoke and maintain a clear line of vision to the target. 60% of the total exhaust must be extracted at a point approximately one-third the distance from the firing line to the target area, and 40% from above the target area. All exhaust air must be filtered to preclude the emission of lead particulates and gunpowder residue into the atmosphere. The discharge of firing range exhaust air to the outdoors must be carefully located to prevent recirculation into the outdoor air intake of any HVAC system. Design must include High-Efficiency Particulate Air (HEPA) pre-filters and final filters.

j. Twenty-Four-Hour Spaces

Areas designated by Sponsor Agencies as requiring 24-hour operations must be provided with dedicated HVAC systems supported by emergency power (if applicable). The use of the building central heating and cooling system is permitted during normal operating hours. Among these areas are: command centers, computer and server areas, BAS computer processing areas, etc.

k. Information Technology Equipment Rooms

Information Technology equipment rooms must maintain neutral or positive air pressure relative to adjacent areas. Provide self-contained critical environmental control units specifically designed for this purpose.

- i. As determined by the Sponsor Agency, the design shall incorporate redundant equipment capacity and/or equivalent method of backup system operation. At a minimum, provide an inline type exhaust fan with thermostat as a back-up in the event the air conditioning system fails. If the computer room houses critical components, as defined in the project's program, the HVAC systems must be connected to the emergency generators (if applicable).
- ii. In large information technology equipment rooms of 5,000sf or larger, cooling of the sensible load (computer load) and control of the outdoor air ventilation and space relative humidity must be provided by separate air handling systems.

- iii. For cooling loads greater than 80 tons, chilled water air handling systems must be provided, utilizing a dedicated chiller with redundant backup, either by multiple machines or through connection to the facility's chilled water plant, if available year around.
- iv. Where feasible, airside/waterside economizers should be applied.
- v. Information Technology equipment will be deployed in hot-aisle/cold-aisle configuration.
- vi. Underfloor Air Distribution will distribute chilled air via raised floor plenum and through perforated floor tiles. The warm air in the hot aisles will be returned to the top inlet of CRAC Unit located in the room.
- vii. Local distribution will introduce chilled air, as close to the cold aisle as possible, performing as supplemental cooling systems for just high-density load racks. Refrigerant as liquid, piped to the cooling equipment near racks, is preferred.

I. Communication Equipment Rooms

Communications equipment rooms must be cooled in accordance with the requirements of the Sponsor Agency's IT equipment manufacturer and EIA/TIA Standard 569. Rooms that house critical communications equipment must be provided with dedicated 24-hour air conditioning systems that must be connected to the emergency power distribution system, where applicable.

m. Elevator Machine Rooms

A dedicated HVAC system must be provided to maintain room temperature conditions required by elevator equipment manufacturer specifications, and in accordance with the indoor design conditions.

n. Hydraulic Elevator Machine Rooms

Hydraulic elevator machine rooms shall be provided with means of natural ventilation and/or mechanical exhaust to prevent the accumulation of smoke and hot gases in case of fire. Smoke exhaust fan system shall be rated for elevated operating temperature and be supplied with emergency power (where applicable) and shall provide a system of mechanical ventilation of sufficient capacity to exhaust at least twelve (12) air changes of the volume of the elevator machine room through the roof or an approved location on an exterior wall other than the lot line wall.

o. Mechanical Equipment Rooms (MER's)

- i. Provide MER ventilation and/or combustion air system in accordance with the NYC Mechanical Code and the equipment manufacturers' printed recommendations. Perform design calculations and indicate CFM quantities along with relative locations and sizes of ventilation inlets and outlets, on the drawings. Fit the inlets/outlets with motorized dampers with position indicating switches.
- ii. Maintain minimum temperature and control of contaminant conditions. Unless required or as otherwise approved, mechanical rooms should not be used as return air, outdoor air, or mixing plenums.
- iii. Show sizes of all structural openings (doors, hatches, etc.) to be used to introduce the equipment for installation in the Mechanical Equipment Room.
- iv. Show clearances required by the National and local codes as well as for operation, maintenance, and eventual replacement of the equipment. For large/long component maintenance (AHU coils, boiler tubes, heat exchanger bundles, etc.), show size of the maintenance apron on the floor plan.
- v. Generally, avoid routing piping and ductwork above electrical equipment/panels in the MER.

- vi. Coordinate with the plumbing engineer to identify the quantity and/or location of the floor drains to satisfy the equipment drainage, and the recommended maintenance/good housekeeping of the MER.
- vii. Provide safety detection and protection hardware and systems to safeguard against hazardous fluids/substances present in the MER. The design shall be per the equipment or substance manufacturers' recommendations and satisfy the NYC Mechanical Code's requirements.
- viii. All floor-mounted or supported equipment shall be on concrete housekeeping pads that are (min. 4") longer and wider than the equipment base. The pad shall be lagged to the floor with (min. 4) steel anchoring devices and chamfered all around. Its height (min. 4") and reinforcement requirements may vary depending on the weight and dynamic forces produced by the equipment.
- ix. The final sizing and layout of the boiler/mechanical equipment should also consider a potential future expansion of the facility's requirements.
- x. Depending on the location/size of the room and the capacity of its equipment, cooling, ventilating and/or combustion air heating equipment (boiler rooms) may have to be added to assure proper ambient temperature.
- xi. For larger size equipment, design ladders and/or walkways/catwalks to facilitate routine inspection and maintenance.
- xii. All major hydronic and steam equipment shall be designed with shut-off valves to facilitate their maintenance and replacement.
- xiii. Access doors or spaces shall be designed with each air handling, hydronic and steam system, whenever concealed components and/or systems need visual/manual monitoring and servicing.

p. Chiller Equipment Rooms

All rooms for refrigerant units must be constructed and equipped to comply with the Code, including engineering and safety controls as required in the event of a catastrophic refrigeration system leak within the building. Chiller operating controls shall be capable of Ddc communication to the central building energy management system.

q. Combustion Equipment Rooms

All rooms that contain fossil fuel burning combustion equipment must comply with the requirements in the code. At a minimum, combustion equipment rooms must provide the required amounts of outdoor air for the combustion equipment through the motorized dampers that interlock with the combustion equipment control system, and the room must be ventilated to control excessive temperature and indoor contaminant levels. Maintain minimum temperature conditions in the combustion equipment room in accordance with the design conditions listed above.

r. Emergency and Standby Generator Rooms

The emergency generator room ventilation system shall be capable of providing sufficient air for generator cooling and combustion. See 'Venting of Boilers and Emergency Generators' below for more information.

- i. The room must be maintained under negative pressure.
- ii. The location of the air intakes and exhausts must comply with Code. The supply and exhaust louvers must be located to prevent short circuiting.
- iii. The ventilation system shall include motorized dampers and thermostatically controlled bypass for emergency generator room temperature control.

- iv. Rooms must be ventilated sufficiently to remove heat gain from equipment operation. Provide self-activating exhaust fan in connection with the emergency generator room, including fresh air and discharge ductwork for an emergency generator radiator.
- v. The ventilation systems must meet the combustion air requirements of the emergency generator equipment manufacturer. When generator is located at roof level, generator combustion exhaust must be discharged at a minimum of 10 ft. above the roof level and in compliance with the generator manufacturer's installation guidelines and code requirements.

s. UPS Battery Rooms

The battery rooms must be maintained at a neutral to negative pressure with respect to adjacent spaces and must be exhausted directly to the outdoors at a rate calculated to comply with Code and manufacturer's recommendations. Fans must be spark resistant and explosion proof, with motors placed out of the air stream. A dedicated exhaust air system must be provided to maintain negative pressure in the ductwork. The ductwork and accessories must be noncorrosive. The exhaust fans must be connected to the emergency distribution system.

16) VENTING OF BOILERS AND EMERGENCY GENERATORS

The venting of all gas and oil-fired appliances shall comply with Code requirements. The venting of natural gas fired boiler plants and No. 2/4/6 oil firing plants shall be in accordance with the requirements of the NYC Department of Environmental Protection (DEP) and the Division of Air Resources at the NYS Department of Environmental Conservation (DEC).

a. Boiler Breeching

- i. Single wall breeching for traditional non-condensing firetube/watertube boilers may be 12-gauge black steel with 1-1/2 in. calcium silicate. Longitudinal seams shall be welded.
- ii. Single wall breeching for traditional non-condensing firetube/watertube boilers in existing masonry chimneys, where repair is required, and in new non-combustible chase enclosures from the boiler room to the roof, may be 10 gauge corrugated stainless steel liner with 3-1/2 inch calcium silicate.
- iii. Double wall breeching for condensing boilers shall utilize positive pressure (category IV) UL listed and AGA (American Gas Association) approved AL-29-4C stainless steel.

b. Emergency Generator Venting

Double wall insulated metal vents (in lieu of insulated schedule 40 black steel pipe) may be used downstream of an emergency generator silencer. All venting upstream of emergency generator silencer shall be insulated schedule 40 black steel pipe. Piping system to be designed and installed for generator back pressure.

c. Fire Ratings

- i. Stack systems extending through any story above the boiler room require a minimum 2-hour rated non-combustible chase enclosure from the boiler room to the roof and a penetration assembly or roof support assembly at the roof level.
- ii. Rooms containing boilers or other equipment of similar or greater explosion hazard shall not be located within 50 ft. of any place of assembly, unless separated from such place of assembly by a minimum of 3-hour fire rated construction. In this event, chase enclosure from the boiler room to the roof shall also be a minimum of 3-hour fire rated.

d. Cleaning and Inspection Requirements for Boilers and Chimneys

- i. Construction Documents for boiler and burner replacement projects shall specify cleaning and inspection requirements for the boiler, boiler breeching and chimney.
- ii. Construction Documents for burner replacement projects shall also include soot cleaning of boiler firetubes.
- iii. No boiler, burner, or vent from a gas appliance shall be connected to an unlined chimney or to a chimney having a damaged lining.
- iv. Construction Documents shall specify lining installation and repair requirements, as appropriate.

17) SMOKE PURGE SYSTEMS

A dedicated smoke purge system (i.e., one that purges the non-assembly spaces through the corridors) is preferred to one that is integrated with the HVAC system for non-assembly spaces. A dedicated system allows the HVAC systems for non-assembly spaces to use non-purgeable, fusible link fire dampers.

a. Performance

The smoke purge system shall be sized to exhaust six (6) air changes per hour or 1 cfm per sf of floor area, whichever is greater, one floor at a time.

b. Zoned System

Public assembly spaces may be purged separately and independently from each other and from other spaces in order to downsize the dedicated purge ductwork and exhaust fans for the other spaces. If a public assembly space is separately purged, the return fans of the space's dedicated air conditioning unit may be used for purging.

c. Fire-Smoke Dampers

The combination fire-smoke dampers necessary for operation of the purge system shall be provided with a manual override feature, which shall be activated by the NYC Fire Department at the smoke purge panel.

- d. The Consultant to ensure that the smoke purge systems (fans and ductwork) are designed for a "cold smoke condition" that could produce temperatures above the standard HVAC design upper limit of 1400F

18) WATER DISTRIBUTION

All HVAC piping systems must be designed and sized in accordance with the latest editions of the ASHRAE Fundamentals Handbook and the ASHRAE HVAC Systems and Equipment handbooks. All hydronic circulation systems must be designed for variable flow, in accordance with Code and as otherwise required.

a. Piping

Hot water and chilled water systems must use a four-pipe main distribution system. Dual temperature piping systems are not permitted. Heating coils shall temper all outdoor air intakes. Condensate drain piping must be provided for all cooling coils, with a deep seal self-draining trap. Reverse return piping must be provided for hot water heating elements. Drain piping must be provided for each pre-action valve assembly and each sprinkler control valve assembly. Use Schedule 80 piping for condensate drains and Schedule 40 piping for sprinkler work: do not use schedule 10.

b. Valves

Loop piping for terminal or branch circuits must be equipped with automatic flow control valves. Each terminal unit or coil must be provided with a flow-indicating balance valve on the return line, a two-way control valve, and either variable primary pumping or constant primary/variable secondary pumping. Three valve bypasses must be provided for each control valve and for each float and thermostatic and bucket type trap. "Warm-up" valves must be provided for all steam services. Blow-off valves must be provided for all strainers.

c. Isolation of Piping at Equipment

Isolation valves, shutoff valves, bypass circuits, drain valves, flanges, and unions must be provided for piping at equipment, including boilers, chillers, pumps, coils, terminal units, and heat exchangers, to facilitate equipment repair and replacement. Isolation valves must be provided on all major pipe branches, such as at each floor level, building wing, or mechanical room, and for zones off vertical risers, including drain valves.

d. Flexible and Rigid Pipe Connectors

All pumps, chillers, cooling towers, and other rotating equipment must have flexible connectors, sized one size larger than the size of the connected piping. Connections to terminal units shall be with rigid piping; flexible piping or hose is not permitted.

e. Additional Components

Use steam or hot water unit heaters, cabinet heaters, and air curtains; do not use electric. A thermostat or aquastat must be provided for each unit heater, cabinet heater, VAV box, and air curtain.

f. Freeze Protection

Heat trace all piping subject to freezing temperature. All steam coils shall be of the freeze proof construction type. Provide circulating pump freeze protection for all hot water heating coils.

g. Cathodic Protection

The need for corrosion protection for underground metallic piping must be evaluated by a soils resistivity test. Cathodic protection or another means of preventing pipe corrosion must be provided, if required by the geotechnical report.

h. Water Treatment

Provide complete systems for water treatment, with one-year service contract. The methods used to treat makeup water must have demonstrated prior success in existing facilities using the same municipal water supply and must follow the guidelines outlined in the ASHRAE Applications Handbook. The design of the water treatment for closed and open hydronic systems shall take into consideration the operational and maintenance needs of all system equipment including such components as boilers, chillers, cooling towers, other heat exchangers, pumps, and piping. The design must address all aspects of water treatment: biological growth, dissolved solids and scaling, corrosion protection, and environmental discharge regulations. The chemical feed system must have BACnet or LonTalk self-contained controls.

i. Air Control

Pressurized diaphragm expansion tanks must be appropriately sized for closed piping systems. Air separators and vents must be provided on closed hydronic systems to remove accumulated air within the system. Automatic bleed valves must only be used in accessible spaces in mechanical rooms, where maintenance personnel can observe them, and they must be piped directly to open drains. Manual bleed valves must be used for terminal units and other less accessible high points in the system. Air vents must be provided at all localized high points of the piping systems and at each heating coil, and system drains must be provided at all localized low points of the piping systems and at each heating coil.

j. Hydronic Criteria for High Rise Buildings

All HVAC systems in buildings that exceed 75 ft. in height or have operating pressures exceeding 125 psi at the pump discharges must be designed to perform in accordance with the high-pressure piping criteria in ANSI/ASME Standards, and to be dynamically tested at 1.5 times the operating pressure.

k. Piping System and Equipment Drawings

Pipe routing to and from interconnected pieces of equipment shall be sized and shown on the HVAC Drawings. Indicate all filter dryers, solenoid valves, strainers, pressure relief valves, flexible connections, receivers, and sight glasses. Provide refrigerant piping schematic flow diagrams.

l. Piping System and Equipment Identification

All pipes, valves, and equipment in mechanical rooms, shafts, ceilings, and other spaces accessible to maintenance personnel must be identified with color-coated piping or color-coded bands, and permanent tags indicating the piping system type and direction of flow, or the equipment type and number, in accordance with ASHRAE handbooks. The identification system must also tag all valves and other operable fittings in accordance with ASTM Standard A13.1.

19) METERS, GAUGES, AND FLOW MEASURING DEVICES

Each piece of mechanical equipment must be provided with instrumentation or test ports to verify critical parameters such as capacity, pressure, temperatures, and flow rates. Each meter, gauge, and flow measuring device must be calibrated before start-up and must have provisions for periodic calibration at its location. For further information on advanced metering see Electrical Engineering section in this Chapter. Following are the general instrumentation requirements.

a. Monitoring and Control

All metering devices must be capable of transmitting information to the central BAS for monitoring and control.

b. Thermometers and Pressure Gauges

Thermometers and pressure gauges are required on the suction and discharge of all pumps, chillers, boilers, heat exchangers, cooling coils, heating coils, and cooling towers.

- i. Duct static pressure gauges must be provided for the Dedicated Outdoor Air Ventilation System (DOAVS) and AHU air supply fan discharge, branch takeoffs of vertical supply risers, and all duct locations at which static pressure readings are being monitored to control the operation of a VAV system.
- ii. Differential static pressure gauges must be placed across filters in air handling units. A temperature gauge is required at the outdoor air intake to each air handling unit.

c. Flow Measuring Devices

i. Airflow

Airflow measuring grids are required for all DOAVSs and AHUs. Measuring grids must be provided at the supply air duct, return air duct, and outdoor air duct. Air-flow measuring grids must be sized to give accurate readings at minimum flow.

ii. Water Flow and Energy Consumption

1. Where compliance with Local Law 86-2005 is required, measuring devices are required for all energy and water consuming equipment.
2. HVAC equipment serving tenant spaces must be provided with energy and water consumption measuring devices.
3. Measuring devices shall conform to NYC Energy Conservation Code requirements.

d. Testing Stations

Permanent or temporary testing stations must be provided for startup and testing of building systems. Connections must be designed so that temporary testing equipment can be installed and removed without shutting down the system.

20) LEAK DETECTION AND ALARM SYSTEMS

a. Gas and Carbon Monoxide: New Buildings, Additions, and Major Renovation

i. Multiple-Station Systems

Provide multiple-station natural gas and carbon monoxide detector/alarm system with detectors adjacent to all gas-fired equipment located within the building (water heater, unit heaters, duct furnaces, etc.); between boilers; and (natural gas detector only) in the gas meter room and gas booster room, if applicable. Multiple-station system operations shall be as follows:

1. Upon detection of combustible gas and/or carbon monoxide, the individual leak detector shall signal the alarm control panel.
2. The alarm control panel shall then institute the following:
 - a. Close the main gas valve on the gas service (isolation valve with fusible link).
 - b. Electrically shut down all equipment.
 - c. Start the explosion proof exhaust fan in the gas meter room, where applicable.
 - d. Digitally signal the BMS/Ddc system (if provided); and
 - e. Activate the audio/visual alarms in the boiler room (or mechanical room, for projects without boiler) and the Engineer's office, as applicable.

ii. Standalone Single Stations

Provide standalone single station carbon monoxide detectors/alarms (in addition to multiple-station detectors as specified above) for all remaining spaces containing fossil fuel burning equipment (spaces with gas stoves or dryers, labs, auto shops, generator room, indoor loading dock, etc.). Such carbon monoxide detectors/alarms shall annunciate locally by both visual and audible means. Standalone single station carbon monoxide detectors/alarms shall not shut down the generator, close the main gas valve, or automatically energize the exhaust fan in the gas meter room.

iii. Power

Primary power for single station detectors/alarms and for the multiple-station alarm control panel shall be hard wired, supplied from a dedicated branch circuit, and connected to emergency power (where applicable). The multiple station alarm control panel shall be in the boiler room (or mechanical room, for projects without boiler) and contain power supplies to feed the gas and carbon monoxide leak detectors, control valves, and the audio/visual alarms.

b. Gas and Carbon Monoxide: Existing Buildings**i. Standalone Single Stations**

Provide standalone single station carbon monoxide detectors/alarms adjacent to all gas-fired equipment located within the building (water heater, unit heaters, duct furnaces, etc.); between boilers; and for all remaining spaces containing fossil fuel burning equipment (spaces with gas stoves or dryers, labs, auto shops, generator room, indoor loading dock, etc.).

ii. Power

Primary power for single station detectors/alarms shall be hard wired, supplied from a dedicated branch circuit, and connected to emergency power (where applicable).

c. Cooling Systems

Mechanical rooms for cooling system equipment (refrigeration, chiller machine rooms) must be designed in accordance with the requirements of ASHRAE Standard 15: Safety Code for Mechanical Refrigeration and shall contain a refrigerant leak detector with audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be in an area where refrigerant from a leak will concentrate. The alarm shall be sent to the BAS/Ddc system, if provided.

d. Pumps

Provide leak detectors for pumps, connected to a local audible alarm in the pump room and to a remote alarm panel located in the supervising station.

e. Fuel-Oil Burning Equipment

Provide leak detectors and level sensors for fuel-oil, level and capacity, high and low levels, adjacent to fuel-oil tanks and in rooms containing fuel-oil burning equipment, connected to a local audible alarm and to a remote alarm panel located in the supervising station.

f. Sprinklers

Upon activation, sprinkler system water flow indicators and tamper switches for the fire alarm or sprinkler system shall transmit a signal to the fire alarm system. For more information see "Fire Protection" below.

g. Ducts

Upon activation, duct smoke detectors shall transmit a signal to the fire alarm station, automatically shut down fan systems, and activate a visible and audible supervisory signal in the supervising station.

21) FUEL OIL SYSTEMS

a. Fuel Oil Piping

Fuel oil piping located underground or outdoors must be schedule 40 black steel or black iron double-wall containment pipe (pipe-in-pipe). Fittings must be of the same metal grade as the pipe material. Valves must be bronze, steel, or iron and must be screwed, welded, flanged, or grooved. Duplex fuel-oil pumps with basket strainers and exterior enclosures must be used for pumping fuel oil to fuel burning equipment.

b. Underground Fuel Oil Storage Tanks (UST)

Underground fuel oil storage tanks (UST) installation must comply with all Code requirements as well as Environmental Protection Agency (EPA), or any authority having jurisdiction.

22) EMERGENCY GENERATOR FUEL TANK

- a. Oil storage shall be designed as per the latest NYC Department of Environmental Conservation (NYCDEC) regulations and the Code.
- b. The parameters and the oil storage capacity must be reviewed and approved by DDC and the Sponsor Agency prior to proceeding with the Construction Document Phase.
- c. Unless otherwise directed, the Consultant shall provide for an independent storage tank for emergency generator fuel storage.
- d. The fuel supply system shall include an electric transfer pump, an emergency hand pump, a day tank, and an alarm activated by high and low-level switches in the day tank.
- e. New construction projects and major renovation projects shall be provided with a minimum of 275 gallon diesel oil storage tank that is integral with the emergency generator.
- f. The Consultant shall review fuel storage space limitations and budget constraints during the Schematic Design Phase.
- g. Design for buried fuel tanks and related ancillary equipment such as piping and cathodic protection shall be based on manufacturer's data for either double wall steel tanks or double wall fiberglass tanks. Consultant may substitute steel tanks for fiberglass or fiberglass tanks for steel.

23) HVAC SEISMIC DESIGN

a. General

For more information see Structural Engineering section in this Chapter, the SMACNA Seismic Restraint Manual, and the ASHRAE Application Handbook. New buildings and additions to existing buildings shall be designed for seismic forces as per code and the following:

- i. If an existing building is required to meet the requirements of the NYC Seismic Code, it is the Consultant's responsibility to apply for a waiver and if a waiver cannot be obtained, the HVAC retrofit work must meet such requirements.
- ii. For new additions, any items in the existing building that are integrated with the life safety systems in the new addition shall also meet the seismic requirements.
- iii. Generic seismic restraint details shall be shown on the contract documents. A note shall be added stating; "Details are shown to illustrate the scope of work. Contractor's registered professional engineer shall provide calculations and be responsible for providing signed/sealed shop drawings indicating locations of seismic restraints and the required connection details to file with DOB"

b. Items Requiring Restraint

Seismic restraints shall be provided for the following HVAC items:

- i.** All fuel oil and diesel oil piping 1" diameter and larger.
- ii.** Sprinkler system piping as required by NFPA 13 as modified by the Code.
- iii.** Ductwork
 1. All rectangular ductwork with cross sectional area over 6sf, where there is more than 12 in. from the bottom of the slab or structural member to the top of the duct for any portion of the duct run.
 2. All round ducts with diameter of 28 in. or larger, where there is more than 12 in. from the bottom of the slab or structural member to the top of the duct for any portion of the duct run.
 3. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
 4. All smoke purge exhaust ducts, emergency generator vents, and gas meter room exhaust ducts, regardless of size and distance to above slab or structural member.
- iv.** All HVAC piping (other than fuel oil piping, diesel oil piping, and sprinkler piping) 2-1/2 inch diameter and larger (1-1/4 inch and larger in boiler and mechanical rooms) where there is more than 12 inch from the bottom of the slab or structural member to the top of the pipe for any portion of the pipe run.
- v.** Any new floor or roof mounted equipment that exceeds 400 pounds in weight. New floor or roof mounted equipment that is not part of life safety system, is not related to hazardous systems, and weighs less than 400 pounds need not be seismically restrained.
- vi.** All new wall mounted or suspended equipment. Suspended fans, VAV boxes, and suspended fan coil units that weigh less than 50 pounds and are independently supported with a minimum of four hanger rods or rigidly connected to ductwork (which in turn must be seismically braced), need not be restrained.
- vii.** The following equipment, without limitation (equipment exclusions based on size or distance from above slab or structural member do not apply; however, equipment exclusions based on weight as defined above do apply):
 1. AC unit chillers
 2. VAV boxes
 3. Heat exchangers
 4. Condensers
 5. Pumps
 6. Unit ventilators
 7. Fans
 8. Air compressors
 9. Unit heaters
 10. Boilers
 11. Cabinet heaters

12. Gravity ventilators
13. Tanks
14. Air handling units
15. Air separators
16. Cooling towers
17. Rooftop units

c. Restraining Devices

All restraining devices shall be approved by an independent testing agency. Calculations (including combining of tensile and shear loadings) for seismic restraint designs must be stamped by Contractor's registered professional engineer with at least five years of seismic design experience in New York State.

d. Attachments

All attachments of hangers and bracing shall be positive attachments that shall be cast in place anchors, drill in wedge anchors, or a welded or bolted connection to structure. Stud wedge anchors and female wedge anchors shall have an evaluation report number from ICBO (International Conference of Building Officials) verifying their allowable loads. Double sided beam clamps are preferred. Single-sided beam clamps are not acceptable unless they are equipped with a safety hook or strap. Single-sided beam clamps for bracing, with or without safety straps or hooks, are not acceptable on sprinkler piping per NFPA 13.

e. Drawings

Incorporate the following note on the Drawings in relation to mechanical HVAC items: "For all items that are required to have seismic supports or restraints, Seismic Drawings and seismic restraints calculations shall be prepared, sealed, and submitted by a Professional Engineer licensed in the State of New York and engaged by the Contractor. The Contractor's Engineer shall provide installation supervision of all seismic supports and restraints and submit signed and sealed affidavit stating that the installation is in full compliance with the signed/sealed Shop Drawings".

24) THERMAL INSULATION

Insulation must be provided. Insulation that is subject to damage or reduction in thermal resistivity must be contained within a metallic jacket. If subject to becoming wet, it must also be enclosed with vapor seal (such as vapor barrier jacket). All insulation materials and accessories such as adhesives, mastics, cements, and tapes must comply with the flame spread and smoke-developed ratings in accordance with the requirements in the ASTM E84.

a. Duct Insulation

All exposed ductwork and accessories such as adhesives, mastics, cements, tapes, etc. must have sealed canvas or rigid fiberboard jacketing. All concealed ductwork and accessories must have foil face jacketing.

i. Supply Air and Outside Air Ductwork

All supply air and outside air ducts must have external insulation of sufficient thermal and moisture resistance to prevent condensation formation on the surface of the ductwork. The use of ductboard or internal duct lining is not permitted in outside air ductwork.

ii. Return and Exhaust Air Ductwork

The insulation of return air and exhaust air ducts must be evaluated for each project and for each system, to guard against condensation formation and, for recirculating or heat recovery systems, heat gain/loss.

b. Piping Insulation

All piping systems, including hot water, steam and steam condensate, domestic hot and cold water, chilled water, condenser water, brine, and refrigerant must be insulated.

i. Exposed and Concealed Piping

All exposed piping must have PVC jacketing, and concealed piping must have all-purpose jacketing.

ii. Permeability and Condensation

All piping systems, with surface temperatures below the average dew point temperature of the indoor ambient air must be insulated with vapor barrier to prevent condensation formation, regardless of whether piping is concealed or exposed. Chilled water, condenser water piping for waterside economizers, and domestic cold and/or chilled water piping systems must be insulated with non-permeable insulation.

c. Equipment Insulation

All equipment, including air handling units, chilled and hot water pumps, and heat exchangers, including hot water and chilled water heat exchangers, must be insulated. All pumps must have removable jacketing.

25) MECHANICAL EQUIPMENT ROOM AND MOUNTING REQUIREMENTS**a. Space Requirements**

- i.** See the Architecture section in this Chapter for space requirements for mechanical equipment rooms.
- ii.** Large central equipment must be situated to facilitate service, repair and replacement.

b. Service Access

See the Architecture section in this Chapter for additional information regarding service access requirements.

i. Access Doors and Panels

Space must be provided around all HVAC system equipment as recommended by the equipment manufacturer for service and routine maintenance. Factory access door panels are to be provided in HVAC equipment. Field/shop installed access doors/panels shall be provided for ductwork and plenums as required for on-site inspection and cleaning. Equipment access doors/panels must be readily operable and sized to allow full access for replacement or repair. Ensure that access doors and panels are fire rated and self-close where installed in a fire rated enclosure.

ii. **Equipment Access**

Adequate means of access must be included for items such as chillers, boilers, air handling units, heat exchangers, cooling towers, reheat coils, VAV terminals in ceiling spaces and in equipment rooms, pumps, water heaters, and all devices that have maintenance service requirements. The Consultant must ensure that provisions are made for removal and replacement of the largest and heaviest equipment component that cannot be further broken down, without damage to structure.

c. **Vertical and Horizontal Clearances**

See the Architecture section in this Chapter for additional information regarding vertical and horizontal clearance requirements.

- i. Sufficient space for maintenance and removal of coils, filters, motors, and similar devices must be provided. Boilers and chillers must be arranged to permit the pulling of tubes from all units. The clearance must be equal the length of the tubes plus 2 ft. Air handling units require a minimum clearance of 2 ft. 6 in. on all sides, except on the sides where filters and coils are accessed, where clearance must be equal to the length of the coils plus 2 ft.
- ii. Maintenance Plan Drawings must be prepared on separate sheets that indicate the paths for removal and replacement of major equipment items. These maintenance plans must also show clearances and, where applicable, access panels.

d. **Roof-Mounted Equipment**

Mechanical equipment other than cooling towers, air cooled chillers, evaporative condensers, packaged rooftop units (RTU), and exhaust fans, is not permitted on the roof of the building. Access to roof-mounted equipment should be by stair or elevator; ship's ladders should be avoided.

e. **Housekeeping Pads**

Housekeeping pads must be at least 6 in. wider on all sides than the equipment they support and must be 4 to 6 in. thick. Consultant is to coordinate location and size of pads across all disciplines.

26) BUILDING AUTOMATION SYSTEM (BAS)

The determination of the type and complexity of control systems to be selected shall include an analysis of the operational preferences and budgetary constraints of the Sponsor Agency's maintenance staff. When implementing a BAS, a comprehensive training program must be developed and provided for the operating staff.

a. **General**

For new construction and substantial reconstruction projects, provide Direct Digital Control (Ddc) with an open BACnet or LonTalk communication protocol. For repair and alteration projects and new additions to existing projects, the following options are permitted: installation of Ddc with BACnet or LonTalk protocol; or integration of the existing system with customized gateways to the BACnet or LonTalk protocol.

- i. The Building Automation System (BAS) must be of the Direct Digital Control (Ddc) type. The BAS must be capable of scheduling building lighting and HVAC equipment operations and maintenance and adjusting building systems to optimize their performance to minimize overall power and fuel consumption of the facility.

- ii. The BAS must use BACnet or LonTalk open communication protocols to provide integration and interoperability between building systems and control vendors. The Consultant must specify and include a functional design manual, a hardware manual, a software manual, an operation manual, and a maintenance manual. The BAS must have energy management and monitoring software. The BAS must consist of a series of Direct Digital Controllers (Ddc) interconnected by a local area network. The BAS must be accessible through a Web Browser.
- iii. The BAS must have a graphical user interface, and provide trending, scheduling, downloading memory to field devices, real-time "live" graphic programs, parameter changes of properties, setpoint adjustments, alarm/event information, confirmation of operators, and execution of global commands. The BAS must record and archive all collected energy consumption data as described in this Section.
- iv. BAS designs that integrate with other Information Technology (IT) systems are preferred to minimize costs and improve operations. Digital building control systems such as utility metering, HVAC building automation systems, lighting controllers, and renewable energy systems can share common communication protocols, compatible equipment, and uniform standards with other building IT services. Since this technology is in a constant state of improvement, the Consultant and Project Manager must coordinate the design of controls and monitoring systems with the Sponsor Agency's IT group at the beginning of design.

b. Direct Digital Control (Ddc) System Design Criteria

i. Level of Integration

Central operator station monitoring, and control must be provided in the building.

- 1. Central equipment (AHUs, rooftop units, boilers, chillers, etc.) shall be provided with Human Machine Interface (HMI) Liquid Crystal Display that can display diagnostic error codes and system information. Consultant shall include in the Bid Set one (1) Portable Operator's Terminal (POT) to permit operator interface to facilitate controller management (and central unit controller management in addition to the central unit controller HMI interface), commissioning, diagnostics and general operator interface with the installed control system. The POT shall be able to connect to all controllers.
- 2. Lighting systems controlled by a BAS must have independent power and control panels and networks. The BAS must monitor the status and energy consumption of the lighting systems.
- 3. Fire alarm systems, security systems, and elevator systems must not be controlled by a BAS. These systems must have independent control panels and networks. The BAS system must monitor the status of these systems only, to prompt emergency operating modes of HVAC and lighting systems.

ii. Automatic Temperature Controls

- 1. Standalone, programmable single or multiple loop microprocessor PID controllers must be provided to control all HVAC subsystems.
- 2. PID control loops must be used. All chillers, boilers, terminal units, and air handling units must have self-contained BACnet or Lon Talk controllers, which communicate with the BAS.
- 3. The control heating and cooling equipment in each zone shall be provided by a thermostat or temperature sensor located in that zone. Perimeter systems must have at least one thermostat or temperature sensor for each perimeter zone.

4. Night setback and setup controls must be provided for all comfort conditioned spaces, even if initial building occupancy plans are for 24-hour operation. Air side economizer, morning warm-up or cool-down options must be part of the control system. Controls for the various operating conditions must maintain pressurization requirements during occupied and unoccupied periods.

iii. **Automatic Humidity Controls**

Indoor and outdoor enthalpy and/or humidity sensors shall be provided. Sensors must be calibrated in-place during system startup and at least annually thereafter. Where precision humidity control is required, provide dew point control, for comfort control applications, RH sensors are permitted, provided they have been calibrated in-place and interfaced with dry bulb sensors so that the BAS can convert these two signals to a dew point value for control purposes.

iv. **IAQ Controls**

Measurement and control instrumentation must be provided to ensure outdoor air intake rates are maintained during occupied and unoccupied hours.

v. **Setpoint Reset Controls**

1. Air Systems

Systems supplying heated or cooled air to multiple zones must include controls that automatically reset supply air temperature required by building loads or by outdoor air temperature.

2. Hydronic Systems

Systems supplying heated and/or chilled water to comfort conditioning systems must include controls that automatically reset supply and return water temperatures as required by changes in building loads or by outdoor air temperature.

vi. **AM Startup**

Morning startup cycles shall minimize the outside air intake dampers during the summer/winter morning pick up period. If outside conditions are favorable, morning startup shall purge the building with cool dry outside ambient air before the initiation of the air-conditioning cycle.

vii. **Energy Management and Conservation**

The BAS must have the capability to allow building staff to monitor system performance and determine energy consumption.

1. HVAC control algorithms must include optimized start/stop for chillers, boilers, pumps, air handling units, exhaust fans, fan powered VAV and fan coil units, and all associated equipment. Control algorithms based on predicted weather patterns may be utilized if they are adaptive and self-correcting. A condenser water optimization control is required to optimize the chiller, tower, and pump energy consumption.
2. Electrical power parameters, such as V, A, KW, KVAR, KVA, PF, KWH, KVARH, frequency, and percent THD, must be measurable for monitoring. See also Electrical Section for separate metering of power consumption monitoring requirements.

3. Energy management measurements must be totalized and trended in both instances and time-based numbers. Energy monitoring data must be automatically converted to standard database and spreadsheet format and transmitted to a designated workstation. The measured energy data must be capable of being analyzed and compared with calculated energy consumption estimated during design.

viii. BAS Control and Monitoring Capabilities

The systems and components that must be controlled or monitored by the central BAS include chillers, boilers, air handling units, cooling towers, exhaust fans, heat exchangers, pumps, VAV terminal units, fan coils, finned tube radiation, air conditioners for computer rooms and other special spaces, building pressurization, lighting, electrical power, and emergency generators.

1. The BAS must be capable of scheduling the operations of the systems and equipment for occupied hours, unoccupied hours, and weekends and holidays. Scheduling of equipment shall be determined by standalone Ddc controllers with scheduling function or using time clocks as digital input into the Ddc controller when the controller is an application specific controller without scheduling function
2. All automatic valves and dampers must have positive positioners installed to indicate operational status.
3. The BAS must be capable of receiving current sensor based digital signals from all field-installed controllers and calculating the electric energy, fuel, and water consumption by using appropriate voltages and phases.
4. The BAS must provide for standalone operation of subordinate components. The primary operator workstation must have graphical user interface. Stand-alone control panels and terminal unit controllers can have text-based user interface panels, which are hand held or fixed.
5. The BAS monitoring capability must include logs of data created by user-selectable features.
6. In new buildings and major renovations, the BAS must have approximately 20% spare capacity for future expansion.

ix. Maintenance Schedules

The central BAS must include application programs for scheduling maintenance of the mechanical and electrical equipment, including information on what parts and tools are needed to perform each task.

c. Retrofit/Repair Projects of Existing Buildings

Some retrofit/repair projects involve replacing essentially all of the HVAC equipment. For such projects, the Consultant shall verify if a full BAS/Ddc system is warranted and if the project funding is adequate to cover such expenses. In retrofits of buildings with an existing conventional control system or BAS/Ddc proprietary system in place, the Consultant must conduct a life-cycle cost analysis to determine between the complete replacement of the existing system or integration of the existing system with customized gateways.

i. BAS Retrofit/Repair with Existing Terminal Units to Remain

In the case of retrofit/repair work on conventional or BAS/Ddc control systems whereby the terminal units in the spaces are to remain and are controlled by electric or pneumatic controls, the new Ddc system shall be a hybrid of standalone central unit digital controls (boilers, chillers, rooftop units, air handling units, etc.) and the terminal units shall be electrically or pneumatically controlled.

1. If the terminal units in the spaces are controlled by pneumatic zone control valves (i.e., pneumatic thermostats are not located in each space) the climate control Scope of Work shall include removing the pneumatic zone control valves and providing digital thermostats (or sensors/controllers) and control valves in each space.
2. The existing terminal equipment pneumatic system shall be analyzed to determine if it is salvageable/repairable.
3. Those portions of the pneumatic system that are not salvageable shall be replaced in kind with new pneumatic lines/equipment. Defective terminal systems' sensors, thermostats, actuators (i.e., those associated with terminal radiation control valves, any pneumatic VAV boxes, etc.) shall be replaced with new pneumatic components. Any defective pneumatic compressors, dryers, PRV stations, pneumatic main lines and branch lines shall be replaced as required. Consultant shall identify an allowance in the Bid Set for specific length of branch tubing to be replaced, estimated based on field inspection during Design.
4. The Consultant's diagnostic tests, conducted during design, will be repeated by testing conducted during Design will be repeated by the successful Contractor to verify the Bid Set work scope. The Contractor's field test is done to verify the work scope baseline of the Bid Documents to minimize the cost of field Change Orders. Contractor shall field test the existing pneumatic system to determine if there are any additional required repairs beyond that defined in the Bid Set. The Contractor's performance testing will be applied to work in progress where notices of direction for repairs have not been issued and when work has not commenced to replace the pneumatic air system beyond the Contract defined work scope.
5. The Contract Documents will call for the branch lines to be replaced by the Contractor on an as needed basis after the Contractor's demonstration of any faulty branch lines.
6. After the existing pneumatic system has been tested/repared and after the pneumatic devices (thermostats, control valves, etc.) have been replaced, the Contractor shall demonstrate any lack of control due to faulty branch lines and these branch lines shall be replaced on an as needed basis.

ii. New BAS with New Terminal Units

In the case of installation of new terminal units (i.e. a new air conditioning unit for an existing building), the new Ddc only control system shall be a totally digital stand-alone system without an interconnecting network.

1. Salvaged air handling units shall have their pneumatic controls replaced with standalone electric direct digital control (Ddc only).

2. New air handling units shall be provided with new standalone electric direct digital controls (Ddc only).
3. Boilers, chillers and commercial rooftop units shall also be provided with standalone direct digital controls (Ddc only).

27) TESTING, ADJUSTING, AND BALANCING

The Consultant must specify the following in the Construction Documents:

a. Startup

Manufacturer's representatives shall be present for the startup of all major equipment, such as boilers, chillers, cooling towers, heat exchangers, air handling units, exhaust fans, packaged pump systems, and BAS.

b. Contractor Qualifications

The Contractor(s) performing the testing, adjusting, and balancing and the performance testing must have up-to-date certifications by the Associated Air Balance Council (AABC), the National Environmental Balance Bureau (NEBB), or the Testing, Adjusting and Balancing Bureau (TABB).

c. Testing, Adjusting, and Balancing

Testing, adjusting, and balancing (TAB) procedures shall include the operation of individual pieces of equipment as well as the operation of the overall HVAC and plumbing systems, in accordance with design intent.

d. Performance Testing

- i. Performance testing of all systems and equipment, including chillers, boilers, air handling units, exhaust fans, water heaters, and related systems, shall simulate part-load and full-load conditions during summer, fall, winter and spring seasons, per the schedules specified by the Engineer.
- ii. The Consultant must specify the services of an organization-certified NEBB, AABC, or TABB Contractor to conduct this performance testing.

e. Air Distribution Systems

- i. Airflow rates together with thermal and acoustic conditions must be tested, adjusted and balanced in all supply, return, and exhaust air pathways, and as a total system.
- ii. Performance testing of the air distribution system and its components must be conducted after TAB has been completed.
- iii. In projects where existing air handling equipment is being replaced, the Consultant to analyze the existing ductwork distribution system. If leakage rates exceed 10% of the design air quantities, replacement of the ductwork should be recommended.

f. Hydronic Systems

- i. Leak testing must be conducted at static pressures as required by Code (or, where no code requirements exist, at 150% of maximum design working pressure of piping systems), with maximum permissible leakage.
- ii. Water flow rates together with thermal and acoustic conditions must be tested, adjusted, and balanced in all hydronic systems after compliance with leakage test has been achieved.

- iii. Performance testing of the hydronic system must evaluate remote outlet temperature maintenance, system and circuit pressure equalization, control of water hammer at peak draw, and compliance with the design intent and specifications for the operation of water heaters, mixing valves, circuit setters/balancing valves, return pumps, and pressure reducing/regulating valves.

g. Reporting and Testing Results

- i. The Consultant must specify that the Contractor(s) shall submit written reports on the procedures and results of the TAB and the performance testing.
- ii. Measured properties must be within +/- 10% of design values.

28) HVAC RELATED TO IMPROVING CRITICAL FACILITY SAFETY FROM FLOODING AND HIGH WINDS

Design HVAC systems and equipment in conformance with FEMA 543/January 2007, Design Guide for Improving Critical Facility Safety from Flooding and High Winds. The critical facilities usually include, but not limited to, fire stations, police stations, rescue squads, emergency operations centers, jails and detention centers, health care facilities, schools, emergency shelters, utilities, communication facilities.

a. Improving Safety from Flooding

i. Utility Installations

Include all systems, equipment, fixtures including mechanical, electrical, plumbing, heating, ventilating and air conditioning. These are best protected when elevated above DFE (Design Flood Elevation) plus Freeboard (factor of safety). HVAC equipment may be affixed to raised supported structure or mounted on platforms that are attached to or cantilevered from the primary structure.

ii. Storage Tank Installations

Include above ground and underground storage tanks in flood hazard areas to be designed to resist floatation, collapse, and lateral movement. Vents and fill openings or cleanouts should be elevated above the DFE or designed to prevent the inflow of floodwaters or outflow of the contents of tanks.

b. Improving Safety from High Winds

i. Exterior-Mounted Mechanical Equipment

Exhaust Fans, HVAC Units, Relief Air Hoods, Rooftop Ductwork and Boiler Stacks are included in this category. The most common problems typically relate to inadequate equipment anchorage, inadequate strength of the equipment itself, and corrosion. Implement Loads and Attachment Methods recommended for HVAC equipment, ductwork and accessories, boiler, and exhaust stacks. Louvers shall be designed to prevent leakage between louver and wall. Consider designing sumps with drains that will intercept water driving past louvers or air intakes. Refer to ASHRAE 62.1 for rain and snow intrusions.

29) COMMISSIONING

See Chapter 07: Commissioning.

J. ELECTRICAL ENGINEERING

1) INTRODUCTION

This Chapter identifies criteria that must be used to program and design electrical power, lighting, and communications systems in Public Buildings. These systems support the many types of equipment in a reliable fashion.

During the life span of a public building, many minor and major alterations are necessary as the missions of Sponsor Agencies change. The flexibility to adjust to alterations must be designed into the building systems from the outset.

Electrical power, lighting, and communications systems must provide ample capacity for increased load concentrations and allow modifications to be made in one area without causing major disruptions in other areas of the facility.

All work shall comply with Code and utility requirements. Energy conservation is a requirement of all electrical systems.

All Electrical Engineering Drawings are to be coordinated with all disciplines; electrical systems shall be designed to avoid inappropriate juxtaposition with other utilities. The services of specialty sub-consultants shall be made available when required by the nature of the work.

2) DESIGN INTENT

The design of the electrical power, lighting, communication systems, and other building components must function together resulting in a building that meets the Project's Program, Task Order and Project Objective, as well as incorporating New York City's commitment to sustainability and energy efficiency.

a. Performance Objectives

Electrical power, lighting and communication systems must be adapted to support all performance objectives defined for the project, typically including sustainability, workplace performance (productivity and efficiency), fire safety, security, historic preservation, and improved operations and maintenance. Compliance with submission requirements is necessary to demonstrate that these systems have been adapted into the project at each phase of the design.

b. Full- and Part-Load Performance

Electrical power, lighting and communication systems must be specifically designed to meet all the defined performance objectives of the project at full-load and part-load conditions that are associated with the projected occupancies and modes of operation.

c. Flexibility

Electrical systems design shall be flexible to facilitate load growth, reliable and utilize techniques to conserve energy.

d. Maintenance

Maintainability and reliability are paramount to the operation of public buildings; therefore, the design and installation of all electrical systems and equipment must allow for repair, removal, and replacement – including major components such as switchboards, motor control centers, etc. – without removal of exterior walls and impact on adjacent equipment and building occupants.

Maintenance requirements should be taken into consideration within each system design, which serves to maximize equipment reliability, performance and usability/life span.

e. Building Automation System (BAS)

A computer-based BAS that interfaces, monitors, and automatically controls lighting, heating, ventilating, and air conditioning is critical to the efficient operation of modern public buildings. The Consultant shall integrate the building automation systems, except for fire alarm and security systems, which must function as stand-alone systems with a monitoring-only interface to the BAS.

f. Commissioning

See Chapter 07: Commissioning for more information.

g. Load Shedding

Investigate costs and benefits of “load shedding”. Costs will be associated with equipment and wiring. Benefits will be associated with reduced energy demand.

3) UTILITY COORDINATION

a. Power Company Coordination

A detailed load study, including connected loads and anticipated maximum demand loads, as well as the estimated size of the largest motor, must be included in the initial contact with the utility company to prepare its personnel for discussions relative to the required capacity of the new electrical service.

The service entrance location for commercial electrical power must be determined concurrently with the development of conceptual design space planning documents. Standards for equipment furnished by the utility company must be incorporated into the concept design. Locations of transformers, vaults, meters, and other utility items must be coordinated with the architectural design to avoid conflicts with critical architectural features such as main entrances and must accommodate both equipment ventilation and equipment removal. All major electrical equipment must be located 2 feet above the 500-year flood plain.

b. Communication Service Coordination

The telecommunications design professional must contact the local telecommunications providers and coordinate with the Sponsor Agency and DOITT to determine the number, size, and location of the incoming services and to determine the enclosure and pathway requirements for telecommunications systems. The scope of services varies with each project; it includes, at a minimum, the design of the infrastructure (pathway and enclosure) and may include the full design and specification of the telecommunications system. The design professional must contact the local telecommunications providers through DOITT early in the project.

Provisions must also be made to provide either cable television (CATV) or satellite service to the facility. CATV or satellite service may be independent from other communications services. The need for multiple space service conduits to accommodate multiple voice/data vendors must be evaluated. The need for separate redundant internal and external pathways may be required depending on the level of security and mission that may be required by the building occupant.

c. Electrical Service and Metering

The Consultant shall request electric service for a new building or any required reinforcement of the electric service to an existing building from the utility company.

i. Flexibility

Service equipment shall be designed to have adequate capacity to serve the load of the facility plus 25% future expansion.

ii. Electric Service Request

Submit to the utility company a site plan showing the building property line, electric service entrance, equipment room, and a breakdown of the electric load (load letter). The request shall inquire about the available service voltage, utility short circuit current and impedance, metering requirements, charges and any other requirements. The request shall also indicate the desired voltage and Point of Entry (POE) into the building or to property line manhole or hand hole, to provide a reasonable route to the electrical room. Significant extra cost may result if the utility company cannot take the shortest route for the service connection. Provide DDC with copies of all utility company correspondence.

iii. Metering

Provisions for utility company's metering shall be made at the service entrance.

iv. Monitoring

Provisions shall be made to monitor voltage, amps, kilowatt hour, power demand, and power factor.

d. Site Requirements

The routing of site utilities and location of manholes must be determined early in the design process in coordination with the site civil engineer. The designer must coordinate with the utility company to determine the capabilities, rate structure options, and associated initial costs to the project and must evaluate the available utility service options.

i. Economic Analysis

The Consultant must perform an economic analysis to justify the service voltage and design option selected.

ii. Electrical Power Services

For buildings less than 100,000 gross square-feet (gsf), utility power must be requested at the main utilization voltage, i.e., 460Y/265V or 208Y/120V.

For buildings greater than 100,000 gsf and less than 250,000 gsf, at least one electrical secondary service at a minimum of 460Y/265V must be provided. For buildings 250,000 gsf and larger, or for campus sites, electrical service must be provided to the site, at medium-voltage distribution, for primary power distribution to substations.

iii. Transformer Vaults

When a transformer vault is required by the utility company, the Consultant shall coordinate location of vaults and shall establish a reference number with the NYC Department of Transportation (DOT) Office of Permit Management and meet with DOT to secure vault grating location approvals. The Consultant shall contact other City Agencies, as required, for coordination and securing approvals for new utility transformer vaults.

iv. Primary Cable Selection

Medium-voltage cable selection must be based on all aspects of cable operation and on the installation environment, including corrosion, ambient heat, rodent attack, pulling tensions, potential mechanical abuse, and seismic activity. Conductors for new construction buildings rated above 150 amperes may be copper or aluminum, insulated with cross-linked polyethylene (XLP) or ethylene propylene rubber (EPR). Conductors rated 150 amperes and below shall be copper. New cabling to be connected to equipment built or installed before 1980 shall be investigated to determine compatibility of aluminum-to-copper terminations prior to specifying aluminum cabling. Insulation must be rated at 133 percent. Individual conductor size must not exceed 500 mcm.

v. Direct Buried Conduit

Direct buried Schedule 80 PVC, coated intermediate metallic conduit (IMC), or rigid galvanized steel must be used for the distribution of exterior branch circuits. The minimum direct buried conduit size shall be 1.5 inches. Backfill around the conduits must be selected based on the thermal conductivity and be free of materials detrimental to the conduit surface.

vi. Concrete Encased Ductbanks

Concrete-encased PVC Schedule 40 ductbanks must be used where runs are under permanent pavements and where service reliability is paramount.

Concrete-encased ducts must be provided with a cover that is at least 30 in. thick. Ductbanks under railroads must be reinforced. Ducts must slope toward manholes and all entries into buildings must have watertight seals. Changes in direction must be by sweeps with a radius of 4 ft. or more. Stub-ups into electrical equipment may be installed with manufactured elbows. Duct line routes must be selected to avoid the foundations of other buildings and structures. Electrical power and communication ducts must be kept clear of all other underground utilities, especially high-temperature water, steam, or gas. Direct buried duct banks must be continuously indicated by installation of tracer tape 12" above the exterior of the duct bank.

Where it is necessary to run communication cables parallel to power cables, two separate ductbanks must be provided with separate manhole compartments. The same holds true for normal and emergency power cables. Ductbanks must be spaced at least 1 ft. apart.

Where redundant service is required (power, communications, and/or life safety), alternate and diverse paths with 1-hour fire separations must be provided.

vii. Duct Sizes and Quantity

Ducts must be sized as required for the number and size of cables. All ducts for medium-voltage services must be a minimum of 4 in. inner ducts must be provided inside communication ducts wherever fiber optic cables will be used. Spare ducts must be included for planned future expansion; in addition, a minimum of 25 percent spare ducts must be provided for unknown future expansion and/or cabling replacement.

viii. Manholes

Manholes must be spaced no farther than 500 ft. apart for straight runs. The distance between the service entrance and the first manhole must not exceed 100 ft. Double manholes must be used where electric power and communications lines follow the same route. Separate manholes must be provided for low and medium-voltage systems. Manholes must have clear interior dimensions of no less than 6 ft. in depth, 6 ft. in length, and 6 ft. in width, with an access opening at the top of not less than 30 in. in

diameter. Medium-voltage manholes must be sized in accordance with utility company requirements. Manholes must have a minimum wall space of 6 ft. on all sides where splices may be racked. Manholes must be provided with pulling eyes, sumps, and grounding provisions as necessary.

ix. Stubs

A minimum of two spare stubs must be provided (to maintain a square or rectangular ductbank), so that the manhole wall will not need to be disturbed when a future extension is made. Stubs for communications manholes must be coordinated with DOITT.

x. Handholes

Handholes may be used for low-voltage feeders (600V and below), branch circuits, or communications circuits. If used, they must be not less than 4 ft. in depth, 4 ft. in length, and 4 ft. in width, and must be provided with standard manhole covers and sumps of the same type provided for manholes. Generally, at least four racks must be installed. Where more than two splices occur (600V feeders only), a 6 ft. by 6 ft. by 6 ft. manhole must be required.

xi. Penetrations

Lighting and communication circuits that penetrate fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions, and between floors must be properly sealed in accordance with the requirements of the NYC Building Code with approved firestopping materials.

xii. Exterior Concrete Pads

Concrete pads constructed to support exterior mechanical and electrical equipment must be provided with sufficient conduit penetrations to provide the necessary power and control connections plus an additional 50 percent for future equipment additions and modifications. Spare conduits need not extend more than 4 ft. past the end of the concrete slab. All spare conduits must be capped at both ends.

e. Space Conditions

It is the joint responsibility of the architect and the electrical engineer, functioning as part of an integrated design team, to provide adequate space and suitable locations for the electrical systems serving the facility and a planned method to install and replace this equipment. However, it is the sole responsibility of the electrical engineer, during the concept phase, to provide detailed space requirements and suggested preferred locations of all critical space requirements for the power and communication systems for the facility.

i. Main Equipment Rooms (Electrical and Telecommunications)

The size of the electrical service room will depend on the type of service provided by the local utility company. If a secondary (465 V or 208 V) service is provided, the size of the room must be determined by the number of service stubs into the room and the respective number and size of switchgear. In this case, the rooms must be located securely in a vault or inside the building along a perimeter wall at an elevation that minimizes the transformer secondary feeder lengths.

The sizes and locations of the telecommunications service rooms must be established in concert with the local communications service provider and DOITT. Depending on the equipment selected, telecommunication service rooms may require 24-hour HVAC service.

ii. **Electrical Rooms**

Electrical rooms are generally located within the core areas of the facility and must be stacked vertically. Adequate numbers of electrical rooms must be provided, such that no electrical room serves more than 10,000 sq. ft.. Electrical rooms must be provided with minimum clear dimensions of 6 ft. by 10 ft. and are not scalable down in size to match floor plate dimension. If transformers are located in the rooms, ventilation must be provided. Doors must swing out. Electrical rooms are distinct from electrical closets, in that electrical closets shall not contain transformers, motors, or other heat generating equipment.

iii. **Communication Rooms**

Communications rooms are also generally located within the core areas of the facility and must be stacked vertically. Rooms must be sized to contain adequate floor space for frames, racks, and working clearances in accordance with DOITT standards. Depending on the equipment selected, provisions may be required for 24-hour air conditioning in these rooms. The installation of dedicated electrical panelboards within the communications rooms should be considered to minimize electrical noise and to prevent unauthorized access.

iv. **Spaces for UPS (Uninterruptible Power Systems) and Batteries**

Since all UPS systems are considered above standard for Public Building space, the requirement for a UPS system will be a Sponsor Agency requirement. To establish the proper size, locations, and environmental requirements for the UPS and battery systems, the electrical engineer must arrange to meet with the architect and representatives of the Sponsor Agencies to determine the required/estimated load and physical size requirements and the nature of the critical loads.

For small systems up to 50kVA, the UPS modules and sealed cabinet batteries must be installed in the room with the equipment being served.

For medium and large systems greater than 50kVA, the UPS system must be provided with standby generator backup to limit the battery capacity. The UPS system equipment and batteries must be in separate rooms and located on the lowest level above the 500-year flood plain because of the weight of the batteries and the noise of the UPS equipment.

4) EXISTING CONDITIONS

For existing buildings, the Consultant shall survey and make recommendations for the reuse, replacement or modification of:

a. **Electrical Services**

Refer to new loads for suitability of Utility Company's metering and capacity of service entrance equipment, power distribution system, panel boards and consideration of non-linear loads.

b. **Power Distribution Systems**

The survey shall record the age and condition of all electric Normal and Emergency power distribution equipment.

c. **Emergency Power**

The survey shall evaluate the adequacy of the Emergency Power System.

d. Lighting Fixtures

The survey shall include illumination levels, lamp bulbs, energy efficient lighting fixtures and controls. Consultant shall advise method of disposal of ballasts, bulbs, etc. that may contain PCBs or mercury.

e. Telephone Service

Evaluate the adequacy of the existing service.

f. Auxiliary Systems

Evaluate fire alarm, communications (voice and data) and security systems.

5) LIGHT AND POWER DISTRIBUTION

Design a complete power distribution system with system and equipment grounding.

a. Distribution

Power shall be distributed to serve all interior and exterior lighting including parking lot lighting, all mechanical and plumbing equipment, fire suppression system, specialty equipment and general receptacles, elevators, dumb waiters, fire alarm, mechanical alarms and security systems, communication equipment and miscellaneous equipment.

b. Design Parameters

Show on the Drawings short circuit calculations for all significant points.

- i. Fuses and circuit breakers shall be coordinated for selective tripping and selected for the interrupting capacity required.
- ii. The voltage drop shall not exceed the limits of Code.
- iii. If the load is one thousand KVA or larger, comply with the requirements of the Advisory Board of the DOB.

c. Panelboards

Lighting and receptacle panelboards, power and distribution panelboards shall be in electrical closets. Panelboards shall be located adjacent to the loads they serve.

- i. Power and distribution panels shall be of the circuit breaker or switch and fuse type.
- ii. Lighting and receptacle panels shall be of the circuit breaker type with bolt on branch circuit breakers and shall have door-in-door trim.
- iii. Panelboards serving office receptacle load shall have 200% rated neutral.
- iv. All panelboards shall include a typewritten directory describing what each individual circuit breaker protects.

d. Existing Panelboards

For existing buildings, show on Drawings all existing distribution, power, lighting and receptacle panelboards together with panel schedules. Recommend re-use, modification or replacement.

e. Computer Panelboards

Computer Panelboards shall have double-size neutrals, ground bus and built-in surge protection.

f. Panel schedules

For all panels provide complete panel schedules on the Drawings, showing circuit number, circuit breaker trip rating, load in volt-amperes for each circuit, load description and location, summary of connected load and demand load. For power panels, add conduit and cable size feeder for individual circuits. For fused switch panels, show switch and fuse rating. Show service voltage, phase, bus rating, short circuit current ratings, main circuit breaker or switch and fuse if required. Indicate panel location and type of mounting.

- i. Provide twenty-five percent spare feeder capacity.
- ii. Provide twenty-five percent spare circuit breakers or fused switches.

g. Feeders and Branch Circuits

Feeders and branch circuits shall be sized per code for load served.

h. Conduit and Wiring

All conduits shall be $\frac{3}{4}$ " minimum and shall run concealed where possible. Heavy wall, rigid, galvanized steel conduit shall be installed where exposed or where required by Code. Electrical Metallic Tubing (EMT) may be installed concealed in hung ceilings or walls. Compression fittings shall be used for EMT. Armored cable shall not be used. Aluminum conduit and wire shall not be used. Flexible conduit shall only be used for short lengths.

- i. Provide a drag wire in all empty conduits.
- ii. Cable connectors shall be of the copper pressure plate type. Connections to bus bars for cable sizes number 1/0 and larger, shall be made with two zinc-plated bolts.
- iii. Power wiring shall be sized to limit the voltage drop in branch circuits to 2% to the farthest outlet, and to 5% total for feeders and branch circuits.

i. Transformers

All transformers shall, as a minimum, have K-13 rating and shall have 200% rated neutral.

- i. Transformers for lighting and receptacle service shall be two-winding per phase, dry type of capacity to serve the lighting and receptacle loads specified.
- ii. Transformers shall have 2 $\frac{1}{2}$ % taps, two above and two below rated voltage.
- iii. Transformer windings shall be copper. Transformers shall have primary and secondary winding protection.
- iv. Dry type transformers up to 45 KVA shall have dB ratings not to exceed 45 dB, and above 45 KVA shall not exceed 55 dB.

j. Motors and Motor Control Centers

Design and specify power for motors and controls. Motor Control Centers (MCC) shall have combination magnetic motor starter and fused disconnect. Each starter will have hand-off auto switch, control transformer, pilot light, two auxiliary contacts, and an external manual reset button.

k. Electrical Closets

Design adequate centrally located electrical closets, which should be stacked in multi-story buildings.

6) CONTINUITY OF SERVICE

For existing buildings, specify continuity of service for power, light, fire alarm, communication, security and all other emergency systems, if the Sponsor Agency intends to continue occupancy during alterations. Assume continuity of service unless otherwise indicated in the Agreement.

7) EQUIPMENT REMOVAL AND DEMOLITION

Show on separate demolition plans electrical equipment required to be removed or relocated. Show source of power from which this equipment shall be disconnected. Provide associated specifications. Indicate staging plans, if required.

8) COMPUTER TECHNOLOGY AND OTHER SENSITIVE EQUIPMENT

Computer use and changing information technology represent increasing demand on electrical service capacity, reliability, wiring and flexibility. The Consultant should consider Sponsor Agency requirements/ project objectives current computer requirements and likely augmentation of equipment including peripherals and high-capacity internet lines when designing the electrical system.

a. Uninterruptible Power Supply (UPS)

Where required, a static uninterruptible power supply system shall be designed to buffer the data processing equipment against transient disturbances and enable continued operations and an orderly shutdown for the duration of a power outage lasting a period to be designated by the Sponsor Agency, but not less than 15 minutes. Batteries for the UPS system shall be installed in a temperature-controlled environment.

b. Maintenance Bypass Switch

A manually operated external maintenance by-pass switch shall be provided for the UPS system to directly connect the critical load to the input AC power source, completely bypassing the input converter, inverter, static switch, all control and monitoring circuits, and all printed circuit boards.

c. Harmonic Filters and Surge Suppressors

Provide stand-alone transient voltage surge suppression devices with high frequency noise filtering for panel boards serving computers and other sensitive electronic equipment. Where significant nonlinear loads are present, passive harmonic mitigation devices shall be installed on transformer.

9) KITCHEN ELECTRICAL REQUIREMENTS

a. General

- i. All disconnect switches in kitchen area shall be NEMA 4 enclosures to provide protection against splashing water. Surface mounted switches shall be provided with waterproof hubs.
- ii. All 20 amps, 125 volt, kitchen receptacles shall be GFI protected.
- iii. The kitchen power panels shall be located in an area adjacent to, but not within, the kitchen.

b. Controls and Interlocking

Electrically and mechanically operated gas valves shall be installed in kitchens and interlocked with auxiliary systems and cooking equipment to provide proper control and safe operation as well as emergency features. Provide interlocks and controls as follows:

i. Exhaust Fan Interlock with Appliances under Hood

Energy sources (gas or electric) producing heat for each appliance under hood shall be interlocked with exhaust fan.

ii. Hood Suppression System/Appliance Shutdown

When the hood suppression (Ansul) system is activated, the energy source for the appliances under hood must be shut down, and an alarm signal reported to the fire alarm system.

iii. Master Control Gas Valve

The master control gas valve shall be capable of shutting off all gas flow to the kitchen in case of emergency.

10) RECEPTACLE OUTLETS

- a.** Provide conduit grounding for general convenience receptacles. Ground conductor shall be provided for individual circuits to receptacles for computers and all other dedicated equipment.
- b.** Provide Ground Fault Interrupter (GFI) type receptacles in mechanical equipment rooms, wet locations, and near sinks in labs and lavatories.
- c.** Provide duplex receptacles for servicing HVAC equipment (125 volts, 20 amps, specification grade, GFCI protected) within 25 ft. of the equipment.
- d.** Provide duplex receptacles for maintenance (125 volts, 20 amps, specification grade) so that all areas are accessible by a 50 ft. extension cord.
- e.** In storage rooms, provide a minimum of one (1) duplex convenience receptacle.
- f.** Unless otherwise required by the Sponsor Agency's Agency, provide duplex convenience electrical outlets in offices (125 volts, 20 amps) spaced approximately twelve (12) ft. maximum on center around the perimeter of the room.
- g.** In offices a maximum of four (4) computer duplex receptacles shall be connected to a 20 amps circuit, and a maximum of eight (8) general convenience duplex receptacles shall be connected to a 20 amps circuit.
- h.** Separate circuits shall be designed for copiers, water coolers, fax machines, printers and other office equipment.
- i.** Provide TVSS duplex receptacles with LED indicator, where required, for protection of plug-in microprocessor-based equipment.

11) ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE)

Conduit pathway infrastructure shall be provided for electric charging stations (EVSE's). Where required by the Sponsor Agency and/or LL130-2013, the infrastructure must be installed within parking lots/garages and/or facilities. These charging stations shall be located as close as possible to their electrical supply service while also assuring that the EVSE's are conveniently located for drivers. EVSE's must not be located near hazardous areas. Charging cords associated with EVSE's must not interfere with pedestrian traffic or present tripping hazards. Curbs, bollards, wheel stops, and/or equipment setbacks should be used to prevent vehicles from damaging EVSE's. Accessibility issues shall be considered when locating EVSE's. Lighting about the charging station shall be provided for both safety and the reading of equipment instructions. If the charging station is to be enclosed, provide adequate ventilation. Each EVSE shall be labeled to indicate the panelboard and circuit number from which it is electrically fed.

12) FIXTURE OUTLETS

On drawings, all fixture outlets shall be marked with the fixture type and control point.

13) ENERGY CONSERVATION

a. Energy Model

The Consultant shall provide Energy Modeling as per ASHRAE 90.1 and LEED requirements. The energy model shall calculate the energy cost for one year and create a Report of the anticipated energy performance of the building. The model will reveal how energy efficient the building can be, while there is still time to enhance it.

b. Energy Profile Report

The Consultant shall provide an Energy Profile Report (EPR) complying with DCAS Guidelines. The EPR shall develop an energy/greenhouse gas (GHG) baseline for existing systems and propose the estimated energy consumption and greenhouse emissions reduction for all design alternatives included in the report. The EPR shall identify the final selected design. The final selected design shall be determined based on a series of factors, one of them is the energy criteria included in this report. The content developed shall be incorporated into the project's construction documents.

c. Implementation of Metering and Verification (M&V) Equipment

The Consultant shall provide design for implementation of Metering and Verification (M&V) equipment in accordance with protocol to be provided by DCAS. Actual M&V will not be conducted by this Consultant; It will be conducted by DCAS's Consultant.

14) LIGHTING AND LIGHTING CONTROLS

Computer generated lighting calculations are required for all building projects and must be submitted no later than the end of Design Development.

a. Energy Efficient Lighting Fixtures

Lighting efficacy (lumens per watt) and lamp life shall be primary considerations in interior lighting design.

- i. Consultant shall use the latest technology LED lights. Brightness, tight focus, and long lamp life are priorities.
- ii. Incandescent lamps shall be specified only where necessary, in limited applications and areas, such as theatrical lighting, track lighting for exhibits, historic interiors, and hazardous areas. Where feasible, low-voltage halogen should be used in lieu of standard incandescent.

b. Lighting Performance

The following attributes make up a lighting system for any space. The descriptions below do not isolate electric lighting from daylighting. Instead, the attributes apply to both sources of light and continually interact throughout the day to provide adequate and appropriate visibility.

c. Lighting Requirements

i. Indoor Lighting and Daylighting Criteria

1. Artwork

Museum standards for lighting works of art must follow the IES 10th Edition Handbook; see Chapter 4.1, Installation Standards, in Fine Arts Collection Policies and Procedures 2007 for additional information.

2. Illumination of Means of Egress

Illumination of means of egress shall be provided in accordance with the requirements in NFPA 101. In addition, the use of automatic, motion sensor-type lighting switches shall be permitted within the means of egress, provided that the lighting control devices comply with the requirements in NFPA 101.

3. Exit Stair Illumination and Photoluminescent Materials

Exit enclosures where Photoluminescent materials are installed must comply with the requirements in NFPA 101.

4. Emergency Lighting Criteria

Power loss resulting from utility system interruptions, building electrical distribution system failure, or the accidental opening of switches or circuit breakers dictates the requirement for emergency lighting.

5. Luminaires for Emergency Lighting

Emergency electric lighting systems may consist of separate luminaires and wiring with an independent power source, e.g., a diesel generator, or separate luminaires or unit devices supplied by the normal power supply and a secondary source that comes on automatically when the normal power supply fails.

6. Emergency Lighting for Means of Egress

Emergency lighting for means of egress must be provided in accordance with the requirements in NFPA 101. Emergency lighting outside the building must also provide illumination to either a public way or a safe distance away from the building, whichever is closest to the building being evacuated.

7. Performance of Emergency Lighting System

The performance of the emergency lighting system must be in accordance with the requirements in NFPA 101.

15) EXTERIOR/SITE/SECURITY LIGHTING DESIGN CRITERIA

a. General

Exterior/site/security lighting shall be provided where required by Sponsor Agency and Code around the perimeter of the building and at parking areas for safe passage and to deter theft and vandalism.

Due to the aesthetics of exterior lighting, its impact on the building façade and the difficulty in describing multiple elevations on a plan, it is essential that the Consultant provide complete exterior building elevations to clearly depict the location and mounting height of each fixture.

b. Light Trespass and Uplight Control Standards

- i. Lighting design shall minimize light trespass from the building and site, reduce sky glow, improve nighttime visibility through glare reduction and reduce development impact on nocturnal environment.
- ii. The exterior lighting should not exceed 80% of the Lighting Power Densities as defined by the latest ANSI/ASHRAE/IESNA standard 90.1, Exterior Lighting Section.
- iii. The required light trespass and uplight control criteria included in this document are based upon the following guidelines: The Joint IDA (International Dark Sky) – IES (Illuminating Engineering Society) Model Lighting Ordinance (MLO) with User's Guide, June 15, 2011.
- iv. All luminaires shall minimize uplight and glare. Backlight shall also be controlled when a luminaire is installed adjacent to property not owned by the Sponsor Agency.
- v. Full cut-off sources should be used for building entries and perimeter lighting.
- vi. Fixtures at doorways should not exceed 10W. Building perimeter lighting should not exceed 20W. Wattage requirements may depend on actual application and illuminance requirements.

- c.** Exterior lighting must meet the IES 10th Edition Handbook recommendations and comply with the IDA/IES Model Lighting Ordinance (MLO) for lumen density limits and backlight, up-light, and glare (BUG) ratings or light pollution and light trespass performance method.

The IES Lighting Handbook along with other IES documents (RP-33, RP-20, RP-8, and DG-5) provide an industry accepted set of recommended practice for common exterior applications. Site conditions requiring enhanced lighting beyond these basic recommendations have also been evaluated by the IES and found to be specific to unusual surroundings or special property function. Guidance on when and how to provide appropriate enhanced lighting in these cases is outlined in "Guideline for Security Lighting for People, Property, and Public Spaces" (IES G-1). Guideline G-1 explains that effective lighting for safety and security should consider:

Horizontal Illuminance, Vertical Illuminance, Uniformity/Shadows and Glare.

Exterior luminaires and control systems must comply with all local zoning laws, and lighting levels for exterior spaces shall not exceed the IES 10th Edition Lighting Handbook recommendations.

Luminaires with instant strike light sources at all entrances and exits must be connected to the emergency lighting system.

d. Site Lighting

Illumination of exterior exit discharges must be in accordance with the requirements in NFPA 101. Flagpoles, if required, must be illuminated and controlled.

e. Open Parking Lots and Roadway Lighting

Parking lots and roadway lighting must be designed per IES Recommended Practice RP-8 and RP-20 current version in addition to the IES and IDA/IES MLO requirements.

f. Parking Structures

Parking structure lighting must be designed per RP-20 current version in addition to the IES and dimmed to at least 50% during periods of low activity and turned off when daylight is plentiful.

Luminaires must meet the following standards:

- i. Efficacy of a minimum of 63 lumen per watt (LPW).
- ii. Wet-location rated.
- iii. Withstand mechanical vibration.
- iv. Life of minimum 25,000 operating hours for LED fixtures before reaching the L70 Lumen output degradation with no catastrophic failures per IES standard LM-21.
- v. Lumen depreciation per IES standard LM-79.
- vi. Luminaire classification per IES TM-15.

16) LOAD CRITERIA

a. Lighting Loads

The lighting and daylighting systems must be sensitive to the architectural design, provide adequate quality and quantity of illumination for interior and exterior lighting, comply with the design criteria, minimize maintenance requirements, and use 30 percent less electrical energy (kwh) than required for compliance with Section 9.6 (Alternative Compliance Path) of ASHRAE Standard 90.1 of 2013.

General lighting must comply with the following luminaire, lamp, light source ballast and driver requirements.

b. Luminaires

All luminaires must be appropriately selected based upon the expected application. Luminaires must have a minimum luminaire efficiency of 65 percent.

Where parabolic luminaires are used, louvers must be semi-specular or diffuse finishes; specular finishes must not be used.

LED lamps must not be retrofitted into existing luminaires unless the retrofitted product meets all of the following requirements:

- i. UL rating is maintained for ENTIRE fixture to include UL 1598C and UL 1993.
- ii. If LED product category is certified by the Design Lighting Consortium (DLC), it must be published on their Qualified Products website: <https://www.designlights.org/>
- iii. Retrofitted lamps must be tested by a recognized Testing Laboratory in accordance with IES standards LM-79, LM-80, and TM-21.
- iv. Minimum TOTAL fixture efficacy of 100 lumens per watt (total efficacy is a combination of lamp plus driver plus ballast).
- v. Product MUST BE dimmable and compatible with existing lighting control systems and future daylighting technologies.
- vi. LED products must have a "low risk" level of flicker (light modulation) of less than 5%, especially below 90Hz operation to prevent photosensitivity epileptic seizures as defined by IEEE standard 1789-2015LED.
- vii. For common office areas, LED product MUST be dimmable and compatible with existing lighting control systems and provide a path to compatibility with future daylighting technologies, or reduced power consumption by at least 50% for non-controlled fixtures.

- viii. For back office areas, electrical, mechanical, and corridors, LED products do not have to be dimmable but compatible with existing lighting control systems and reduce power consumption by at least 50%.
- ix. Space photometrics and glare control must meet IES guidelines for tasks performed in the retrofitted spaces.
- x. A mock up retrofit of typical areas of the building is required to confirm the above performance requirements of lighting output suitability, controllability and flicker measurements.
- xi. Minimize lamps, light sources ballasts and driver types.

c. Lamps

- i. Effort must be made to minimize the number of lamp types within a facility to simplify lamp maintenance.
- ii. In retrofit scenarios, all fluorescent lamps must be recycled by firms that recover the mercury that is contained within the lamps. All PCB containing ballasts must be disposed of through specialized disposal firms that destroy the PCBs. All applicable lamps must be Energy Star certified as applicable.

d. Ballasts and Drivers

- i. Ballasts for fluorescent lamps must be "NEMA Premium" when applicable. Ballasts must be compatible with control system.
- ii. Electronic ballasts and drivers must be used wherever possible and have a sound rating of "A."
- iii. When EM ballasts must be used in special applications, EM ballasts must have a sound rating of "A" for 430MA (Standard Output) lamps, or "B" for 800 MA lamps, and "C" for 1,500 MA lamps.
- iv. Special consideration must be given to the ballast types where an electronic clock system is also specified to confirm compatibility of application.
- v. Instant-start ballasts are preferred, except where lamp replacement is difficult.
- vi. Dimming ballasts are preferred, particularly in naturally lit spaces. Dimming ballasts with minimum settings less than 5% of full output should be limited to spaces with audio/visual equipment or similar program.
- vii. In spaces without full-time stationary occupants, utilize stepped ballasts, or multiple level switching, in lieu of continuous dimming ballasts.

e. Lighting Controls

All interior lighting shall automatically be controlled by a programmable Lighting Control Panel (LCP) with integral clock except for the emergency lighting.

- i. Each area enclosed by walls or floor to ceiling partitions shall have at least one switch to control the lighting within.
- ii. For spaces 2,000 sf. or less in area, lighting shall be controlled by ceiling mounted occupancy sensors and override switch.
- iii. Enclosed office lighting shall be controlled by ceiling mounted occupancy sensors with override switch.
- iv. Libraries and Places of Assembly shall generally be provided with key operated switches.

- v. Corridor, Lobby and Toilet Lighting shall be controlled automatically from the Lighting Control Panel.
- vi. Corridor and Stair Emergency Lighting shall be unswitched.
- vii. Special light controls shall be provided for certain applications, as required.
- viii. Control systems must be compatible with lamps, light sources, ballasts and lamps.
- ix. Lighting controls must use individual luminaire control, such as DALI equivalent.
- x. Ambient lighting must be adjusted per daylight availability, occupant/vacancy, and other BAS signals, such as demand response.
- xi. Task and personalized ambient lighting must be adjusted per occupancy/vacancy and personal dimming.
- xii. Lighting controls must be commissioned to operate as intended without false triggering.
- xiii. All lighting controls must be compatible with luminaires.
- xiv. Lighting control devices provided for illumination within exit enclosures must comply with the requirements in NFPA 101.
- xv. Occupancy sensors and Time Clocks - Use infrared, ultrasonic, and microphonic occupancy sensors. Dual technology infrared and ultrasonic combination-type sensors are recommended. Sensors should be manual- on, automatic-off, particularly when used in naturally lit spaces. Where occupancy sensors are not practical, time controls must be used.
- xvi. In new construction and substantial reconstruction, all exterior/site/security lighting shall be master controlled by the lighting management system.

17) SECURITY LIGHTING, EXIT SIGNS, AND EMERGENCY LIGHTING

a. Security Lighting

Security lighting in daylit spaces must be controlled by photosensors. When security lighting also functions as emergency lighting, separate circuits and emergency ballasts are required.

b. Exit Signs

- i. Exit signs must meet the requirements in NFPA 101 and be energy efficient and environmentally friendly products (e.g., light emitting diodes (LED type), Photoluminescent type).
- ii. Locations - Means of egress shall be clearly marked by illuminated exit signs placed as required so that exits and path of egress are easily recognized from any point in a corridor or Place of Assembly. Locations of exit signs shall be designated by the Architect/Engineer of Record.
- iii. Design Parameters - Exit signs shall have 8" letters illuminated by light emitting diodes (LED) only. Wall mounted exit signs are preferred over pendant mounted exit signs. The use of pendant mounted exit signs is limited to meet visibility requirements, and only when wall mounted units may not suit the need.
- iv. Connection to Emergency Lighting Panel - For buildings with generator, exit signs shall be connected to the emergency lighting panel through transfer switch. For buildings without a generator, exit signs shall be connected to an emergency lighting panel which is connected to an emergency service switch tapped ahead of the main service switch.
- v. Battery Backup - Exit signs shall be provided with integral rechargeable battery packs. Batteries shall be of the nickel cadmium type.

c. Emergency Lighting

Emergency lighting for means of egress must illuminate designated stairs, aisles, corridors, ramps, escalators, walkways, and passageways leading to an exit. Emergency lighting must also be provided at exit discharges extending to the public way and for safety and security as required by the Sponsor Agency.

- i. Emergency lighting must be provided in accordance with the requirements of NFPA 101. At a minimum, un-switched emergency lighting (to serve as night lights) must be provided in the following areas:
 - 1. Zones covered by closed-circuit TV cameras.
 - 2. Security zones.
 - 3. Fire command center.
 - 4. Security control center.
 - 5. Where required in NFPA 101.
 - 6. UPS and battery rooms.
- ii. Emergency lighting may be manually switched from within for the following areas:
 - 1. Communication equipment rooms.
 - 2. Electrical rooms.
 - 3. Technology/server rooms.
 - 4. Engineers' offices.
- iii. Supplemental battery-powered emergency lighting must be provided in the following spaces to bridge the generator startup time:
 - 1. Generator rooms.
 - 2. Main mechanical and electrical rooms.
 - 3. Any locations where lighting cannot be interrupted for any length of time.
- iv. Circuits for emergency lighting in an area required to be provided with emergency lighting shall be arranged so that loss of normal or emergency power supply shall not reduce the available lighting levels below the level required for emergency lighting by the applicable provisions of the Administrative Code, Reference standards or Rules of the City of New York.
- v. Illumination levels required for emergency lighting shall be at a minimum:
 - 1. Places of Assembly:
 - a. General: 1 foot-candle measured 18" above floor
 - b. Aisle: 2 foot-candles measured 18" above floor
 - c. Exit Doors: 5 foot-candles measured at the floor level
 - 2. Corridors and Stairs: 2 foot-candles measured 18" above floor.

- vi. Buildings with Generator - In new buildings, major modernizations, or major additions, where an emergency generator is called for in the Agreement, or otherwise mandated by Code, provide power for emergency lighting through an Automatic Transfer Switch (ATS) and emergency lighting panel.
- vii. Buildings without Generator - In buildings not provided with an emergency generator, emergency lighting fixtures shall be connected to a power source recognized by the Code. The emergency lighting fixtures in a Place of Assembly and paths of egress to the outside shall be controlled by a relay with sensing circuit off the local lighting panel.

d. Specific Lighting Requirements

i. Special Areas

Certain areas, where the lighting design must be an integral part of the architecture, require special lighting design concepts. The certified lighting designer must integrate the design with the interior finishes and furniture arrangement to enhance the functionality of the spaces.

Further consideration must be taken to adhere to the energy criteria and maintenance criteria, as well as minimizing the number of special lamp types and fixtures required.

Areas generally requiring special lighting treatment are as follows:

1. Main entrance lobbies.
2. Atriums.
3. Elevator lobbies.
4. Public corridors.
5. Public areas.
6. Auditoriums.
7. Conference rooms.
8. Training rooms.
9. Dining areas and serveries.
10. Libraries.

ii. Lighting - Historic Buildings

Historic chandeliers, pendant lights, sconces, and other period lighting may be upgraded with energy efficient light sources and optical enhancements that preserve the historic appearance of the luminaire and space.

Replica lighting for restoration zones should be fabricated or modified to accept energy efficient lamps.

Supplemental lighting, when required, must be designed and located to minimize penetration of ornamental wall and ceiling surfaces and to avoid competing visually with historic lighting.

Recommended alternatives for increasing light levels in ceremonial spaces, when relamping is not sufficient, include compatibly designed floor lamps, task lights, and discretely placed indirect lighting.

18) ENERGY EFFICIENT LIGHTING FIXTURES

Lighting efficacy (lumens per watt) and lamp life shall be primary considerations in interior lighting design.

- a.** In general, interior lighting fixtures shall be fluorescent lamps operating at 265 volts (if available). Typical fluorescent lamps shall be high-performance low-mercury T8 with solid state ballasts suited for the application (see below).
- b.** Consultant shall consider utilizing low-mercury T5 fluorescent lamps if the increased efficiency justifies the increase in initial and long term maintenance costs.
- c.** Compact fluorescent lamps shall be used in lieu of incandescent for most general, task, and accent lights.
- d.** Incandescent lamps shall be specified only where necessary, in limited applications and areas, such as theatrical lighting, track lighting for exhibits, historic interiors, and hazardous areas. Where feasible, low-voltage halogen should be used in lieu of standard incandescent.
- e.** Consultant shall consider utilizing the latest technology LED lights for indoor and outdoor applications where brightness, tight focus, and long lamp life are priorities.
- f.** Do not exceed recommended spacing criteria for overhead ambient lighting fixtures.

19) LIGHTING CALCULATIONS

Consultant shall provide computer generated lighting calculations for the entire project site and for the building perimeter. Calculations shall show horizontal illuminance at ground level. Light loss factor of 0.7 shall be used for calculations. In general, Illuminating Engineering Society (IESNA) standards shall apply (up to 15% deviation is permitted).

20) EMERGENCY AND STANDBY POWER SYSTEMS

Emergency and standby power systems must be designed to comply with the requirements of the NYCBC, NFPA 110, and NFPA 111. Compliance with the electrical safety of the installation, operation, and maintenance of emergency systems is required, as addressed in Article 700 of NYCEC. Unless otherwise specifically authorized by the contracting officer, all facilities must be provided with a standby generator to supply power to the facility in the event of a sudden loss of power.

a. Classification of Emergency Power Supply Systems (EPSSs)

The class and type of Emergency Power Supply Systems (EPSSs) for Public buildings must be a minimum of Class 72, where 72 is the minimum time in hours for which the EPSS is designed to operate at its rated load without being refueled (see Chapter 4, NFPA 110). The EPSS must have a designation of Type 10, where 10 is the maximum time in seconds that the EPSS will permit the load terminals of the transfer switch to be less than 90 percent of the rated voltage.

Where the standby generator supplies a switchboard, power may be distributed from the switchboard to the emergency, legally required standby, and optional standby systems, in accordance with Figure B.1 (a) and B.1 (b), NFPA 110.

b. Emergency System

The EPSS must supply emergency loads through an automatic transfer switch upon failure of the normal supply. The transfer time limit must not exceed 10 seconds. At all critical facilities, automatic transfer switches shall be provided with maintenance bypass switches to allow the automatic transfer switch to be maintained while still providing power to the building.

Emergency illumination must include all required egress lighting, illuminated exit signs, and all other lights specified as necessary to provide required illumination.

An emergency supply source must supply equipment classified as emergency through an automatic transfer switch upon failure of the normal supply.

Emergency loads (life safety loads) must include:

- i. Emergency lighting.
- ii. Fire alarm system.
- iii. Gas leak detection system.
- iv. Carbon Monoxide detection and alarm system.
- v. Exit signs.
- vi. Automatic fire detection equipment for smokeproof enclosures.
- vii. Emergency voice/alarm communication systems.
- viii. Smoke control systems.
- ix. Exit stairway pressurization systems.
- x. Fire pump and Sprinkler Booster pump.
- xi. Sump pumps.
- xii. Sewage ejection pumps.
- xiii. Pressure maintenance (jockey) pump.
- xiv. Telephone System.
- xv. Security System.
- xvi. Select lighting for security office, electrical and mechanical rooms.
- xvii. Air compressors serving dry-pipe or preaction systems.
- xviii. Power and lighting for fire command center and security control center.
- xix. Fire service access elevators and associated controllers and the cooling and ventilation equipment serving their machinery rooms and machinery spaces (simultaneously all designated elevators).
- xx. Occupant evacuation elevators and associated controllers and the cooling and ventilation equipment serving their machinery rooms and machinery spaces (simultaneously all designated elevators).

c. Required Standby System

This system must automatically supply power to selected loads (other than those classified as the emergency system) upon failure of the normal source. The transfer time limit must not exceed 60 seconds.

Required standby loads must include:

- i. Visitor screening equipment.
- ii. Telephone switches and fiber cable battery systems.
- iii. Mechanical control systems.
- iv. BASs.
- v. Uninterruptible power systems serving technology/server rooms.
- vi. HVAC systems for technology/server rooms, UPS rooms, and communications rooms.
- vii. Exhaust fan in UPS battery rooms.
- viii. FAA aircraft obstruction lights.
- ix. Drinking water booster pumps (high rise buildings).

d. Optional Standby System

This system must supply power to the facilities or property where life safety does not depend on the performance of the system. The optional standby system must supply on-site generated power to selected loads, either automatically or by manual transfer.

Optional standby system loads may include:

- i. General areas of the buildings.
- ii. HVAC and refrigeration systems.
- iii. Data processing and communications systems.
- iv. Boiler, hot water pumps, perimeter HVAC units, and any other ancillary heating equipment necessary to freeze-protect the building.
- v. Receptacles and emergency lighting in large conference rooms to facilitate command and control operations during an emergency situation.
- vi. Additional Capacity as required by the Sponsor Agency.

e. Generator System

The emergency and standby generator system must consist of one or more central engine generators and a separate distribution system with automatic transfer switches, distribution panels, lighting panels, and, where required, dry-type transformers feeding 208Y/120V panels. The electrical engineer must coordinate with the mechanical engineer and architect on the design of the generator system.

Diesel fuel and natural gas are permitted as energy sources for building emergency generators.

f. Service Conditions

- i. If possible locate the generators outside and on grade. If installed outdoors, they must be provided with a suitable walk-in acoustic enclosure and jacket water heaters to ensure reliable starting in cold weather. If critical action structures must be located within a floodplain, generators shall be elevated above the 500-year base flood elevation.
- ii. When installed at high altitudes or in areas with very high ambient temperatures, the generators must be derated in accordance with manufacturers' recommendations. Operation of starting batteries and battery chargers must also be considered in sizing calculations. In humid locations heaters can reduce moisture collection in the generator windings. Critical silencers are required for all generators. Acoustical treatment of the generator room must be provided as necessary. Temperature and ventilation must be maintained within the manufacturers' recommendations to ensure proper operation of the unit.
- iii. Radiators must be unit mounted if possible. If ventilation is restricted in indoor applications, remote installation is acceptable. Heat recovery and load shedding must not be considered. The remote location of radiators must be designed to avoid excess pressure on the piping seals.
- iv. The generators and the generator control panel must be located in separate rooms or enclosures.

g. Capacity

The engine generators must be sized to serve approximately 150 percent of the design load and to run at a maximum of 60 percent to 80 percent of their rated capacities after the effect of the inrush current declines. When sizing the generators, the initial voltage drop on generator output due to starting currents of loads must not exceed 15 percent.

h. Startup

Automatic Transfer Switches (ATS) shall be designed to start the emergency generator upon normal power failure and to transfer the load.

i. Load Bank

A permanently installed load bank, sized at a minimum of 50 percent of generator rating, must be provided. The load bank may be factory mounted to the radiator. Care should be taken in selecting materials that will tolerate the high temperatures associated with radiator-mounted load banks to include belts, flex connections, motors, sprinkler heads, and so on.

For diesel generators, the load bank shall provide a load add/ shed feature that will maintain load levels at the generator manufacturer's recommended minimum load. The load bank shall have a minimum of four automatic load taps controlled by a load add/shed relay incorporated into the run circuit on the generator.

j. Remote Annunciators

Provide remote annunciators for the emergency generator; quantity and locations, as required.

k. Noise Control

Special attention shall be given to the noise produced by the emergency generator and compliance with NYC Local Law 113 of 2005 (Noise code).

l. Fuel Storage Tank Design

- i. Unless otherwise directed, the Consultant shall provide for an independent storage tank for emergency generator fuel storage.
- ii. The fuel supply system shall include an electric transfer pump, an emergency hand pump, a day tank, and an alarm activated by high and low-level switches in the day tank.
- iii. The fuel storage tank shall be designed as per the latest NYS Department of Environmental Conservation (NYSDEC) regulations and the Code.
- iv. Design for buried fuel tanks and related ancillary equipment such as piping and cathodic protection shall be based on manufacturer's data for either double wall steel tanks or double wall fiberglass tanks.

m. Fuel Storage Tank Capacity

- i. Consultant shall review fuel storage space limitations and budget constraints during Schematic Design.
- ii. Fuel storage tank shall be sized based on Sponsor Agency's requirements, but as a minimum shall be based on fuel consumption to provide at least eight (8) hours of running capacity at $\frac{3}{4}$ full load.

- iii. New construction projects and major renovation projects shall be provided with a minimum 275 gallon diesel oil storage tank that is integral with the emergency generator.
- iv. The parameters and the fuel storage capacity for all projects must be reviewed and approved by DDC and the Sponsor Agency prior to proceeding with Construction Documents.
- v. Day tanks must be sized for a minimum capacity of four hours of generator operation. Provide direct fuel oil supply and fuel oil return piping to the on-site storage tank. Piping must not be connected into the boiler transfer fuel oil delivery "loop."
- vi. Care must be exercised in sizing fuel oil storage tanks by taking into account that the bottom 10 percent of the tank is unusable and that the tank is normally not full (normally at a 70 percent level) before the operation of the generator.

n. Grounding

Show grounding for the emergency generator. Determine if a separately derived grounding system will be used.

21) FIRE ALARM SYSTEM

a. General

The fire alarm system shall be fully supervised, microprocessor – based multiprocessing system, addressable type. The Fire Alarm System must be coordinated with the Fire Protection System and with the Building Automation System (BAS) for fan controls.

b. Compliance

Design the fire alarm system in accordance with the Fire Department and Code requirements for the building occupancy.

c. Remote Annunciator

A remote annunciator panel shall be provided in the central station to annunciate the status of the fire, smoke, and sprinkler alarm systems.

d. Equipment and Locations

- i. Fire Alarm Control Panel (including smoke purge, where required) – at main entry lobby.
- ii. Printer – In Maintenance Office or at other location, as directed.
- iii. Remote Annunciator – At location as directed.
- iv. Manual Pull Station – At each door leading to legal exit, in corridors, lobbies, places of assembly and as required to meet Code travel limitations.
- v. Visual Annunciators (Strobes) – Wall mounted in corridors, conference rooms, places of assembly, libraries, maintenance shops, toilets and where required by Code. Visual annunciators shall be unobstructed by other objects, visible from any position in the area, and a maximum of 15 ft. from the ends of corridors.
- vi. Audible annunciators (Speakers/horns) – At corridors and where required by Code. Where locations coincide with visual annunciators, use combination type.

- vii. Area Smoke Detectors – In mechanical rooms (including fuel storage tank), electrical switchgear rooms, electric closets, main telecommunication rooms and closets, Audio/Video closets, elevator lobbies, elevator shaft, elevator machine rooms, non-sprinkled rooms storing combustible materials, and over compartmentalization or fire separation doors where magnetic door holders are provided.
- viii. Heat Detectors – In boiler room
- ix. Water flow and tamper switches for the Fire sprinkler system.
- x. Elevator recall.
- xi. Kitchen hood suppression system (Ansul System) – Activation shall be indicated as an alarm on the Fire Alarm System.
- xii. Central Station Monitoring and, where required, Owner's designated remote monitoring station.

e. Existing fire alarm systems

- i. The fire alarm systems' installations in certain public buildings fall under the following 5 categories:
 - 1. No fire alarm system installed in a particular facility.
 - 2. Functional Fire Alarm system is installed – filed with DOB and approved by FDNY.
 - 3. Functional Fire Alarm system installed – not filed with DOB and Not approved by FDNY.
 - 4. Currently dysfunctional Fire Alarm System – Originally filed with DOB and approved by FDNY.
 - 5. Currently dysfunctional Fire Alarm System – Never filed with DOB nor approved by FDNY.
- ii. Where projects require HVAC replacement/modifications, the design must comply with the latest Building and Mechanical Codes and therefore will require installation of smoke/duct detectors, fan shut down relays and fire smoke dampers. These devices will be integrated into the existing fire alarm system (if one exists).
- iii. To facilitate a clean process through the construction, sign-off, approvals and close-out phases involving HVAC replacement scopes of work with each of the categories listed above, DDC recommends that the following process and procedures be followed:
 - 1. Facilities with no fire alarm system installed:

The Consultant shall specify fire alarm devices (smoke detectors, shut-down devices, etc.) that will, in event of a fire or smoke condition, perform a local shut-down of the affected HVAC equipment.
 - 2. Facilities with existing functional Fire Alarm system – filed with DOB and approved by FDNY:

The Consultant shall specify the additional HVAC related fire alarm devices. The additional HVAC related fire alarm devices will be tied into the existing fire alarm panel. The modifications to the existing fire alarm system will be filed with DOB and submitted to FDNY for approval.

3. Facilities with existing Functional Fire Alarm system – not filed with DOB and not approved by FDNY:

The Consultant shall prepare all documents necessary for filing a new Fire Alarm System with DOB and approval by FDNY. The documents shall include all the additional HVAC related fire alarm devices, as well as all other (not HVAC related) fire alarm devices, and all modifications/replacement of existing devices, as required for filing of the entire system as being new. The design and installation shall comply with all applicable codes and all authorities having jurisdiction.

4. Facilities with existing dysfunctional Fire Alarm System – Originally filed with DOB and approved by FDNY:

The Consultant shall provide new HVAC related fire alarm devices, as well as all necessary corrective measures to bring the existing system into a fully functional and operational mode. The Fire Alarm system with its additional devices and the corrective measures provided, is to be filed with DOB and submitted to FDNY for approval.

5. Facilities with existing dysfunctional Fire Alarm System – Never filed with DOB nor approved by FDNY:

The Consultant shall prepare all documents necessary for filing a new Fire Alarm System with DOB and approval by FDNY. The documents shall include all the additional HVAC related fire alarm devices, as well as all other (not HVAC related) fire alarm devices, and all modifications/replacement of existing devices, as required for filing of the entire system as being new. The design and installation shall comply with all applicable codes and all authorities having jurisdiction.

22) SECURITY SYSTEM

The need for a security system shall be indicated in the Agreement. The type and level of security system required shall be determined by the Sponsor Agency, DDC, and the Consultant. The security system must be integrated into the design if it is part of a new building, or provided for in a non-intrusive way, in the case of an existing building. The system shall be provided with battery backup and connected to the building emergency generator (if applicable).

23) TELECOMMUNICATIONS, LAN AND CABLE TELEVISION SERVICES

The Sponsor Agency shall request telecom/data service for a new building, or any required update of an existing service, from the provider company. The Consultant shall coordinate the telecom/data system design with the provider's specifications and requirements.

a. New Service

Submit to the telecom provider a site plan with the property line indicated together with telephone/telecommunications requirements. Request a location for the service point of entry into the building. Coordinate the location and source of any additional planned or potential service, such as high-capacity internet lines. This also applies to cable television service when required.

b. Main Telecommunication Room

A main telecommunication room shall be designed to house the main control equipment of the following systems:

- i. Local Area Network.
- ii. Telephone System.
- iii. Cable TV System.
- iv. Sound, Intercom and Security Systems.
- v. Closed Circuit Surveillance System.
- vi. Building Automation System (BAS).

c. Communication Closets

Design adequate communications closets to conform to the requirements of the utility company, and telecom providers. The communication closets shall be centrally located and, in multi-story buildings, stacked.

d. Empty Conduit System

Empty conduit system shall be designed for telecom, data and cable TV systems. Drag wire shall be provided in all empty conduits. Conduit size shall be a minimum of 1".

24) OTHER SPECIAL PURPOSE SYSTEMS

The following special systems will be designed as indicated in the Task Order and/or Project Objectives:

- a. Audio/Visual (A/V) presentation system in conference rooms and designated areas
- b. Video teleconferencing facilities in designated areas
- c. Empty conduit for roof mounted satellite antenna
- d. Entry door bell system
- e. Entry door intercom system
- f. Electric snow melting system
- g. Electric heat tracing

25) GROUNDING SYSTEM

Grounding systems must be designed to be coordinated with the specific type and size of the electrical distribution system, including the following applicable generic types of grounding systems or grounding components:

i. Separate Equipment Ground Conductor

1. The types, sizes, and quantities of equipment grounding conductors must comply with NYCEC, Article 250, unless specific types, larger sizes, or more conductors than required by code are indicated.
2. Insulated equipment grounding conductors must be installed with circuit conductors for the following items, in addition to those required by the code:
 - a. Feeders and branch circuits.
 - b. Lighting circuits.
 - c. Receptacle circuits.
 - d. Single-phase motor and appliance branch circuits.
 - e. Three-phase motor and appliance branch circuits.
 - f. Flexible raceway runs.
 - g. Metal clad cable runs.
 - h. Cable trays (bond each individual section).

ii. Busway Supply Circuits

Insulated equipment grounding conductors must be installed from the grounding bus in the switchgear, switchboard, or distribution panel to the equipment grounding bar terminal on the busway.

iii. Separately Derived Grounds

To minimize extraneous “noise” on certain systems, particularly those in which harmonics are generated; the specific system grounds must be separated before grounding at the service grounding electrode or counterpoise.

iv. Isolated Grounds

Isolated grounds may be applied where the equipment served may be particularly sensitive to external interference from sources generating third harmonics and higher. In these instances the grounds, beginning from the panelboard ground and the grounding conductor from the raceway to the grounding terminal at the receptacle or outlet box, must be electrically isolated from the main grounding system. The isolated grounds must terminate at a common ground or counterpoise.

In buildings where a 208Y/120V service is supplied by the power company and there is no intermediate transformer isolating the utilization voltages from the various harmonic generators previously mentioned, the use of isolated ground panels serving the office power requirements must be installed.

v. Raised Floor

All access floors must be grounded. A grounding conductor must be bonded to every other floor pedestal and must be extended to the technology/server room common ground bus.

vi. Counterpoise

Where feasible, a grounding conductor (counterpoise) must be provided in an isosceles triangle configuration with sides greater than or equal to 10 ft. The conductor must be tinned copper not less than No. 4/0 AWG and must be electrically connected to the incoming domestic water services (provided the piping for the water service is a conducting material) on either side of the building as well as the various clusters of three ground rods spaced at intervals. Ground rods must be 5/8 in. diameter by 96 in. long and must be zinc coated copper. The counterpoise loop will involve direct burial in earth 24 in. below grade. The following items must be connected to the counterpoise loop. All ground rod and grounding connections must be exothermically welded:

1. Lightning protection system "down conductors".
2. Transformers in substations.
3. Emergency generator ground.
4. Telecom and data room grounds.
5. Separately derived grounds.
6. Isolated ground panels.
7. Main switchgears.
8. Normal and emergency distribution systems.
9. Flagpoles.

vii. Common Ground System

Consideration should be given to providing a common ground bus throughout the building. Conceptually a common ground bus would originate from the main service entrance and run up through stacked electrical rooms, where an insulated wall-mounted copper ground plate would be installed for connecting any equipment needing a common ground. Where conditions might prohibit an isosceles triangle counterpoise ground, consideration should be given to installing chemical ground rods in trenches or borings supplemented with conductivity-enhancing soil conditioners such as Bentonite clay or conductive concrete.

viii. All transformers, switchboards and panelboards shall be designed with ground bus and shall be properly grounded.

ix. The neutral of the emergency generator shall be grounded to the ground electrode.

26) LIGHTNING PROTECTION SYSTEM

i. Lightning Risk Assessment

The Consultant shall perform lightning risk assessment calculations based on the latest NFPA 780 to determine if a Lightning Protection System (LPS) is warranted for the building. If warranted, the Consultant shall design a lightning protection system with UL Master Label Certificate in accordance with NFPA 780, UL 96A.

ii. Equipment and Location

The lightning protection system shall be of the Franklin Rod type with air terminals along the rooftop, rooftop perimeter, and selected rooftop mechanical equipment; ground conductors, and dedicated ground rods. The lightning protection grounding system shall be bonded to the electrical grounding system.

27) SEISMIC DESIGN FOR ELECTRICAL SYSTEMS

i. New and Existing Buildings

New buildings and additions shall be designed for seismic forces. If an existing building is required to meet the requirements of the NYC Seismic Code and a waiver cannot be obtained, the electrical retrofit work must then meet such requirements.

ii. Building Additions

For new additions, any items in the existing building that are integrated with the life safety systems in the new addition shall also meet the seismic requirements.

iii. Drawings

Generic seismic restraint details shall be shown on the design Drawings. A note shall be added stating "Details are shown to illustrate the scope of work. Contractor's Registered Professional Engineer shall provide calculations and be responsible for providing signed/ sealed Shop Drawings indicating locations of seismic restraints and the required connection details to file with DOB".

iv. Items Requiring Restraint

Seismic restraints shall be designed for all equipment and machinery necessary for life safety operations. Such equipment and machinery shall be anchored to the structure for a seismic force as defined by Code. These items include, but are not limited to:

1. Pumps for sprinkler system.
2. Motors and switchgear for sprinkler pumps.
3. Transformers.
4. Control panels.
5. Major conduit runs serving the equipment and machinery listed above.
6. All life safety conduits.
7. All conduits 2½" diameter and larger (1¼" and larger in boiler rooms and mechanical rooms).
8. All cable trays regardless of diameter, weight and distance from the bottom of slab or structural member.

v. **Calculations**

Consultant to include in the design documents instructions requiring that "Calculations shall be performed by the Contractor's registered professional engineer verifying that the standard mountings for the life safety equipment can withstand seismic inertia loads. If not, Contractor's engineer shall detail additional restraints as required".

28) ARC FLASH

The design engineer must submit a computer-generated Arc Flash analysis for the entire building electrical distribution system. The data from the arc flash calculations for individual pieces of electrical equipment must be transposed to NFPA 70E-approved labels and all panelboards, motor control centers, switchgear, and major electrical equipment must be appropriately labeled and protection boundaries delineated per OSHA 1910 Subpart and NFPA 70E requirements.

29) SHORT CIRCUIT AND COORDINATION STUDY

The electrical engineer must submit a preliminary short circuit analysis on all projects. The final coordination and analysis must be completed by the electrical Contractor's testing agency or by an independent agency employed by DDC, and a report must be submitted. The building power system model shall be provided in a format coordinated by the region. DDC shall be provided the source code for the analysis and have rights to the source native files at no additional cost to the City.

30) COMMISSIONING

See Chapter 07: Commissioning for more information.

K. PLUMBING ENGINEERING

1) INTRODUCTION

The purpose of this guide is to convey general "basis-of-design", standard of quality, and DDC preferences as they relate to building plumbing system design. Specific Sponsor Agency and facility preferences shall be revealed through each Consultant's investigations on the project. Agency-specific requirements may be found elsewhere in this manual.

Plumbing systems and equipment shall be designed to strive to achieve the highest level of quality and engineering. All work shall comply with Code and utility requirements. Water conservation is a requirement of all plumbing systems.

All plumbing engineering drawings are to be coordinated with all disciplines; domestic water, sanitary and storm drainage, and other liquid conveyance systems shall be designed to avoid inappropriate juxtaposition with other utilities. The services of specialty sub-consultants shall be made available when required by the nature of the work.

2) GENERAL

- a.** The Consultant shall acquire at the project's outset a minimum working knowledge of the project intent, scope and extent of plumbing work. This activity may also require coordination with Engineers from one or more trades.
- b.** The initial scope and extent of plumbing work shall be verified by visiting the project site and further communicating with the designated project DDC Project Manager and Team Leader (TL).
- c.** The Consultant shall identify the plumbing system, equipment, materials, and any specialized professional services or systems required to execute the project.
- d.** All applicable New York City and industry codes and standards invoked by the codes must be recognized early in the design stage so that they can be referred to whenever required throughout the project's design phases. Plumbing design relies heavily on the current editions of the New York City Building Codes (NYCBC) and the National Fire Protection Association (NFPA). These codes should be used as strict guidelines during design.
- e.** The Consultant shall show that the latest "green building" solutions have been incorporated and/or considered in the design consistent with the project's established LEED / sustainability goals or requirements.
- f.** Required metering is coordinated with the Sponsor Agency to comply with the NYC Energy Conservation Code.
- g.** The Plumbing Consultant shall coordinate with the project structural engineer in the Program phase to determine the seismic design requirements for the project.
- h.** All piping penetrations into different fire or smoke zones shall be protected with appropriately rated firestopping materials or systems. Each trade should be responsible for firestopping work.
- i.** Coordinate plumbing equipment locations with all architectural and engineering trades from the project outset. Ensure that all chases, structural components such as footings and structural steel will allow for proper installation of plumbing components. Work closely with the Architect and Structural Engineers to allow for proper pipe support, proper piping pitch, ample room in chases and space within Mechanical Equipment Rooms.
- j.** Identify through testing the existence of asbestos, and other hazardous materials in the work area during the Schematic Phase. Coordinate abatement scope of work and procedures with DDC OEHS unit via the project PM.
- k.** Follow DDC guidelines for drawing layout and presentation of materials and equipment whenever applicable.
- l.** Final equipment choice shall be the result of a best value assessment which considers function, materials, features, O&M issues, costs and project budget.
- m.** Chases containing equipment such as valves, air hammer arrestors, concealed flush valves etc. are accessible

3) MECHANICAL EQUIPMENT ROOMS (MER'S)

- a.** When practical, Domestic Water Service piping should enter the building at an MER. Coordinate closely with the Architect and Engineering trades to allow proper spacing for backflow preventers. All clearances required by the plumbing Code of New York City, NFPA and the equipment manufacturers' printed recommendations must be adhered to.
- b.** Coordinate with the HVAC Consultant for proper placement of floor drains, hose bibs and valved outlets to service their equipment. Floor drains are required for pumps, pressure relief valves, backflow preventer discharge, equipment drainage and general maintenance/good housekeeping. Make efforts to combine drains where practical.

- c. Consultant prepares and files NYC DEP application for Approval of Backflow Prevention Devices where required.
- d. Avoid routing piping above electrical equipment/panels in the MER.
- e. All floor-mounted or supported equipment shall be on concrete housekeeping pads provided in the plumbing work that are (min. 4") longer and wider than the equipment base. The pad shall be lagged to the floor with (min. 4) steel anchoring devices and chamfered all around. Its height (min. 4") and reinforcement requirements may vary depending on the weight and dynamic forces produced by the equipment.
- f. The final sizing and layout of equipment should also consider a potential future expansion of the facility's requirements.

4) DOMESTIC AND SPRINKLER WATER SERVICES

a. Separate Water Supplies

Where required by code, two (2) water services shall be provided, one for the domestic water system and the other for fire sprinkler system. The two (2) services shall be drawn from two (2) separate street water mains where available. Where two mains are not available, a take-off from the domestic water system shall supply the sprinkler system.

b. Connection of Services

Each service shall be fitted with shut-off valves immediately upon entering the building. A connection joining the fire sprinkler service with the domestic service shall be installed to ensure an auxiliary supply for the domestic water distribution. A meter, strainer and backflow prevention device (double check valve or RPZ) shall be installed in the header of each service supplying water for domestic service. The take-off feeding the fire sprinkler system shall be fitted with a strainer and a double detector check valve assembly with meter.

5) VENTING METHODS

- a. Venting methods used are according to the plumbing Code of New York City.
- b. Vent connections on floor plans are shown as drops when connecting to horizontal drain pipes.
- c. Vent terminals are shown as offset at the roof and increased one pipe size prior to penetrating the building roof. This method of design is for frost control.
- d. Every dry vent shall rise vertically to a minimum of 6 inches above the flood rim of the highest trap or trapped fixture being vented. For example, a common mistake made during design is to combine individual vent pipes from floor drain traps below the floor level the drains are located at. These vents cannot combine until penetrating the floor level of the floor drains and rising 6 inches. See NYC plumbing Code for further explanation and exceptions.
- e. Fixtures located within bathroom groups are individually vented. This does not include floor drains and floor sinks. For floor drains and floor sinks, DDC encourages the use of rules for wet venting to eliminate costly individual venting of floor drains. The distance of a floor drain trap from the wet vent cannot exceed the maximum distances of "fixture trap from vent" published by the NYC plumbing Code.

6) MATERIAL, EQUIPMENT AND DESIGN PREFERENCES

- a.** Whenever practical, shut off valves are shown and specified as ball valves.
- b.** Use water hammer arrestors in lieu of air chambers in all accessible area.
- c.** Vents discharge to atmosphere. The use of air admittance valves is discouraged unless all possible avenues to atmosphere have been found to be impractical.
- d.** Choose the size, shape, fitting/accessories, material composition, and layout of piping that best fits the application, minimizes piping cost, building penetrations and minimizes friction loss. Layout of piping for domestic water systems should not use "bull head" tees and branch piping must be shown by a symbol on the drawings as coming from the top half the piping main.
- e.** As a general guide, the following notes should be considered by all Consultants:
 - i.** Grooved type and hydraulic press joints can offer considerable cost savings. DDC encourages the Consultant to consider them as options on each project.
 - ii.** The use or substitution of plastic or PVC piping is discouraged in secure type facilities. TL / PM approval must be obtained for its use.
 - iii.** This listing does not intend to exclude an engineer from using an alternative material where conditions dictate, or a cost savings can be incurred. TL / PM approval must be obtained for an alternative use.
- f.** Vandal proof fasteners are common on many public and secure buildings.

7) DOMESTIC WATER SUPPLY SYSTEMS

Design potable cold and hot water systems and their accessories in compliance with Regulatory Agency requirements.

a. Domestic Cold-Water Service

- i.** Domestic cold water service must consist of a pressurized piping distribution system incorporating an independent (separate) service pipe from the tap at the exterior utility service water main to the water meter and backflow preventer equipment inside the building.
- ii.** Internal distribution must consist of a piping system that supplies domestic potable cold water to all plumbing fixtures, plumbing equipment, water heaters, mechanical makeup, and cold water equipment/system demands.

b. Domestic Water Service Pressure

- i.** The distribution water pressure must be sufficient to provide the outlet pressures required by fixtures or equipment at the hydraulically most demanding (generally the topmost/highest and most remote) outlet. The required outlet pressure must be determined as the minimum requirements of the Code or by the higher requirements of the fixture or equipment, as required by the manufacturer.
- ii.** Distribution water pressures must not exceed the system material, piping, and device-rated maximum working pressures, or maximum pressure at the fixture, equipment, or outlet, as required by Code. The Consultant must schedule and specify pressure regulating valves or valve stations where pressures at maximum working pressures may exceed the code maximum. Pressure Reducing Valves 'PRV' with expansion tank (for domestic hot water) must be used to regulate supply water pressures within distribution zones. Master PRV outlets must use pressure regulating valves. Pressure reducing valves must be specified to operate at peak flow within the entire hydraulic range, from low hydraulic grade line (HGL) to the maximum working pressure of the system (high HGL, plus pump shutoff head for pressure boosted systems).

c. Domestic Water Booster Pumping System

A packaged and third party tested triplex (three-pump) booster pumping system or duplex (two-pump) with a minimum of 80 gallon hydro-pneumatic storage pressure tank must be used where water flow test and water utility company low HGL water pressures do not provide required demands at peak draw.

i. Domestic Hot Water Service

The load calculations, storage capacities, insulation requirements, system types, and performance requirements of the water heating equipment must comply with the mandatory requirements in Sections 7.4.1 through 7.4.4 of ASHRAE Standard 90.1-2010.

- ii. There are many types of commercial domestic hot water heaters available for use. The Consultant should inquire as to individual Sponsor Agency preferences prior to design. This statement does not intend to limit the designer's choice or obligation to recommend the best type for the application at hand. Work closely with the TL or PM when choosing a method for production of domestic hot water.
- iii. Domestic potable hot water may be generated by hot water heaters utilizing the most economical source of fuel such as natural gas, electricity, or steam or heating hot water (the hot water produced by the mechanical system to heat interior spaces) as the primary energy source.
- iv. Cold (or preheated) water supply to water heaters must include a service valve, check valve, expansion tank (sized for expansion of storage capacity only), 27 inch heat trap, mixing valve bypass primer, and hot water return connection at a minimum. For energy savings, a minimum trap height of 27 inches must be provided at water heater cold water inlets.
- v. Instantaneous water heaters are not permitted as a primary source for potable hot water except for incidental, sporadic equipment demands or remote individual fixtures (e.g., lavatory, sink, shower, service sink). Point-of-use instantaneous water heaters are permitted for use at emergency fixtures to supply tepid water immediately at the emergency fixture or group of emergency fixtures.
- vi. DDC encourages domestic hot water supply temperatures to be generated and stored at a minimum of 1400F, and tempered to deliver 1100F to outlets, where permitted by Code and consistent with ASHRAE guideline 12-2000. Hand washing, lavatory, sink, and similar fixtures accessible to the disabled, elderly, or children must be tempered to deliver 850F to 1090F water temperatures at the fixture or group of battery fixtures. Bathing and showering fixtures (except emergency showering) must be tempered to deliver 850F to 1200F water temperatures at the fixture or group of battery fixtures, in accordance with ASHRAE guideline 12-2000. Individual fixture or battery thermostatic mixing valves must be provided where distributed, or zone, outlet temperatures may exceed 1100F. Hot water supply to dishwashers must be at 1400F, and the temperature must be boosted from 1400F to 1800F for the final sanitizing rinse.
- vii. There must be no dead legs or capped spurs within the potable domestic water plumbing system. Rubber fittings and device components are not permitted within the potable domestic hot water or return systems, as they have been associated with persistent colonization of *Legionella* spp.
- viii. The domestic hot water distribution system must consist of a piping system that connects water heaters to all fixtures, equipment, and outlet demands requiring potable domestic hot water. Circulation return systems with circuit setters/balancing valves or temperature maintenance systems must be provided for all branches in excess of 20 feet from the water heater or circulated distribution main.

- ix. Domestic hot water return circuits of substantially varying pressures, as a result of pressure zoning or static head, cannot successfully be joined to a single pressure zone water heater. Locate individual pressure zone water heaters within the pressure zones, where return pressures would vary substantially causing deadhead on the lower pressure return circuits. Hot water return systems must have circuit setters (balancing valves) and test plugs at each return circuit, and systems must be balanced.
- x. DDC encourages scald protection by use of a master mixing valve of the thermostatic type prior to local mixing at the end using fixture.

d. Domestic Water Supply Equipment

- i. Domestic water supply equipment and components must include, but not be limited to, the following equipment: water meters, water heaters, water filtration, water softening, pressure booster systems, pressure regulating valves, circulating pumps, backflow preventers, circuit setters/balancing valves, thermostatic mixing valves, expansion tanks, isolation valves, hangers and supports, and thermal insulation.
- ii. Water heaters and expansion tanks must be compliant with ASME standards and with Code, stamped and rated.
- iii. Water hammer arrestors must be provided at each elevation change of every horizontal branch to fixture batteries, at all quick-closing automatic valves (mechanical makeup, drinking fountains, flush valves, single lever control faucets, temperature regulating valves, dishwashers, return pumps, and similar), and at each floor on each horizontal main for branches with/without individual fixture or battery water hammer arrestors, for both hot and cold water. Water hammer arrestors must be compliant with the plumbing and Drainage Institute (PDI) Standard PDI-WH201, ANSI/ ASME A112.26.1M, as required by Code, and as recommended/required by the fixture and equipment manufacturer or warranty.
- iv. Domestic cold and hot water distribution systems must be insulated in accordance with the paragraph "Thermal Pipe Insulation" below.

8) WATER METERING

Meters with remote reading capability must be provided to collect water use data for each water supply source (e.g., domestic potable water, reclaimed water, rainwater). Utility company service entrance/interval meters can be used.

a. Locations

Provide sub-metering with remote metering to collect water use data for each building subsystem such as: cooling towers (meter on makeup water), evaporative coolers, steam and hot-water boilers, irrigated landscape areas with controllers, separate campus or project buildings, separately leased or rented space, and any other large water using system or process.

b. Water Meter Capabilities

All building meters and sub-meters must be configured to communicate water consumption data to a meter data management system which must be capable of electronically storing data and creating user reports showing calculated hourly, daily, monthly and annual water consumption for each meter and sub-meter.

9) POTABLE WATER USE REDUCTION

a. Mandate

All DDC building projects are expected to achieve significant water savings in comparison to typical buildings of similar size and program. Local Law 86 of 2005 mandates, at a minimum, 20% water savings for projects with a total construction cost above certain threshold levels and a domestic plumbing construction cost, including fixtures, above \$0.5M. A 30% reduction is required if waterless urinals are approved by DOB. For eligible new construction, DDC may require a 40% reduction.

b. Methodology

The methodology for determining potable water reduction shall not be less stringent than that prescribed by LEED (Leadership in Energy and Environmental Design). Water performance ratings for plumbing fixtures that were established by the Energy Policy Act of 1992 (EPA 1992) shall be incorporated into the methodology to be followed for potable water use calculations.

c. Strategies

In addition to the use of water-conserving fixtures (see below) and water meter data management (see above), the Consultant is expected to explore clearwater recycling, rainwater capture and re-use, and other methods to minimize potable water use. The Consultants should reference "Water Matters", DDC's design manual for water conservation in buildings.

10) PLUMBING FIXTURES

a. Plumbing fixture accessibility clearances, installation, and accessories must be compliant with the code and ADA requirements.

b. All plumbing fixtures must be water-conserving/saving-type fixtures, faucets, and valves. Low flow water fixtures must be provided.

i. Water Closets (Toilets) – Flushometer Valve Type

Water closets may be either dual-flush or low-flow type, manually controlled or motion sensor controlled. Effective flush volume shall be in accordance with ASME A112.19.14 and EPA WaterSense labeled toilet tank-type High Efficiency Toilet (HET) Specification. For single flush, maximum flush volume – 1.28 gal. For dual-flush – light flush -1.1 gpf, standard flush- 1.6 gpf.

ii. High Efficiency Toilets (HET) Water Closets -- Tank-Type

Tank-type water closets must comply with the performance criteria of US EPA WaterSense tank-type High Efficiency Toilet specification 1.28 gal.

iii. High Efficiency Urinals (HEU)

Urinals must be low-flow, flush-type fixtures. Maximum flush volume shall be in accordance with ASME A112.19.2 – 0.125 gal.

c. Public Lavatory Faucets

Use metered-type faucets for lavatories. Maximum water use shall be 0.25 gal. per metering cycle when tested in accordance with ASME A112.18.1.

11) WALL HYDRANT REQUIREMENTS

A freeze proof wall hydrant shall be provided every 150 feet length of the building façade so that hoses, with maximum length of 75 feet, can service the entire facility. Provide a minimum of one freeze-proof wall hydrant on each wall façade.

12) SPECIAL PURPOSE AREA PLUMBING SYSTEMS

a. Mechanical Rooms

Water lines must not be located above motor control centers or disconnect switches and must comply with the requirements of the Code. Mechanical rooms must have floor drains in proximity to the equipment they serve to reduce unsafe operating conditions from standing water or drain lines extending into aisles. All valves above 8 ft. from the floor must have chain-operated devices for ease of operation.

b. Vertical Chases and Shafts

All pipes in vertical chases and shafts must have drain valves at the bottom of the risers for ease of maintenance. A floor drain must be provided at the lowest level in each chase or shaft. Access to the valves and floor drains must be provided.

c. Electrical Equipment Rooms

No water lines are permitted in electrical rooms, except for dedicated area fire sprinkler piping.

d. Information Technology Equipment Rooms

To the extent possible, avoid any plumbing, sanitary, or storm piping in IT rooms.

e. UPS Battery Rooms

Battery rooms must be equipped with emergency eyewash and shower equipment (ANSI standard Z358.1). Floor drains required at the emergency shower (within the battery room acid containment curb) must extend with acid waste piping to an acid neutralization tank before discharge to the sanitary sewer or building drain.

13) SANITARY AND STORM DRAINAGE SYSTEMS

The Consultant shall design separate sanitary and storm drainage systems and determine availability of public utilities. Each system shall be designed to connect to its respective street system. Design and specify duplex sewage ejectors and/or duplex sump pumps for those fixtures and/or storm drains that cannot drain by gravity. Design storm water detention or retention, where necessary and wherever feasible within the space and budget limitations, as per NYC DEP latest requirements.

a. Sanitary (Soil and Waste) and Vent System

i. Sanitary Drainage System

1. A complete sanitary building drainage system must be provided for all plumbing fixtures, sanitary floor drains, kitchen equipment, and equipment with sanitary, soil, or waste drainage/discharge.
2. Steam condensate as well as chemically treated mechanical discharge from cooling towers, boilers, chillers, and other mechanical equipment must not discharge to the sanitary drainage system without proper treatment for protection of the environment and waterways.

ii. **Sanitary Floor Drains**

1. Sanitary floor drains must be provided in multi-fixture restrooms, kitchen areas, mechanical equipment rooms, and locations where interior floor drainage accumulates wastes. Single-fixture toilet rooms do not require floor drains.
2. Floor drains for public toilets, kitchen areas, and other public areas must be cast iron body type with strainers. Equipment room areas require large diameter cast iron strainers, and parking garages require large diameter tractor grates rated for expected wheel loading. Drainage for ramps requires either trench drains or roadway inlets, if exposed to rainfall.
3. Floor drains must be provided at each piece of dishwashing and kitchen equipment where accidental spillage is anticipated and to facilitate floor-cleaning procedures. Drains to receive indirect wastes from kitchen equipment must be of the floor sink-type with sediment bucket and removable grate.
4. Venting methods interceptors must be provided for all waste piping serving sinks used for pot washing or food preparation and floor drains or floor sinks serving the immediate area of the equipment.
5. Receptors, open-site drains, hub drains, trench drains, and similar drains must have a dome bottom strainer (in addition to pedestrian/vehicle grate strainers where required) to reduce splashing, increase free area, and prevent debris blockage. Drain body, frame, and grate strainers must be rated for expected wheel loading and must include drain adapters, extensions, receivers, deck clamps, and similar, as required by building construction.
6. Floor drains and/or trench drains in vehicle repair / maintenance garages must discharge to a sand / oil separator before discharging to the sanitary sewer per the plumbing code of New York City.
7. Drain strainers in pedestrian areas must be heel-proof type. Every drain and system opening must have 1/4-inch maximum strainer openings for rodent-proofing. Discharges must be elastomeric pinch valves or similar for rodent-proofing. Receptor drain outlets must be two times the area of combined inlet pipe areas.
 - a. Floor drains with sanitary connections are provided for all emergency showers.
 - b. Trap primers must be provided for all sanitary drains (floor drains, receptors, open site drains, hub drains, and similar) where drainage is not routinely expected or is seasonal.

iii. **Grease Interceptors**

1. Drains, fixtures, and equipment discharging fat, oil, or grease-laden waste; within 10 feet of the cooking battery; and as required by the Department of Health, must discharge to a grease interceptor before connecting to the sanitary sewer.
2. Grease interceptor(s), must meet criteria mandated by the Industrial & Acid Waste Unit at DEP. Sizing of grease interceptors must be based on the so-called volume sizing guideline, not the drainage fixture-unit technique.

iv. **Sand/Oil Separator**

Floor drains and/or trench drains in vehicle repair garages must discharge to a sand/ oil separator before discharging to the sanitary sewer.

v. Automatic Sewage Ejectors

Sewage ejectors must be used only where gravity drainage is not possible. Only sanitary drainage from the lowest floors of the building may be connected to the sewage ejector; fixtures on upper floors must use gravity flow. Sewage ejectors must be nonclog, screenless, alternating duplex pumps, capable of passing a 2-in. solid, with each discharge not less than 4 in. in diameter. They may be connected to the emergency power system, where available, and must be properly vented.

b. Rainwater (Storm) Drainage System

A complete rainwater (storm) building drainage system must be designed and engineered for all rainwater (storm) drainage for roofs, plazas, balconies, decks, area wells, parking structures, parking garages, and similar structures. A separate and independent secondary roof drainage system must be provided in compliance with applicable codes and standards.

i. Rainwater (Storm) Management System

1. The intent of a rainwater (storm) management system is to limit the outflow from a site to adhere to the allowable rates set by DEP. The Consultant should be aware that DEP has lowered allowable rates for new development and for alterations such as additions that expand the footprints of buildings and impervious surfaces.
2. Planning, design and construction of onsite storm water shall comply with the latest NYC DEP's storm water performance standards for new buildings and existing developments, when alterations as defined by DOB, increase impervious surfaces on the lot by greater than 20% of existing impervious surfaces.
3. The design (as per DEP's Criteria for Detention Facility Design) shall reduce peak discharges to the city sewer system during rain events by requiring greater on-site detention of storm water runoff and slow release to the sewer system. The performance standard is a key element of the New York City Green Infrastructure Plan.
4. In addition to the requirements of DEP's storm water performance standard, Consultant to comply with the requirements of DOB that established acceptance and maintenance criteria for rain water recycling systems.

ii. Secondary (Overflow) Roof Drainage

Provide secondary (overflow) roof drainage using sidewall scuppers, scupper drains, or a secondary (overflow) roof drainage system. Secondary (overflow) roof drains must be the same as roof drains, except with integral standpipe or damming weir extension 3 in. above waterproofing membrane and located within 5 ft. of (adjacent to) the primary roof drain and extended to discharge above grade. Termination above grade must include a concealed elastomeric pinch valve or similar for rodent-proofing, near the discharge, and near the finished discharge in high finish areas. The discharge must be in a non-occupied, non-pedestrian area that permits drainage away from the building and pedestrian access.

iii. Clearwater Drainage

Clearwater drainage (cooling coil condensate drainage, evaporation pan drainage, ice makers) and similar clear, non-chemically treated drainage should be recovered and reused for cooling tower make-up, irrigation, greywater use (such as toilet flushing), or similar purposes. Rainwater must be drained away only as a last option. In that case, clearwater drainage without chemical, vegetable, human, animal, protein, fecal, oil,

grease, or similar pollutants may be discharged to the rainwater (storm) drainage system where approved by Code and the U.S. Environmental Protection Agency. Clearwater drainage may not discharge to the sanitary drainage system.

1. Storm Drains

Rainwater (storm) drains include domed roof drains, secondary roof drains, hub and receptor drains (that do not receive floor drainage), deck drains, parking garage drains, trench drains, area well drains, and similar.

2. In general, drains must be cast iron body type, with nickel-bronze strainers for finished pedestrian areas, aluminum domes for roof drains, ductile iron or bronze finish for unfinished pedestrian areas.
3. Roof drains and planter drains in non-pedestrians/vehicle areas must have high dome strainers. Rainwater drains and equipment room areas must require large diameter strainers. Drainage for ramps must require either trench drains or road-way inlets, if exposed to rainfall.
4. Receptors, hub drains, trench drains, and similar drains must have a dome bottom strainer (in addition to pedestrian/vehicle grate strainers where required) to reduce splashing, increase free area, and prevent debris blockage.
5. Drain body, frame, and grate strainers must be rated for expected wheel loading and must include drain adapters, extensions, receivers, deck clamps, gravel stops, and similar, as required by building construction. The drain strainer free area must be equal to, or greater than, the free area of the calculated outlet pipe size area.
6. Drain strainers in pedestrian areas must be heel-proof type. Every drain and system opening must have 1/4 in. maximum strainer openings for rodent-proofing. Discharges must be elastomeric pinch valves or similar for rodent-proofing. House traps must be provided only on storm systems where required by code.

iv. Automatic Sump Pumps

Sump pumps must be used only where gravity drainage is not possible. Only rain- water and clearwater drainage from the lowest floors of the building may be connected to the sump pump; drainage from upper floors must use gravity flow. Sump pumps must be alternating duplex sumps and must be connected to the emergency power system, where available.

v. Foundation and Subsoil Drainage

1. The requirements of the foundation and subsoil drainage system must be identified, capacity calculated, and materials identified by the geotechnical soils engineer and identified in the geotechnical report. The layout and installation details and materials (identified by the geotechnical report) must be specified and identified in the structural foundation drawings and indicated on the architectural drawing sections and details. See Structures and Soils section in this Chapter.
2. The foundation and subsoil drainage system must be provided with an emergency power source, backwater prevention, and perforated drain tile piping in washed gravel bed with filter fabric, which must extend to the duplex sump pumping system as required.

14) SPRINKLER SERVICE LINE AND STANDPIPE SYSTEMS

- a.** Design and specify fire standpipes in accordance with the hydrant flow test report. Provide water service up to and including the backflow preventer device for sprinkler systems and combined sprinkler/standpipe systems as indicated hereinabove.
- b.** Design and specify a fire pump or sprinkler booster pump where water pressure in street main is not adequate.

15) PIPING

- a.** Hub-Less (no hub) Cast Iron piping is permitted for the sanitary system inside the building except for underground applications. Service weight Cast Iron is allowed in either above or underground applications, but underground connections shall be Cast Iron bell and spigot pipe with a lead and oakum joint.
- b.** Hub-less (no hub) pipe and fittings shall not be used for the storm piping inside or outside the building. Only Service Weight with caulked joint (bell and spigot, lead and oakum) for underground application shall be used for storm drainage piping. The use of the so-called "push-on-joint" or a hub pipe with neoprene gasket is allowed for interior and above the ground storm piping.
- c.** Piping schedule shall comply with code requirements.

16) NATURAL GAS SYSTEMS

Design and specify a natural gas supply system. In conjunction with the utility company, determine street pressure availability. If high pressure is available specify pressure regulators. If low pressure is available, determine need for gas boosters.

a. Service Point of Entry

Natural gas service utility piping entering the building should be protected from accidental damage by vehicles, foundation settlement, or vibration. Wall penetrations are preferred above grade, where feasible, and provided with a self-tightening swing joint located upstream of the building wall penetration. Where wall penetration above grade is not possible, the gas pipe must be within a schedule 80 black steel, corrosion protected, sealed and vented, gas pipe sleeve that extends from 10 ft. upstream of the exterior face of the building wall penetration (or to the limits of excavation shoring if greater than 10 ft.) to a minimum of 12 in. downstream of the interior face of the building wall penetration.

b. Gas Piping within Building Spaces

Gas distribution piping should not be piped through confined spaces, including trenches or unventilated shafts where leaking gas could accumulate to dangerous levels or leak into the facility. All spaces containing gas-fired equipment, such as boilers, chillers, air handling units, water heaters, and generators, must be mechanically ventilated and must include CO (carbon monoxide) monitoring and alarms. Vertical shafts carrying gas piping must be ventilated. Diaphragms and regulators in gas piping must be vented to the outdoors. All gas piping inside ceiling spaces must have plenum rated fittings. Gas valves (concealed or accessible) are not permitted above ceilings. Gas meters must be in a vented mechanical room or meter room and providing access to the local gas utility.

17) FUEL OIL STORAGE TANKS AND PIPING FOR VEHICULAR FUELING STATIONS

a. Fuel Oil Piping

- i. All underground piping shall be double wall fiberglass which is sloped back to the tank manway and pitch verification is needed on all piping for underground tanks.
- ii. All piping that is not sloped to the tank manway, must be provided with line leak detection.
- iii. All above ground piping shall be steel.
- iv. Each spill line shall be provided with spill containment and be mounted outside of the building to allow filling without disruption of service.
- v. The spill containment sump must provide positive drainage back to the tank with no product residue remaining.

b. Fuel Oil Storage Tanks

Fuel oil storage tanks shall be installed above ground in bulk fluid storage room or buried underground.

- i. Underground fuel oil storage tanks (UST) shall be double wall fiberglass and shall be as specified for the vehicle fuel storage tanks. All underground tanks shall be installed as per FDNY, DEC and DOB regulations.
- ii. Above ground tanks shall be single or double wall steel and provided with access manhole, high cut-off valve, high level alarm and 110% containment tub.
- iii. Where above ground tanks are used, the room shall be capable of containing 110% of the volume of the largest tank. In addition, a leak detection system should be provided at the lowest point in the room.

18) THERMAL PIPE INSULATION

- a. All sanitary sewer vents terminating through the roof must be insulated for a minimum of 6 ft. below the roof line to prevent condensation from forming and must include vapor barrier jacket on this insulation.
- b. All piping exposed in plenums, or above the ceiling, must be insulated to prevent condensation. The thermal pipe insulation for plumbing systems must comply with fire and smoke-developed index in accordance with the Code requirements.

19) CHEMICAL WASTE SYSTEM

- a. Chemical waste disposal system design and sizing shall conform to DEP (Department of Environmental Protection) requirements.
- b. Waste water from emergency showers and eyewash basins need not be connected to the chemical neutralizing system and may discharge directly into the sanitary system.
- c. The plans for chemical waste management shall be submitted for review and approval by NYC DEP, Bureau of Wastewater Treatment (BWT).

20) PLUMBING SEISMIC DESIGN

a. New and Existing Buildings

New buildings and additions shall be designed for seismic forces. If an existing building is required to meet the requirements of the NYC Seismic Code and a waiver cannot be obtained, the plumbing and drainage retrofit work must then meet such requirements.

b. Building Additions

For new additions, any items in the existing building that are integrated with the life safety systems in the new addition shall also meet the seismic requirements.

c. Drawings

Generic seismic restraint details shall be shown on the contract documents. A note shall be added stating, "Details are shown to illustrate the scope of work. Contractor's registered professional Engineer shall provide calculations and be responsible for providing signed/sealed shop drawings indicating locations of seismic restraints and the required connection details to file with DOB."

d. Items Requiring Restraint

Plumbing and drainage piping equipment associated with life safety systems as well as other systems that must be operational to function in the aftermath of a seismic event, shall be seismically restrained.

21) PIPING SYSTEM AND EQUIPMENT IDENTIFICATION

All pipes, valves, and equipment in mechanical rooms, shafts, ceilings, and other spaces accessible to maintenance personnel must be identified with color-coated piping or color-coded bands, and permanent tags indicating the piping system type and direction of flow or the equipment type and number, in accordance with ANSI Standards. The identification system must also tag all valves and other operable fittings in accordance with ASTM Standard A13.1.

22) COMMISSIONING

See Chapter 07: Commissioning for more information.

23) SECURE DESIGN

Many of the Sponsor Agencies DDC performs work for have secure buildings or areas of buildings. Many of the requirements for secure areas are standardized but not published in this design guide. For individual Sponsor Agency standards for security design issues, coordinate closely with the TL or PM.

24) CIVIL ENGINEER DRAWINGS

Confirm civil engineer will show street water main, sanitary, storm, and gas connections; otherwise, include in plumbing scope.

L. FIRE PROTECTION

1) INTRODUCTION

The goal of DDC fire protection program is to incorporate into all projects fire protection and life safety systems that are effective in detecting, extinguishing, or controlling a fire event, thereby improving overall building safety to an acceptable level. The primary goal is to protect human life from fire and products of combustion. The secondary goals are to reduce City and taxpayers' potential losses from fire (i.e., protect City real and personal property, maintain Sponsor Agency mission continuity, and control environmental impact).

The purpose of this design criteria is to convey general "basis-of-design", standard of quality, and DDC preferences as they relate to building Fire Protections systems design. Specific Sponsor Agency and facility preferences shall be revealed through each Consultant's investigations on the project.

Fire Protection systems and equipment shall be designed and engineered. All work shall comply with Code and utility requirements. All Fire Protection Engineering Drawings are to be coordinated with all disciplines.

Where required by Code, the Consultant shall provide a complete state-of-the-art fire protection system compatible and coordinated with each architectural or mechanical design scheme, including but not limited to sprinklers, Siamese connections, pumps, water supply, water reserve, emergency power, smoke purge, and fan shutdown.

2) APPLICABILITY

Where work areas consist of portions of a building, the requirements within this Chapter must be limited to the work area in which work is being performed, unless specified otherwise by DDC.

3) FIRE PROTECTION ENGINEER

The fire protection engineer, as a minimum, must perform the following:

a. Analysis of:

- i. Building construction
- ii. Occupancy Classification
- iii. Water based fire extinguishing systems.
- iv. Non water-based fire extinguishing systems
- v. Fire alarm system
- vi. Smoke control systems.

b. Calculations for:

- i. Water supply
- ii. Smoke control (fire dynamics)
- iii. Hydraulic calculations.

c. Design of all fire protection and life safety systems including but not limited to:

- i. Water based fire extinguishing systems.
- ii. Non water-based fire extinguishing systems.
- iii. Smoke control systems and stair pressurization systems.

4) ALTERNATIVE DESIGN

The fire protection engineer may propose alternative designs to that prescribed herein, but the DDC PB/A&E fire protection engineer must approve the alternative design. Such review must determine if the proposed alternative is deemed equivalent or superior to the intent of the prescribed requirements in this Chapter.

5) GENERAL DESIGN REQUIREMENTS

- a. In general, fire protection design drawings are produced as a guideline for bidding purposes. DDC recognizes that the fire protection installer will perform hydraulic calculations and may revise system piping and head layout. All fire protection projects require shop drawing submission and approval.
- b. The fire protection engineer shall assess the adequacy of the existing water supply and shall perform water supply flow testing of fire hydrants and/or pumps.
- c. The fire protection engineer shall request a flow test or obtain results of a recent flow test prior to start of design of any sprinkler or stand pipe system.
- d. Fire Protection systems must be designed to support the performance objectives defined for the project's program requirements.
- e. Maintainability, efficiency, and reliability are prerequisite requirements for public buildings.
- f. Accessibility - The design and installation of all fire protection systems and equipment must allow for their access, service, repair, and eventual removal and replacement, including major system components such as fire pumps, automatic transfer switches, etc. Comply with the manufacturer's recommended clearances around installed equipment, unless otherwise directed by the Sponsor Agency.
- g. The design engineer shall acquire at the project's outset a minimum working knowledge of the project intent, scope and extent of Fire Protection work. This activity may also require coordination with designers from one or more trades.
- h. The initial scope and extent of Fire Protection work shall be verified by visiting the project site and further communicating with the PM and the designated Team Leader.
- i. The engineer shall identify the Fire Protection systems, equipment, materials, and any specialized professional services or systems required to execute the project.
- j. All applicable New York City and industry codes and standards invoked by the codes must be recognized early in the design stage so that they can be referred to whenever required throughout the project's design phases.
- k. At a minimum, fire protection drawings show a proposed piping layout, pipe sizes, locations of ancillary equipment such as alarm valves and devices, inspector and fire department connections, fire pumps, main drains, anti-freeze loops and hose cabinets. Sprinklers are shown in a pattern meeting all room coverage and requirements of NFPA.
- l. The Fire Protection Engineer shall coordinate with the project structural engineer in the Schematic phase to determine the seismic design requirements for the project.
- m. All piping penetrations into different fire or smoke zones shall be protected with appropriately rated (fire or smoke) dampers and/or sealing compounds.

- n. Coordinate the Fire Protection equipment location with all the architectural and engineering trades right from the project outset.
- o. Identify through testing the existence of asbestos, and other hazardous materials in the work area during the Schematic Phase. Coordinate abatement scope of work and procedures with DDC OEHS unit via the project PM.
- p. Show results of flow test and hazard classification used for design on drawings for purpose of having installing Contractor perform hydraulic calculations.
- q. Provide documentation listed in NFPA 13 Chapter "Plans and Calculations" with the 100% Submission which includes, but is not limited to, the hydraulic calculations and hydrant flow test.
- r. Show service and location of nearest main for purpose of allowing installing Contractor to perform hydraulic calculations.
- s. Closely coordinate sprinkler locations with lights, HVAC outlets, architectural configurations, structural steel and ductwork. Coordinate location of alarm devices with the electrical designer.
- t. Consideration is given to shutdown of existing systems; i.e. – plan is in place for continuous service, firewatch, etc. and local fire department is notified.
- u. Generally, use the NFPA symbol list for all sketch and drawing representations.
- v. Final equipment choice shall be the result of a best value assessment which considers function, materials, features, O&M issues, costs and project budget.
- w. Confirm the location, type, thread of the fire department connection, post indicator valve and the stairway standpipe hose connection locations with the first responders.

x. Alarm and Flow Switches

An alarm valve shall be installed on the main service. Flow switches shall be installed on floor branches. System shall produce a water flow alarm and be capable of indicating the floor where sprinkler was activated.

y. System Design

System shall be hydraulically designed utilizing the most cost effective of the 'tree' or 'loop' type configuration. Minor alterations to an existing system may be done by the pipe schedule method. Whether hydraulically designed or designed by the pipe schedule method, the system shall comply with the requirements of NFPA-13 as modified by the Code. Schedule 10 piping may be utilized where allowed by Code.

z. Booster/Fire Pump

A sprinkler booster pump or fire pump system shall be provided if the hydraulic calculations indicate that street pressure is inadequate to properly pressurize the highest floor sprinkler heads. The Consultant shall submit hydraulic calculations, complete with a hydrant flow test letter from DEP. A five (5) psi safety factor shall be used in the calculations.

aa. Drawings/Shop Drawings

The Consultant's Sprinkler Drawings and the Fire Protection Contractor's Shop Drawings shall be dimensioned, including pipe sizes, distance between heads, and distance to walls, and shall include standard sprinkler notes as required by Code. The Shop Drawings are not permitted to reduce the size of risers, mains, or sub-mains. Only branch piping may be revised by the Contractor to accommodate the need for additional sprinkler heads or rerouting of piping due to interferences. Whether or not changes are made, the Consultant shall confirm that the hydraulic calculations provided by the Contractor's Engineer still provide for a minimum 5 psi safety factor. Upon approval of Shop Drawings and receipt of such confirmation, the Consultant shall amend the Contract Documents to match the approved Shop Drawings, and file with the Fire Department.

bb. Water Service

Water service up to and including the backflow preventer device for sprinkler systems and combined sprinkler/standpipe systems are designed by the plumbing trade.

cc. Fire Safety During Construction and Renovation Projects

Disruptions to fire alarm and sprinkler systems must be kept to a minimum or avoided. The fire protection engineer must delineate phasing of construction to ensure that installations of new systems are expedited, and existing systems are kept in service until the replacement system is operational. If fire protection systems are to be disrupted, procedures must be incorporated into the design to maintain equivalent levels of fire protection and provide formal notification to the facility while systems are down.

6) COMMISSIONING

See Chapter 07: Commissioning for more information.

M. HISTORIC PRESERVATION

1) INTRODUCTION TO HISTORIC PRESERVATION

The extent of Historic Preservation services will vary with the scope of work. Other services may be described in the Agreement. It is critical for preservation expertise to be brought to bear at an early planning stage, in pre-schematic or schematic design, regardless of whether the prime or a sub-consultant is responsible for historic preservation design work. Early decisions that define a project's direction can have serious implications for the historic and architectural integrity of a building or site beyond technical preservation and materials conservation. Historic preservation design criteria apply to work on structures, interiors, sites, streetscapes and works of art that fall into three categories based on the regulatory framework:

- a.** Designated New York City landmarks, interiors, scenic landmarks, and properties in designated historic districts -- including all features within the boundaries of scenic landmarks and historic districts -- are subject to regulatory oversight by the NYC Landmarks Preservation Commission (LPC). The Commission makes little distinction in regulatory procedure or standards between individual landmarks and properties within historic districts.
- b.** Properties that are not designated by the LPC but are of landmark quality, including those listed on or eligible for the New York State or National Registers of Historic Places, or eligible for local designation by virtue of their significant historic, cultural, architectural or landscape features, are not subject to regulatory oversight by the LPC. The determination of whether properties affected by a project are landmark quality is made by DDC's Historic Preservation Office (HPO) in consultation with the New York State Historic Preservation Office and the Landmarks Preservation Commission.
- c.** Projects affecting properties in both above categories may require review by the NY State Historic Preservation Office (SHPO) and under the City Environmental Quality Review Act (CEQR) or other environmental review laws, depending on funding sources and potential for adverse impacts on historic resources. Projects affecting works of art will also require review by the Public Design Commission.

2) STANDARDS AND GUIDELINES

Regardless of the outside regulatory framework, all projects affecting historic properties are reviewed by the DDC Historic Preservation Office for conformance with historic preservation standards, generally defined by LPC rules and guidelines and/or the Secretary of the Interior's Standards for treatment of historic properties. The Consultant must obtain from the HPO the latest published guidelines, standards, rules, application forms and instructions pertaining to historic preservation from any agency having jurisdiction over a designated property. The scope of the project will determine the most appropriate way to apply preservation standards. Every effort shall be made to achieve full compliance with the standards and to protect the historic and architectural features which support the designation, listing, or eligibility of the property.

3) CONSULTANT SERVICES

The extent of services described below may vary according to the overall scope of work and regulatory framework. Other services may be required and may be more fully described in the Project Objectives-Scope of Work or Task Order. Typically, required services include:

a. Research

Documentary, historical, and field research sufficient to inform the project scope and intent will provide a sound basis for design decisions and help in evaluating conditions exposed during probes and/or construction.

b. Evaluation of Significance

The Consultant is expected to prepare an evaluation of the relative importance of features relevant to preservation. The evaluation shall be based on research, and on an inventory of features such as spaces, materials, structural and other building systems, equipment, furnishings, stylistic details, craftsmanship, works of art, as well as historic or cultural significance.

c. Existing Conditions

The Consultant shall provide a conditions report based on observation, interviews, probes and tests. The Consultant is expected to identify, plan and oversee probes and tests, to provide detailed reports, and to incorporate results into the design strategy.

d. Documentation

In the absence of existing measured drawings, the Consultant shall produce a set of base measured drawings of historical features in the areas of work included in the scope. Throughout the project, the Consultant shall keep a record of all changes to existing and original features including materials, methods, design intent, and detailing. The Consultant shall provide photographic documentation of conditions and activities throughout the project.

e. Design Options

All design options shall respect and preserve the historic and architectural integrity of the structure or site. At least one option must fully conform to applicable LPC guidelines and rules and the Secretary of the Interior's Standards. Any project affecting a historic resource, even if it primarily involves non-architectural trades or is not specifically for historic preservation, can have preservation implications, which must be considered in the design. Each scheme must fully explain the approach and the consequences as they relate to preservation issues. Each scheme must also be accompanied by a cost estimate and must include a life-cycle analysis with long-term cost/benefit scenarios.

f. Salvage of Historic Artifacts

Architecturally and historically significant features and fixtures such as sculpture, doors, woodwork, light fixtures, and furnishings should be incorporated into the project, preferably in their original locations or elsewhere on the project site. If a reuse on site cannot be found, the Consultant is to arrange for their relocation or reuse by the sponsor agency. If not practical, the Consultant is to arrange some other disposition that preserves the historic material for re-use. The contract documents shall reflect these determinations.

g. Historic Structures Reports

Preservation services rendered as part of the project shall be documented in a way suitable for inclusion in a historic structure report (HSR), noting all sources of information, both written and graphic. The Agreement for a project may require the Consultant to produce a complete HSR as part of the project scope.

h. Application for Eligibility

The Consultant may be required to prepare an application for the determination of eligibility for the National or State Historic Register as an additional service.

i. Special Experience Requirements

When the construction contract calls for special experience requirements, the Consultant shall assist in the review and verification of the special experience qualifications submitted by the Contractor and/or proposed sub-contractors. The Consultant may be required to participate in site visits to view qualifying work.

j. Historic Preservation Specialists

The Consultant shall provide a full range of preservation and conservation services by qualified experts. These experts shall be used wherever appropriate, in all phases of the project, including construction. The level of their participation and the extent of their responsibility shall be clearly defined at the beginning of the project. Specialists who may be required include, but are not limited to: historians, archaeologists, architectural and art conservators, materials specialists, historic structural and systems engineers, historic landscape architects, and advisors on special crafts associated with historic properties.

k. Maintenance Handbook

The Consultant shall provide a maintenance handbook addressing all features and finishes related to the historic preservation work. These may be conserved and restored features, new features that replicate historic features, or other features and finishes that are complementary to the work and contribute to the historic and architectural character of the building or site. The handbook should include requirements and recommendations from manufacturers and suppliers of any materials or fixtures.

CHAPTER 07: COMMISSIONING

- A. INTRODUCTION
- B. COMMISSIONING AGENT
- C. SERVICES
- D. DELIVERABLES
- E. COMMISSIONING DESIGN GUIDANCE

A. INTRODUCTION

Commissioning is a quality control process for verifying that projects are designed, constructed, and operated as intended. It includes clearly documenting Sponsor Agency expectations, reviewing drawings to verify that these expectations are met, and site inspections and testing during the construction phase to make sure that installation conforms to the design.

B. COMMISSIONING AGENT

A Commissioning Agent is an owner's representative, managing the commissioning process and reporting directly to the owner. DDC retains third-party Commissioning Agents through a separate contract for projects that are pursuing LEED certification, for projects that require commissioning to comply with the New York City Energy Conservation Code, and for projects with large or complicated systems at the discretion of DDC and the Sponsor Agency. The Consultant shall assist and support the Commissioning Agent throughout the project. The Commissioning Agent will work with the Consultant team to clarify Sponsor Agency goals and make sure that the design addresses those goals through implementation of a Commissioning Plan. Please note that the term "Commissioning Agent" may refer to one or more individuals from one or more consulting companies.

C. SERVICES

1) COMMISSIONING MEETINGS

- a. The Consultant shall participate in a Design Phase Commissioning Kickoff Meeting prior to the final Schematic Design Submittal. At this meeting, the Commissioning Agent will present an overview of the commissioning process to the team. This meeting may be an allocated portion of a biweekly progress meeting.
- b. The Consultant shall participate in an Owner's Project Requirements (OPR) Development Meeting during early Design Development to gather any outstanding information required from the Sponsor Agency to complete the OPR.
- c. If applicable, the Consultant shall participate in a Monitoring-Based Commissioning Meeting during Design Development. At this meeting, the Consultant, his/her LEED Consultant, and the Commissioning Agent will present the requirements for the monitoring-based commissioning program. The Sponsor Agency will provide feedback to clarify their expectations and capabilities to support monitoring-based commissioning. The CxA will then provide a monitoring-based commissioning plan and the Consultant shall ensure that the final design supports the plan.
- d. The Consultant shall participate in other commissioning meetings as required throughout the process, at the discretion of DDC.
- e. The Consultant shall ensure the participation of the appropriate team members and sub-consultants in any and all commissioning meetings, including but not limited to the LEED Consultant, MEP Engineer, Lighting Designer, and Envelope Consultant.

D. DELIVERABLES

1) DOCUMENTATION OF PROJECT INTENT

The Consultant shall produce a narrative of the design intent, in the form of an Owner's Project Requirements (OPR) and Basis of Design (BOD). These documents shall memorialize the intent of the project, including the intended function, any project-specific requirements or expectations, and how the design proposes to meet these requirements.

The Consultant shall develop:

a. Owner's Project Requirements (OPR)

- i. The OPR shall clearly outline the project goals and the intended operation of the building. This shall include project scope, building use, occupancy information and schedules, budget constraints, energy efficiency goals, verifiable performance criteria, and operations and maintenance requirements. It must address all systems to be commissioned, as well as the building envelope.
- ii. The Consultant shall provide a draft OPR document with the SD submittal, and a final OPR Document with the DD submittal. The OPR shall be updated and resubmitted during CD at the discretion of DDC and will be required typically only in the event of significant change in project scope or intent.
- iii. For projects following an expedited design track, the Consultant shall submit the draft OPR two weeks after the SD2 submittal. The final OPR shall be included at the next submittal milestone.
- iv. Upon request, the Commissioning Agent will provide an OPR template to the Consultant team to guide the development of this document.
- v. DDC will hold an OPR Development Meeting to clarify the Sponsor Agency's expectations and incorporate this input into the document.
- vi. The Sponsor Agency must approve the final OPR.

b. Basis of Design (BOD)

- i. The Basis of Design explains how the proposed design will meet the requirements and expectations outlined in the OPR. It shall describe the selected systems and explain anticipated facility operation. The BOD shall document the rationale for the design, including codes and standards, direction from the Sponsor Agency, concepts, calculations, design methods, and software used. The BOD shall include a history of revisions to the project, explaining the reasons for changes throughout the project phases.
- ii. The Consultant shall provide a draft BOD document with the SD submittal, and a final BOD Document with the DD submittal. The BOD shall be updated and resubmitted during CD at the discretion of DDC and will typically be required only in the event of significant change in project scope or intent.
- iii. For projects following an expedited design track, the Consultant shall submit the draft BOD two weeks after the SD2 submittal. The final OPR shall be included at the following submittal milestone.
- iv. If required for compliance with LEED certification target, Low Energy Building measurement and verification, or the benefit of the project at the discretion of DDC, the BOD shall include a Monitoring-Based Commissioning Protocol. Such Protocol

shall include the elements outlined in Chapter 08: Sustainability and Resiliency, A Sustainability, Section 4 Deliverables, c Low Energy Intensity Buildings, iv Metering and Verification Equipment/Monitoring-Based Commissioning Protocol.

2) COMMISSIONING SPECIFICATIONS

- a.** The Commissioning Agent will provide Commissioning specifications to the Consultant during the design process.
- b.** The Consultant shall coordinate the Commissioning specifications with the project specifications and incorporate them into the project specifications no later than the 75% CD submittal.

3) DESIGNING FOR COMMISSIONING

The Commissioning Agent will perform design reviews of the Consultant's submittals. The Consultant shall respond, in writing, to all comments from the Commissioning Agent and incorporate their comments into the design documents. For LEED projects, the Consultant shall be responsible for formatting the comment responses for upload to LEED Online. Commissioning review comments shall be integrated into the Design Documents as required until all review comments are closed by the Commissioning Agent.

The commissioning review is intended to comment on system functionality and control, instrumentation, energy performance, water usage performance, access and maintainability, sustainability, and indoor air quality impact. Other areas of comment may include constructability, cost efficiency, LEED compliance, document clarity, and clarity of scope. A detailed list of commissioning review items is provided below, in Section E: Commissioning Design Guidance below.

4) CONSTRUCTION PHASE COMMISSIONING SUPPORT

Consultant shall provide support for commissioning activities during the construction phase of the project. Such support services include:

- a.** Meetings and Site Visits: The Consultant shall attend the Construction Phase Commissioning Kickoff Meeting, and other commissioning meetings, site visits, and performance tests as required.
- b.** Contractor Submittals: Consultant shall coordinate the review of Contractor submittals with the Commissioning Agent, prior to approving submittals. Commissioning Agent will review for conformance with Design Documents, and adherence to the requirements documented in the OPR and BOD. The Contractor shall incorporate the commissioning comments into their response to the Contractor.
- c.** Requests for Information (RFI): The Consultant shall make any and all RFIs available to the Commissioning Agent, for incorporation into their testing procedures.
- d.** Consultant shall support commissioning team and Contractor in resolution of issues, providing prompt clarification as required.
- e.** Operations and Maintenance Manuals: Consultant shall coordinate the review of Operations and Maintenance Manuals with the Commissioning Agent, prior to acceptance. Commissioning Agent will review for accuracy and completeness of manuals. The Consultant shall incorporate commissioning comments into their response to the Contractor.
- f.** As-Built Drawings: Consultant shall coordinate the review of As-Built Drawings with the Commissioning Agent, prior to acceptance. Commissioning Agent will review As-Built drawings for accuracy and completeness. The Consultant shall incorporate commissioning comments into their response to the Contractor.
- g.** LEED Documentation: For all LEED projects, the Consultant shall review all LEED submittals, provide guidance as required, and assist in uploading the proper documents to the USGBC.

E. COMMISSIONING DESIGN GUIDANCE

- 1) The Commissioning Agent's review will typically include the following items, as applicable to the project scope. The Consultant shall incorporate these elements into the Design Documents:

a. General

- i. Concise and complete Commissioning specifications are included, both as a stand-alone administrative section (provided by DDC's General Conditions) and in individual equipment sections (provided by the Commissioning Agent). The Consultant shall incorporate these specifications into the project documents.
- ii. Drawings comply with the OPR and BOD.
- iii. Complete Operations and Maintenance (O&M) requirements are included in the specifications.
- iv. Drawings show important mechanical details such as coil piping, diffuser connections, and pumps, etc.
- v. Critical section views and exploded plan views are included for congested areas and mechanical rooms with restrictive ceiling heights.
- vi. Ductwork is drawn double-line for main trunks, around AHUs, and in corridors to verify adequate installation space and reduce interferences.
- vii. Duct and piping risers are labeled for size, service, and continuation point.
- viii. Equipment schedules are complete, list make and model numbers, match other drawings, and performance data appears sensible. Equipment schedule shall match equipment unit labels on plans.
- ix. Pipe sizes are shown on the plans; piping is clearly identified.
- x. Sheet notes are clear and adequate to describe the work.
- xi. Room names and numbers are shown.
- xii. Multiple, secondary equipment (e.g. VAV boxes) have distinctive, individual tag numbering and equipment schedules sufficient for identification of the equipment during TAB, commissioning, and building operation and maintenance; the tag number is consistent on all drawings and on the equipment schedule.

b. Demolition

- i. Limits of demolition are well-defined. New points of connection correspond to points of connection on the demolition drawings.
- ii. If covers and other accessories (e.g. fin tube covers) are removed during demolition, they are clearly labeled for replacement in the drawings indicating new work.
- iii. If demolition cross hatching is applied to an area, anything in the area that should not be removed is clearly defined.

c. Design Concepts

- i. Redundancy of the equipment has been considered and explained in the documents and complies with the OPR and BOD.

- ii. HVAC design has considered part-load and off-peak conditions; systems have adequate ramp-down function and can operate efficiently at less than full load (e.g. VAV, staging).
- iii. Constant volume HVAC equipment has features to control humidity at part load, such as hot gas bypass, reheat coils, or VFD compressors.
- iv. Temperature zoning appears correct. There is no conflict between interior and exterior zones. The number of zones seems appropriate for the building and use.
- v. Any space humidity requirements can be met by the specified equipment; humidifiers and/or dehumidifiers are included as needed.
- vi. Selected equipment and systems are generally considered reliable and easily maintained; systems are not unusual or unnecessarily complex.
- vii. Diversity has been applied to VAV system design, and AHUs are sized accordingly.
- viii. Minimum flowrates can be maintained through boilers and chillers with VFD pumps, or bypass loops are required.
- ix. Alternative HVAC system designs that might improve cost, efficiency, reliability, simplicity, zoning, space, maintenance, or other concerns should be considered.

d. Equipment Access

- i. Equipment has access space for service and maintenance.
- ii. Equipment has clearance space for tube pulls, removals, and door swings.
- iii. Equipment location can be safely accessed (e.g. hatches, permanent ladders, stairwells to roof, and clear passageways)
- iv. Equipment is not blocked by other equipment or utilities.
- v. Access doors and panels are shown on drawings with notes.
- vi. Instruments and controls are accessible.
- vii. AHU filters can easily be replaced. Panel swings are acceptable.
- viii. Valves are accessible and visible.
- ix. Access spaces between AHU coils for cleaning have been provided.
- x. Avoid installing equipment above hard ceilings.
- xi. Avoid installing VAV's or reheat coils above furniture or partitions.
- xii. Large equipment can be feasibly installed or rigged through doors, roofs, basements, halls, etc. Access allows equipment to be replaced in future.
- xiii. Adequate clearance for electrical panels is provided.
- xiv. Space exists for future additional equipment, if applicable.
- xv. VFD cabinets and DDC panels are shown on walls or equipment.

e. Noise and Vibration

- i. Equipment has vibration/spring isolators or inertia bases.
- ii. Piping near equipment has spring hangers.
- iii. Connections to rotating equipment have flex connectors.
- iv. Sound traps are installed in ductwork, if required.
- v. Equipment is not installed below or above sound-sensitive areas.
- vi. Ductwork has acoustical lining.

f. Commissionability and Testing, Adjusting, and Balancing (TAB)

- i. Isolation valves are provided at all equipment.
- ii. Pressure gages, thermometers, P/T plugs and flowmeters are available at all equipment for testing.
- iii. Branch volume dampers in ductwork are provided.
- iv. Sufficient straight duct sections are included for manual pitot traverses or airflow monitoring stations.
- v. Balancing valves are shown at base of main piping risers.
- vi. Pumps have appropriate balancing accessories. Coils have balancing valves.
- vii. Airflow diagrams are recommended to aide with air balancing and zoning analysis.
- viii. Water system flow diagrams are included to show piping circuit design, pump accessories, air control devices, and make-up water connections.
- ix. The Testing and Balancing specification is adequately detailed and certification requirements are included.

g. Ductwork

- i. No ductwork is exposed to the weather. All ducts from roof top equipment enter straight down through roof curbs for equipment.
- ii. Duct seal class and pressure class is specified or shown on plans. Duct gages should comply with SMACNA guidelines.
- iii. There are no excessive duct fittings around air handling units, creating high-static system effects and excessive losses.
- iv. VAV boxes have uniform inlet connections.
- v. Rectangular to round duct transition to VAV has the recommended minimum length for proper flow development.
- vi. Volume dampers are shown at all diffusers and grilles.
- vii. Fire dampers are located at appropriate wall/floor penetrations. Access doors are provided at fire dampers.
- viii. Duct sizes are designed for proper velocity (random check).
- ix. Duct liner is clearly specified and locations are indicated.

h. Typical Issues

- i. The distance between the cooling tower basin and the condenser pumps allows for adequate Net Positive Suction Head.
- ii. Drawings show the Engineer has considered the existing structural elements and other components as potential interferences in routing ductwork and piping (e.g. using "high" ducts in shallow ceiling).
- iii. Roof penetrations for piping and ducts are kept to a minimum, and all go down through equipment curbs. Where required, penetrations are better through vertical walls (such as roof equipment penthouses).
- iv. Piping and duct penetrations through walls and slabs should be sealed
- v. Relief valves for boilers, chillers, and other equipment are shown along with vent piping.
- vi. Chemical water treatment equipment is shown for piping systems.
- vii. Alternate piping methods (e.g. Victaulic, PEX, crimping) are specified or permitted.

- viii. Specifications are included for pipe pressure testing and cleaning and duct leakage testing.
- ix. Vents are shown at high points of piping systems or required by notes.
- x. Heaters are provided in stairwells, entrances, toilet rooms, and mechanical rooms.
- xi. Ventilation or cooling has been provided for electrical closets and elevator equipment rooms.
- xii. If glycol solution is needed for freeze protection, the pumps, coils, and other equipment are rated for glycol.
- xiii. Freeze protection schemes (heat tracing, insulation, pumps, etc.) are indicated.
- xiv. Piping is not installed in electrical rooms or complies with all code clearance requirements.
- xv. Automatic isolation valves are provided at multiple chillers and boilers. Where possible, isolation valves shall be easy to access without the aid of ladders.
- xvi. Return air path and/or ductwork is clearly shown.

i. Air Handling Units and Fans

- i. AHU Schedule has appropriate and required data: e.g. face velocity, coil heat balance, flowrates, filter efficiencies, and static pressures.
- ii. Fan motors have 20% safety margin over calculated brake horsepower, to allow for adjustments during TAB and inefficient field duct conditions.
- iii. Condensate drain traps are detailed and sufficient height is available. Condensate drains should be sloped away from the unit and piped to the nearest drain.
- iv. Adequate access space is provided between heating and cooling coils for cleaning and temperature sensors.

j. VAV boxes

- i. Responsibility for providing/mounting/installing VAV controls is clearly stated.
- ii. Drawing details show a minimum of 3 duct diameters of straight duct upstream of inlet.

k. BAS/BMS and Controls

- i. Detailed and complete written sequences of operation are provided for all systems, and all equipment has a corresponding sequence of operations.
- ii. Control points are labeled on flow diagrams/schematics.
- iii. Sufficient points are available to facilitate performance verification and O&M.
- iv. The BAS includes adequate trending and reporting features.
- v. VAV duct static pressure sensor locations are shown.
- vi. Chilled and hot water loop differential pressure sensor locations are indicated, and isolation valves and pressure gages are provided at transmitters.
- vii. Room thermostats and space humidity sensors are shown.
- viii. Flowmeters and air monitoring stations have proper downstream dimensions.
- ix. A BACnet or Lonworks generic DDC interface has been specified for equipment (e.g. chillers, boilers, RTUs) and vendor responsibilities are clearly noted. Specified BAS protocol is compatible with equipment controller protocols
- x. A BAS point list is included. Control or monitoring points to be available to BAS from other equipment's control panels (e.g. chiller) is provided.

- xi.** Sequences of Operation correspond to AHU and other equipment details on the drawings.
- xii.** Boiler/Chiller room safety equipment, interlocks, and alarms are specified.
- xiii.** Chillers and boilers have automatic isolation valves if needed for lead/lag sequencing.
- xiv.** Controls schedule/part number list is included on the drawings.

I. Sequence of Operations

- i.** Morning warm-up and cool-down modes are described.
- ii.** Economizer sequence is applied. Enthalpy sensors are used, if appropriate.
- iii.** Occupied and unoccupied sequences are described.
- iv.** A fire and emergency power response matrix is provided for HVAC systems, lighting, alarms, and generator during power outage or fire alarm.
- v.** The emergency shutdown and fire alarm sequences are described.
- vi.** Chilled water system sequences are provided, including start/stop, temperature control, lead-lag, loading and unloading, and primary-secondary operations.
- vii.** VFD control of pumps and fans is described.
- viii.** Ventilation mode (Carbon dioxide) control is described, including overrides with temperature.
- ix.** Energy and/or heat recovery sequences are explained, with setpoints.
- x.** Freeze protection strategies are included.
- xi.** Mechanical Room ventilation is described, including refrigerant leak mode
- xii.** Kitchen Exhaust and make-up air sequence are described; including Ansul suppression system equipment interlocks.
- xiii.** Hot water heating system sequences including start/stop, temperature control, lead-lag, primary-secondary operations are provided. Heat recovery feature has been explored.
- xiv.** Supply fan and return fan tracking strategy is provided.
- xv.** Sequences are included for stand-alone equipment not interfaced to BAS.

m. Indoor Air Quality

- i.** Outdoor air intakes at louvers or rooftop units are not close to exhaust fans, cooling towers, plumbing vents, or boiler stacks.
- ii.** Outdoor air intake louvers are not close to loading docks, traffic, or dumpsters.
- iii.** Exhaust fans serve photocopy rooms, storage rooms, break rooms, labs, etc.
- iv.** Ventilation rates will be met when VAV boxes are at minimum air flow condition, and calculations or procedures are included.
- v.** Air filters are the appropriate efficiency for the application, and meet applicable LEED requirements. Filter rack appropriate for filter size and specification.
- vi.** The use of duct liner and exposed insulation in AHUs has been evaluated as a potential source of microbial contamination and debris, and the potential for such contamination has been minimized.
- vii.** Demand control ventilation strategies using CO2 sensors have been considered. Sensors have been located adequately and protected from tampering.

n. Operations and Maintenance

- i. Valves are provided at all piping risers and main branches. Valves meets recognized quality standards.
- ii. O&M Manual requirements are included in the specifications.
- iii. Owner orientation requirements are included in the specifications.
- iv. Equipment warranty requirements are detailed in specifications.

o. Plumbing

- i. AHU condensate drains are piped to floor drains.
- ii. Floor drains have trap primers where needed.
- iii. Floor drains are properly vented.
- iv. Proper backflow prevention devices are specified.
- v. Hot water return system is indicated.
- vi. Domestic make-up water is shown for HVAC systems fill.
- vii. Roof drains are combined with overflow drains.
- viii. Plumbing drawings include riser diagrams with pipe sizes and fixture units shown.
- ix. A domestic water booster pump is provided if required.
- x. Specifications include sterilization of domestic water piping.
- xi. Gas pressure regulators are provided at appliances or equipment, if needed.
- xii. Water hammer arrestors are included in the specifications, if needed.

p. Coordination

- i. The voltages and phase information provided on the mechanical equipment schedules match the electrical drawings.
- ii. MEP equipment structural, space, and clearance requirements have been reviewed.

q. Electrical

- i. Emergency generator loads are listed, and support life safety, data backup, communications, heat, food refrigeration, or other Sponsor needs.
- ii. Sequences of operation are specified for emergency generators, automatic transfer switch, and uninterruptible power supply.
- iii. Fire and Emergency Power Response Matrix are included.
- iv. Furnishing and installation of duct smoke detectors are coordinated with Trades.
- v. Drawings show important typical Electrical details such as conduit penetrations, ductbank sections, grounding, lightning protection, cable supports, power, and control connections at fixtures, equipment and components, manholes, and handholes.
- vi. Drawings show important Schedule Details such as Cable and Conduit Schedules, Panel Schedules, Lighting Fixture Schedules, Specialty Wiring Device Schedules (or equivalent details), and Low Voltage and Alarm Component Schedules (or equivalent details).
- vii. Drawings show important One Line, Riser, and Block Diagrams such as Overall Power one line; Sub System Swbd or MCC one lines; Process and Instrumentation Diagrams (P&IDs); Power, Fire Alarm, and Low Voltage Risers; and Major Interconnection Block Diagrams.

- viii.** Circuits on emergency power should be clearly indicated on the plans.
- ix.** Major conduit runs are laid out to ensure there are no conflicts with piping and ductwork. Plan drawings show large numbers of conduits as a bank of conduits drawn to scale (in width) with a section taken to show height and width dimensions and conduit identifications, not as a single line.
- x.** Temporary power is shown and/or specified in adequate detail to be accurately bid and to provide the temporary power required to execute the work. It is clear who provides temporary power for the other Contractors, who pays the Utility Bills, and how they are paid.
- xi.** Specifications require vendor or Contractor submit Factory Test procedures and check lists.
- xii.** Equipment has clearance space for circuit breaker rack out, removals, door swings, etc.
- xiii.** Equipment location can be safely accessed: hatches, ladders, clear passage ways. Room for future growth is provided, if appropriate.
- xiv.** Electrical equipment rooms do not have other unrelated systems running through them.
- xv.** Access doors and panels are shown on drawing or with notes.
- xvi.** All mechanical equipment and controls are included on power plans (e.g. condensate pumps, small heaters, small booster pumps, BAS panels, heat tracing, chemical treatment equipment, automatic valves, VAV box transformers, air compressors).
- xvii.** Power to plumbing automatic flush valves and faucets has been coordinated. Power to electronic trap seal primers is provided.
- xviii.** Furnishing and installing of motor starters, disconnect switches, VFDs is clearly defined by Trade.
- xix.** Convenience receptacles and lighting are provided at rooftop HVAC units and fans, if required.

r. Envelope

- i.** The construction documents include documents for a partial building enclosure mockup, if applicable.
- ii.** The air barrier, insulation, vapor barrier, and weather resistant barrier are continuous. Interruptions in any of these barriers create opportunities for the development of condensation and moisture infiltration in the exterior walls or roof.
- iii.** The wall system is free of thermal bridges, which may be a source of condensation within the wall system in cold climates.
- iv.** The details describing interruptions in the typical exterior wall system (typically around windows, doors, and skylights) ensure adequate joinery in air, vapor, weather, and thermal barriers bridging the typical wall with the window and door systems.
- v.** Materials within the exterior wall systems provide adequate accommodation of differential movement resulting from thermal stresses.
- vi.** The materials within the exterior wall systems accommodate movement resulting from moisture absorption and evaporation. Some envelope materials are absorptive which cause changes in size and movement that must be properly accommodated during design.

- vii.** All joinery of exterior wall systems is detailed to ensure no water infiltration paths, and the building is designed to be completely watertight. Liquid water can penetrate a wall system via gravity, capillary suction, surface tension, kinetic energy, hydrostatic pressure, and air pressure. All wall systems are designed to ensure adequate drainage paths for water to exit.
- viii.** All components of the exterior wall systems can safely permit the naturally occurring movements that all buildings experience during their lifetime. Sealant joints are included and sized appropriately to allow for the natural deflection of structural beams, lintels, and angles. Adequate construction tolerances are provided between wall systems and structural systems, and between distinct wall systems. Details depict the actual sizes of wall components.
- ix.** Roof assembly is complete. If rigid insulation is used, adequate materials are provided to protect insulation boards during construction. Adequate protection from moisture migrating out of the concrete roof slab is provided.
- x.** Adequate drainage is provided for all surfaces of the roof. Drainage is not to be impaired by normally deflecting structural roof members, mechanical equipment, inadequate slope, etc.
- xi.** Adequate descriptions are provided for all roof penetrations, including plumbing vents, roof drains, supports/legs/curbs for all mechanical equipment, mechanical piping, conduits, roof hatches, etc.
- xii.** Materials within the roof system allow for adequate accommodation of differential movement resulting from thermal stresses.
- xiii.** Effective and current field testing (performance testing) methods are specified, as agreed by DDC and the Sponsor Agency.
- xiv.** Review of construction drawing details for compliance of materials with thermal resistance values per design.

CHAPTER 08: SUSTAINABILITY AND RESILIENCY

A. SUSTAINABLE DESIGN

B. RESILIENT DESIGN

A. SUSTAINABLE DESIGN

1) INTRODUCTION

NYC and DDC have a long history of supporting sustainable design, starting with the *High Performance Building Guidelines*, published by DDC in 1999. Mayoral initiative followed with *PlaNYC* in 2007 (updated 2011) and the *Greener, Greater Buildings Plan* of 2009.

Mayor de Blasio's 2014 initiative, *One City: Built to Last*, followed this trajectory, enacting laws to ensure that the City leads by example in efforts to reduce greenhouse gas emissions from buildings. Pursuant to Local Law 66-2014, which committed the City to reduce its greenhouse gas emissions 80% by 2050, the Mayor's Office of Sustainability published *New York City's Roadmap to 80 x 50*.

The latest *OneNYC 2050* strategic plan reaffirms these commitments, and is supported by a set of new local laws known as the Climate Mobilization Act, requiring even greater effort to reduce greenhouse gas emissions and achieve carbon neutrality by 2050.

DDC approaches all projects it administers with the goals of reducing energy use, conserving water and other natural resources, and creating a healthy and resilient city. Environmentally sustainable, high performance design and construction standards shall be fully integrated into all projects. At a minimum, the Consultant shall meet the requirements of all City green buildings laws. Where feasible, and without adding to the project's cost or schedule, the Consultant's design shall exceed the minimum legal requirements for energy efficiency, water use, stormwater management and indoor air quality.

2) NYC GREEN BUILDING LAWS

The Consultant is responsible for complying with all relevant local, state and federal regulations applicable to the project. The following are some local laws, directives and guidelines that apply to DDC projects at the time of publication. This list is provided for the Consultant's convenience and is by no means exhaustive. The Consultant is responsible for researching all applicable laws, including all new laws effective at the time the project is initiated.

- a. New York City Energy Conservation Code (NYCECC): The Consultant shall design the project per the NYC ECC current at the time of filing and provide all documentation required to meet current Department of Buildings submission requirements. The Consultant is advised that the energy code updates approximately every three years.
- b. Local Law 86-2005 (LL86) mandates energy and water efficiency and Leadership in Energy and Environmental Design (LEED) certification for certain buildings. This law is codified in Chapter 9, Section 224.1 of the NYC City Charter and is still applicable for buildings added to the capital plan prior to July 1, 2017.
- c. Local Law 32-2016 (LL32) is an update to LL86's LEED requirements, and Local Law 31-2016 (LL31) is the new low energy intensity buildings law which updates most of the energy performance requirements. These laws are codified in the same section of the charter as LL86.
- d. Local Law 118-2005 establishes Environmentally Preferable Purchasing (EPP) requirements for eligible projects not required to pursue LEED under Section 224.1.

- e.** Local Law 66-2014 (LL66) commits the City to reduce its greenhouse gas emissions 80% by 2050, relative to 2005 levels, in order to help limit global warming to 2.0°C above pre-industrial levels.
- f.** Executive Order 26-2017 (EO26), requires City agencies to reduce the energy consumption of their building portfolios 20%, relative to 2017 levels, by 2025.
- g.** Local Law 97-2019 (LL97) mandates a 40% reduction in greenhouse gas emissions from City government operations by 2030 and 80% reduction by 2050.

The Consultant shall consult with the Sponsor Agency to determine the impact of the project on these targets and establish energy consumption and greenhouse gas emissions goals for the project that reflect the requirements of LL66, EO26, and LL97. The goals statement shall incorporate the findings of any energy audits, as applicable, per section A.4.b.i.

- h.** Local Law 22-2008 requires the City to publish its greenhouse gas inventory on an annual basis.
- i.** Local Law 94-2019 (LL94) mandates sustainable roofing zones on all new buildings, new roofs resulting from enlargement of existing buildings and existing buildings replacing an entire roof deck or roof assembly. 100% of available roof space must integrate either a solar photovoltaic electricity generating system, a green roof system, or a combination thereof. LL94 also updates reflectance requirements for cool roofs.
- j.** Local Law 6-2016 (LL6) requires new municipal buildings and HVAC retrofits to utilize the online NYC Geothermal Pre-Feasibility Tool to assess ground-source heat pumps (GSHP) as an alternative to other HVAC system designs. If the screening tool finds that a full or hybrid GSHP system is potentially viable for the project, LL6 requires a comprehensive engineering and cost analysis. If the analysis finds that GSHP has the best net present value of all alternatives considered, LL6 requires that GSHP be selected for implementation.
- k.** Local Law 24-2016 requires all projects to provide the Department of Citywide Administrative Services (DCAS) an assessment of the solar photovoltaic (PV) potential of each city building with a floor area of 10,000 gsf or more, and to identify the cost, energy cost savings, and greenhouse gas emissions reductions of a PV system that fulfills this potential. Required procedures are outlined in the DCAS Solar 100 Report.
- l.** Local Law 130-2013 introduces Electric Vehicle Capacity requirements for parking lots and facilities to support electric vehicle charging stations.
- m.** Executive Order 359-2013 requires all municipal new and major renovation projects to complete the City's Active Design Guidelines checklist and implement the Active Design Guidelines and DOT Street Design Manual guidelines determined to be relevant and appropriate to the project. It also requires all municipal LEED projects to pursue the Design for Active Occupants credit, whenever practicable.

3) PERFORMANCE REQUIREMENTS

a. System-Based Energy Cost Reductions

Certain mechanical and electrical systems projects, which are not subject to whole building energy performance requirements, or the low energy intensity criteria (see section c below), are required to meet minimum 5-10% energy cost reduction targets beyond code.

b. Whole Building Energy Cost Reductions

In addition to possible LEED requirements, certain projects over \$12 million in construction cost and not required to be low energy intensity buildings (see section c below) are required to exceed energy cost reduction beyond code by specific percentages.

- i. Projects over \$12m shall be designed to achieve a minimum 20% energy cost reduction relative to the NYCECC in effect at the beginning of Design Development, and up to an additional 5-10% reduction if there are additional energy efficiency measures with a simple payback of seven years or less.
- ii. Projects over \$30m shall be designed to achieve a minimum 25% energy cost reduction, and up to an additional 5% reduction if there are additional energy efficiency measures with a simple payback of seven years or less.
- iii. **Energy cost reductions shall be calculated using LEED methodology.**

Refer to the Mayor's Office of Environmental Coordination website for more information. Should the construction cost increase above a higher threshold at any time before the final construction Certificate to Proceed, the associated energy cost reduction target for the higher threshold applies. Therefore, projects close to the thresholds shall be designed with this in mind.

c. Low Energy Intensity Buildings

Most new buildings, additions, and major renovations are required to be designed and constructed to use half the energy of a similar conventional building. "Half" is defined as 50% of an ASHRAE 90.1-2013 baseline or half the Energy Use Index (EUI) of buildings of a similar type as determined by the city's benchmarking database (as measured in kBtus of source energy per sf of building area per year). There is a third, typically stricter, compliance path similar to the Passive House standard.

Energy performance needs to be considered early in the design process. It is, therefore, imperative to use an Integrative Process per Sections A.3.j and A.6.f.i. Simple box models are required before a Schematic Design can be approved. Updated and further developed energy models are required at each subsequent phase.

d. Onsite Energy Generating Buildings

Low energy intensity projects pursuant to "c" above shall consider the feasibility of design and construction of a building that generates 10% or more of its total energy needs onsite.

e. Net Zero Energy Building

Low energy intensity projects pursuant to "c" above that are three stories or fewer must also consider the feasibility of design and construction of a building that generates 100% of its energy needs onsite.

f. Water Efficiency

All projects shall be designed to maximize water efficiency. For LL86 and LL32 projects involving the installation or replacement of plumbing fixtures with domestic plumbing costs greater than \$500,000, the City Charter mandates a minimum 30% potable water use reduction, to be calculated using the methodology prescribed in LEED.

g. Stormwater Management

Stormwater in NYC is managed with two system types.

- i. Combined sewers combine stormwater and sanitary waste into one conveyance system which typically transports wastewater to a treatment plant for processing. During heavy rainfall, these systems overflow into local waterways at a combined sewer outfall (CSO). Reducing the quantity of flow in these areas is paramount.

Some limited areas in the combined sewer network have high-level storm sewer lines which allow stormwater to overflow while prioritizing the sanitary waste to be treated. Projects in areas with high-level storm sewers are subject to the requirements of the City's MS4 permit (see below).

- ii. The Municipal Separate Stormwater Sewer System (MS4) has separate stormwater and sanitary sewers. The stormwater drains through city infrastructure and into local waterways with no or only very limited treatment. This also includes "direct drainage" sites where the water drains directly into a waterway without passing through any city infrastructure and "overland sites" where the water may pass over city streets but not through dedicated stormwater conveyance infrastructure. Maintaining the quality of the water is paramount in these areas.

The Consultant shall confirm which stormwater system applies to their project and meet the applicable requirements. Projects in MS4 areas and high-level combined sewer areas must comply with the general NYC MS4 (SPDES Number NY-0287890) from the NYS Department of Environmental Conservation. Five aspects of the permit impact capital construction projects:

- i. Site Assessments: The Departments of Transportation, Environmental Protection, Police, Fire, Sanitation, and Parks and Recreation are required to conduct assessments of their properties and create a plan to eliminate or reduce pollutants of concern from entering waterways. Many of these plans will require capital improvements. Therefore, these plans shall be used in the scoping and development of any capital project.
- ii. Illicit Discharges: All NYC employees are mandatory reporters of illicit discharges. The Consultant shall also report any illicit discharges to the DDC project manager, sustainability project director, and 311.
- iii. Green Infrastructure: All projects over \$2 million which generate stormwater will need to be assessed for the feasibility of green infrastructure per the process in the MS4 permit.
- iv. Construction Permits: Projects over one acre of disturbed area (soon to be reduced to 20,000 square feet) are required to prepare a Stormwater Pollution Prevention Plan (SWPPP) and obtain a permit from the Department of Environmental Protection. (Formerly, such permits were issued by NYS Department of Environmental Conservation.)
- v. Post-construction Permits: For certain projects, post-construction measures are necessary and will require a Post-Construction permit.

The Consultant shall ensure that all projects conform to all federal, state, and local laws regarding stormwater management and assist in obtaining all permits.

Projects that are required to be Low Energy Intensity Projects must also assess feasibility of green infrastructure.

As a matter of good practice, all projects should incorporate green infrastructure where practicable.

h. Environmentally Preferable Purchasing Projects

Environmentally Preferable Purchasing (EPP) is typically required of projects 15,000 sf of interior project area and greater. This is based on project size, not building size. This includes projects that involve multiple buildings, if the total interior area exceeds the threshold. Conversely, projects smaller than 15,000 sf in larger buildings are exempt.

Projects that are required to comply with the LEED provisions of Section 224.1 (LL86 and LL32) are exempt. Projects that are required to comply with the system-specific requirements of Section 224.1 are only exempt for the portions of the project for said systems.

EPP projects are required to follow the Mayor's Office of Contract Services (MOCS) Minimum Standards for Construction Products which cover issues such as, but not limited to, efficiency requirements for lighting and HVAC equipment, minimum recycled content requirements, and VOC content limits.

i. LEED Projects

Local law requires projects in certain occupancies to be designed to meet the standards set forth in the United States Green Building Council's (USGBC) LEED rating system. Projects must meet Gold, Silver (only for legacy projects grandfathered under LL86/05), or Certified requirements in addition to meeting any energy and water efficiency requirements.

Since the cost thresholds in the laws are based on construction cost as per the final construction Certificate to Proceed from the Office of Management and Budget, projects shall be designed to meet LEED standards if the estimated construction costs approach the current inflation-adjusted thresholds. Also, if the scope expands to "substantial reconstruction" as defined by the law or the occupancy changes, certain provisions of Section 224.1 might then become applicable. The Consultant is responsible for identifying scope or occupancy changes that might affect the applicability of these laws and codes and communicating this information to the DDC project manager and sustainability project director.

Projects shall be registered and certified with the Green Building Certification Institute (GBCI). All tasks, submittals, and filing/registration activities required to successfully meet this standard and receive formal certification shall be the responsibility of the Consultant.

j. Integrative Process

In the publication *One City: Built to Last*, the City re-committed to reducing greenhouse gas emissions 80% by 2050 with public buildings leading the way as "models for sustainability." Superstorm Sandy made us all too aware of the need for building more resilient buildings. The City's Active Design Guidelines promote physical activity and health in design. DDC's Water Matters promotes water conservation and DDC's Project Excellence program elevates the role of design in creating our public buildings and spaces.

DDC requires an Integrative Process (IP) that focuses on collaboration and helps to avoid the pitfalls of a siloed systems approach. While this process is iterative and requires more up-front investment in time and effort, it helps avoid unnecessary changes.

To be effective, the IP requires all professionals and stakeholders, from design to operations, to be part of the process from an early stage. The architect, or prime Consultant, should serve as the integrative process facilitator.

Early in the design process, after the initial Pre-Schematic Design investigation, the Consultant shall coordinate an all-hands-on-deck meeting or series of meetings to address:

- i. Site issues and design constraints
- ii. Sustainable design
- iii. Energy and water management
- iv. Resilient design
- v. Active design and wellness

All projects that are applying for LEED certification shall follow the process of and pursue the LEED Integrative Process credit. Furthermore, for water-related strategies, attention should be paid to minimizing impact on the combined sewer system or the municipal separate stormwater sewer system (MS4) as applicable.

k. Project-Specific Expertise

As applicable, the Project Team shall demonstrate in-house proficiency in the following areas, as described below:

i. Energy Auditing Services:

ASHRAE Level II energy auditing services including thermographic analysis of building envelopes.

ii. Envelope Design Services:

Computer-aided structural analyses, thermal bridge analyses, and hygroscopic (WUFI) analyses, as well as completed design of airtight building enclosures as demonstrated by blower-door testing.

iii. LEED Services:

Project Team must include at least one LEED expert at all times that has directly, as the primary contact person, certified a minimum of 10 LEED projects at Gold level or higher under version 3 or later and has experience working on at least 10 additional LEED certified projects at Gold level or higher under version 3 or later. Consultant must demonstrate this by providing LEED Online records. Incomplete certification efforts or completed certifications documented primarily by another person, Consultant or sub-consultant do not qualify.

iv. Energy Modeling Services:

LEED-compliant computer-aided energy model analyses using software in compliance with ASHRAE 140 – 2017 Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs, as well as completed design of buildings with low energy consumption as demonstrated by post-occupancy measurements.

v. Energy Efficient Lighting:

LEED-compliant computer-aided room-by-room illuminance, daylight, and glare analyses, including plan analyses with a maximum 3x3-foot grid.

vi. Photovoltaic Design Services:

Computer-aided solar yield calculations using PVWatts, HelioScope, or similar software, as well as completed design of PV systems including safety, structural, Fire Code, and electrical analyses.

vii. Ground-Source Heat Pumps:

Project Team must include sufficient expertise for the LL6 assessment to engineer and analyze conventional and ground source heating and cooling systems; evaluate construction and maintenance costs, greenhouse emissions, and equipment life expectancy; and calculate net present value/cost. For geothermal design and construction administration, Project Team must include both geologic and mechanical engineering expertise and experience on installed geothermal systems demonstrated to the satisfaction of the Office of Sustainable Design.

4) DELIVERABLES

Deliverables shall be provided by the Consultant per the schedule below (Section 5 table) and updated in subsequent submissions based on updated information and DDC and Sponsor Agency comments. For each deliverable, provide the applicable calculations, narratives and supporting documents necessary to demonstrate that requirements are met. Provide explanations and calculations where appropriate for items that are determined to be “not feasible.” For additional LEED-specific deliverable requirements, see Sections 6 and 7.

The Integrative Process necessitates a comprehensive approach to integrating sustainability into the design. Consultants on all DDC projects are expected to initiate a high level of sub-consultant coordination from the beginning of design and sustain this level of coordination through construction. While the below checklist indicates required deliverables, it's understood that an integrative design approach will precede these deliverables. Should any project phase be skipped, initial deliverables shall be provided in the preceding phase, not subsequent. For projects without a Pre-Schematic phase, those deliverables shall be provided during the investigative sub-phase of Schematic Design.

Refer to the Project Objectives for additional deliverables that may be required.

a. NYC Energy Conservation Code (NYCECC)**i. NYCECC Compliance Path Approach**

The Consultant shall identify the proposed path for energy code compliance.

ii. EN Sheet - MEP Systems**iii. EN Sheet - Building Envelope****iv. Energy Modeling Form**

When this compliance path is to be utilized, the consultant shall provide the completed energy model form in excel format and the modeling input and output files that correspond to the form.

b. Systems and Whole Building Energy Performance**i. Energy Audit Report, as applicable**

For existing buildings, if a recent LL87-2009 energy audit and retro-commissioning study or a DDC-prepared energy audit was completed for the building, a copy will be provided by DDC. If such an audit has not been conducted, DDC may direct the Consultant to provide a whole-building ASHRAE Level II Energy Audit, including thermographic analysis of the building envelope. The audit shall follow the format required by LL87 and include all energy conservation measures to support a deep energy retrofit consistent with the goals of LL66 and EO26. The Consultant shall review the results of the audit, consider any changes implemented in the building since the audit, and incorporate into the project those Energy Conservation Measures (ECMs) that have the highest potential to reduce energy consumption.

ii. Energy Analysis/Modeling Report, as applicable

For projects with specific energy cost savings targets for building systems or the whole building per Section 224.1, the Consultant shall provide calculations and/or modeling, to the satisfaction of the DDC Office of Sustainable Design, to demonstrate compliance.

c. Low Energy Intensity Buildings**i. Approach Path and Energy Use Intensity (EUI) Target**

The Consultant shall investigate the implications of a low-energy intensity building, as defined in the City Charter, and determine:

1. the appropriate compliance path
2. the specific EUI target the building will be designed to meet
3. approximate energy end use distribution.

ii. Energy Analysis for all Design Alternatives

The Consultant shall provide "simple box" models of each proposed design option to demonstrate that the required EUI target is attainable and what efforts (envelope R-values, fenestration specifications, equipment efficiencies, etc.) must be made to achieve that target. The Consultant shall provide an evaluation for all design alternatives based on performance, initial cost, ease and costs of maintenance, energy cost and greenhouse gas production, space requirements, noise levels, and payback periods.

iii. Energy Model Report

The Consultant shall provide an energy model of the chosen Schematic Design scheme that confirms the project will meet its energy efficiency target. Modeling shall be performed in accordance with local law and LEED requirements using software in compliance with ASHRAE 140 – 2017 Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs and approved by the DDC Office of Sustainable Design. Additional models or variations of one model might be necessary to meet all local laws, the energy code, and LEED requirements. The findings of the model shall be summarized in a Report comparing baseline and proposed performance in terms of real site and source energy units (kBtus), costs (\$), and greenhouse gas equivalent (MtCO₂e) on a whole building and per unit area basis. The model and report shall be further developed during subsequent phases. Updates to the report should be identified with bold text (or some other means of identification). A final report shall be submitted at 100% Construction Documents with such formatting removed.

iv. Metering and Verification (M&V) Equipment / Monitoring-Based Commissioning Protocol

The Consultant shall develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems to address the following:

1. Roles and responsibilities
2. Measuring requirements (meters, points, metering systems, data access)
3. The limits of acceptable values for tracked points and metered values (where appropriate, predictive algorithms may be used to compare ideal values with actual values)

4. The elements used to evaluate performance, including conflict between systems, out-of-sequence operation of systems components, and energy and water usage profiles
5. An action plan for identifying and correcting operation errors and deficiencies
6. Training to prevent errors
7. Planning for repairs needed to maintain performance, and
8. The frequency of analyses in the first year of occupancy (at least quarterly.)

The Consultant shall include all required equipment and metering points in the base design of the building. M&V during operations will not be conducted by this Consultant.

v. On-Site Renewables Feasibility Study

The Consultant shall investigate the feasibility of generating on-site renewable energy and incorporate it into the design as practicable.

vi. Net Zero Feasibility Study

For low energy intensity buildings three stories and fewer, the Consultant shall investigate the feasibility of constructing a net zero energy building. If feasible but not being constructed as a net zero energy building, the Consultant shall generate a report justifying this decision.

vii. For Low Energy Intensity Projects that are not required to pursue LEED Certification, provide the following items from the LEED Project Deliverables Table in Section 7, per the phase indicated:

1. Environmental Programming Matrix
2. Solar/Wind Analysis
3. Building Occupancy Group Determination
4. Energy Goals Statement
5. Energy Analysis Plan

d. Mayor's Office of Environmental Coordination (MOEC) Project Intake

The Consultant shall complete and submit the draft MOEC Project Intake Form to DDC within 30 CCDs of the General Contractor's notice of award, and the final form at the end of construction. More information can be found on the MOEC Reporting page.

e. Greenhouse Gas Emissions Assessment

The Consultant shall submit a greenhouse gas emissions assessment on the form provided by DDC Office of Sustainable Design using the methodology found in the NYC Mayor's Office of Sustainability's "Inventory of New York City Greenhouse Gas Emissions" to determine the coefficients for converting energy use into metric tons of carbon dioxide equivalent (MtCO₂e). GHG emissions in the Citywide Inventory are calculated and reported per the guidance of the Global Protocol for Cities (GPC), which is the worldwide standard for GHG emission reporting. This assessment shall be updated at each submission.

f. Other Energy Deliverables**i. Solar Assessment (LL24-2016)**

For roof replacements, new buildings, and additions, provide an analysis of the project's solar PV potential, including both building and site. Include cost, energy cost savings, and greenhouse gas emissions reduction estimates. Incorporate the report's findings into the other energy performance deliverables.

ii. Sustainable Roofing Zone (LL94)

1. Provide specification for roofing materials in compliance with Section BC 1511 of the New York City Building Code.
2. Provide compliance information within the code analysis section of the investigative SD sub-phase, and supporting design documentation in each phase.

iii. Geothermal Pre-Feasibility Tool (LL6-2016)

If the Pre-Feasibility Tool or DDC's Office of Sustainable Design (OSD) indicates that a full or hybrid GSHP system is viable for the project, the Consultant shall estimate the mechanical loads of the building and use DDC OSD guidance on using mechanical loads to determine pre-feasibility during the investigations sub-phase of Schematic Design. If the Tool or OSD continues to indicate that a full or hybrid GSHP system is viable for the project with the proposed mechanical loads, the Consultant shall present at least one GSHP mechanical scheme during Schematic Design. The Consultant shall provide a comprehensive engineering and cost analysis following the requirements of the law to determine whether the GSHP option has the best net present value of all alternatives considered and, if so, describe the proposed system. If the GSHP system will not be implemented, the Consultant must provide a justification in accordance with the law.

iv. Electric Vehicle Capacity (LL130-2013)

Consultant shall demonstrate compliance with required electric vehicle charging capacity in the design documents.

g. Water Use Reduction

The Consultant shall provide calculations demonstrating potable water use reduction using the LEED methodology.

h. Stormwater Management**i. Stormwater Management Assessment**

The Consultant shall verify the stormwater system as combined sewer, combined sewer with high-level storm sewer, MS4, direct drainage, or other system and determine city, state, and federal stormwater management requirements including possible on-site detention or infiltration and permitting requirements. The Consultant shall also review any site assessments conducted through the MS4 permit and incorporate the best management practices and other improvements in the implementation plan as practicable.

ii. Green Infrastructure Analysis

For all new construction projects, any projects that include site work, and projects over \$2 million that generate runoff in the MS4 zone, the Consultant shall study the feasibility of Green Infrastructure. For projects in the MS4 zone, this analysis shall be in accordance with the requirements of the City's MS4 permit. Green infrastructure shall be incorporated in the design as practicable.

iii. Stormwater Pollution Prevention Plan (SWPPP)

For projects subject to the City's MS4 Construction and Post-Construction Program, the Consultant shall prepare the SWPPP in accordance with the MS4 permit for all construction and post-construction requirements including maintenance protocols. The Consultant shall serve as the engineer-of-record on the permit and be prepared to make changes to said plan to accommodate the ways and means of the Contractor and resubmit the plan for DEP approval as necessary during mobilization and construction.

i. Environmentally Preferable Purchasing (EPP) Projects

The Consultant shall provide:

i. EPP-Compliant Specifications

Provide specifications in compliance with the Mayor's Office of Contract Services (MOCS) Minimum Standards for Construction Products which cover issues such as, but not limited to, efficiency requirements for lighting and HVAC equipment, minimum recycled content requirements, and VOC content limits.

ii. EPP Report

Provide an EPP Report in compliance with the MOCS standards. Report shall be updated as directed by DDC.

j. Active Design

Consultant shall provide Active Design checklists per the Active Design Guidelines published by NYC and the Center for Active Design.

5) PERFORMANCE REQUIREMENTS PROJECT DELIVERABLES TABLE

Deliverables shall be provided by the Consultant per the table on the following page, and updated in subsequent submissions based on updated information and DDC and Sponsor Agency comments. For each deliverable, provide the applicable calculations, narratives and supporting documents necessary to demonstrate that requirements are met. Provide explanations and calculations where appropriate for items that are determined to be "not feasible." For additional LEED-specific deliverable requirements, see Sections A.6 and A.7

The Integrative Process necessitates a comprehensive approach to integrating sustainability into the design. Consultants on all DDC projects are expected to initiate a high level of sub-consultant coordination from the beginning of design and sustain this level of coordination through construction. While the below checklist indicates required deliverables, it's understood that an integrative design approach will precede these deliverables. Should any project phase be skipped, initial deliverables shall be provided in the preceding phase, not subsequent. For projects without a Pre-Schematic phase, those deliverables shall be provided during the investigative sub-phase of Schematic Design. Refer to the Project Objectives for additional deliverables that may be required.

KEY:

X: First submission of applicable calculations, narratives and supporting documents necessary to demonstrate that requirements are met.

—●: Continue to update documents for each subsequent submission through to endpoint. Updates to text should be identified in bold or some other means of identification. Final report shall be submitted at 100% CDs with such formatting removed.

	Project Deliverables	Capital Project Phases											CPSD		
		Pre-SD	SD			DD		CD		Construction					
			Int. I	Int. II	100%	50%	100%	75%	100%	Bid & Award	Constr. Admin	Post-Const.	Stage I	Stage II	Stage III
Energy Code	NYCECC Compliance Path Approach	X											X		
	EN Sheet - MEP Systems					X									
	EN Sheet - Building Envelope					X									
	Energy Modeling Form					X									
Systems and Whole Building Energy Performance	Energy Audit Report	X										X			
	Energy Analysis Report			X										X	
Low Energy Intensity	Approach and EUI Target	X											X		
	Energy Analysis for all Design Alternatives			X										X	
	Energy Model Report				X										
	M&V Equipment/ Monitoring Based Commissioning Protocol					X					X				
	On-site Renewables Feasibility Study		X											X	
	Net-Zero Feasibility Study		X											X	
	LEED Project Deliverables (see Section 4.c.vii)	X												X	
MOEC	Project Intake Form								X		X				
GHG	Greenhouse Gas Emissions Assessment				X									X	
Energy Other	Solar Assessment				X									X	
	Sustainable Roofing Zone		X												
	Geothermal Pre-Feasibility Tool		X									X			
	Electric Vehicle Capacity					X								X	
Water	Water Use Reduction					X								X	
Site/Stormwater	Stormwater Management Assessment		X												X
	Green Infrastructure Analysis				X									X	
	Stormwater Pollution Prevention Plan					X							X		
EPP	EPP Compliant Specifications					X								X	
	EPP Report						X								
Active Design	Active Design					X								X	
Climate Resiliency Design Guidelines	Risks	X										X			
	Planning	X										X			
	Risks Summary and Abatement				X								X		
	Other Mitigation Strategies					X									

6) LEED PROJECT DELIVERABLES

For LEED projects, the Consultant shall provide the following deliverables per the schedule below (Section 7 table). The Consultant shall update deliverables in subsequent submissions based on updated information and DDC and Sponsor Agency comments.

All documentation shall be updated, as applicable, at the end of each phase of design, reflect the documents submitted for that phase and be consistent with each of the project's other LEED deliverables. Changes to text should be bold and date of revision provided.

DDC requires an integrative design approach, which will necessitate a comprehensive approach to integrating sustainability into the design. Consultants on all DDC projects are expected to initiate a high level of sub-consultant coordination from the beginning of design and sustain this level of coordination through construction. While the below checklist indicates required deliverables, it is understood that an integrative design approach will precede these deliverables. Should any project phase be skipped, initial deliverables shall be provided in the preceding phase, not subsequent. For projects lacking a pre-schematic phase, the Consultant shall provide the deliverables during the first investigative sub-phase of schematic design.

a. Environmental Design Workshop:

This goal-setting workshop to integrate high performance standards into the project shall be organized and facilitated by the Consultant and attended by the Consultant team, DDC representatives, and Sponsor Agency representatives, including facilities maintenance and operations staff. For this meeting, the Consultant shall prepare for discussion preliminary drafts of the following deliverables:

i. Environmental Programming Matrix:

Using the template provided by DDC, describe the preferred conditions of each space including size, occupancy, hours of use, temperature, ventilation, lighting and acoustics. The Environmental Programming Matrix shall be updated at the end of Schematic Design and Design Development.

ii. Solar/Wind Analysis:

For new construction, additions, and substantial reconstruction, provide a site-level sun path diagram and wind rose diagram indicating adjacent structures, and narratives indicating how they will inform the massing, orientation, fenestration, and shading of the project. Early "simple box" modeling of these parameters is required for Low Energy Intensity projects and LEED projects.

iii. Energy Audit Report, as applicable:

For existing buildings, if a recent LL87-2009 energy audit and retro-commissioning study was completed for this building, a copy of the report will be provided by DDC, if available. The Consultant shall review the results of the audit, consider any changes implemented in the building since the audit, and incorporate into the project those Energy Conservation Measures (ECMs) that have the highest potential to reduce energy consumption. If such an audit has not been conducted, DDC may direct the Consultant to provide a whole-building ASHRAE Level II Energy Audit, including thermographic analysis of the building envelope. The audit report shall follow the format required by LL87 but shall address all ECMs listed in the 2017 Request for Information issued by DCAS for "Deep Energy Retrofits in Support of EO26," which will also be provided by DDC.

iv. Project Specific LEED Checklist:

Provide a standard LEED checklist of targeted credits to meet local law requirements, and a brief description of how each credit impacts the specific project.

v. Project-Specific LEED Plan:

As based on the LEED checklist, the Consultant shall provide description of each credit's applicability to the project, the strategy proposed to achieve targeted credits, sub-phase to be completed, and assignment of responsibilities for the entire Project Team. Provide explanations and calculations where appropriate for credits that are determined to be "not feasible" for this project. The LEED Plan shall be updated at the end of Schematic Design, Design Development, 75% Construction Documents and 100% Construction Documents. Changes to text should be bold and date of revision provided.

vi. Site Plan Indicating LEED Project Boundary:

The LEED project boundary must include all contiguous land that is associated with the project and supports its typical operations. This includes land altered as a result of construction and features used primarily by the project's occupants, such as hardscape (parking and sidewalks), septic or stormwater treatment equipment, and landscaping. See USGBC website for further guidance. The LEED project boundary must be approved by OSD.

vii. Building Occupancy Group Determination:

The primary occupancy group to be used for the project building, as classified in accordance with the New York city construction codes.

viii. Energy Goals Statement:

In addition to providing the minimum energy requirements for the project as established by code and/or local law, the Consultant shall work with the Client's energy manager, capital Project Team and facilities staff to establish energy consumption and greenhouse gas emissions goals for this project that reflect the urgency of LL66 and EO26. For existing buildings, the goals statement shall incorporate the findings of a previous LL87 energy audit or a new audit.

ix. Energy Analysis Plan:

Identify the energy analysis software, methodology, occupancy schedule, temperature set points, energy rates, and other parameters to be used in the energy analysis for the project and propose energy efficient measures and systems to be studied. Separate analyses may be required to demonstrate compliance with LEED, local law, and code.

b. Registration**i. LEED Online Registration:**

If the project is required to pursue LEED certification, the Consultant shall register the project with GBCI and invite "ddcsustainability@ddc.nyc.gov" to the project's LEED Online record. For City-owned projects, register project as "City of NY – [Project Name]."

ii. LEED Online Submission:

The Consultant shall submit the preliminary LEED Design application to LEED Online within 30 CCDs of the General Contractor's notice of award. The Consultant shall manage the review comments, collect and develop the additional project information as needed, and submit the final LEED Design application.

c. Energy**i. HVAC Evaluation for all Design Alternatives:**

The Consultant shall provide an HVAC Evaluation for all design alternatives, based on performance, initial cost, ease and cost of maintenance, energy cost and greenhouse gas production, space requirements, noise levels and payback periods.

ii. Energy Model Report:

The Consultant shall provide an energy model of the chosen Schematic Design scheme that confirms the project will meet its energy efficiency target, including energy cost reduction targets. Modeling shall be performed in accordance with local law and LEED requirements using software in compliance with ASHRAE 140 – 2017 Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs and approved by the DDC Office of Sustainable Design. Additional models or variations of one model might be necessary to meet all local laws, the energy code, and LEED requirements.

The Consultant shall provide the findings of the model in an Energy Analysis Report. The report shall include a comprehensive analysis of energy use, energy cost and greenhouse gas emissions for the selected design (on a whole building and per unit area basis), demonstrating compliance with LEED, local law and code. The analysis shall specify recommended energy efficiency measures (EEMs) and payback periods.

The report shall be updated at the end of Design Development, 75% Construction Documents and 100% Construction Documents, reflecting the documents submitted for that phase. Changes to text should be bold and date of revision provided. The final report shall be submitted with such formatting removed.

d. Environmental Construction Workshop

The Environmental Construction Workshop shall be conducted within 30 CCDs of the project's construction kickoff to review the construction requirements and procedures for the project and to identify and assign responsibility for specific strategies to fulfill the targeted LEED certification level and other City sustainability requirements. This meeting shall be organized and facilitated by the Consultant and attended by the construction manager, Contractor, primary (MEP) sub-contractors, Sponsor Agency representatives and DDC representatives. The meeting shall address, at a minimum:

- i.** Requirements of all LEED construction credits applicable to the project
- ii.** Erosion and Sedimentation Control (ESC) Plan and procedures
- iii.** Construction and Demolition Waste Management (CDWM) Plan and procedures
- iv.** Indoor Air Quality Management (IAQM) Plan and procedures

- v. Submittal requirements and routing, including assignment of responsibilities and frequency of LEED construction documentation updates
- vi. Construction site signage
- vii. Flush-out or air quality testing requirements and scheduling

The Consultant shall review and approve the ESC, CDWM and IAQM Plans, as applicable, and the CDWM and IAQM Plans prepared by the Contractor in advance of the Construction Kickoff Meeting. The Consultant's services during construction shall also include compliance review and tracking of LEED submittal information for materials and products, collection and compilation of all LEED construction credit information from the Contractor and construction manager. The Consultant shall provide to DDC monthly updates on documentation of all LEED construction credits and submit all credit documentation to GBCI within two months of substantial completion of construction.

e. LEED Credit Deliverables

Refer to USGBC LEED Reference Guide for the project's required measures and deliverables and provide accordingly, except for where DDC's required deliverables are more stringent as outlined in section A.6.f. below.

All documentation shall be updated, as applicable, at the end of each phase of design, reflect the documents submitted for that phase and be consistent with each of the project's other LEED deliverables. Changes to text should be bold and date of revision provided.

For each LEED credit deliverable, provide the applicable calculations, narratives and supporting documents necessary to demonstrate that credit/prerequisite requirements are met. Narratives should summarize the design approach to credit compliance and identify the project-specific design and specifications requirements to be incorporated into the design documents. Provide explanations and calculations where appropriate for credits that are determined to be "not feasible."

f. Additional Deliverables for Specific Credits:

i. IP Credit: Integrative Process

1. Pre-Schematic Design:

Early in the pre-schematic design phase, the Consultant shall:

- a. Conduct preliminary energy and water research and analysis, including a "simple box" energy model.
- b. Engage DDC in Integrative Process (IP) Workshop planning and agenda development, as outlined in section A.3.j. for Sustainable Design and B.3.b. for Resilient Design.
- c. Prepare summary presentation of studies and analyses results to present at the workshop. Send all analyses and studies included in the requirements to DDC at least 3 days before the workshop.
- d. Lead the IP Workshop, to be held separately from the Environmental Design Workshop. Facilitate in identifying, clarifying and evaluating integrative design opportunities. Listen to and synthesize DDC and Sponsor Agency responses to identified challenges, opportunities and next steps.
- e. Within two weeks after the IP Workshop, provide a summary of potential strategies and follow up actions required, along with responsible parties for each.

- f. Complete the IP worksheet.
- g. Provide an IP report that includes the following:
 - i. Energy and Daylight Related Systems:

Document how the energy and daylight analysis has informed the building design, location of building on site, MEP systems and energy use. Include the following, as applicable:

1. Established performance targets, per project's energy requirements by code and laws, including Energy Cost Reduction targets and Geothermal Screening Tool results
2. Building and site program
3. Building form and site layout
4. Building envelope and façade elements on different orientations
5. Modification to, or significant downsizing of building systems (e.g., HVAC, lighting, controls)
6. Modifications to exterior materials, interior finishes, and other systems
7. Assessment of on-site renewable energy potential
8. An updated "simple box" energy model that evaluates energy load reduction strategies

- ii. Water Systems:

Document how the water budget analysis informed building and site design decisions and the systems outlined below. Demonstrate how at least one on-site non-potable water supply source was analyzed to reduce the burden on the NYC municipal supply or wastewater treatment systems. Include the following, as applicable:

1. Site location in a combined sewer or MS4 area, and the applicable requirements
2. Monthly and annual rainfall volume landing on site and building roof
3. Monthly and annual site and building water use
4. Rainwater quantity and quality management systems
5. Landscaping, irrigation, and site elements
6. Roofing systems and/or building form and geometry
7. Potential locations for green infrastructure
8. All supply sources. Assess and quantify all potential non-potable water supply sources, such as on-site rainwater, greywater, and HVAC equipment condensate

9. Annual Water Demand Analysis. Calculate annual water demands for building; match with potential supply sources

10. Potential cost impact associated with installing proposed water-conserving systems

iii. Other systems, as applicable

iv. Meeting Minutes of IP Workshop

ii. LT Credit: High-Priority Site

Provide initial narratives and supporting documents in Pre-Schematic Design.

1. For Option 3, if brownfield remediation is part of the project's scope of work, provide the following deliverables:

a. Design Development: Incorporate remediation requirements into specifications and details, and provide a narrative summarizing the actions necessary to remediate the site and the results of these actions.

b. Construction Administration: Provide documentation from authority having jurisdiction confirming that remediation has been completed to its satisfaction.

iii. EA Credit: Enhanced Commissioning

Refer to Section 4, Low Energy Intensity Deliverables for Monitoring-Based Commissioning Protocol. Provide deliverables as indicated in the Section 5 Deliverables Table.

7) LEED PROJECT DELIVERABLES TABLE

Refer to USGBC LEED Reference Guide for the project's required measures and deliverables and provide accordingly, except for where DDC's required deliverables are more stringent, as outlined in Section A.6.f. Refer to Sections A.6.b.ii and A.6.d for timeline details on the LEED Online Submissions.

All documentation shall be updated, as applicable, at the end of each phase of design, reflect the documents submitted for that phase and be consistent with each of the project's other LEED deliverables. Changes to text should be bold and date of revision provided. For each LEED credit deliverable, provide the applicable calculations, narratives and supporting documents necessary to demonstrate that credit/prerequisite requirements are met. Narratives should summarize the design approach to credit compliance and identify the project-specific design and specifications requirements to be incorporated into the design documents. Provide explanations and calculations where appropriate for credits that are determined to be "not feasible".

KEY:

X: First submission of applicable calculations, narratives and supporting documents necessary to demonstrate that requirements are met.

—●: Continue to update documents for each subsequent submission through to endpoint. Updates to text should be identified in bold or some other means of identification. Final report shall be submitted at 100% CDs with such formatting removed.

	LEED Project Deliverables	Capital Project Phases											CPSD		
		Pre-SD	SD			DD		CD		Construction					
			Int. I	Int. II	100%	50%	100%	75%	100%	Bid & Award	Constr. Admin	Post-Constr.	Stage I	Stage II	Stage III
LEED Project Kick Off	Environmental Design/Construction Workshop	X								X			X		
	Environmental Programing Matrix	X											X		
	Solar/Wind Analysis	X											X		
	Energy Audit Report, as applicable	X											X		
	Project-Specific LEED Checklist	X								X			X		
	Project-Specific LEED Plan	X								X			X		
	Site Plan Indicating LEED Project Boundary	X											X		
	Building Occupancy Group Determination	X											X		
	Energy Goals Statement	X											X		
	Energy Analysis Plan	X											X		
Registration	LEED Online Registration				X										
	LEED Online Submission									X		X			
Energy	HVAC Evaluation for all Design Alternatives			X										X	
	Energy Model Report				X										
LEED Credit Deliverables	Integrative Design Workshop - Energy and Water	X											X		
	IP Credit: Integrative Process	X												X	
	LT Credit: Sensitive Land Protection	X												X	
	LT Credit: High-Priority Site	X									X			X	
	LT Credit: Surrounding Density	X												X	
	LT Credit: Access to Quality Transit	X												X	
	LT Credit: Bicycle Facilities				X									X	
	LT Credit: Reduced Parking Footprint				X									X	
	LT Credit: Green Vehicles				X									X	
	SS Prerequisite: Construction Activity Pollution Prevention							X							
	SS Environmental Site Assessment	X												X	
	SS Site Development, Protect/Restore Habitat				X										
	SS Open Space				X										
	SS Rainwater Management				X									X	
	SS Heat Island Reduction				X										
	SS Light Pollution Reduction						X								
	WE Outdoor Water Use Reduction				X										
	WE Indoor Water Use Reduction				X										
	WE Building-Level Water Metering				X										
	WE Cooling Tower Water Use						X								
	WE Water Metering						X								

CHAPTER 08: SUSTAINABLE DESIGN

A. SUSTAINABLE DESIGN

	LEED Project Deliverables	Capital Project Phases											CPSD		
		Pre-SD	SD			DD		CD		Construction					
			Int. I	Int. II	100%	50%	100%	75%	100%	Bid & Award	Constr. Admin	Post-Constr.	Stage I	Stage II	Stage III
LEED Credit Deliverables (cont.)	EA Minimum/ Optimize Energy Performance			X											
	EA Building-Level Energy Metering/ Advanced Energy Metering					X									
	EA Fundamental Refrigerant Management						X								
	EA Fundamental and Enhanced Commissioning				X										
	EA Demand Response						X								
	EA Renewable Energy Production						X								X
	EA Enhanced Refrigerant Management						X								
	EA Green Power and Carbon Offsets								X						
	MR Storage and Collection of Recyclables							X							
	MR Construction and Demolition Waste Management Planning							X							
	MR PBT Source Reduction-Mercury						X								
	MR Building Life-Cycle Impact Reduction						X								
	MR BPDO-EPDs							X							
	MR BPDO-Raw Materials Sourcing							X							
	MR BPDO-Material Ingredients							X							
	EQ Minimum Indoor Air Quality Performance						X								
	EQ ETS Control						X								
	EQ Enhanced Air Quality Strategies						X								
	EQ Low-Emitting Materials						X								
	EQ Construction IAQ Management Plan							X							
	EQ IAQ Assessment						X								
	EQ Thermal Comfort						X								
	EQ Interior Lighting						X								
	EQ Daylight						X								
	EQ Quality Views						X								
	EQ Acoustic Performance						X								
	ID Innovation/ Pilot Credits						X								
	ID Active Design						X								
	ID LEED AP with Specialty						X								

B. RESILIENT DESIGN

1) INTRODUCTION

A changing climate and rising sea levels will challenge NYC in the coming years. Resilient design, broadly speaking, delivers projects capable of adapting to these changes. Well-coordinated tactics that can evolve and adapt over time can create robust buildings, infrastructure, neighborhoods and services.

2) CLIMATE RESILIENCY DESIGN GUIDELINES

The City is taking a proactive stance against potential environmental threats. In March 2019, the Mayor's Office of Resiliency (MOR) issued the third version of their Climate Resiliency Design Guidelines (CRDG). While these guidelines are not mandatory at present, resiliency needs to be an integral part of all new city projects. These guidelines should serve as a starting point to incorporate resiliency into our planning and design process as we begin to understand the risks we face. Refer to the latest version of the CRDG available on MOR's website.

3) DELIVERABLES

For each of the applicable deliverables listed below, refer to the Sustainable Design's Section 5 Deliverables Table for anticipated deliverables by phase.

a. Risks

As part of the initial investigation and research phase of Schematic Design, the Consultant shall investigate the risks that climate change poses to the project. The findings shall be on the agenda of the Integrative Process meeting or a separate Resilient Design meeting, as appropriate.

Using the CRDG as a basis, the Consultant shall investigate the following risks:

i. Increased Heat

The CRDG address two aspects of increased heat: increasing the urban heat island effect and the resultant increased demand on building systems.

1. Heat Island Effect

The Consultant shall design all projects to reduce their contribution to the heat island effect as practicable. For projects pursuing LEED certification, the design shall pursue the two Heat Island Effect credits, one for the roof and one for non-roof. Non-LEED projects can also use these credits as a guide.

2. Building Systems and Enclosure

While the impact of increased heat on building systems will likely be significant, the time frame in which these changes will occur exceeds the useful life of most HVAC equipment. According to the CRDG, it is not necessary to design building mechanical systems for these increased temperatures.

On the other hand, most of our buildings will eventually experience these increased temperatures. The useful life of the building enclosure long exceeds the time frame in which we expect to see significant increases. Passive strategies, namely increased insulation, window performance, and air tightness, will help mitigate the impacts of rising temperatures and contribute to a more energy-efficient building from the onset. These and other strategies, such as operable windows, also provide for passive survivability when systems fail.

The Consultant shall give due attention to thermal expansion, warping, softening, or other forms of material change, as well as accelerated degradation of structural integrity caused by excessive heat.

The Consultant shall also investigate any alternate or emergency uses for the facility, such as libraries being used as cooling centers. Depending on the criticality of the facility, redundancy or back up power might be necessary.

ii. Increased Precipitation

The NYC Panel on Climate Change (NYC PCC) predicts that the City will see increased precipitation in “normal” storms as well as more intense precipitation events.

1. Design Storm:

The CRDG lay out the process the Consultant shall use to determine increased DEP requirements for CSOs, MS4, and direct drainage. These findings should be incorporated into the Integrative Process meeting for water-related issues.

During schematic design, for projects with DEP retention requirements, the Consultant shall provide a baseline design based on the current DEP requirements and an up-sized design to meet the increased retainage suggested by the CRDG. The Consultant shall also provide a cost estimate for this alternate.

2. Intense Precipitation Events

Although not specifically addressed in CRDG v. 3.0, the City is at risk for severe flooding due to intense precipitation events such as the flooding in Islip, NY on August 12-13, 2014, 13.57" of rain over 24 hours was recorded. Had this storm tracked 40 miles to the east, portions of the city would have been devastated. In such an event, the flow would exceed the capacity of roof drains and storm sewer systems and the water would find its way through scuppers and the streets. In many cases, very simple design adjustments can prevent significant flooding or reduce the damage from flooding.

The Consultant shall investigate the risks associated with Intense Precipitation Events that greatly exceed typical design capacities and explore the ways in which drainage systems would fail or overflow. Attention should be paid to both environmental risks, such as relatively low-lying sites, and building-specific risks, such as roof overflows. The intent of this investigation is to discover potential hazards and avoid them.

Once the results of the City's assessment of intense precipitation events is published, the Consultant shall incorporate those findings into their designs.

Unlike hurricanes, these events are usually sudden and unpredictable, so they do not offer a chance to prepare barriers or other deployable structures. Management of Intense Precipitation Events must be built into the original design.

iii. Sea Level Rise (SLR)

The NYC PCC predicts up to 75" of SLR by 2100 in the worst-case scenario. The middle range prediction is 22-55", which will have severe adverse impacts on many city facilities.

1. Tidal Inundation

The CRDG lays out the process the Consultant shall use to determine the design flood elevation based upon expected tidal inundation due to Sea Level Rise (SLR). Since tidal inundation will be a regular occurrence, all designs should prevent any damage or loss of use to the facility for the expected life of the project.

The Project Objectives will present preliminary information on tidal inundation due to SLR. The Consultant shall verify all information.

2. Storm Surge

The CRDG lay out the process the Consultant shall use to determine the design flood elevation (DFE) for storm surge, incorporating the effects of SLR. Ideally, all facilities will be able to handle storm surge passively, but in some cases special designs incorporating wet or dry floodproofing might be necessary. There is usually advanced warning of flood threat, so deployable structures may be acceptable, but not preferred.

The Project Objectives will present preliminary information on current DFE and future DFE based on the CRDG and the determine degrees of resilience to explore.

The Consultant shall identify impacts, base code compliance, CRDG compliance and professional best practices. During Schematic Design, the Consultant shall design, present, and cost out CRDG-compliant as well as non- or partially-compliant schemes so that the City can ascertain the benefits and costs of multiple perspectives.

b. Planning

Following the initial schematic design investigation sub-phase, the Consultant team shall conduct a Resilient Design meeting. Depending on the issues discovered, this may either be a dedicated meeting or be part of a larger Integrative Process meeting.

For each of the above risks, the discussion should include:

- i.** Is this an issue at all? High elevations are not at risk for flooding due to SLR but may be affected by intense precipitation.
- ii.** Can we avoid the issue through design? Consider raising the elevation of the building above the design flood elevation or the surrounding area.
- iii.** Can we design around it? Wet or dry floodproofing, while not desirable, may be viable options. Refer to the latest versions of the NYC Building Code and ASCE 24 Flood Resistant Design and Construction to determine options, as based on project specifics.
- iv.** How? Identifying design constraints at this early stage will help set the course for a successful project.
- v.** Costs associated? Many solutions can be free or have very little impact on the budget when incorporated early.
- vi.** What risks cannot be avoided? Some projects must accept a certain level of risk. This exercise will help the Sponsor Agency identify those risks.

c. Risk Summary and Abatement

As Schematic Design progresses, the Consultant shall address all risks and design issues for each option presented. At the culmination of Schematic Design, the Consultant shall present all the required design features necessary to address climate resilience issues.

During subsequent design phases, the Consultant shall ensure that further developments and/or modifications of the design continue to address all climate resilience issues. Systems shall be integral with the design whenever possible.

d. Other Mitigation Strategies

In some cases, design alone will not be sufficient to assure resilience. Whenever special systems will need to be implemented (e.g. deployment of flood barriers), or where special procedures will be necessary (e.g. relocating vehicles or storage to higher ground), the Consultant shall prepare a Climate Resilience Action Plan to clearly communicate to the building operators the steps necessary to protect the asset(s) and how to train staff in their proper use. An outline of this document shall be presented at 100% Design Development with the full document at 100% Construction Documents. Drafts shall be presented at the 75% interim submissions for both.

Simplicity and brevity is appreciated.

CHAPTER 09: PERCENT FOR ART

- A. INTRODUCTION
- B. THE PERCENT FOR ART LAW
- C. GENERAL INFORMATION FOR THE CONSULTANT
- D. APPROACHES TO COMMISSIONING PUBLIC ART
- E. PERCENT FOR ART CONTRACT
- F. ARTWORK REVIEW INFORMATION
- G. ARTWORK PAYMENTS
- H. DELIVERABLES

A. INTRODUCTION

The Percent for Art Program offers City agencies the opportunity to acquire, commission, or restore works of art specifically for City-owned buildings throughout the five boroughs. Managed by the City's Department of Cultural Affairs (DCLA), the Percent for Art Program has commissioned hundreds of site-specific projects in a variety of media — painting, new technologies, lighting, mosaic, glass, textiles, sculpture, and works that are integrated into infrastructure and architecture — by artists whose sensibilities reflect the diversity of New York City. Percent for Art seeks to commission works from the broadest range of artists from all backgrounds. By bringing artists into the design process, the City's civic buildings and public spaces are enriched. For more information and to view examples of past Percent for Art projects visit: www.nyc.gov/percent.

As the City's primary capital construction project manager, the Department of Design and Construction (DDC) partners with DCLA to implement the Percent for Art program on eligible capital projects. For each eligible capital project, an art project manager from DDC's Public Art Unit and a representative of the Percent for Art Program at DCLA, join the project management team for the duration of the project. Completed artworks become a part of the collection of the City of New York.

B. THE PERCENT FOR ART LAW

Since 1982, New York City's Percent for Art law (Local Law 65/1982) has required that one percent of the budget for eligible City-funded construction projects be spent on public artwork. The Percent for Art law is defined in Chapter 9 § 224 of the New York City Charter, and procedures related to the implementation of the law are described in Title 43 § 2 of the Rules of the City of New York.

1) EXCERPTS FROM THE RULES OF THE CITY OF NEW YORK: "PERCENT FOR ART LAW PROCEDURES"

a. Applicability

"These regulations apply to projects listed in the city's capital budget and include each line project and each project of a multi-project effort generally described in a lump sum budget line. Individual projects, including multi-year projects, which are part of a major improvement program or betterment at a specific site, may be subject to these rules as set forth below."

b. Exemptions

"In the scope of each capital project, the Design Agency [DDC] shall specifically state, either, that: the project is an eligible project, as defined in § 224 of the Charter; or the project is not an eligible project."

"The mayor may exempt a capital project from the provisions of this section if, in his/her sole judgment, the inclusion of works of art as provided thereby would be inappropriate."

c. Implementation

"It is the intent of the Percent for Art Law that the works of art be an integral part of and compatible with the project being constructed. Hence, the procedures called for in these regulations are meant to commence at the earliest stages of project design to assure that the project construction schedule has incorporated into it the schedule to be followed for the creation, acquisition, or restoration of the works of art to be included therein."

2) EXCERPTS FROM THE NEW YORK CITY CHARTER: “WORKS OF ART”

a. Eligible Capital Projects

“Works of art shall be provided for each capital project which involves the construction or the substantial reconstruction of a city-owned public building or structure the intended use of which requires that it be accessible to the public generally or to members of the public participating in, requiring or receiving programs, services or benefits provided thereat.”

b. Art Allocation

“An amount not less than 1% of the first \$50,000,000 and 1/2% of any amount in excess of \$50,000,000 of capital funds appropriated by the city for each such capital project, other than funds appropriated for the acquisition of real property, shall be allocated for works of art; provided, however, that this section shall in no case require, but shall not prohibit, the expenditure of more than \$900,000 for works of art for any capital project, nor more than the sum of \$4,000,000 for all works of art in any fiscal year.”

C. GENERAL INFORMATION FOR THE CONSULTANT

1) OVERVIEW OF KEY RESPONSIBILITIES

The Consultant shall:

- a.** Design any site preparation required to integrate the artwork with the design of the capital project, including engineering and detailing or accommodating all resources necessary to support the artwork;
- b.** Participate in meetings and give presentations;
- c.** Provide project materials and information to the Artist;
- d.** Make payments to the Artist for services performed;
- e.** Advise the Artist of all applicable statutes, ordinances, and regulations of any governmental regulatory body having jurisdiction over the project and monitor the Artist's compliance with said requirements;
- f.** Coordinate reviews of the artwork at key milestones;
- g.** Monitor compliance by and act as liaison to the Artist with regard to certain procedures as set forth in the Percent for Art contract for the project.

D. APPROACHES TO COMMISSIONING PUBLIC ART

The art allocation can be used in several different ways, as described below. The approach employed will be based on the specific considerations of each project.

1) ARTIST FULL SERVICES

The Artist is responsible for designing, fabricating, and installing a site-specific artwork. The Consultant ensures that the capital project has been designed to properly receive the artwork at installation.

2) ARTIST DESIGN ONLY

The Artist collaborates with the design team to develop an artwork that is fully integrated into the design of the capital project. The Contractor is responsible for installing the artwork as part of the construction of the capital project.

3) ARTWORK PURCHASE

Readily available artworks may be chosen and purchased for pre-determined locations within the capital project. The Consultant manages transport, delivery, installation, and any other vendor services in relation to the artworks.

4) ARTWORK CONSERVATION

Existing artwork is accessed and conserved by professionals. When appropriate, the art allocation can be used for restoring or refurbishing existing artworks for the site, the moving of artworks to the eligible project from another site, storage of artwork offsite while building renovation is in process, or any other appropriate alternative recommendations. The Consultant manages the conservation project and ensures that any necessary site preparation is completed before the installation or re-installation of the artwork.

E. PERCENT FOR ART CONTRACT

Upon selection, the Consultant shall retain and contract with the selected Artist(s). The Artist shall be responsible for providing the artwork, as described in the Percent for Art contract. The actual contract utilized will be determined by the specifics of a given project and the artwork approach pursued.

F. ARTWORK REVIEW INFORMATION

The artwork shall be reviewed and approved at key milestones, as described in the Percent for Art contract for the project.

1) REVIEWING ENTITIES

a. Core Review Group

All artwork reviews are conducted first by the Core Review Group (CRG). The CRG includes representatives of:

- i. The Consultant
- ii. The Department of Design and Construction
- iii. The Department of Cultural Affairs
- iv. The project Sponsor Agency
- v. The facility user, if applicable

b. Community Board

Once an artwork proposal is approved by the CRG, and before Conceptual review by the Public Design Commission, the proposal should be presented to the local community board.

c. Public Design Commission

All Percent for Art commissions must be reviewed by the Public Design Commission (PDC). Artwork reviews should be coordinated with PDC reviews of the capital project and submitted in tandem, whenever possible. For the installation of new artworks, PDC reviews the project at three points: Conceptual review, Preliminary review, and Final review. For more information, including submission checklists for each review, please refer to requirements regarding Artwork Installation on the PDC website at www.nyc.gov/designcommission.

2) CONCEPTUAL REVIEW

Artworks should be submitted for Conceptual review and approval early in the design process and will be reviewed at a committee meeting prior to a public hearing. If any significant design changes are made in design development after Conceptual approval, the project must be submitted for committee review and approval prior to proceeding to fabrication drawings.

3) PRELIMINARY REVIEW

Preliminary review and approval by the Public Design Commission shall take place when the design has been fully developed. Approval at this stage means that a work of art can be fabricated and installed.

In addition, any conservation, restoration, repair, alteration, replication, removal, or relocation of any City-owned artwork must be submitted to the Public Design Commission for Preliminary review and approval before the work begins. Artworks shall not be sold, disposed of, altered, modified in any way, or relocated without the prior written approval of the Public Design Commission.

4) FINAL REVIEW

Final review by the Public Design Commission does not occur until installation of the artwork is complete. Final review and approval are based on the submission of color, archival-quality photographs documenting the completed work in situ.

G. ARTWORK PAYMENTS

The Consultant is responsible for payments to the Artist. The artwork allowance will be added to the Consultant's scope of work through a Task Order and identified as an allowance in the Consultant's payment requisitions. The artwork allowance is calculated based on the capital budget for the project and is allocated as a lump sum amount that is paid out according to the Fee Schedule in the Percent for Art contract for the project.

1) FEE SCHEDULE

A typical Fee Schedule for a Full Service Percent for Art project follows for reference. Please refer to the actual Fee Schedule in the signed Percent for Art contract for the project for the specific terms.

Payment	Milestone	Percent of Total
A	Initial Proposal	6%
B	Conceptual Design	7%
C	Preliminary Design	7%
D	Notice to Fabricate	25%
E	Fabrication 50% completion	25%
F	Fabrication 100% completion	15%
G	Installation	10%
H	Final Acceptance	5%
	Total	100%

2) PAYMENT PROCESS

When a payment milestone can be approved according to the requirements described in the Fee Schedule, the following process is used to submit and process a payment to the artist:

- a. The Consultant or DDC's Public Art Unit notifies the artist and CRG of approval of the milestone.
- b. The Artist submits an invoice to the Consultant for the payment milestone that has been reached, along with any required documentation.
- c. When preparing a payment requisition to DDC, the Consultant adds a corresponding percentage of the Consultant's fee for artwork to the amount of the artist's invoice.
- d. The Consultant includes the Artist's invoice and any required documentation in their next payment requisition to DDC.
- e. DDC has up to 30 days for review. At any point during the review period, DDC auditors may reject the requisition and ask the Consultant to revise and resubmit it. The 30-day review clock starts over upon resubmission,
- f. The City issues payment to the Consultant;
- g. Upon receipt of funds from the City, the Consultant issues payment to the Artist as soon as possible or within 10 business days.

H. DELIVERABLES

1) CAPITAL PROJECT DELIVERABLES

a. Pre-Design or Schematic Design Phase

i. Initial Artwork Meeting

The Consultant is asked to participate in a brainstorm meeting to consider opportunities for artwork and any constraints within the project scope. The Consultant may recommend general locations and site parameters for the artwork, a concept (i.e. media, style, materials), and/or artists to be considered. An overview of the Percent for Art process is provided during the meeting.

ii. Workshop/Design Charrette (optional)

If requested, a charrette may be held with project stakeholders and/or potential artists under consideration. The Consultant will prepare and present opportunities for artwork and any related constraints within the context of the proposed project. The Consultant will use the charrette to gather feedback about the site, initial artwork ideas, and to assess compatibility with the Consultant's design approach, and Sponsor Agency or community goals and preferences. This charrette may be conducted in lieu of Artist Selection Panel 2, depending on the project.

iii. Artist Selection Panel 1 (Managed by DCLA)

1. The Consultant will present a brief overview of the project and art opportunities to the artist selection panel. The presentation should include project scope, site designs, art opportunities and any related constraints, budget, schedule, and any other considerations relevant to the panelists, Sponsor Agency, site context, and/or local community.
2. During the panel, DCLA staff will present approximately 30 to 60 different artists to be considered for the project. The group of artists considered may include suggestions from: the Consultant, Project Team, panelists, community members, and/or elected officials, among others. A DCLA staff person chairs the panel and the voting panelists choose a small group of artists to be considered as finalists, generally 3 to 6 artists.
3. The voting panelists include three arts professionals from the neighborhood or borough where the project will be located and one representative each from DCLA's Percent for Art Program, DDC's Public Art Unit, and the Sponsor Agency. The Consultant and all other participants are considered advisory panelists. An invitation to participate in the selection panel in an advisory capacity is also extended to representatives of the Public Design Commission, local community board, and local elected officials.

iv. Artist Orientation

1. DDC and DCLA staff will arrange a project orientation for the artist finalists. The orientation meeting may be conducted on site, where appropriate. During the meeting, the Consultant and Project Team will provide an overview of the project and neighborhood context, current design, artwork budget, opportunities and constraints for the artwork, and potential locations, if identified.

2. The Consultant shall distribute electronic file copies of the current design materials to the artist finalists before or immediately following the Artist Orientation. The materials will include: a project narrative that includes project history, mission, vision and scope; a design description that includes site map, existing site photos, proposed plans, and renderings or other visuals that will inform the artists about the project, site, and opportunities; a community profile; drawings of identified art locations and opportunities; and project sponsor information.
3. The Consultant shall also be available to respond to questions or requests for additional information from the artists, as requested.

v. Artist Selection Panel 2 (Managed by DCLA)

1. The Consultant will present a brief overview of the project and art opportunities to the artist selection panel. The Consultant shall participate as an advisor to the panel.
2. Each artist is given a 30-minute time slot to present his/her proposal and/or past work to the panel.
3. The voting panelists select an artist(s) who will be awarded the commission, plus one or more alternates. Afterward, DCLA will notify the artist finalists of the outcome of the panel.

vi. Percent for Art Contract

1. Upon selection, the Consultant shall retain and contract with the selected Artist(s), using the approved Percent for Art contract for the project, as provided by the City.
2. If applicable, Payment Milestone A (Initial Proposal) is payable upon contract signing and submission of an initial proposal for the artwork

b. Design Development Phase

i. Artist Conceptual Design Development

The Consultant will participate in meetings with the artist and/or Project Team throughout the Conceptual Design development process.

1. The Artist's Conceptual Design phase usually begins with a kick-off meeting with the artist and CRG/Project Team.
2. The Consultant shall distribute electronic file copies of the current design materials to the artist, as requested. The materials requested may include: a project narrative, location maps, photos of the existing site and neighborhood context, existing and proposed site plans, and drawings, renderings, or other visuals.
3. Throughout the Design Development phase, the Artist and Consultant shall work together to integrate the artwork into the project design and the Consultant shall advise the artist and Project Team of any applicable regulations, design parameters, and/or potential issues.

ii. Artist Conceptual Design Review

1. Core Review Group
Upon the Artist's submission of a completed Conceptual Design proposal, the Consultant shall arrange for review of the Conceptual Design proposal by the CRG.

2. Community Board

Once the Artist's Conceptual Design proposal has been approved by the CRG, and before Public Design Commission review, the City will schedule a presentation to the local community board for the project, if applicable. The Consultant will attend the community board meeting to answer any relevant questions and give a presentation if requested.

3. Public Design Commission

Following the presentation of the Artist's Conceptual Design proposal to the community board or, if no such presentation is made, after the Conceptual Design is approved by the CRG, DDC, and DCLA will submit the artist's proposal to the Public Design Commission for Conceptual review. During the period in which the Public Design Commission is considering the Conceptual Design proposal, the Artist and Consultant shall be available to meet with the Project Team, Percent for Art Program, and/or Public Design Commission to discuss the Conceptual Design proposal and make revisions as requested. The Consultant shall accompany the artist to the Public Design Commission hearing for the artist's Conceptual Design proposal, if applicable, and be prepared to answer any relevant questions.

If applicable, Payment Milestone B (Conceptual Design) is payable upon approval by Public Design Commission of the Conceptual Design proposal for the artwork.

c. Construction Documents Phase**i. Artist Preliminary Design Development**

After Public Design Commission approval of the Artist's Conceptual Design proposal, the Artist will prepare and submit to the Consultant a detailed Preliminary Design proposal for the artwork. The Preliminary Design proposal should specify the materials, dimensions, weight, finish, proposed site preparation requirements, proposed installation method, and any additional modifications to the site necessary to prepare it for the artwork. To assist the artist in preparing the Preliminary Design proposal, the Consultant shall furnish to or obtain for the artist all drawings, material samples, and other similar documentation necessary to enable the artist to prepare the Preliminary Design proposal in compliance with any applicable legal requirements.

ii. Artwork Site Preparation/Design Integration

The Consultant is responsible for coordinating the design of the selected site with the artwork, including engineering and detailing all resources necessary to support the artwork and/or accommodating electrical, structural, landscaping, lighting, footings, plumbing, and any other loads imposed by the artwork; provided, however, that all such work shall have been fully outlined and approved in advance by the City as part of the approved artwork design. By 75% CD review, the CDs shall note all artwork locations on relevant drawings and all required site preparation shall be detailed, including any drawings, dimensions, specifications, notes, and/or other information required by the Contractor; or that are necessary for proper coordination during construction.

iii. Artist Preliminary Design Review**1. Core Review Group**

Upon the Artist's submission of a fully developed Preliminary Design proposal, the Consultant shall arrange for review of the Preliminary Design proposal by the CRG.

2. Public Design Commission

Following CRG approval of the artist's Preliminary Design proposal, DDC and DCLA will submit the artist's proposal to the Public Design Commission for Preliminary review. During the period in which the Public Design Commission is considering the Preliminary Design proposal, the artist and Consultant shall be available to meet with the Project Team, Percent for Art Program, and/or Public Design Commission to discuss the Preliminary Design proposal and make revisions as requested. The Consultant shall accompany the artist to the Public Design Commission hearing for the artist's Preliminary Design proposal, if applicable, and be prepared to answer any relevant questions.

If applicable, Payment Milestone C (Preliminary Design) is payable upon approval by Public Design Commission of the Conceptual Design proposal for the artwork.

d. Construction Administration Phase

i. General Construction Coordination

The Consultant will monitor construction progress, with special attention paid to ensuring that site preparation for the artwork is scheduled appropriately, executed correctly, and coordinated with any relevant sub-contractors.

ii. Artwork Shop Drawings Review

The Consultant, along with the CRG, shall review all shop drawings, including materials, means, and methods, and provide comment. The Consultant should inform the CRG in writing of any proposed deviation from the approved Preliminary Design for the artwork. Significant changes in the appearance, color, or dimensions of the artwork may require submission of an amended Preliminary Design proposal to the Public Design Commission for review. Upon approval of shop drawings for the artwork, a Notice to Fabricate will be issued by DDC. Fabrication should not commence before a formal Notice to Fabricate is issued.

If applicable, Payment Milestone D (Notice to Fabricate) is payable upon the artist's submission of approved schedule for fabrication and installation, and receipt of a Notice to Fabricate.

iii. Artwork Inspection at 50% Fabrication

The Consultant, along with the City, will inspect the artwork at 50% fabrication completion and provide comment. The Consultant should inform the CRG in writing of any deviation from the approved Preliminary Design and/or shop drawings for the artwork. Upon approval by the CRG, DDC will issue a letter documenting the approval.

If applicable, Payment Milestone E (50% Fabrication) is payable upon 50% completion of the fabrication of the artwork, as determined by the CRG.

iv. Artwork Inspection at 100% Fabrication

The Consultant, along with the City, will inspect the artwork at 100% fabrication completion and provide comment. The Consultant should inform the CRG in writing of any deviation from the approved Preliminary Design and/or shop drawings for the artwork. Upon approval by the CRG, DDC will issue a letter documenting the approval.

If applicable, Payment Milestone F (100% Fabrication) is payable upon completion of the fabrication of the artwork and preliminary acceptance of the artwork by the CRG.

v. Artwork Installation

Once installation of the artwork is complete, the Consultant, along with the City, shall inspect the artwork along with any related plaques or signage and provide comment. The Consultant should inform the CRG in writing of any deviation from the approved Preliminary Design for the artwork, or if there are outstanding construction issues that affect or may affect the artwork. If, after artwork installation, there will be ongoing or future construction activities that could affect the artwork, the Consultant shall ensure that appropriate measures are being taken to protect the artwork. Upon approval by the CRG, DDC will issue a letter documenting the approval.

If applicable, Payment Milestone G (Installation) is payable upon determination by the CRG that the artwork as installed is ready for review and acceptance by the Public Design Commission.

vi. Post-Installation

After installation approval and the resolution of any missing, incorrect, or incomplete items affecting the artwork, the Artist shall submit their final deliverables to the City, including installation photos of the artwork in situ. DDC and DCLA will then submit the artwork installation photos to the Public Design Commission for Final Review.

vii. Artist Payment

If applicable, Payment Milestone H (Final Acceptance) is payable upon Final Acceptance of the artwork by the Public Design Commission and completion of all other service required of the artist under the Percent for Art contract, including submission to Percent for Art of all required documentation.

2) CAPITAL PROJECT SCOPE DEVELOPMENT (CPSD) DELIVERABLES**a. New Artwork**

The Consultant should assess the applicability of LL 65/1982 (the Percent for Art Law) to the capital project. If the Consultant determines that Percent for Art likely applies, an anticipated approach, budget, and possible locations or other recommendations related to the commissioning of new artworks should be included in the Phase 3 and Final CPSD Reports.

b. Existing Artwork

If the project includes existing artwork(s), commissioned through the Percent for Art program or otherwise, the Consultant should also assess the applicability of LL 65/1982 (the Percent for Art Law) to the capital project regarding artwork conservation or relocation. If the Consultant determines that Percent for Art likely applies, an anticipated approach, budget, and locations or other recommendations related to the conservation or relocation of the existing artwork(s) should be developed and included in the Phase 3 and Final CPSD Reports. Any measures necessary to protect existing artwork(s) during construction should also be identified in the Final CPSD Report, even if the artwork is not likely eligible for conservation through the Percent for Art Program.

CHAPTER 10: REGULATORY APPROVALS

- A. INTRODUCTION
- B. REGULATORY APPROVAL SERVICES
- C. REGULATORY APPROVAL DELIVERABLES
- D. DEPARTMENT OF BUILDINGS
- E. NEW YORK CITY COMMUNITY BOARDS
- F. PUBLIC DESIGN COMMISSION
- G. LANDMARKS PRESERVATION COMMISSION
- H. ADDITIONAL REGULATORY AGENCIES

A. INTRODUCTION

The Consultant is responsible for filing complete applications and documentation, and for obtaining all approvals for the project in accordance with current requirements of the appropriate regulatory entities and utility companies.

B. REGULATORY APPROVAL SERVICES

It is the professional responsibility of the Consultant to ensure that the project's design satisfies all applicable codes and regulations. The Consultant shall file complete applications and documentation to obtain required approvals from the appropriate regulatory entities and utility companies. The Consultant shall include projected dates for all required regulatory approvals and utility company applications in the overall project schedule and update the status on a regular basis.

- 1) The Consultant shall file for utility service requests at the earliest possible time because review periods can be of considerable duration. Where the same utility company provides electric, gas, and/or steam service, requests for such services must be made at the same time. The Consultant shall include a plot plan of the proposed building, with the desired points of service entry measured from a fixed surveyed point. The Consultant will submit a copy of accepted service requests to the DDC Project Manager.
- 2) Immediately upon filing any application, the Consultant shall submit copies to the DDC Project Manager and the Office of Community Outreach & Notification (OCON). The Consultant must follow through to insure rapid handling and examination, to minimize time loss. The Consultant must notify the DDC Project Manager if any delays occur. Copies of responses from regulatory agencies and utilities must be submitted to the DDC Project Manager.
- 3) When approvals have been received and changes are subsequently made which affect the work, the Consultant shall arrange to file amendments and receive approvals for the revised work. The Consultant shall advise the DDC Project Manager and OCON of any developments which conflict with submittals under review or submittals previously approved by regulatory agencies.
- 4) The Consultant shall provide documents required for permitting amendments and sign-offs.

C. REGULATORY APPROVAL DELIVERABLES

1) DELIVERABLES BY PHASE

Copies of all regulatory agency approvals of both plans and applications shall be included in the required milestone submissions.

a. Schematic Design

- i. Any regulation that impacts the siting or other schematic development of the project must be resolved prior to the conclusion of the SD phase to ensure that there are no fatal flaws in the selected scheme. This includes zoning issues requiring a determination (ZRD1), egress easements, or other property line issues that may impact the building's footprint.
- ii. Public Design Commission Review. See section in this Chapter for requirements.

b. Design Development

i. Determinations by the New York City Department of Buildings (DOB)

Any item requiring clarification or pre-consideration by the DOB must be filed as a Construction Code Determination (CCD1) and fully resolved by the conclusion of the DD phase. Approved CCD1s are to be included with the DD Submission.

The DOB has primary responsibility for the enforcement of the NYC Building, plumbing, mechanical, fuel and gas, electrical, energy conservation codes, the Zoning Resolution, portions of the NYS Multiple Dwelling Law and Labor Laws, as well as the enforcement of regulations relating to construction, alteration, maintenance, use, occupancy, safety, and sanitary conditions of buildings in New York City. The DOB also issues violations for non-compliance with the Building Code. Some NYC Building Code items and filings also require approval by the DEP, DOT, FDNY, OER, or other agencies. Projects adjacent to waterways are reviewed by the New York City Department of Small Business Services (SBS) rather than the DOB.

ii. Hazardous Materials

When hazardous material abatement is not performed by DDC, the Consultant shall file the appropriate documentation with DEP and DOB.

iii. Public Design Commission Review. See section in this Chapter for requirements.

iv. Landmarks Preservation Commission. See section in this Chapter for requirements.

c. 75% CD

i. Plan/Work Applications

The initial DOB Filing Set should be completed and filed with the DOB before the 75% CD phase. Electronic filings are preferred by DDC. The Consultant shall file appropriate applications with DOB for project work. The Consultant shall be governed by DOB application and approval procedures as related to individual application type, such as New Building, Alteration, Use Permits, Public Assembly, etc.. Any filings with other Agencies having Jurisdiction must also be initiated prior to the 75% CD Phase. Filing ID numbers shall be provided as part of the submission.

ii. **Special Inspections/Progress inspections**

Special/progress inspections are paid for and furnished by DDC. For each project DDC will identify the Registered Professional responsible for the special/progress inspections. The Consultant is responsible for identifying all items that will require special inspections. This information should be provided to DDC four weeks prior to the projected pre-filing date at the DOB. After the application is approved, DDC will designate the special/progress Inspection provider who will perform the inspections.

iii. **Builder's Pavement Plan (BPP)**

The Builder's Pavement Plan Unit of the DOB and DOT reviews and approves paving applications that are required for all new buildings and Alt 1 projects. Paving plans must show sidewalks, street trees, curbs, roadway work, street modifications, sidewalk vaults, drainage across sidewalks, and planned legal sidewalk, road, and curb elevations as established by DOT or by official waiver of legally established grades.

iv. **Department of Small Business Services (SBS)**

The Waterfront Permits unit at SBS, instead of DOB, reviews and approves construction on properties adjacent to the waterfront and certain other specialty projects.

v. **Public Design Commission Review.** See section in this Chapter for requirements.

vi. **Any related existing violations which will be corrected during the process of the application shall be included in the application process.**

d. **100% CD**

Any objections received by any authority having jurisdiction are to be submitted with the 100% CD Submission.

i. **B-Scan/DOB Now: Build**

The Consultant shall provide copies of DOB approved plans and applications to DDC to be held at the project construction site. The documents shall bear original DOB approval stamp. Whenever E-filing, or DOB Now Filing, Consultant shall include DDC staff (CPM, PM, Deputy Director and Director) as delegates.

ii. **Amendments**

The Consultant must file amendments for changes implemented during construction that cause the executed work to differ from that for which approvals were originally obtained from the regulatory agencies.

iii. **Sign-offs and Certificate of Occupancy**

Consultant participation may be required during the sign-off and the Certificate of Occupancy process at the DOB. Any related existing violations corrected during the process of the application shall be administratively closed out.

iv. **Record Set**

The Consultant shall also provide a digital copy of scanned, approved plans and applications on a digital storage device for DDC's records.

D. DEPARTMENT OF BUILDINGS

1) BACKGROUND AND HISTORY

a. Background

- i. The Department of Buildings (DOB) promotes the safety of all people that build, work, and live in New York City by regulating the lawful use of over one million buildings and construction sites across the five boroughs. The Department enforces the City's Construction Codes, Zoning Resolution, and the New York State Multiple Dwelling Law.
- ii. The Department enforces compliance with these regulations through its review and approval of building plans, permitting and licensing functions, and inspections.

2) DEPARTMENT OF BUILDINGS REVIEW IS REQUIRED IN THE FOLLOWING INSTANCES:

- a. Building Systems Installation & Modifications
- b. Alterations
- c. Renovations
- d. Demolition
- e. Construction Equipment
- f. New Buildings

3) SUBMISSION REQUIREMENTS

- a. DOB is in a process of modernizing its submission interfacing. As a result, there are currently three approaches to submitting initial applications. They are:
 - i. Manual paper filing which should be avoided at all costs. Forms may be found here: <https://www1.nyc.gov/site/buildings/about/forms.page>
 - ii. Hub Filing otherwise called E-filing or E-submit. This method is first generation of e-filing and has 4 variants (Development Hub, Hub Full-Service, Hub Self-Service, NYC Development Hub) <https://a810-efiling.nyc.gov/eRenewal/loginER.jsp>
 - iii. DOB Now: Build not to be confused with DOB Now: Safety, DOB Now: Inspections, DOB Now: Licensing which is the second-generation e-filing and DDC preferred method of filing. <https://a810-dobnow.nyc.gov/publish/#/> For more, see their FAQ and Resources sections.
 1. Each of the above forms of filing has three variants for review type:
 - a. Plan examined (DDC preferred variant)
 - b. Self-Certification of objections
 - c. Self-Certified

2. Closeout inspections have two variants:
 - a. Self-Certified usually called Directive 14
 - b. Agency inspection usually called Non-directive

b. Minimum DOB submission requirements for first review are:

- i. Initial Application form (PW1, PA1, Laa1 or other)
- ii. 3 sets of plans conforming to Bscan standards
- iii. Cost affidavit (PW3)
- iv. Identification of special and progress inspections (TR forms)
- v. Asbestos Form or filing with DEP

c. Upon receipt of initial objections from DOB the applicant shall schedule meetings with the plan examiner to resolve objections. Objections are usually resolved by processing a Pre-approval amendment:

- i. Submitting a PW1 to clerical staff and an AI1 form listing resolution by objection number and meeting with the plan examiner in office or virtually
- ii. Meeting with plan examiner and their supervisor (for objections not resolved in previous step)
- iii. Meeting with Chief plan examiner (for objections not resolved in previous step)
- iv. Submitting a formal reconsideration process for Commissioner's review or Technical review
- v. Getting mayoral override or affected agency waiver

4) TIMING OF SUBMISSIONS

Projects are submitted prior to 75% CD. As determined complex projects requiring DOB Zoning or Building Code pre-determinations may also require submission earlier in the timeline. On occasion, relatively simple projects may be filed at about 90% CD. Approval shall be attained prior to construction kickoff meeting.

5) POST-APPROVAL AMENDMENTS

DOB has a process to amend initial approvals via the Post Approval Amendment process. This process is basically the same as the initial approval. Changes are submitted to DOB / Changes are reviewed / Objections are resolved via appointments and approval is obtained.

E. NEW YORK CITY COMMUNITY BOARDS

1) BACKGROUND AND HISTORY

Community boards are local representative bodies. There are 59 community boards throughout the City, and each one consists of up to 50 unsalaried members, half of whom are nominated by their district's City Council members. Board members are selected and appointed by the Borough Presidents from among active, involved people of each community and must reside, work, or have some other significant interest in the community. Each community board is led by a District Manager who establishes an office, hires staff, and implements procedures to improve the delivery of City services to the district. While the main responsibility of the board office is to receive complaints from community residents, they also maintain other duties, such as processing permits for block parties and street fairs. Many boards choose to provide additional services and manage special projects that cater to specific community needs, including organizing tenants associations, coordinating neighborhood cleanup programs, and more.

2) RESPONSIBILITIES & COMMITTEES

a. Responsibilities, include but are not limited to:

- i. Dealing with land use and zoning issues: CBs have an important advisory role and must be consulted on the placement of most municipal facilities in the community. Applications for a change in or variance from the zoning resolution must come before the board for review, and the board's position is considered in the final determination.
- ii. Assessing the needs of their own neighborhoods: CBs assess the needs of their community members and meet with City agencies to make recommendations in the City's budget process.
- iii. Addressing other community concerns: Any issue that affects part or all of a community, from a traffic problem to deteriorating housing, is a proper concern of community boards. It is important to note that while community boards serve as advocates for their neighborhood, they do not have the ability to order any City agency or official to perform any task. Despite this limitation, boards are usually successful in resolving the problems they address.

b. Committees:

Board committees do most of the planning and work on the issues that are brought to action at community board meetings. Each community board establishes the committee structure and procedures it feels will best meet the needs of its district. Committees may be functional committees that deal with specific Charter mandates (e.g. "Land Use Review" and "Budget" committees) or agency committees that relate to a particular agency (e.g. "Police" and "Sanitation" committees), among other structures. Non-board members may apply to join or work on board committees, which helps provide additional expertise and manpower.

3) CONSULTANT RESPONSIBILITIES

- a. Community Boards have pre-set meeting dates/times/locations. This is something to keep in mind when LPC or PDC approval is required before DOB permits may be issued. The Consultant must anticipate the need to present to the community board and as soon as possible and with the knowledge and assistance of DDC-Office of Community Outreach & Notification (OCON). It is much more likely to be added to the agenda for any particular committee one or two months in advance than it is to be added on an agenda that is only a few days or weeks away.
- b. Community Boards generally do NOT have any meetings in July or August (Summer Hiatus)
- c. The Consultant must prepare presentations and must attend/present as required by the needs of the project and by DDC.

F. PUBLIC DESIGN COMMISSION

1) OVERVIEW

a. Background

The Public Design Commission (PDC) is New York City's design review agency. PDC approval is required for work on City-owned property as stipulated in Chapter 37 of the New York City Charter. PDC reviews projects during design, construction, and closeout, and PDC approval is required to obtain a building permit and a Certificate of Occupancy from the Department of Buildings (DOB). By properly planning for PDC review, teams can ensure an efficient process that does not impact the project schedule. All submissions and communication with PDC are managed via DDC's PDC liaisons, who are responsible for guiding teams through the review and approval process and handling all PDC-related matters on behalf of the agency.

b. History

PDC was originally established as the Municipal Art Commission in 1898 to regulate public art and architecture. Created in response to the City Beautiful movement, the Art Commission was established as part of the City Charter that consolidated the five boroughs into a single municipality. It was renamed the Public Design Commission in 2008 to better reflect its mission: "As an advocate for excellence and innovation in the public realm, the PDC works to ensure the quality and viability of public projects, programs, and services for New Yorkers in all five boroughs for years to come." Additional information can be found on the Commission's website at: <http://www1.nyc.gov/site/designcommission/index.page>

c. People

PDC is comprised of eleven Commissioners serving pro bono and a staff headed by an executive director. As stipulated by the City Charter, the Commissioners include an architect, landscape architect, painter, sculptor, and three lay members, all of whom are nominated by the Fine Arts Federation and appointed by the mayor. They also include one representative of the Mayor's office, the Metropolitan Museum of Art, the New York Public Library, and the Brooklyn Museum.

d. Purview

PDC reviews permanent works of architecture, engineering, landscape, and art on City-owned property, where “permanent” is defined as lasting for 365 days or more. PDC reviews exterior work only, regardless of whether that work is visible, except in the case of art. PDC reviews all artworks on City-owned property, both exterior and interior, and serves as the curator and caretaker of the City’s public art collection.

Properties designated as NYC landmarks are subject to review by the Landmarks Preservation Commission (LPC) instead of PDC. However, PDC has binding jurisdiction over construction of new structures and works of landscape architecture within scenic landmarks. Additionally, PDC has binding jurisdiction of all works of art on City owned property, including designated Landmarks. In cases where PDC review is binding, LPC has advisory review and a written Advisory Report from LPC must accompany the submission to PDC. See Landmarks Preservation Commission section in this Chapter for more information, including jurisdictional purview, and to PDC’s website for additional jurisdictional information: <http://www1.nyc.gov/site/designcommission/review/jurisdiction.page>

e. Role of DDC’s PDC Liaisons

DDC’s Project Excellence team serves as the liaison to PDC, managing the submission process and handling all PDC-related matters on behalf of the agency and its Consultants. The team provides guidance on civic design requirements and best practices to aid projects in receiving timely approval. DDC’s PDC liaisons advise teams on the required PDC approvals, provide up-to-date guidance on submission requirements, and provide an in-depth review of all draft submissions before they are submitted to PDC. All communication between project teams and PDC is handled via the liaisons, who further assist in acquiring the requisite agency signoffs from DDC and partner agencies. Liaisons are key stakeholders in all projects requiring PDC review and approval and remain engaged from project kickoff through design and construction.

2) REQUIRED REVIEWS**a. Overview**

PDC reviews and approves projects during design, construction, and project closeout. PDC Commissioners meet once a month to review projects submitted by all agencies City-wide. To be reviewed at PDC’s monthly meeting, projects must be listed on DDC’s monthly transmittal and submitted to PDC on the required date. Before a project can be submitted to PDC, a complete draft of the submission must be reviewed and approved by DDC’s PDC liaisons. PDC’s monthly meeting calendar is posted on their website, and DDC’s PDC liaisons maintain and distribute a calendar that includes draft submission deadlines.

b. Stakeholder Review and Approval

Before a project can be submitted to PDC for review and approval, it must be reviewed and approved by all stakeholders, including the DDC Program Unit, A&E, and Project Excellence teams, the Sponsor Agency, and any other agencies with jurisdiction over the project or site. In addition, the community is given the opportunity to review projects prior to PDC review through the Community Board process.

All projects subject to the Uniform Land Use Review Procedure (ULURP) must be reviewed by PDC at a conceptual level during the application and pre-certification phase, and prior to ULURP certification. Submission should be made at or around the same time as the Department of City Planning (DCP) inter-divisional meeting.

See the Additional Regulatory Agencies section in this Chapter for additional information on partner agency and Community Board requirements.

c. Review of Capital Projects During Design

During design, the requirements for PDC review and approval depend on project type, scope, and complexity. Large or complex projects such as new buildings, major additions or renovations, and master plans, require at least three levels of design review. Standard projects, such as façade replacements, ADA upgrades, and site improvements, typically require two levels of design review. Projects with limited exterior scope, such as system upgrades, may qualify for a single level of design review. Teams must consult with DDC's PDC liaisons at project kickoff and throughout design and construction to identify all required PDC reviews.

i. Conceptual Review

Conceptual review and approval occurs at approximately 75% SD, after selection of a schematic design scheme. It is required for all new buildings and significant additions, major infrastructure, master plans, or other large-scale or complex projects. As noted above, all projects subject to the Uniform Land Use Review Procedure (ULURP) must receive PDC conceptual review prior to ULURP certification. PDC conceptual review occurs prior to review by Community Board.

ii. Preliminary Review

Preliminary review and approval occurs at approximately 25% DD. It is required for all projects that were reviewed at a conceptual level, and for all other projects with exterior work unless they qualify for a single design review as described below. PDC preliminary review occurs after review by the Community Board. If the design changes substantially after this milestone, the project must be submitted for interim review as described below.

iii. Final Review and Combined Preliminary/Final Review

Final review and approval occurs at approximately 50-90% CD and is required for all projects with exterior work, including those that were reviewed at conceptual and preliminary levels. Projects with limited exterior scope, such as system upgrades, roof replacements, or window replacements, may qualify for a single combined preliminary/final review at this milestone as identified by DDC's PDC liaisons. PDC preliminary/final review occurs after review by the Community Board.

Final approval by PDC is required to obtain a building permit from the Department of Buildings and must be secured before construction can proceed. If the design changes after this milestone, the project must be submitted for amended final review as described below.

iv. Interim Review

Interim review and approval occurs between preliminary and final review, and may be required to address any conditions of approval stipulated by PDC at preliminary review. Interim review is also required when the design changes substantially after preliminary approval. DDC's PDC liaisons guide the team in determining whether interim review is required or appropriate.

v. Informal Review

Informal review is available for complex and high-priority projects with expedited timelines, including projects receiving an Emergency Declaration. It occurs during a pre-schematic or master plan phase, or during the early stages of schematic design. Informal review does not take the place of the required design reviews but, for time-sensitive projects, can aid in achieving Commission buy-in and support early decision-making.

d. Review of Capital Projects During Construction**i. Amended Final Review/Construction Change**

Amended final review and approval occurs when the design changes after the project has received final approval. When this occurs during construction, amended final review is also known as "construction change review," and design revisions must be submitted to PDC prior to proceeding with the work. To expedite the approval process, construction change submissions have an abbreviated set of requirements and may be submitted outside the typical review cycle upon coordinating with DDC's PDC liaisons.

ii. Extension of Approval

Extension of approval occurs when the final approval expires prior to the start of construction. Final approval by PDC is conditioned on construction commencing within two years.

e. Review of Capital Projects During Closeout**i. Final Sign-off**

Final sign-off occurs when the construction of a project is complete. It is required to demonstrate that the project was built as approved.

Final sign-off by PDC is required to close out a building permit and obtain a Certificate of Occupancy from the Department of Buildings.

f. Waivers for Replacement-in-Kind

For projects eligible for a PDC waiver, the waiver request occurs after a permit application has been submitted to DOB and DOB has returned an objection identifying the requirement for PDC review. Waivers are available for projects where the exterior work is strictly limited to repair or replacement-in-kind, with replacement components having the same specifications, size and finish as existing components. Replacement of exterior mechanical equipment does not typically qualify for a waiver. DDC's PDC liaisons will advise whether the project qualifies for a waiver.

g. Review of Artwork

Artwork is subject to separate review and approval by PDC, including the installation of new artwork through the Percent for Art program and the conservation or relocation of existing artwork. DDC's PDC liaisons and Public Art team provide guidance on submission requirements and coordination with capital project submissions.

i. Percent for Art

PDC requires Percent for Art projects to be submitted for conceptual, preliminary, and final review. Conceptual review and approval occurs early in the design process and should occur when the associated capital project is submitted for preliminary review. Preliminary review and approval of Percent for Art projects occurs prior to fabrication, and requires information on the fabricator, installation specifications, maintenance requirements, and maintenance funding. Final review and approval occurs after installation of the artwork and is required to demonstrate that the work was installed as approved. As with capital projects, interim review may be required to resolve any conditions of approval or to address substantial changes after approval. DDC's PDC liaisons guide the team in determining whether interim review is required or appropriate. See Chapter 09: Percent for Art.

ii. **Artwork Relocation and Conservation**

PDC requires any conservation, repair, alteration, removal, or relocation of existing City-owned artwork to be submitted for preliminary and final review. For complex projects or when additional guidance is needed, projects can be submitted for conceptual review before requests for proposals (RFPs) are completed and/or before a conservation team has been engaged. Preliminary review and approval occurs prior to the start of work. Final review and approval occurs after the work is complete and is required to demonstrate that the work was executed as approved.

3) SUBMISSION REQUIREMENTS

Each type of PDC review has specific submission requirements, many of which are detailed on checklists specific to the submission (conceptual, preliminary, etc.) and project type (structures, open spaces, etc.) DDC's PDC liaisons provide the relevant checklists and submission instructions. For submission types that do not have a checklist, DDC's PDC liaisons identify the items required for the submission.

For any submissions that require an application as identified on the checklist, DDC's PDC liaisons are responsible for completing the application, obtaining the required agency signatures, and delivering the original application to PDC.

4) SUBMISSION PROCESS

Successful review and approval by PDC requires that teams work closely with DDC's PDC liaisons throughout the project to accurately plan for all required approvals.

a. Early Planning

The team must consult with DDC's PDC liaisons early in the design process to identify the required PDC approvals. This early coordination ensures that the PDC review and approval process does not impact the overall project schedule. DDC's PDC liaisons remain key stakeholders throughout the design and construction process and will guide the team in planning for PDC approvals in the event of scope or design changes.

b. Pre-Submission Planning

Two to three months prior to submitting for PDC review, teams must reach out to DDC's PDC liaisons to obtain the current review calendar, submission checklist, and project-specific instructions and guidelines.

c. Submission and Review of Drafts

DDC requires that a complete draft of the submission, including all items on the checklist, be provided to DDC's PDC liaisons by noon two weeks prior to the PDC submission date. Additional time may be required for large or complex projects that require submission by multiple agencies.

Prior to submission of a draft, the design of the project must be approved by the DDC Program Unit and A&E team, in addition to the Sponsor Agency and any other agencies with jurisdiction over the site. DDC's PDC liaisons review the draft for completeness and clarity of the submission, conformance to PDC requirements and guidelines, alignment with city-wide standards and best practices, and appropriateness of the design. Multiple draft revisions may be required within the two-week period prior to PDC submission.

For certain high-priority projects, DDC may require the Consultant to present the project in person at DDC before it is submitted to PDC. This meeting generally occurs at least one week prior to the submission to PDC.

d. PDC Submission

PDC requires submission of hard copies, samples and models, and digital files as described below. With the exception of the application form and Community Board letter, all items are the responsibility of the Consultant. DDC's PDC liaisons complete the required application form, obtain the requisite agency signature(s), and deliver the monthly transmittal, signed application, and Community Board letter to PDC.

i. Submission of Digital Files

DDC submits all digital files to PDC directly. A complete digital submission, including a checklist and all indicated items, must be submitted to DDC's PDC liaisons by noon on the day before the PDC submission date.

ii. Submission of Hard Copies

Hard copies are delivered by the Consultant to the north entrance of 1 Centre Street and dropped off in the mail room for screening. All materials must be clearly labeled with the project name and addressed to the Design Commission at City Hall, Third Floor. Hard copy submissions are due on the submission date by noon and may not be delivered early.

iii. Submission of Samples and Models

Large or delicate samples and models may be delivered directly to PDC's offices on the third floor of City Hall on the submission date. Such deliveries must be coordinated in advance with DDC's PDC liaisons, who will arrange a delivery time with PDC staff.

After PDC has completed their review, the Consultant will be required to pick up any models or large samples at a pre-arranged time coordinated via DDC's PDC liaisons.

e. PDC Review

Upon submission to PDC, the project is reviewed by staff and informal committees of Commissioners. PDC provides feedback including questions, requests for information, and requests for revision. These requests are conveyed to the team via DDC's PDC liaisons and require timely response due to the limited review period.

f. PDC Meeting

Three business days prior to the monthly meeting, PDC distributes a meeting agenda via DDC's liaisons. The agenda includes three sections: Committee, Consent, and Public Hearing. Projects on the Committee Agenda will be presented to PDC by the Consultant, with the DDC and Sponsor Agency teams in attendance. Projects listed on the Consent Agenda are recommended for approval at the meeting and do not require attendance by the team. Projects may be scheduled for a Public Hearing if a member of the public wishes to testify.

The meeting agenda is limited to the major types of design review submission (conceptual, preliminary, and final review, with interim review submissions occasionally presented). Other submission types, such as construction changes, are handled via communication with DDC's PDC liaisons and are not included on the meeting agenda.

i. Meeting Attendance

Meetings are typically held in PDC's offices on the third floor of City Hall, and teams presenting a project on the Committee Agenda are required to arrive 45 minutes in advance of their scheduled presentation. However, meeting times and locations are subject to change and will be confirmed by DDC's PDC liaisons.

PDC will have the team's submitted presentation displayed on a screen, and samples and models will be laid out on a table. Teams may not bring any new material to the meeting.

g. Approval and Documentation

Following the monthly meeting, PDC distributes formal communication documenting the results of their review. The type of communication depends on the type of review. In addition, PDC meetings are video recorded and may be viewed via a link on PDC's website. All communication from PDC is distributed via DDC's PDC liaisons.

i. Interagency Communication Memo

Projects that were presented at the monthly meeting as part of the Committee Agenda will receive an interagency communication memo summarizing feedback from the Commission and identifying the next step. Formal approval is not granted by the interagency communication memo, but the project may be recommended for approval at PDC's next meeting.

ii. Certificate and Perforated Drawing Set

Projects on the Consent Agenda will receive a numbered certificate, which serves as the formal documentation of PDC approval. The certificate types are as follows: Conceptual (for Percent for Art projects only), Preliminary, Final, and combined Preliminary/Final. Preliminary certificates may include conditions of approval that must be addressed in subsequent submissions.

Certificates for final approval include the following conditions: that construction must commence within two years of the certificate date, and that photographs be submitted for final sign-off upon completion of the work. For projects receiving final approval, PDC also provides a perforated drawing set for record of the approved design.

iii. Email

PDC may require that a project be revised and resubmitted at a subsequent submission date before it is calendared for the monthly meeting. This type of request is communicated via email to DDC's PDC liaisons.

For submission types not listed on the monthly meeting agenda, including construction changes, final sign-offs, and some interim submissions, PDC's response will be provided by email via DDC's PDC liaisons. This email serves as the formal documentation of PDC's review and approval.

G. LANDMARKS PRESERVATION COMMISSION

1) BACKGROUND AND HISTORY

- a. The Landmarks Preservation Commission (LPC) is the mayoral agency responsible for designating and protecting New York City's architecturally, historically, and culturally significant buildings and sites. Since its creation in 1965 by the Landmarks Law, Section 3020 of the New York City Charter, and Chapter 3 of Title 25 of the Administrative Code, LPC has granted landmark status to more than 36,000 buildings, including 1,415 individual landmarks, 120 interior landmarks, 11 scenic landmarks, and 144 historic districts in all five boroughs. The agency consists of eleven commissioners comprised of at least three architects, a historian, a realtor, and a planner or landscape architect, as well as at least one commissioner from each borough. The paid chair leads the agency and a staff headed by the executive director.
- b. The objective of designating landmark properties is to "safeguard the city's historic, aesthetic, and cultural heritage" and to "foster civic pride in the beauty and accomplishments of the past." Protection of designated properties is achieved through mandatory review and approval of plans for restoration, alteration, addition, reconstruction or other proposed changes.
- c. The LPC has jurisdiction over all properties that are either designated or pending designation as NYC landmarks. The four types of landmark designation are individual (exterior), interior, scenic, and historic districts. In addition, projects undergoing City Environmental Quality Review (CEQR) fall under LPC jurisdiction. Properties reviewed under CEQR or other environmental laws might be listed on or eligible for the New York State or National Registers of Historic Places or meet criteria for local designation, even if they are not New York City designated landmarks. CEQR review covers historic, aesthetic, cultural, archaeological, and architectural resources.
- d. Coordination between LPC and the Public Design Commission
Areas of overlapping jurisdiction between the LPC and the PDC have been minimized with the adoption of Local Law 77 (1995). If the project primarily concerns an individual landmark, or a project within an historic district, the LPC will conduct the only design review, and PDC review will not be required. For these projects LPC review and approval will be binding. However, all projects within scenic landmarks, except for work on existing buildings, and all works of art as defined by the PDC will continue to require review by both the PDC and LPC.

2) DDC HISTORIC PRESERVATION OFFICE

The DDC Historic Preservation Office assists and guides the Consultant in the completion of all steps leading to approval of the project by the Landmarks Preservation Commission and by other entities having jurisdiction over historic properties such as the State Historic Preservation Office (SHPO). The DDC Historic Preservation Office should be contacted at the outset of projects potentially within the jurisdiction of the LPC to verify the designation status of the property. Assistance is provided throughout the application and approval process, and HPO may also monitor the job during construction. The schedule of LPC submission deadlines and hearings is available on the LPC website. Please note that "landmark quality" properties also are identified by the DDC Historic Preservation Office. (See Historic Preservation Design Criteria in Chapter 06: Design Criteria of this Guide for details).

3) PROCEDURES

There is usually only one formal application to the Landmarks Preservation Commission for a given project; however, there are sometimes two or more separate submissions. The first submission accompanies the application form for the proposed work. This is typically done during the Design Development phase when a clear design direction has been determined. At this point a Landmarks Preservation Commission staff member will be assigned to the project, and the likely level of action, either staff review or public hearing, will be established.

The second required submission is for the final approval, issued in the form of a permit or report. This submission includes final construction documents including specifications. For some simple and straight-forward projects, a single submission near the end of design will be sufficient. When a submission for final approval has been deemed complete by LPC staff, the Commission has 45 business days to issue a report.

For more complex projects, such as those involving a Pre-Schematic Phase or extensive alterations to a landmark, it is important to involve the LPC early. For these projects it is useful to have a pre-submission meeting with the LPC staff to discuss project scope and possible alternative design strategies. It is also useful to discuss the scope of work and get advice on appropriate presentation materials. Initial contact could be by telephone or by a meeting, depending on the nature of the project. HPO will guide the Project Team on the appropriate timing for interactions with LPC based on the nature of the project.

For projects that require a pre-submission meeting with LPC, the Consultant shall prepare all information as required to discuss alternate strategies, schematic designs or scopes of work with the LPC staff. DDC will receive and review the Consultant-prepared materials prior to the meeting with LPC. This meeting should include the Sponsor Agency, the Consultant, staff of the DDC Historic Preservation Office, the DDC project manager and team leader. After approval by DDC, the Consultant will deliver the required submission materials to the LPC.

4) SUBMITTAL REQUIREMENTS FOR INITIAL APPLICATION

Please see the Permit Application Guide on the LPC website <http://NYC.gov/landmarks> for the latest submission requirements for various types of work. These may specify materials in addition to the general illustrative materials described below. All submission materials must be approved by DDC prior to submitting to the LPC. Two sets are required for the LPC and two sets for DDC.

a. Application Form

The application form will be prepared by the HPO staff, with the Chief of Historic Preservation entered as "Person Filing Application," and the Associate Commissioner of A&E signing as "Owner."

b. Landmark Presentation Illustrative Materials

Materials illustrating the proposed design shall include a full and complete set of drawings, renderings, photographs, and photo-montages that clearly and completely describe all the proposed work that affects the protected features, interior or exterior, of the landmark structure or site. Materials will typically show, side by side, historic, existing, and proposed conditions. These typically include all relevant floor plans, building sections, exterior elevations, interior elevations if applicable, details, and building and site context.

c. Samples

One set of material and color samples with supporting product literature and identification specifications is required.

d. Research

Relevant research, test reports, and documentation shall be submitted with the application.

e. Presentations to the Landmarks Preservation Commission Staff

Accompanied by DDC staff and the Sponsor Agency representative, the Consultant is required to make presentations to the LPC staff.

f. Mock-Up Requirements

For all rooftop additions and/or mechanical equipment installations, the Consultant will be required to provide all necessary information for the construction of a wood or light steel frame mock-up matching the overall size and configuration of the proposed addition/equipment. Photographs of the completed mock-up shall be part of the LPC submission package. In certain cases, the mock-up may be required to remain in place for a period of time to allow Commission members an opportunity to visit the site. Costs for the construction of the mock-up shall be identified as a reimbursable expense or part of the construction budget, depending on the direction of the DDC project manager.

5) SUBMITTAL REQUIREMENTS AND PROCEDURES FOR A PUBLIC HEARING (IF REQUIRED)

Projects requiring public hearing review can be scheduled about five weeks after the Commission receives a substantially complete application. Hearings are held on at least two Tuesdays per month, generally during normal business hours. The scheduled time for each item on the day's calendar is posted on the LPC web site at the end of the week before the hearing.

If a public hearing is required for LPC review, the Consultant must first present the proposed project to the appropriate committee of the local community board prior to the hearing. The Sponsor Agency will typically take the lead in scheduling this with the assistance of DDC and the Consultant. Usually one presentation to the CB committee is sufficient. However, depending on the nature of the proposed project, the Consultant may be required to present to the full Community board as well. LPC requires that the community board have the opportunity to review the project and submit a written resolution by the time of the scheduled Landmarks public hearing.

It is at this stage that the Consultant must include OCON for input regarding the presentation that the Consultant plans on showing to the Community Board. OCON may require some revisions be made and provide the Consultant with contacts and guidance on engaging the Community Board. Once the presentation has been executed, the Consultant will ask the Community Board to provide a "resolution" letter which is then included as part of the submission to LPC.

Please note that most of the 59 Community Board's Committees meet only once per month and do not meet at all in July and August.

Illustrative materials for the public hearing are as described in section (4) above. In addition, the Consultant must provide 12 sets of 11 by 17-inch, color copies of the presentation for distribution to the LPC commissioners. Digital presentations in final form can be submitted by PDF or thumb-drive about one week prior to the hearing. Presentation boards are also acceptable.

At the close of the public hearing, the Commission will vote on the project, request revisions or additional information, or defer action. A vote, which requires a majority of the 11 commissioners, may be to approve, approve with specified modifications, approve with revisions to be worked out with staff, or deny. A vote (other than a denial) will result in issuance of a Status Update Letter describing the action taken. This letter will indicate that a permit (or report) will be issued upon review of final contract documents that conform to the Commission's approval.

6) SUBMITTAL REQUIREMENTS FOR FINAL APPROVAL

Final Construction Documents shall include:

- i. Two sets of signed and sealed drawings and one set of specifications each for LPC and DDC.
- ii. One set of material and color samples as well as related product literature and specifications.

7) CHANGES DURING CONSTRUCTION

If there are changes to the design during construction that deviate from the approved LPC drawings, the Consultant shall prepare for submission to LPC all necessary drawings and documentation illustrating the changes, with a letter requesting an amendment prepared by the HPO staff.

8) NOTICE OF COMPLIANCE FROM LPC

At the end of the construction phase, LPC will issue a Notice of Compliance if so requested. The LPC Notice of Compliance is a requirement by the Department of Buildings before its final sign-off. The Consultant shall submit to DDC final photographs with key of all work that affected any of the protected features of the landmark structure or site. DDC will forward these photographs to LPC with a request for issuance of a Notice of Compliance. The Consultant shall also submit to DDC and LPC as-built drawings for any portions of the work that deviate from the LPC-approved drawings. After determining that all the work was completed in accordance with the approved plans and specifications as well as any amendments to the approval, LPC will issue the Notice of Compliance.

H. ADDITIONAL REGULATORY AGENCIES

Depending on circumstances, approval may also be required from other agencies. The following list is intended as a guide and should not be considered comprehensive.

1) **NYC DEPARTMENT OF CITY PLANNING (DCP) AND THE CITY PLANNING COMMISSION (CPC)**

The DCP and the CPC have overall responsibility for zoning variances, special permits, and Uniform Land Use Review Procedure (ULURP). ULURP is required for zoning changes, site selection, acquisition and disposition of City owned property, select concession contracts, select revocable consents, permits, and map changes. Consultant services in support or preparation of ULURP shall be identified in the Agreement.

2) **NYC DEPARTMENT OF TRANSPORTATION (DOT)**

DOT is responsible for operations relating to streets, bridges, and tunnels, and the issuance of necessary permits. These include review and approval, as necessary, by:

a. **Administrative Superintendent of Highway Operations (ASHO)**

ASHO may place a hold on a permit when the proposed work location is scheduled for resurfacing by DOT in the near future or was resurfaced within the past 18 months.

ASHO may release the hold if the proposed work can be scheduled or designed in a way that does not interfere with planned or recent work. ASHO may also place a hold when the proposed work location is part of a DDC street reconstruction project, in which case DDC will review the permit and seek to coordinate the proposed work with the reconstruction

b. **Bureau of Permit Management and Construction Control (the Bureau)**

The Bureau issues permits relating to the maintenance and repair of public roads, streets, highways, parkways, bridges, and tunnels. Permits are required to be taken out by the Contractor for street closings, sidewalk and roadway construction, protective bridges (sidewalk sheds) and other similar construction operations. The Consultant may be required to prepare necessary drawings.

c. **Office of Franchises, Concessions, and Revocable Consent (OFCRC)**

Approval from the OFCRC of DOT is required for any construction extending beyond the property line, whether above or below street level, that is not exempt by provisions of the NYC Building Code, and underground tunnels, vaults, and utilities. It is required for other work, including the construction of bridges over streets and tunnels or utilities under roadways. Such approval can be withdrawn at any time (revocable consent). Any above ground work, requiring revocable consent will also require the approval of the PDC or LPC.

3) METROPOLITAN TRANSIT AUTHORITY (MTA)

If the proposed construction could infringe upon or adversely affect structures of subsurface, surface, or elevated transit systems, it will be necessary to receive the approval of the MTA prior to receiving approval by the DOB.

4) FIRE DEPARTMENT (FDNY)

The FDNY's Bureau of Fire Prevention enforces all laws and rules pertaining to the prevention of fire.

5) NYC DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP)

The NYC DEP enforces all laws and rules pertaining to environmental conditions and hazardous materials and includes:

a. Asbestos Control Program

While DEP oversees asbestos reporting and abatement in the City, DDC has primary responsibility for identifying asbestos containing materials at DDC projects and developing drawings and specifications for their abatement (see Section A-1 of this Appendix, Part A, "Design Process", and Part K, "Hazardous Materials"). In most instances, the Consultant's responsibility is limited to identifying potential areas of asbestos containing material and coordinating other work with abatement work. Asbestos forms may need to be filed with DEP regardless of whether the overall project requires filing with DOB.

b. Bureau of Environmental Planning and Analysis

The Bureau supports the City and State Environmental Quality Review processes (CEQR and SEQOR) through which City agencies may be required to assess, disclose, and plan for the mitigation of the environmental consequences of projects (see NYS Department of Environmental Conservation below). Consultant services in support of CEQR/SEQOR, including environmental assessment statements (EAS) and environmental impact statements (EIS), shall be identified in the Agreement.

c. Division of Air and Noise Policy, Permitting and Enforcement

This division regulates activities and equipment that emit atmospheric contaminants, including demolition activities that can produce airborne particulate matter, boilers that can produce noxious gases, and construction vehicles that can produce both kinds of contaminants. This division also enforces the NYC Noise Code, Local Law 113. The Consultant is responsible for ensuring that noise-producing elements of the project scope, such as outdoor mechanical equipment, comply with code.

d. Bureau of Water and Sewer Operations (BWSO)

BWSO authorizes the repair or replacement of water and sewer lines, the installation of backflow prevention devices, and the connection of domestic water, sprinkler, sanitary, and stormwater systems to City water and sewer mains. BWSO also provides water pressure tests for connections to new domestic water and sprinkler systems and confirms the availability of sewer service for new sanitary and stormwater systems. If applicable to a project, BWSO approvals are required to obtain DOB approvals (see Appendix A-1 Section I, "Plumbing Engineering Design Criteria").

e. Bureau of Wastewater Treatment (BWT)

Construction activities such as excavations and well drilling that will discharge more than 10,000 gallons per day of ground water into the public sewers must obtain a Dewatering Permit from BWT. Projects involving well point de-watering in Brooklyn and Queens must also contact the NYS Department of Environmental Conservation (see below).

f. NYC Water Board

The Board manages DEP's Comprehensive Water Reuse Program, which offers a rate reduction for buildings that capture and use stormwater.

6) NYC DEPARTMENT OF PARKS AND RECREATION (NYC PARKS)

NYC Parks approves projects within parks or designated parkland, as well as removal or planting of street trees. Street tree plantings may be required for new construction or significant renovation projects as required by DCP regulations. Street tree planting approval is required prior to DOB or DOT approval. Street tree plantings must be inspected and accepted by NYC Parks Forestry division to obtain DOB final sign-off or Certificate of Occupancy.

7) NYC DEPARTMENT OF HEALTH AND MENTAL HYGIENE (DOHMH)

The DOHMH approves the operations of food service establishments and swimming pool facilities. DOHMH regulations also pertain to other types of facilities including day care centers and animal care facilities.

8) NYC DEPARTMENT OF SANITATION (DSNY)

The DSNY approves refuse disposal methods, including disposal of special refuse.

9) ENVIRONMENTAL CONTROL BOARD (ECB)

The ECB is the division of the Office of Administrative Trials and Hearings (OATH) that hears cases on violations of City laws that protect the public's health, safety, and environment issued by agencies including, but not limited to, the DOB, DOT, FDNY, DEP, and NYC Parks.

10) UTILITY COMPANIES AND NYS ENERGY RESEARCH AND DEVELOPMENT AUTHORITY (NYSERDA)

Utility companies review and approve applications for electric, gas, and steam connections. Consultants are also expected to be aware of and help Sponsor Agencies apply for energy conservation incentive programs by NYSERDA and individual utility companies.

11) COMMUNITY BOARDS

Community Boards review and make recommendations pertaining to projects located within their boundaries. All projects that must undertake a PDC or LPC review must begin with a presentation reviewed by the community board and/or particular committee and/or the Full Board themselves. Consultants may need to present new buildings, major additions, and landscape projects to at least one group the community board designates and on occasion more than one. The Consultant should be in direct contact with DDC/Office of Community Outreach & Notification (OCON) to begin this process. The Consultant is also responsible for all services in support of Community Board notification and review, if required or if requested by DDC/OCON.

12) MAYOR'S OFFICE OF ENVIRONMENTAL COORDINATION (MOEC)

This office coordinates the City Environmental Quality Review (CEQR) process. DDC projects that have potential for significant effects on the environment, including historic resources, are subject to CEQR. During the process these potential effects are identified and disclosed, and options for avoiding or mitigating the effects are proposed. See the CEQR Technical Manual (<https://www1.nyc.gov/site/oec/environmental-quality-review/technical-manual.page>). CEQR requirements and procedures are equivalent to those for the New York State Environmental Quality Review (SEQR) (see section 13, below). OER has an electronic filing process for applications at the following website: <https://a002-epic.nyc.gov/app/search/advanced>

13) NEW YORK STATE AGENCIES

a. Department of Environmental Conservation (DEC)

DEC administers and enforces the State's Environmental Conservation Law (ECL). Consultants for DDC projects will work primarily with DEC's office for Region 2, which covers New York City, and with the Division of Environmental Permits, which conducts environmental assessments and reviews projects that require DEC permits. Permit applications are processed according to the ECL's Uniform Procedures Act. The most common DEC reviews, permits, and authorizations required for DDC projects include:

i. State Environmental Quality Review (SEQR)

DDC projects that receive State funding, require a DEC permit, or require discretionary action such as a variance by a State agency, must proceed through SEQR. Under SEQR, an Environmental Assessment Statement (EAS) must be prepared to identify potential environmental impacts; if such impacts are anticipated, an environmental impact statement (EIS) must be prepared to describe how they will be mitigated.

Under SEQR, projects may be designated as follows:

1. Type I Action: Projects that meet or exceed statewide or agency thresholds, typically – but not always – requiring the preparation of an EIS.
2. Type II Action: Projects that do not require further SEQR review.
3. Unlisted Action: Projects that do not meet Type I thresholds but may still require an EIS.

ii. State Pollutant Discharge Elimination System (SPDES)

This permit is required for construction activities involving soil disturbance of at least one (1) acre, or less than 1 acre where DEC finds a potential threat to water quality. Construction activities involving soil disturbance of more than 5 acres at a time must comply with additional requirements. To obtain approval, projects must prepare a Stormwater Pollution Prevention Plan (SWPPP) that conforms to the NYS Stormwater Management Design Manual. Because the SWPPP for a project in New York City must be approved by DEP (see above), such projects must also conform to the DEP Guidelines for the Design and Construction of Stormwater Management Systems.

iii. Coastal Erosion Hazard Area

This permit is required for construction activities on land along coastal waters including the Hudson, Harlem, and East Rivers; the Kill van Kull and Arthur Kill; Long Island Sound; the Atlantic Ocean; and all connecting water bodies, bays, harbors, shallows, and wetlands. To obtain approval, projects must have public benefit, must not cause an increase in erosion or have adverse effects on protective features or natural resources, and must be safe from flood and erosion damage. DEC maintains maps of the State's Coastal Erosion Hazard Areas.

iv. Tidal Wetlands and Freshwater Wetlands

This permit is required for construction activities that could impact wetland functions. To obtain approval, projects must not degrade or destroy any wetlands. DEC maintains the State's Fisheries (freshwater wetlands) Maps and Tidal Wetland Inventory. In general, the City's wetlands are concentrated around the south shores of Brooklyn and Queens (see Critical Environmental Areas below), the north shore of Queens, the southeast shore of the Bronx, and the north and west shores of Staten Island, with small tidal and freshwater wetland areas scattered throughout the five boroughs, especially Staten Island and the major parklands of northern Queens.

v. Critical Environmental Areas (CEA)

The shoreline of Jamaica Bay, which includes parts of Brooklyn and Queens, is the only designated CEA in New York City. Projects subject to SEQR that are in or substantially contiguous to this area must specifically evaluate potential impacts to the unique characteristics of the CEA, which may include its benefit or threat to human health; valuable natural, agricultural, cultural, historic, recreational, or educational qualities; or an inherent environmental sensitivity to change.

vi. Environmental Remediation

DEC maintains the States' Registry of Inactive Hazardous Waste Disposal Sites and, together with the New York City Mayor's Office of Environmental Remediation (OER), oversees the remediation of State Superfund Sites and brownfields in the City.

b. Office of Parks, Recreation and Historic Preservation (OPRHP)

In addition to administering the seven (7) New York State parks within the City, as well as Hudson River Park, jointly administered with the City through the Hudson River Park Trust, OPRHP administers the State's Open Space Conservation Plan, which identifies conservation and historic preservation priorities on public and private property in the City and throughout the State.

c. State Historic Preservation Office (SHPO):

This office of OPRHP maintains the National and New York State Registers of Historic Places (see Landmarks Preservation Commission above) and maps of known areas of archeological sensitivity. SHPO acts as the primary reviewer of projects receiving state or federal funding that are found through SEQR (see DEC above) to have potential impacts on Register-listed properties or archeological resources. Projects receiving only City funding are reviewed by LPC.

d. Department of State

Projects located in Coastal Erosion Hazard Areas (see above) must obtain a Coastal Consistency Certification from the Department's Coastal Management Program. The certification will be incorporated into the permit decision of the U.S. Army Corps of Engineers if federal approval is required, or of DEC if no federal approval is required.

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