DESIGN STANDARDS

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DESIGN PROCESS STANDARDS

BUILDING DESIGN STANDARDS*

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APPENDIX SECTIONS

INTRODUCTION

Salt Lake County, a political body of the state of Utah, has approximately one hundred ninety different facilities throughout the County consisting of office buildings, health clinics, jails, recreational complexes, libraries, senior centers, waste management centers and parks. Contrasting needs and uses make it impossible to establish a single, all-inclusive, set of facility programming, design and construction procedures and standards that will apply to every project. However, specific minimum procedures and standards have been identified as relating to all Salt Lake County projects. This compilation of instructions to Architects has been developed by Salt Lake County Facilities Management Division.

For all major design and construction projects, a specific building program will be prepared by a consulting Architect stating the specific needs to be met and the scope of the project. The building program is intended to be used in conjunction with this compilation for all design and construction projects. Both documents are equally binding in the preparation of plans and specifications. The same subject may be treated in the building program and in these instructions. If a conflict does occur, the conflict must be brought to the attention of the authorized County Project Manager.

The Architect assigned the task of programming or design shall be responsible for careful review of all material contained herein. These procedures and standards are the product of many years of experience by the Facilities Management Division and other personnel of Salt Lake County. Where these procedures and standards apply, strict compliance is expected.

Salt Lake County has a commitment to sustainable building practices and as such all new construction and major retrofit projects for all County facilities and buildings shall be designated and constructed to meet High Performance Building Standards (HPBS)and LEED® Gold level standards with emphasis on energy efficiency.

Projects will be required to submit preliminary LEED® Scorecards as part of the schematic design submittal. Schematic Design LEED® submissions will include at least 4 points exceeding Gold Level Minimum, and have this level of scoring reflected in Schematic Design submission cost estimates. For more information on LEED® credit points please review United States Green Building Council (USGBC) documentation. On the very rare occasion that a project is designated by the County Council or Mayor as exempt from LEED® standards it will still be required to comply with HPBS with an emphasis on strategies that maximize energy efficiency including building envelop and MEP System Performance. Throughout this document efforts associated with the above shall be referred to as HPBS.

This document should be kept intact and should not be separated for the various aspects of architecture and construction. The procedures and standards herein are dynamic in nature and thus are subject to constant review and change. Changes will be updated in electronic format, and will be available in electronic format through Salt Lake County, Facilities Management website. It is the responsibility of the consultant to obtain the most recent approved version of this document. For requirements which change during the project design and construction project, the authorized County Project Manager will determine applicability.

GENERAL REQUIREMENTS

These requirements are intended to assist the Architect in performing the specific duties identified in the Architect agreement for each specific project. The Architect should carefully and frequently review all duties indicated in the contract.

DEFINITIONS

Architectural Program

Architectural program shall qualitatively and quantitatively define project concept and scope to include: total facility identity and purpose; organization and service requirements; individual and space descriptions; project concept; preliminary project cost estimate; preliminary code analysis; mechanical, electrical, plumbing, civil, environmental, structural and FF&E general scope.

Integrated Design

Design process that incorporates thinking and working across disciplines, from the earliest stages in the process, to achieve whole-system solutions that maximize building performance and return on investment. Incorporates ideas from the engineering and specialty consultants, as well as future building occupants, during feasibility and conceptual design phases so that decisions can be informed by critical insight.

PDT

Project Development Team (PDT). The group of County Project Managers that will direct a project's activities along with the County Project Manager. This team will consist of agency representatives, user groups and other County personnel. On a case by case basis, community representatives may be part of the PDT.

Project Manager

Herein, unless designated otherwise, the term Project Manager shall refer to the project representative from the Salt Lake County Facilities Management Division.

Scope

The portion of work to be completed by the design team or the contractor during construction.

County Representation

All County facility design and construction projects will be accomplished under the direction of The Facilities Management Division. A specific County project manager will be assigned to each project and will direct the projects activities along with a Project Development Team (PDT). The Architect will be required to report to and coordinate all activities through the County project manager.

High Performance Building Standards (HPBS)

Criteria identified throughout sections of this document which specify minimum requirements for buildings in general – See Introduction Part A. These requirements shall be implemented in order to achieve maximum value and energy performance for all Salt Lake County facilities as described in the following pages.

LEED® Gold standards application:

-All new construction and major remodels over $3.5 million will be designed and constructed to LEED® Gold standards.

-For projects under $3.5 million the Project Development Team with the Architect will review the possibilities of design and construction to LEED® Gold standards and will present options to the

Mayor for the project. These options will include requirements, including costs, to meet LEED® Gold standards, energy efficiencies and sustainable practices that will be achieved regardless, reasons why LEED® standards should or should not be pursued, etc. The Mayor will then determine if the facility should be design and constructed to LEED® Gold standards or not.

-In the rare instance that a facility over $3.5 million does not fit well with LEED® Gold standards, i.e. warehouse facilities, prefabricated metal buildings, etc., the Project Development Team with the Architect will provide justification as to why the facility should not be designed and constructed to LEED® Gold standards, as well as options to achieve LEED® standards to the Agency and Facilities Management Administration, who will then present to the Council for final determination on meeting LEED® Gold standards.

Integrated Design

The success of any building project depends upon thinking and working across disciplines to achieve whole-system solutions that maximize building performance and return on investment. All too often in a traditional design process, the consultants and end user are not included in the beginning stages, and decisions are made without critical insight into nuances that may affect the way the building will actually be constructed or occupied. This often results in systems being engineered late in the design process that could have been optimized had they been implemented in the earliest stages. It also results in poorly coordinated drawings, change orders, delayed fit out, schedule challenges, resource consumption, and cost impacts that could be avoided through the inclusion of all team members early in the project. Integrated design is the involvement of all team members in the earliest phases of the process.

Effectively integrated design is the key to creating buildings that do a better job of serving their occupants, their owners, the community, and the environment. When all pertinent disciplines interact early in the design process, there are opportunities to align technical systems and design elements, integrating not only the team process, but also the building itself. This can result in the downsizing of mechanical equipment, avoidance of unnecessary materials and operational systems, and a design that can be built more efficiently and functions more effectively. Integrated design also allows a more successful approach to sustainability that is not seen as merely an add-on option or alternative path. Rather, the result is a design that is beautiful, environmentally appropriate, economically viable, and exceptionally functional.

Essential Process Elements

1. Use knowledge of integrated design process to guide the design team from the beginning of the programming process. The integrated design process should also be implemented at the beginning of schematic design, and continue as a regular tool through all project phases.

2. Use Design charrettes to bring the team together at the outset of the project to:

    a. Become acquainted with the County standards and how to implement them.
    b. Provide a forum for input from team members, stakeholders, the consultants, and the County.
    c. Define project goals and establish priorities within the context of the County standards.
    d. Gain shared understanding of potential related to all design strategies.
    e. Gain shared understanding of potential for interdisciplinary synergies and opportunities to collaborate.
    f. Develop building strategies, concepts, and recommendations that will inform the design process and facilitate truly integrated high-performance results. These should include both general project goals and specific parameters for the site, design, materials, technologies and systems.
    g. Determine and set goals for the particular LEED® credits that the project will strive to obtain should the project be required to meet LEED® requirements.

3. Consider the use of available tools including but not limited to daylight simulations, energy modeling, life-cycle cost spreadsheets, comparisons of materials options, site analysis, acoustic analysis, etc. to assess contribution of alternate design concepts to financial and environmental performance.

4. Clarify the roles of all design-team members, from the architect and owner, to all of the engineers and agents, early in the design process.

   Involve independent commissioning agents early in the process to improve the agent's understanding of the design intent, to minimize possible implementation errors that might result from lacking forethought or clarity in the construction documents, and to facilitate streamlining post-construction commissioning. Refer to the information in the commissioning section of the standards or further information and requirements.

Project Initiation

The Architect shall be responsible for orchestrating the project's complete development including pre-design activities listed below.

1. Organize and develop a complete Design Team; and, identify the project team leader, primary staff and major sub-consultants through all normal project phases. The team leader of the Architects shall participate in all regularly scheduled project meetings during each phase of the project.

2. Thoroughly review all contractual responsibilities; and assign, schedule, list and distribute each phase service assignment to meet the various stated project objectives.

3. Obtain the project scope and/or program; investigate, analyze, evaluate and define all project variables; and, verify the primary project goal, major objectives and various other requirements with the County's officially designated Project Development Team. Strictly adhere to all officially adopted Architectural Programs unless instructed otherwise in writing.
3.
4. Identify the Building Authority having jurisdiction over the design and construction of the proposed project; research, itemize and analyze all regulatory ordinances, facts and conditions regulating such construction activity; and, establish the orderly achievement of each and every conditions regulating such construction activity; and, establish the orderly achievement of each and every condition and obligation as may be required for the timely development of the project through the occupancy phase.

5. The delivery method for the bid documents shall be design-bid-build unless otherwise directed in writing by the County project manager. Design-build is not allowed for any portion of the work.

All projects must meet the following standards as a minimum regardless of LEED® Gold standard requirements. In a case where a conflict arises between different sections, the more stringent requirements should apply and the County Project Development Team (PDT) should be notified about the conflict and resolve the dispute.

INTEGRATED DESIGN PROCESS

The process and expectations outlined includes certain activities and events that are required to happen during the project. The intent thereof is to inform the project team of what should happen over the course of a project to not only meet the requirements of the HPBS but also maximize the value of design and construction efforts to Salt Lake County.

Adjustments to the process outline below, in order to best suit the needs of each project, are expected and should be discussed with the project team periodically through the project and recorded in the OPR.

A. The Owner shall directly hire the Building Envelope Commissioning Agent, and Systems Commissioning Agent in the programming phase.

A.

B. Energy modeling if applicable will be reviewed by the Design Team.

B.

C. The Owner, Commissioning Agent, and Building Envelope Commissioning Agent, shall provide timely input to the design team related to the OPR, BOD, and related HPBS documentation.

D. An updated BOD and OPR, including narrative of HPBS goals and strategies, shall be included in each design phase submittal to the owner. Changes from one phase to the next shall be documented as to provide a record of the development of the project.

E. An updated sustainable site plan shall be included in each design phase submittal to the owner

F. A HPBS Workshop must be completed during the first half of each phase of the project. Goals, strategies, and performance metrics must be documented in the OPR, BOD, programming document and project documents accordingly. Additional informal HPBS Workshops shall be held to provide clear direction to the project in regards to the requirements of the HPBS. Each HPBS Workshop shall include, but not limited to, the following project team members:
    1. County Project Managers
    2. Agency Representatives
    3. Facility Operators (if unknown – PDT to identify suitable substitute)
    4. Design Team Members
    5. Commissioning Agent(s)

G. Owners Project Requirements and Basis of Design
The purpose of the OPR is to provide a clear and concise document of the Owner's goals, expectations and requirements for the building. It provides the design team with the information to develop the Basis of Design (BOD) during schematic design, serving as a map for the development of the design and construction documents. Additionally, OPR and BOD provide the owner and commissioning agent with tangible benchmarks to measure success, quality and confirm that the building and systems constructed align with the Owner's expectations and requirements.

A concise OPR must be developed by the design team and owner during the project programming phase, or by the midpoint of schematic design, for projects without a programming phase. For projects with a programming phase, the OPR is required to be complete and included in the project program. For projects without a programming phase the, the OPR is required to be complete and included in the schematic design review set.

As the project develops, it is expected that many of the elements of the OPR and BOD will evolve. Once the initial OPR and BOD are developed by the design team and the Commissioning Agent (CxA) has been integrated into the project, it is to be reviewed by the CxA at the SD, DD and CD submittal. Changes to the OPR and BOD, from one design phase to the next, must be documented by the design team.

Additionally, the OPR and BOD should serve as a foundation for the project systems manuals delivered to the Owner as part of the "as-built" documents.

The following sections should be included in the OPR:

1. Project Information – Building site address, Utility bill/account information and project team contact information.
2. Project Background:
   General building information including but not limited to the following

   a. Square footage
   b. Number of floors
   c. Construction Costs (soft and hard)
   d. Location
   e. Design schedule
   f. Construction schedule
   g. Project delivery method
   h. Estimated occupancy
   i. Code occupancy schedules
   j. Abatement (if necessary)

   General project background
   a. Brief summary of the project
      i. Intended use
      ii. Occupancy
      iii. Construction type
      iv. Other
   b. Mission
   c. Objectives
   d. Possible needs for flexibility and expansion

3. Codes and Standards
4. Building Performance – See Appendix GG.

H. User Group Representative (if applicable) The Owner, design team, Commissioning Agent, and Building Envelope Commissioning Agent shall review each design phase submittal for compliance to the HPBS. Appropriate design phase comments shall be provided to the design team within 10 business days.

1. The design team shall conduct a building envelop systems meeting, during design development phase, to review possible envelope strategies. Topics to review included, but are not limited to, air, thermal and moisture performance, functional performance requirements, constructability, energy efficiency, aesthesis, mock ups, and testing.

HIGH PERFORMANCE BUILDING STANDARDS (HPBS) REQUIREMENTS

PROGRAMMING

The following must be provided during the schematic design phase of the project. The design team shall provide simplified modeling iterations of various conceptual design proposals including, but not limited to, massing, orientation, glazing orientation, and glazing amount for assessment.

SCHEMATIC DESIGN

The following must be provided during the schematic design phase of the project.

1. The design team shall conduct a building systems meeting to review the possible systems applicable to the project. Agenda items to include, but not limited to, performance, Life Cycle Cost (LCC), first costs, operations and maintenance, and existing infrastructure integration.

2. The design team, appropriate Facilities Operators, Commissioning Agent, Project Development Team and other appropriate parties must be in attendance.

3. County Project Manager to sign Rocky Mountain Power's Incentive General Applications as provided by Architect

4. LEED® scorecard with a minimum of 4 points above Gold standard requirements.

5. The Cost Estimator or General Contractor/Construction Manager (dependent upon project procurement method) must provide relevant supporting construction cost estimates to the PDT and Design Team in a timely manner.

DESIGN DEVELOPMENT

The following must be provided during the design development phase of the project.

A. The design team shall conduct a second building systems meeting to review the possible systems applicable to the project. Agenda items to include, but not limited to, performance, LCC, first costs, operations and maintenance, and existing infrastructure integration.

B. LEED® scorecard with a minimum of 4 points above Gold standard requirements.

CONSTRUCTION DOCUMENTS

The following must be provided during the construction documents phase of the project.

A. The design team shall conduct a building controls meeting to review the possible systems applicable to the project. Agenda items to include, but not limited to, metering, controls, points, analytics and operations and maintenance.

A.

B. The design team, appropriate Facilities Operators, Commissioning Agent, Project Development Team and other appropriate parties must be in attendance.

C. The Design Team shall coordinate all incentives and rebates as previously agreed.

D. The Design Team shall submit all required documentation to the County as part of the CD submittal. The submittal shall include, but is not limited to the following.

1. Sustainable site plan
2. HPBS Spreadsheet
3. Any exceptions and appeals
4. Owner's Project Requirements (OPR)
5. Basis of Design (BOD)

E. The Design Team (if applicable) shall submit all required documentation to County as part of the CD submittal:

1. Energy Model Spreadsheet
2. Life Cycle Cost Worksheet

F. The CxA shall submit all required documentation, to PDT as part of the CD submittal:

1. Commissioning Plan

G. The BECxA shall submit all required documentation, to PDT as part of the CD submittal:

1. Building Envelope Commissioning Plan

BIDDING

1. Value engineering efforts and substitution request must be evaluated in context of the HPBS, preferred operations and maintenance procedures and performance impacts over the life of the building.

CONSTRUCTION

1. Submittals and shop drawings related to HPBS requirements shall be reviewed by the CxA, BECxA and Project Manager in the time period set forth in the construction documents. Their review does not relieve or supersede the responsibility of the design team to review the HPBS related submittals and shop drawings for compliance set forth in the construction documents.

2. The Design Team shall provide the required incentive and rebate documentation to the County Project Manager.

3. BECx related performance tests shall be tracked in the weekly OAC meeting minutes.

4. At a minimum, the BECxA shall attend, in person or via a conference call, OAC meetings monthly. Reasonable effort by other team members shall be made to discuss related issues at the beginning of each meeting

5. A building envelope commissioning kick off meeting shall be coordinated by the general contractor and BECxA.

    a. Required attendees include, but are not limited to the following: Architect, County PDT. Commissioning Agents. Subcontractors responsible for the following building components shall attend when applicable; masonry, insulation, air barrier, cladding, glazing, roofing and others as dictated by the envelop design.

6. Testing of building envelope components, on the building mock up, shall be completed with acceptable results prior to installation of said components.

    a. The general contractor and subcontractors responsible for the installation of the components shall attend the functional testing.

   b. The BECxA shall review deficiencies and possible causes of failed tests with each subcontractor prior to leaving the site on the day of the test(s).
7. At a minimum the Commissioning Agent shall attend, in person or via a conference call, OAC meetings on a month basis.

8. A building systems commissioning kick off meeting shall be coordinated by the general contractor and CxA.

SUBSTANTIAL COMPLETION AND PROJECT CLOSEOUT

1. The CxA shall coordinate with the County PDT or designee to set up the project for benchmarking in EPA ENERGY STAR Portfolio Manager.

2. The CxA, Owner, and General Contractor shall conduct a Four Month Walk Through Performance meeting.

3. The CxA shall finalize the incentive and rebates per agreement

4. The O&M manuals and As-Built documents must include, but is not limited to, the OPR, BOD, HPBS Worksheet, Energy Modeling Spreadsheet, Life Cycle Cost Worksheet, and Controls As-Builts.

CONTEXT SENSITIVE DESIGN

Site Design

1. The Design Team shall conduct a review of the local and regional planning documents pertinent to the project. These documents may include, but are not limited to:

   a. Municipal Master Plan or Land Use Plan
   b. Applicable Open Space Plans, including trail and recreation plans, municipal open space plans...
   c. Municipal, Regional or State Transportation Plan
   d. Local or Regional Stormwater Plans or Guidelines
   e. Applicable environmental regulations that may apply to the site

2. The project design shall reflect the community vision for the site. The building site, open space design and access points shall reflect the goals of the regional and municipal planning documents.

Building Design

1. The building shall be sited and oriented to reflect the community development patterns and vision, while responding to the site, solar access, and other climate considerations.

2. The building design shall reflect the community vision and vernacular design patterns.

Building Orientation

1. The façade design shall reflect the solar access and orientation of the site through the integration of shading devices, window location, and scale. Window to wall ratios that are

appropriate based on building energy performance, orientation, and interior programming shall be integrated into the design.

Access

1. Provide enhanced access from the project entry to the identified pedestrian and transit access points at the perimeter of the site.

    a. Ensure pedestrian paths are safe, accessible and maintainable by facility staff. Separate pedestrian paths from vehicular paths with landscaped barriers to the extent feasible.

    B. Identify key paths on a Sustainable Site Plan drawing submitted at the Schematic Design.

DEVELOPMENT, AND CONSTRUCTION DOCUMENT PHASES

Transportation Management

A. Identify transportation management goals for the project to help reduce single rider vehicle impacts. This goal may be an overall percentage reduction in single-vehicle ridership, an increase in transit usage or the implementation of a carpooling program. Record this goal in the OPR.

B. Incentivize transit use through a reduction in parking stalls provided. This reduction should be based on a 10% reduction in comparison to municipal requirements or a 25% reduction based on the 4th Edition Parking Generation Guide by the Institute of Transportation Engineers and as allowed by local zoning.

C. Define clear, safe paths of access for pedestrians and cyclists from the public right-of-way to the building entry. Locate shower and changing rooms – as applicable – near these locations.

D. Provide a minimum of 10 secure bicycle storage locations.

    1. After the course of one year Facility Operators shall assess the need to for additional bicycle storage racks and provide as necessary.

    2. If the project cannot or should not meet the above requirements, provide a written justification in the OPR.

E. Provide a minimum of two reserved parking stalls for carpool vehicles and fuel-efficient, low emitting vehicles on each project.

F. Implement three of the following strategies to reduce single vehicle ridership to and from the project.

    1. Identify transit and alternative transportation options for the users and site. Identify strategies to encourage transit ridership, such as reduced or free pass offerings.

    2. Incentivize transit use through increased parking fees or paid parking lots.

    3. Provide telecommuting and / or reduced work week programs to minimize single vehicle ridership to the building.

    4. Provide shower and changing room(s) for cyclists and those who exercise mid-day.

5. Designate 5% or more of the total parking provided as parking stalls for low emitting/fuel efficient - locate these stalls in preferred parking locations.

6. The designer shall consider the addition of electric vehicle supply equipment (EVSE) capable of level 2 (208-240 volts or greater) charging capacity for 2% of all parking spaces. At a minimum, conduits shall be run for future addition of EVSE chargers. Terminate conduits in an in-ground box if tripping hazard poses a concern.

7. Designate 5% or more of the total parking provided as parking for carpool vehicles- locate these stalls in preferred parking locations.

8. Demonstrate single-vehicle ridership or vehicle impact reductions through an alternative method.

G. The three strategies selected shall be identified in the OPR.

SITE DESIGN CRITERIA

Open Space Design

A. Create an open space plan that defines the usable site areas, designates open space, and identifies the landscape and hardscape areas. These specific areas shall be shown on the Sustainable Site Plan drawing, include a brief description of the anticipated level of use of each of the areas, and submit with each design review phase.

B. Necessary pedestrian open spaces such as sidewalks, paths, and passive and active recreation areas, shall be designated. Include transportation management areas as required.

1. Define active hardscape areas that will be used for pedestrian traffic or regular pedestrian or visitor use.

2. Define active landscape areas that will be used by building users and visitors regularly. Identify intended uses that may occur within this landscaped area.

3. Define aesthetic and native or natural open-space areas, as applicable

4. Define active pedestrian hardscape areas that are used for emergency or non-active uses

C. The site shall be designed to minimize “hiding spaces” or spaces of concealment to mitigate safety and maintenance concerns.

D. The Landscape Architect shall provide an estimated maintenance schedule for the landscaped areas, with an emphasis on the reduced maintenance and reduced water consumption of the native and adapted landscaped areas.

1. This maintenance schedule shall be included in the Operation and Maintenance Manuals for the project.

Landscape Water Consumption

A. Create a site irrigation water use budget based on your location and site conditions, per the EPA Water Sense criteria.

1. Use the EPA WaterSense Tool1 to identify the water allowance for the site after landscaped areas have been defined. A summary of the water allowance shall be included in the Operations and Maintenance Manuals for the project.

    a. http://www.epa.gov/WaterSense/water_budget/
    b. Salt Lake County Engineering and Flood Control – Guidance Document for Storm Water Management – January 2012; Chapter 7, paying attention to Best Management Practices.

B. Landscape water consumption shall not exceed the monthly water allowance for the site as defined by the EPA WaterSense Tool. Justification for exceeding monthly water allowance may be reviewed and approved by the County PDT in rare cases. Design and implement landscape materials and features that respond to the allocated water budget established in the OPR, meeting native and adapted landscape material requirements.

C. Landscape features shall align with the anticipated use areas defined in the in HPBS Requirement Integrate an EPA WaterSense Labeled irrigation controller into the irrigation system.

Storm Water Design

A. Design, construct, and maintain storm water BMPs that manage rainfall on site and prevent the off-site discharge of precipitation from the first one inch of rainfall from a 24-hour storm preceded by 48-hours of no measurable precipitation.

B. Implement at least two BMPs from the Best Management Practices for Storm Water.

1. Provide two BMP Information Sheets from the Guidance Document and a description of how the specific BMPs are implemented in the project.

2. Identify and describe the selected strategies in the OPR, and submit with the Design Development submission.

Heat-Island Effect

Plan exterior hardscape materials to reduce the urban heat island effect. Use materials with an SRI of 35 or greater for all pedestrian oriented paved surfaces and reduce the overall use of asphalt as much as feasible.

A. Indicate the compact parking on the Sustainable Site Plan drawing. Amount of compact parking shall be agreed upon during Schematic Design.

B. Use concrete at all pedestrian oriented hardscape areas. Colored concrete shall not have an SRI of less than 29.

Use reflective roofing to reduce the urban heat-island effect at the building. Install a reflective roof with an SRI of 78 or greater over 75% of the low slope roof areas (slopes below or equal to 2:12) for all buildings in Climate Zone five.

C. Consider a tan colored, planted or ballasted roof at roofs that are visible from inside the building to reduce glare and increase occupant comfort.

D. Install roofing with an SRI of 29 or greater at steep-sloped areas (slopes above 2:12)

E. SRI values for roofing and hardscape must be included in the Sustainable Site Plan.

Light Pollution Reduction

A. Specify horizontal cut offs of exterior luminaries to comply with light pollution reduction requirements indicated n current LEED® version.

B. All exterior lamps shall be LED.

C. Lighting values at defined site boundary, shall comply with current LEED® version requirements, except as required by the municipality or local government for pedestrian safety.

D. Exterior lighting shall be controlled by a photocell sensor.

E. All interior lighting systems shall be designed and controlled to shield interior light from the exterior of the building, or include a 50% reduction in lighting output between the hours of 11:00 pm and 5:00 am.

F. Control internally illuminated exterior signage to not exceed a luminance of 200 cd/m^2 (nits) during night time hours and 2000 cd/m^2 (nits) during daytime hours.

ENERGY

Commissioning

A. All Salt Lake County projects will utilize building systems commissioning to assist design and construction teams with meeting project design and performance requirements. The Commissioning provider will be contracted directly to Salt Lake County. It is the responsibility of the Owner, Design and Construction teams to ensure the Commissioning Provider has the appropriate information and technical support to perform commissioning duties.

Energy Performance

A. All new construction and major renovation, projects (Proposed design) to achieve, if life-cycle cost-effective, an energy cost performance 20% below the energy cost performance of the corresponding Baseline design as proposed by the Design Team and approved by the Project Manager.

1. For the purpose of calculating the energy cost savings, include all fuel costs incurred for all systems normally specified as part of the Proposed design scope, regardless of specifying entity (interior & exterior), including receptacle and process load energy costs.

2. Energy costs for both the Baseline and Proposed designs shall be determined by using the Performance Rating Method as defined by Appendix G of ANSI / ASHRAE / IESNA Standard 90.1-2010, Energy Standard for Buildings Except Low-Rise Residential Buildings (with errata, without addenda).

3. The building/project Performance Rating percentage improvement shall be determined by use of the formula in paragraph G1.2 of Standard 90.1-2010, in terms of total energy cost, as follows.

    a. Percentage improvement = 100 x (Baseline building performance – proposed building performance, divided by Baseline building performance.

4. During the programming process the Design Team and the County PDT will review the projects BOD and OPR and may in rare cases propose to the County Council project exemptions from required 20% improvement.

5. Minimum documentation requirements for demonstration of compliance with this are as follows, and must be based upon the drawings and specifications referenced in the final construction document bid set, including the completion of value engineering, bid alternates, and addenda.

    a. All relevant project information as required by Standard 90.1-2010-G1.4 (Reference Appendix B – Project Energy Performance Statement
    b. All energy model input values not specified by Standard 90.1-2010-G1.4. Examples include, but are not limited to, thermostatic settings and occupancy & equipment schedules. Software output reports may be used to demonstrate compliance with this section.

Refrigerant Management

A. No CFC or HCFC refrigerants are acceptable on Salt Lake County projects.

B. The contractor will submit data for each piece of project equipment containing or utilizing refrigerant detailing:

    1. Type of refrigerant

    2. Operating refrigerant charge for each refrigerant circuit

    3. Manufacturer's data regarding annual refrigerant leakage rates.

C. Fire suppression systems shall not utilize halons as the chemical suppression agent

Appliances and Equipment

A. As available, provide appliances, equipment, products, and/or furnishings that meet one of the following criteria.

    1. ENERGY STAR Qualified.

    2. EPACT Registered

    3. Products that meet or exceed the US Department of Energy's FEMP Energy Efficiency Recommendations

    4. Rocky Mountain Power incentive, Questar Gas rebate program, or local utility company incentive/rebate approved equipment.

B. Credit for plug & process (unregulated) loads that are associated with products complying with this section may be given credit in the Proposed design energy model by following the exceptional calculation method described in Standard 90.1-2010, G2.5, or through use of the procedures described in section 6.4.5 of COMNET's Commercial Buildings Energy Modeling Guidelines and Procedures4.

MINIMUM REQUIREMENTS FOR NEW CONSTRUCTION

A. The building envelope requirements in Standard 90.1-2010 Tables 5.5.1-8 or code minimum, whichever is more stringent, are mandatory.

B. Building Enclosure Commissioning and Requirements are indicated in Appendix FF.

C. Minimum efficiency requirements of Standard 90.1-2010 section 6.8 and section 7.8 or code minimum, whichever is more stringent, are mandatory for all new equipment covered under the standard.

D. The building envelope requirements of IECC C402.3.1 are mandatory regardless if the project is complying with ASHRAE 90.1 or IECC.

E. All Salt Lake County projects will include building envelop commissioning to ascertain design and construction compliance with stated requirements. The commissioning provider will be contracted directly by Salt Lake County. It is the responsibility of the Owner, Design Team and Construction Team to ensure the commissioning provider has the informational and technical support to perform commissioning duties.

F. During design development the Electrical Engineer will provide a room-by-room count of installed and space-by-space allowed lighting power per Standard 90.1-2010 Table 9.6.1, as well as any lighting power exceptions taken per Standard 90.1-2010 section 9.2.2.3.

WATER EFFICIENCY

A. Meet the EPA WaterSense v. 5 requirements for high efficiency plumbing fixtures and appliances within the building. http://www.epa.gov/WaterSense/water_budget/

B. Once-through process water systems are not permitted.

C. Identify water efficiency goals and system expectations into the OPR and BOD submitted at Schematic Design phase.

MATERIALS AND RESOURCES

A. Provide recycling containers and implement a recycling program in all new buildings.

1. Recycling containers shall be collocated with the garbage bins.

2. If co-mingled recycling is not permitted, bins must be clearly marked.

3. At a minimum, mixed papers, cardboard, mixed plastics, and mixed metals shall be recycled.

B. Integrate water bottle filling stations at a minimum of one drinking fountain in the building.

C. Implement a construction waste management plan to divert a minimum of 75% of construction waste, by volume, from the landfill.

1. Provide a narrative for exceptions to compliance with 75% requirement. Narrative shall define the feasible diversion rate, by volume, and is subject to review and approval by County PDT.

2. Contractor shall track recycled content, per the HBPS Worksheet, and provide a summary of construction waste at project construction meetings to be reviewed for compliance by the

architect.

SUSTAINABLE MATERIAL SOURCING

A. Identify and specify building materials that are both extracted and manufactured within 500 miles of the project site.

    1. Only the value associated with the regional content, by percentage, shall contribute to the sustainable value of the product.

    2. Key materials include concrete, concrete masonry, brick, stone, gypsum board, steel joists, and regionally manufactured misc. metals.

B. Identify and specify building materials that contain recycled materials.

    1. Recycled content shall be tracked as both pre-consumer and post-consumer recycled content.

    2. Key materials containing recycled content include concrete, all metal containing materials, plastic containing materials, carpet, and suspended ceiling systems.

C. 35% of building materials, by value, shall meet one or more of the above sustainable materials strategies.

    1. Provide the appropriate specification sections and documentation requirements in the construction document set to ensure the contractor understands the sustainable material requirements and expectations.

    2. Contractor shall track sustainable material sourcing values and product purchase verification, per the HPBS spreadsheet. The architect shall review summary values for compliance at the project construction meetings.

D. Only use low mercury or LED lamps in new construction projects.

INDOOR ENVIRONMENT QUALITY

A. Minimum Ventilation: All Salt Lake County projects shall be designed to meet the minimum ventilation requirements of ASHRAE 62.1-2010 or the current version of the IMC - whichever is greater.

B. Implement an indoor air quality management plan during construction. This plan shall meet the SMACNA IAQ Guidelines for Occupied Buildings Under Construction, 2nd edition ANSI/SMACNA 008–2008.

    1. The Contractor shall submit an Indoor Air Quality Plan to the CxA, outlining the implementation strategies to achieve the SMACNA requirements.

    2. Implementation of this plan shall be tracked on the weekly Construction Meeting Minutes.

C. Implement a pre-occupancy air quality plan.

    1. At the end of construction, prior to occupancy, conduct an air quality test per Salt Lake County Commissioning requirements.

2. The Test and Balance sub-contractor shall provide documentation to the Commissioning Agent demonstrating the dates and air flows achieved during the building flush.

D. All interior paints and coatings shall meet the low emitting materials standards set forth by the South Coast Air Quality Management District Rule 1113, as adopted in January 2012 or current version.

E. All interior adhesives and sealants shall meet the low emitting materials standards set forth by the South Coast Air Quality Management District Rule 1168, as adopted in January 2005 or current version.

F. All flooring systems shall be low emitting, and meet the Green Label Plus program, FloorScore, Greenguard, or the Greenguard low emitting requirements.

G. All janitor's closets, print and copy rooms, and chemical storage spaces shall be directly exhausted and constructed with a hard ceiling or walls constructed and sealed to deck.

H. Provide permanently installed entryway systems, regularly maintained walk-off mats, or a combination of the two systems. All entry carpets shall be at least 10' in length at primary entryways.

I. A minimum of 65% of all regularly occupied spaces shall either have direct access to daylight and views or indirect access through shared glazing systems at interior partitions.

1. Complete the HPBS Sustainability Worksheet to demonstrate compliance.

2. Daylighting and view strategies must be included in the OPR.

EDUCATION AND OUTREACH PROGRAM

A. At direction of the County PDT, develop and implement a Building Education and Outreach Program to inform the building users of the sustainable design strategies. This program shall include a minimum of two of the following:

1. Digital or fixed signage describing the sustainable goals and strategies as well as behavior modifications to complement the sustainable design and construction efforts.

2. A brochure or pamphlet on the sustainable strategies. This shall highlight the location of specific strategies and provide resources for additional information.

3. Information on the building or department website highlighting the sustainable goals, strategies, and behavior modifications to compliment the sustainable efforts.

4. Enhanced building training to ensure the building operators and users understand the systems and sustainable design strategies. This includes providing enhanced Operation and Maintenance information on the building systems and control strategies.

B. The outreach program shall address the following sustainable strategies:

1. Context Sensitive Design
2. Transportation Demand Management Plan and Programs
3. Sustainable Site Design
4. Energy Efficiency

5. Water Efficiency
6. Indoor Environment Quality
7. Recycling and Material Management

C. Energy Star Tracking

1. The Facilities Operator or Commissioning Authority shall register the building under the Energy Star Portfolio program and input and monitor energy and water consumption of the building.

METERING

Metering System Scope

All projects shall incorporate the utility metering requirements of this section into new construction and major renovation projects. The scope of metering shall include at minimum:

A. Meters on each utility connected to the building, including but not limited to power, natural gas/propane, domestic water, and irrigation water, shall be provided as part of the construction project and shall be connected to an energy metering monitor network. If meters provided by utility companies can be connected to this network, these meters can serve to meet this requirement. Otherwise, separate meters will be required as part of the construction project that can connect to the meter monitoring network.

1. Irrigation metering is only required on projects where irrigation system feeds from a building or is a standalone system as part of the project.

B. Monitoring network for utility meters shall be connected to each meter and submeter in the building. This network shall connect to the building controls network via a dedicated automation engine device such as a JACE, NAE, or equivalent as approved by County PDT. Communication protocol on the monitoring network shall be BACnet, LON, and/or Modbus RTU and shall be coordinated with the building automation network. All devices connecting to this network shall use the selected communication protocol as their standard means of communication and shall make all data points readily available for monitoring through the network. A schematic of the monitoring network shall be included in the construction drawings.

C. For projects with budgets exceeding $5,000,000, or as directed by the County PDT, provide submetering of electrical loads to HVAC systems, lighting, and plug loads. For Medium Voltage switchboards at 4160 volt or higher, provide metering at each branch circuit. Multi-relays that gather metering data may be used in place of a standalone meter on branch circuits of large switchboards. Provide additional submeters for large renewable energy projects that interconnect to the building electrical panels.

1. Submeters shall connect to the monitoring network. Connection to the monitoring network shall be through one connection point through a dedicated Building Automation node. Do not mix HVAC monitoring and Electrical metering on the same BAS node. Allow the HVAC monitoring and control to continue during maintenance on the metering side

D. Provide additional submetering for any equipment or systems exceeding the following thresholds:

1. Electrical load exceeding 100 kW
1.
2. Any individual energy that represents 10% or more of annual energy consumption
2.
3. Natural gas/propane load exceeding 1,500,000 Btu/h

4. Cooling tower fill and drain for cooling towers on systems with over 150 tons cooling capacity. If this information is available from chemical treatment or other systems, these systems can be included in the metering network in lieu of separate meters.

5. Evaporative cooling system fill and drain for evaporative cooling systems sized for 50,000 CFM or more.

6. If individual pieces of equipment do not cross these thresholds, but they are part of systems (e.g. chiller or boiler plant) that have demands above the threshold level, provide submetering for the entire system.

E. If individual pieces of equipment have internal metering capabilities that meet the requirements of this section, these points can be mapped into the meter monitoring network in lieu of external submeters.

F. The meter monitoring network shall be provided with graphics pages available over the web and through the building controls head end system (if provided). The graphics page shall provide a summary of the instantaneous readings of each meter, provide hourly and daily peak kW trend graphics, as well as the monthly and annual peak kW and total kW-hr readings of each meter. Provide data to allow comparisons of each month and year of the building's operation. Trends shall collect data at 15 minute intervals coincident for each meter on the network.

G. The meter monitoring network shall be provided with export capabilities of a minimum of one year of data at hourly intervals, for all metered points, with trend data required, to either CSV or SQL format.

1. Construction documents shall include schedules and locations of meters, and require submittals of meters for review by the design team, County PDT, and commissioning agent. Commissioning agent will review installation, calibration, and operation of meter system.

UTILITY METER REQUIREMENTS

Electric Power Meters

A. Provide digital power meters on all buildings. If there is more than one building on the project, provide separate metering for each structure.

B. Provide power meter output in the communication protocol selected for the meter monitoring network.

C. For monitoring the submeters, connect all back to a central location for interface with the Building Automation system node. Provide riser, plans, and details of wiring and conduit connections. Carefully consider how meter wiring can be routed and connected through switchboards. Consider how meters and wiring can be serviced in live switchboards. An acceptable alternate to switchboard mounting is a separate bank of meters adjacent to the switchboard.

D. Meters shall meet the ANSI standard for billable type meters. Provide meters to monitor with true RMS metering, with 0.2% accuracy.

E. Power meters shall have on board clock with date and time, and be able to record the day and time of any maximum demands or other events.

F. Monitor shall include instantaneous demand for kW, kWh, power factor PF, and shall also include maximum demand kW and total kWh.

G. Power meters shall have an on board digital display that reports measured voltage, amperage, kW, kWh, and power factor. The digital display shall be programmed and calibrated against a portable meter. Verification and commissioning is required for the monitoring network and the on unit digital display.

H. For large switchboards exceeding 2000 amp, or for medium voltage exceeding 4160 volt, provide test blocks on the face of the switchboard for testing the CT's and PT's. For medium voltage application, provide three PT's, 3 phase 4 wire system, and multiple tap CT's.

I. For main service meters, additional meter functions may be considered at the main service such as Total Harmonic Distortion, waveform capture, high speed event capture, and power analysis data. Do not provide these features for submetering unless requested by the PDT.

J. Where application calls for net metering, provide this function.

K. Metering and submetering data shall be coincident, with trending available independently for each individual metering point.

Natural Gas/Propane Meters

A. Provide diaphragm type flow meters for sizes up to 1,000,000 Btu/h. Provide rotary type flow meters for sizes above 1,000,000 Btu/h. Accuracy on diaphragm meters shall be +/- 3% over the published flow range of the meter. Accuracy of the rotary meter shall be +/- 2% over the published flow range of the meter. Verify that maximum and minimum flow requirements for the project are suitable for the meter selected. Include requirement in the contract documents to correct meter multiplier for project gas pressure.

B. Provide a strainer upstream of all meters. Provide a bypass around meters. If meter is installed outside, route output wiring to local display inside building mechanical room. Orient pipe horizontally where meter is installed. Meter installation shall be in accordance with manufacturer's specifications. Show straight pipe requirements on contract drawings (12 pipe diameters upstream and 7 pipe diameters downstream, unless more is required by manufacturer). Strainers and bypass fittings are not to be included in the straight pipe length.

C. If the meter is provided with a dry-contact pulse output, a 4-20 mA output, or a proprietary protocol, require a controller/convertor be provided to convert the signal to the communication protocol used in the meter monitoring network.

D. Meter output to the monitoring network shall provide instantaneous flow rate as well as totalized flow rate. A local display shall be provided that shows these flow rates at the meter. Units shall be in CFH for instantaneous flow rate and 100's of cubic feet (CF) for the totalized flow rate.

Domestic/Irrigation Water Meters

A. Provide positive displacement type flow meters for sizes up to 2" and direct coupled turbine type flow meters for sizes up to 20". Insertion turbine type flow meters are acceptable in sizes from 2 1/2" to 8".

Accuracy on all meters shall be +/- 2% over the published flow range of the meter. Verify that maximum and minimum flow requirements for the project are suitable for the meter selected.

B. Provide a strainer upstream of all meters. Provide a bypass around meters that are installed inline. Bypasses are not required for insertion turbine meters that can be removed from the pipeline for maintenance without interrupting flow. Provide a test port downstream of meters.

C. Install meter in well-lit and easily accessible area (irrigation meters may be installed in underground meter boxes, but display shall be located inside adjacent buildings). Orient pipe horizontally where meter is installed. Meter installation shall be in accordance with manufacturer's specifications. Show straight pipe requirements on contract drawings (12 pipe diameters upstream and 7 pipe diameters downstream, unless more is required by manufacturer). Strainers and bypass fittings are not to be included in the straight pipe length.

D. If the meter is provided with a dry-contact pulse output, a 4-20 mA output, or a proprietary protocol, require a controller/convertor be provided to convert the signal to the communication protocol used in the meter monitoring network.

E. Meter output to the monitoring network shall provide instantaneous flow rate as well as totalized flow rate. A local display shall be provided that shows these flow rates at the meter. Units shall be in GPM for instantaneous flow rate and Gallons, or 10's of Gallons, or 100's of gallons for the totalized flow rate as applicable to the project size.

FEASIBILITY STUDIES AND BUILDING PROGRAM REQUIREMENTS

Feasibility Studies

1. Project Objectives. A feasibility study should begin with a definition of the basic goals and objectives for the given project, including possible project site(s), proposed building type(s) and size(s), general site and parking requirements, and the level of sustainability to be achieved in the project. This information will be provided by the County.

2. Site Assessment. Based on the provided project objectives, a site assessment should be performed and should include studies of building footprints on the proposed site(s), with parking and landscape areas shown and evaluated for feasibility. Issues such as public access, delivery and service zones, and relationships to neighboring structures should be addressed. Alternatives should be explored based on direction and feedback from the County, with pros and cons provided for each approach. The HPBS and LEED® credit options each site provides are be reviewed and incorporated into the Site Assessment. A Preliminary zoning analysis shall be completed.

3. Scope Alternatives. Scope alternatives should be explored, identifying where a proposed project can be modified in order to better meet the objectives. For example, an alternative may be presented in which a project scope is reduced to better fit within a site with significant constraints, or high parking demands.

4. Cost Analysis. Costs should be presented with each respective alternative and should be as detailed as the available project information allows. Costs will not only be used for future financial planning and project funding, but as comparisons against each alternative provided. Any special cost issues that should be considered in order to make a project feasible for a given site should also be identified with each alternative.

BUILDING PROGRAMMING

Limit the Architectural program to the following areas of definition: 1) executive summary; 2) total facility identity and purpose; 3) organization and service requirements; 4) individual and space descriptions; 5) project concept development; 6) preliminary project cost estimate; 7) preliminary code analysis; 8) mechanical, electrical, plumbing, civil, environmental and structural narratives; 9) FFE scope and purchase responsibilities. Include charts and diagrams to clarify all written descriptions.

Executive Summary

1. The executive Summary should include a concise statement of the programming task, a short description of any alternatives that were evaluated during the process and a statement of the final outcome or proposed direction.

Facility Identity and Purpose

1. State the authority and areas of responsibility of all participants in the project through all phases of its development.

2. Provide a description of the prime objective of the project and that which will be accomplished by the proposed project development.

3. Provide a justification for the development of the new facility to accommodate both existing and projected new functions. Provide a general explanation of the facility's contribution to both the community and the organization itself. Justify expanded services and/or increased capacity, or

where previously separated activities are now being combined, provide more detailed descriptions.

4. Identify HPBS and LEED® goals complying with minimum requirements per the direction of the County PDT.

5. Include an assessment of any agencies' present location, area limitations, association with other functions within the program & a projection of their potential growth, if any.

6. Provide the identity of all users of the proposed project. Include total occupant loads for this facility or a combination of separate facilities. Occupant and user groups to identify include but are not limited to Management, Operations and Maintenance, Users and General Occupants, Special Functions and Other.

Organization and Service Requirements

1. Provide a description of the major objectives of the organization or sub-division.

2. Distinguish the facility requirements in terms of desired and required individual spaces, groups of spaces and overall space relationships. This should be according to previously stated agency, department, division and section organization responsibilities and the jurisdiction of authority by which they operate.

3. Identify the facility in terms of organizational requirements, fully describing major agencies, departments, divisions and sections, and their interrelationships, including general adjacency requirements.

Individual Space Descriptions

1. Identify and properly name all required spaces by individual or use designations.

2. Determine floor area and volume requirements according to current architectural standards or needs of the activities to be accommodated within the space.

3. Determine occupant quantity for each space in terms of management, user and overall public requirements.

4. Determine primary, secondary and other related functions of each space, including any flexibility requirements.

5. Determine adjacencies and space relationships of each space according to overall organization, sub-divisions, user needs and general service requirements. Prioritize in order to determine most flexible usage. Provide diagrams and/or charts to illustrate relationships.

6. Identify physical environmental requirements in terms of space quality, character, shape, finishes, air control, light and power, acoustics, safety, technology or other unique conditions discovered in program research with the facility management and users. Provide diagrams and/or charts organized by individual rooms to illustrate requirements and conditions.

7. Provide a summary of all fixed equipment in each space. Include specific items and descriptive information for such items and information/instruction devices, storage cabinets, work top and base cabinets, racks and benches, lockers, tables, bookcases, tool/wall cabinets, coat spaces or other similar equipment. Itemize, clearly stating quantities and other detailed fixed requirements.

8. Provide a description of all movable furnishings which will be required to optimize maximum service of each space. Include specific items such as chairs, desks, tables, waste receptacles, files, task lights or other similar furniture. Itemize clearly stating quantities and other detailed requirements affected by the provision of the furnishings.

9. Provide a description of all mechanical equipment requirements for each space. Include specific requirements related to air quality and control, plumbing fixtures and outlets, humidity, natural gas, compressed air, floor drains, water service, sound control or other special mechanical requirements. Identify all potentially hazardous conditions which might require special finishes or safety precautions.

10. Provide a description of all special electrical equipment requirements for each space. Include specific requirements related to lighting, power, telecommunications, data communications, sound, fire alarms, appliances, office machines, maintenance equipment or other special electrical requirements. Identify all potentially hazardous conditions which might require special finishes or safety precautions.

11. Provide a description of all other special equipment requirements as might exist for each space. Include that which might be strictly limited to service areas, public spaces or exterior spaces.

12. Provide a summary of all individual space requirements according to the identified organizational service outline. Include appropriate allowances for circulation, mechanical rooms, electrical rooms, telecom rooms, service areas, toilet rooms and other unassigned areas. This summary will be the basis of the project cost estimate.

Project Concept Development

1. Identify the project concept and mission in overall terms of major goals, accommodation of activities, special requirements and other general considerations affecting design of the project. This shall serve as a project vision statement which primarily identifies the architectural problem to be solved by a future design process and not the immediate solution.

2. The statement should explain what the facility should do within limits of performance expectations and relationships. It should consider basic concepts of both space and function and the interaction of human needs, physical limitations and external influences. Factors such as community, social, political and image requirements should be addressed clearly and as simply as possible.

3. HPBS and LEED® criteria should include a statement which outlines the various objectives being sought, identifying the desired outcome. Allow for a qualitative analysis/explanation in instances where quantitative measure cannot be identified.

4. Concept development may include written material, diagrams, charts, data and general design percepts. The task is to accurately and completely identify the overall concepts of a total facility and its program, not to create ready-made plans, elevations and/or artist's drawings.

Preliminary Project Cost Estimate

1. Provide a project cost estimate based on the summary of individual space descriptions which shall include an appropriate grossing factor for all areas. A line item shall be included in the project cost estimate showing estimated escalation in 1 year increments to at least 5 years in the future.

   Include the cost for site development, including demolition if necessary, utility development, fixed equipment, furnishings as directed, graphics, or other identified requirements not listed

elsewhere. A design contingency, construction contingency, design fee and owner's management fee will be included in the estimated construction cost and determined by the programmer in conjunction with the county's project manager.

2. The total project cost shall be identified and described in terms of net square foot, gross square foot, number of stories, unique volume requirements and total project cost.

Preliminary Code Analysis

1. A preliminary code analysis shall be provided based on the information available at the end of the programming process and the recommendations of the program. It shall list occupancy and group, probable construction type, basic fire rating requirements, proposed use of any fire-sprinkler systems, approximate building height including number of stories if known, total building area, approximate occupant load, required exiting widths, and number of plumbing fixtures required. Any additional code-specific items that are known at the time of programming, and will guide future development and design of the project should be noted in the preliminary code analysis. Include specific requirements for the local jurisdiction such as zoning or other local ordinances and requirements.

Mechanical, Electrical, Plumbing, Civil, Structural and Environmental Narratives

1. Narratives for building systems (mechanical, electrical, plumbing, civil, structural) shall include general descriptions of probable system components including materials, approach, economics, and advantages for any probable system.

2. High Performance Building Standard (HPBS). This narrative should indicate components of the County's HPBS and should include strategies for achieving this standard. Provide a point chart and narrative for each credit being sought to meet LEED® Gold standards. Any known exceptions to the standard should be noted in the narrative. Note whether exceptions to the standard are proposed or if they have been approved by the County. The narrative should still include applicable sustainable strategies that will be used for the project.

3. Environmental Issues. There may be environmental issues which must be addressed in the planning of a project. Of greatest concern are environmental regulations imposed at the local, state and federal levels pertaining to air and water quality mandating that consideration be given to atmospheric emissions; discharges to storm and sanitary systems, canals and navigable waterways; and the handling of solid and hazardous substances, including their disposal.

FFE Scope and Purchasing Responsibilities

1. Furnishings, fixtures, and equipment (FF&E) needs should be included in the building program. With the County project manager, identify basic FF&E needs, and clearly define the responsibilities of the County and the architect in specifying and procuring FF&E items. Identify any budget items associated with both specification and procurement of FF&E items and include in the preliminary project costs.

Implementation

1. The primary goal of this effort is to provide both a long-term viable program to guide ultimate development of the project. It shall provide clarity and order for manageable development within the limitations of current funding.

2. Provide the County with up to ten (10) bound copies and one digital copy of the approved program upon completion of this work. Provide digital copies in their native file formats, (i.e.:

Revit, AutoCAD, QuarkXpress, InDesign, Word, etc.) as well as final packaged documents (i.e.: pdf)

Field Trips

For some projects, a trip to related facilities may be authorized by the County's Project Manager for the study of buildings of similar function. If a trip authorized, it will be taken before the building program is finalized and bound. Programmer shall document each facility visited with photographs and notes to be included in the final building program document. At the conclusion of the trip, the Architect shall prepare a "trip report", including the photographs and notes taken, which will be made available to the County project manager and PDT.

Calculation of Building Floor Areas

In the preparation of plans in all phases of the project--schematic, preliminary and working drawings-- the architect is expected to make each room and facility conform reasonably well to the footages listed in the building program. Strict compliance with the total gross floor area of the building listed in the program is mandatory, however.

The AIA definition of architectural areas as listed in AIA Document D101™ - 1995 shall be used in all floor area calculations.
Gross Floor Area of Buildings

"The Architectural (gross) area of a building is the sum of the areas of the several floors of the building, including basements, mezzanine, equipment platforms and intermediate floored tiers and penthouses of headroom height measured from the exterior faces of exterior walls of from the centerline of walls separating buildings."

"The Architectural (gross) area does not include such features as pipe trenches, exterior terraces or steps, chimneys, roof overhangs, etc."

Net Assignable Floor Area of Buildings

The standard net assignable area is that portion of the area which is available for assignment or use by an occupant, including every type of space usable by the occupant.

The standard net assignable area should be measured from the predominant inside finish of permanent outer walls to the office side of corridors or permanent partitions. Where there are interior spaces surrounded by corridors, measurement shall be from the inside face of enclosing walls. Included should be space subdivisions for occupant use; i.e., offices, file rooms, office storage rooms, etc. Deduction should not be made for columns and projections necessary to the building or for partitions subdividing space.

General Room Requirements

Mechanical rooms should be located to isolate sound and vibrations from offices, and other occupied spaces. Mechanical Spaces to be located to minimize piping and/or duct runs.

A custodial equipment and supply room with a 10' clear height shall be located on each floor of 15,000 square feet or less. A suspended ceiling is not necessary in this room. On larger floors, there shall be one room for each 15,000 square feet of floor space. If the length of a building hallway exceeds 250 feet, then one of these equipment and supply rooms should be located near each end of the hallway. Each room shall have a floor drain and mop sink not smaller than 2' x 3' and mixer type facets mounted 2' above the sink. This room needs at least one electrical outlet. Each closet which has a sink should also have check-valves and anti-siphon protection. Lights should include covers. Air should exhaust to the outside from

these rooms. Shelving and hanging fixtures shall be specified by the architect for the storage of supplies and tools. Doors shall swing out of room.

Custodial equipment and supply rooms must be separate from any other mechanical or electrical areas. There shall be no electrical panels, telephone junctions, fire alarm boxes, pipe chases or major plumbing junctions located inside these rooms. Otherwise, since a clear area of at least three feet needs to be maintained in front of these areas, the usable custodial space would be negated.

Each major building (approximately 40,000 square feet and up) shall have one custodial bulk storage room of approximately 200 square feet in addition to the custodial equipment and supply rooms noted above. In buildings which exceed 150,000 square feet, an additional space of approximately 100 square feet shall be provided for each additional 75,000 square feet above 150,000 square feet. This additional space may be part of the same room or in an additional room. The location of these rooms is not critical but must be near an elevator as the purpose of these rooms is for bulk storage of chemicals, equipment and paper supplies. In very large buildings, it is preferable to have two rooms, one located on or near the bottom floor and one on or near the top floor. These rooms may be adjacent to electrical or mechanical areas but not be a part of them nor have major junction boxes, fan areas or other similar systems as part of this space

Each building shall have a separate storage area for tables, chairs, and other items for building support commensurate with the amount of scheduled events planned for the building. The minimum space should be 8’ x 10’ and have an extra wide door or pair of doors with a magnetic hold open. This storage area needs to be located by the loading dock (if applicable) and the service elevator (if applicable). Doors swing (to the greatest extent possible) shall be to the outside of the space.

INITIAL SITE SURVEY AND REPORT

After receiving the County's building program requirements and other related instructions, the Architect shall proceed with the following:

1. Visit the site with the County Project Manager in order to become familiar with all governing site conditions (unless released from this requirements by written instructions).

2. Request from the County other requirements and information, such as existing drawings or previously completed reports, needed for the work. If available, the County Project Manager will provide such information to the consultant.

3. Request from the County an accurate site boundary and topographic survey including, but not limited to, property lines, fences, easements, contours, spot elevations, streets, drive cuts, curb and gutter, sidewalks, structures, trees and major vegetation, survey control and benchmark elevations. If the survey has been obtained previously by the County, the Architect will not be required to resurvey, but will be expected to review the survey information provided and verify that it meets the design needs. Civil surveys provided by the County to an architectural consultant shall not be substituted for the civil or architectural site plan drawing for the project.

4. Advise whether soil bearing and water table studies should be conducted. It will be the County's responsibility to order and pay for the borings or test pits and subsequent mechanical, chemical or other tests. This data should be included with the site survey and report.

5. Request flow and pressure tests, which will be obtained and provided by the County.

6. Submit a written report to the County Project Manager incorporating the data and findings enumerated above together with a declaration as to the suitability of the site. The Architect shall also include a statement in this report as to his ability or inability to develop a building plan that will meet the project program requirements. Include any recommendation for further engineering studies, if any. After receipt of this report, the County will advise the architect of any additional or unusual engineering studies that may be performed as directed by the County Project Manager.

7. Specialty Surveys – the County will obtain and provide specialty surveys, such as hazardous materials reports, seismology surveys, asbestos reports, traffic studies, and soil/climate analysis on an as-needed basis to the consultant.

   When the initial site survey and report have been completed satisfactorily, the County Project Manager will advise the Architect to proceed with schematic drawings.

SCHEMATIC DESIGN

The Architect (Design Team) shall prepare schematic drawings in accordance with the owner's building program requirements and the recommendations contained therein. At the beginning of the Schematic Design phase, the Architect shall propose and submit a Design Process Schedule with the Schematic Design Phase shown in great detail (noting meeting or workshop dates, etc.) to be reviewed and accepted by the County project manager.

The Design Team is required to utilize an integrated design process, as described in the General section of this document, and develop several solutions to address design parameters and to arrive at the most functional schematic plan. HPBS and LEED® design elements should be incorporated at the Schematic Design phase. Frequent consultations with the PDT during this important phase of work are essential.

Documentation of HPBS and LEED® requirements should be coordinated with the Salt Lake County Project Manager.

Design Approach

The Design Team is asked to utilize a design approach that acknowledges the primary role of providing public services to the citizens of Salt Lake County. An appropriate design response is desired to achieve an image of substance and integrity, and actual performance which is exemplary in energy performance, site impact minimization, and waste reduction management and life cycle costs.

Salt Lake County facilities are required to be open and readily accessible, commodious and safe, with well-defined entries for pedestrian walkways, easily maintained landscaped open spaces with responsibly lighted circulation and parking areas.

The resulting design should achieve a timeless aesthetic, with careful evaluation of trends or styles, simply landscaped, constructed of durable and waste-cycle conscious materials, and respectfully in scale and character with the neighborhood in which it is located.

Building Program Integration

The Design Team is required to read the scope or building program requirements carefully and bring to the County project manager's attention any conditions or requirements that they feel cannot be met.

Clarify the project program requirements through exploration and development of the most promising alternative design approaches; provide a reliable basis for each solution with attendant justification for the most desirable schemes; and, include appropriate site plans, space floor plans, elevation studies, conceptual building sections, sketches, diagrams, outline specifications, cost estimates and other graphic or written material as may be required to adequately represent the various concepts proposed by the effort.

Proposed deviations from the program requirements must have written approval of the County project manager before the work proceeds.

Building Codes and Related Recommendations

Plans and specifications for Salt Lake County buildings shall conform to all applicable building codes for this area. Design and construction for Salt Lake County facilities is not exempt from any particular applicable code. Such codes include, but are not limited to, the current version of the following, in no particular order:

American National Standard ICC/ANSI A117.1
Americans with Disabilities Act (ADA) Standards for Accessible Design

AWPA Manual of Standard Plans and Specifications
Building and Zoning Ordinances having jurisdiction at specific site location
City and County Health Department regulations
Fire Marshall Regulations
International Building Code (IBC)
International Energy Conservation Code (IECC)
Life Safety Code
National Plumbing Code
NFPA
Salt Lake County's Insurance Company Regulations
Seismic Code
Utah State Health Code

Classifications of Building

All buildings to be constructed for Salt Lake county shall be classified in accordance with the International Building Code, latest edition adopted by jurisdictional authorities.

Seismic Considerations

All buildings to be constructed for Salt Lake County shall be designed in accordance with the Uniform Building Code Seismic Requirements, latest edition. Essential County facilities including sheriff and fire facilities shall be designed to specific location seismic code requirements. Careful consideration should be given to the seismic design of all County facilities to increase the design criteria and requirements as project funding allows.

Energy Conservation

Building projects involving heating and/or cooling shall be designed to minimize energy consumption and shall have maximum operating efficiency. All projects shall be designed to exceed the Baseline Performance Criteria integrated throughout this document, complying with specific HPBS identified in this document. Projects shall meet LEED® criteria, defined in the General and HPBS section, with specific requirements throughout this document. The Design Team is required to present all energy saving proposals and strategies in the schematic design phase.

SCHEMATIC DESIGN SUBMITTAL

Schematic Design Narrative

A written narrative describing design concept and intent, functional aspects, and general descriptions of major building systems shall be part of this submittal. Major building systems may include, but are not limited to proposed structural system, mechanical and electrical systems, roof and site drainage strategy. Narrative shall describe the design's strategy to meet or exceed energy performance, site impact minimization, and waste reduction requirements. Indicate future expansion requirements as identified in building program.

Cover Sheet - Design Criteria

The following design criteria are to be included on the cover sheet of the schematic drawings:

1. Building Code (Year of IBC):
2. Construction type:
3. Occupancy:
4. Seismic Zones:
5. Square Footage- (Basement, First Floor, etc.)

Floor Plan Drawings
1/16" = 1'0" or 1/8 = 1'0" scale floor plan drawings should be in accordance with the building program requirements. The plan submitted shall be the resulting iteration of several studies and options considered by the PDT during the design process. This plan shall be reviewed and approved to move forward into the next phase by the PDT.

Floor Area Comparison
Associated with the schematic floor plan, include a floor area comparison showing square footage recommended for each facility in the project's building program compared to the schematic drawing square foot floor area. Square foot floor area shall be calculated by the AIA definition of architectural space.

Site Plan
A site plan, or plans, should show the general shape of the proposed building and location of adjacent buildings, streets, sidewalks, parking lots, utilities, etc. The plan submitted shall be the resulting iteration of several studies and options considered by the PDT during the design process. The site plan shall include the following information where applicable:

1. A scale of 1' = 20'0", or larger
2. A north indicating arrow
3. Name of Project and address
4. Direction of prevailing winds
5. Outline of existing buildings
6. Existing land contours with elevations (rough)
7. Proposed land contours with elevations
8. Parking area, tally of parking capacity, and proposed parking layout with accessible parking stall locations.
9. Location and type of existing trees
10. Outline of existing open areas, roads, sidewalks, curbs and gutters
11. Location and pertinent data of existing wells, springs, ditches, canals, culverts, water mains, sanitary sewers, storm
    sewers, gas lines, electrical power lines, both buried and overhead, etc.
12. Location of proposed roads, sidewalks, curbs and gutters.
13. Location of proposed buildings or additions.
14. Identify feasibility of site water infiltration (preferable) and balance use of impervious pavements.

Schematic Elevations
Schematic elevations and sections should be sufficient to indicate scope of size, shape and volume, but not to provide details of architectural design appearance or structural system. If the County project manager requests, the Design Team shall also provide one or two optional elevations studies for consideration and approval by the PDT.

Presentation Drawings
When requested by the County project manager for publicity purposes, the Design Team shall provide presentation quality drawings, in the form of boards or colored drawings and electronic format. Type of drawings to be included will be based on needs of specific project, and shall be negotiated within A/E fee if the presentation drawing scope is determined at the time of fee proposal.

Specification Outline
Outline Specifications, in broad scope, should be prepared to indicate anticipated systems to be included, as well as general appearance and finishes.

Estimated Construction Cost

An estimate of probable construction cost based on area, volume or other unit cost should be carefully prepared. The estimate shall include costs for individual building areas, site work, furnishings to be included in the contract, general conditions, contractor mark-up, design contingency and escalation where applicable. In the event the estimated construction cost exceeds the County's construction budget, the A/E team shall provide recommendations and options to bring the project into budget as part of the base A/E Service Fixed Fee amount.

High Performance Building Standards (HPBS) & LEED® Design

A preliminary LEED® point chart (score card), using the current rating system that will be in force when project is registered with the United States Green Building Council, with all anticipated points marked should be included with the Schematic Design Submittal. A minimum of four credits above required minimum LEED® Gold standard will be identified and costs associated with these credits shall be included in the Estimated Construction Cost.

SCHEMATIC SUBMITTAL, REVIEW, AND APPROVAL

The number of copies of the Schematic submittal materials shall be determined by the County project manager.. The architect will be invited to a review meeting at which time they will be given copies of comments and suggested changes to be made to the plans and specifications. The agreed upon changes must be completed and revised plans returned to the County's representative as soon as possible. Formal adoption of the Schematic Design will be indicated by County PDT's signature, upon which time the project may move on to the Design Development phase.

The architect is responsible for reviewing plans and specifications with the appropriate governing building inspection agency to ensure that all applicable codes and ordinances are complied with. In this schematic drawing phase, the Architect is required to visit with the governing agency personnel and review the proposed facilities. The architect will be responsible for producing specifications and plans that meet or exceed all applicable codes and regulations.

Payment for Schematic Design Phase

Payment of Architect's fees will be made after the Architect receives the County's written approval of schematic drawings, in accordance with the architect's agreement. Request for this payment should be submitted on printed forms furnished by the County.

DESIGN DEVELOPMENT

At the completion of the Schematic Design Phase, and before commencing the Design Development Phase, the Design Team shall meet with the project development team (PDT) who will invite the appropriate county personnel to jointly determine the best electrical, mechanical, and specialty systems for the proposed building. The Schematic Design submittal will be the basis for this review.

At the beginning of the Design Development phase, the Architect shall propose and submit a Design Process Schedule which shows the Design Development and Construction Documents phases in detail, showing milestone meeting and progress dates, to be reviewed and accepted by the County project manager.

DESIGN DEVELOPMENT GUIDELINES

Further identify, define and describe all important aspects of the approved design; integrate and coordinate all major building systems as related to the soils elements, utilities, substructure, superstructure, facility envelope, walls and partitions, openings, materials, mechanical needs, electrical needs, fire suppression demands, building code requirements, HPBS and LEED® design elements, or other special factors identified in the program; develop more definitive and quantifiable floor plans, elevation studies, building sections, details, material and fixture schedules, furnishings and equipment layouts and other documentation to fully describe the achievement of the project objectives and goals; and, provide a formal presentation of the recommended design solution including drawings, outline specifications, semi-detailed cost estimate and colored architectural rendering or model (of the County's choice) accurately depicting the project.

Develop the facility design keeping in mind the primary role of providing services to the citizens of Salt Lake County and of enhancing those services through the skillful incorporation of the following design factors:

1. Floor area and facility volume requirements by both individual and functional needs.

2. Optimum area arrangements and occupant loads for each space according to current Building Code demands.

3. Primary, secondary, and alternate uses for each space in accordance with the identified priorities.

4. Space access, adjacencies and relationships according to overall organizational, facility user and service requirements.

5. Physical environment of each area in terms of space quality, character, shape, finishes, air control, daylighting, light and power, acoustics, safety and unique functional needs as identified by the program.

6. Fixed equipment and furnishings for each area, clearly indicating and controlling its effect on the area, its storage and service.

7. Mechanical, electrical and other special equipment for each and every area.

8. Unassignable areas of entries, lobbies, corridors, reception areas, toilet rooms, service areas, mechanical and electrical areas as may be required to make all other areas function properly.

Building codes and Related Recommendations

The Architect is responsible for reviewing plans and specifications with the appropriate governing building inspection agency to ensure that all applicable codes and ordinances are complied with. In this drawing phase, the Architect should review the design and proposed structural and utility systems with the governing agency personnel. The Architect will be responsible for producing specifications and plans that meet or exceed all applicable codes and regulations.

Energy Conservation

The Design Team is required to develop all energy saving proposals and strategies in the design development phase, outlining suggested systems and preliminary exterior envelope performance.

Design Development Submittal

The Design Development submittal shall include floor plans, elevations, building sections, outline specifications, with an estimate of cost, a site plan, and an area comparison. Each sheet should be complete with title block, project name, scale, etc. Submittal should be accompanied by a letter of transmittal.

Outline Specifications, Cut Sheets, & Design Development Narrative

Outline Specifications, material cut-sheets, and written narratives describing design concept and intent, functional aspects, daylighting strategy, and primary aspects of each major building system shall be part of this submittal. Major building systems may include, but are not limited to proposed structural system, mechanical and electrical systems, roof and site drainage strategy. Provide cut sheets indicating actual equipment and major items proposed including furnishings, mechanical equipment, plumbing fixtures, electrical fixtures and other major items as may be requested. Narrative shall include information pertaining to possible expansion and other unique requirements as indicated in the project program.

For both LEED® and HPBS buildings, narrative shall describe particular aspects of the design strategy, products, or systems which meet or exceed energy performance, site impact minimization, and waste reduction requirements.

Cover Sheet - Design Criteria

The following design criteria are to be included on the cover sheet of the design development drawings:

1. Building Code (Year of IBC):
2. Construction type:
3. Occupancy:
4. Seismic Zones:
5. Square Footage- (Basement, First Floor, etc.)

Floor Plan Drawings

1/8 = 1’0” scale floor plan drawings, with possible enlarged partial plans of selected areas should show refinement from schematic design phase. The plan submitted shall incorporate input from the PDT during the design development process meetings.

Floor Area Comparison

Associated with the floor plan, include a floor area comparison showing updated square footage for each component of the project, noting differences from the schematic design phase, and the original program.

Site Plan

A site plan, or plans, should show footprint of the proposed building and location of adjacent buildings, streets, sidewalks, parking lots, utilities, etc. The plan submitted shall reflect the direction agreed upon by the PDT during the design process. The site plan shall include the following information where applicable:

1. A scale of 1’ = 20’0”, or larger
2. A north indicating arrow
3. Name of Project and address
4. Outline of existing buildings
5. Existing land contours with elevations
6. Proposed land contours with elevations
7. Parking area, tally of parking capacity, and proposed parking layout with accessible parking stall locations.
8. Location and type of existing trees
9. Outline of existing open areas, roads, sidewalks, curbs and gutters
10. Location and pertinent data of existing wells, springs, ditches, canals, culverts, water mains, sanitary
    sewers, storm sewers, gas lines, electrical power lines, both buried and overhead, etc.
11. Location of proposed roads, sidewalks, curbs and gutters.
12. Location of proposed buildings or additions.

Exterior Elevations and Building Sections

Design Development elevations and sections should be sufficient to indicate scope of size, shape and volume, as well as integration of architectural design appearance and structural system. Rough clearances planned for interstitial space for mechanical and other building systems should be indicated. Proposed exterior materials should be indicated as well.

High Performance Building Standards

For HPBS Buildings, the Design team shall provide a preliminary daylighting study and preliminary whole building project energy simulation. The format of the studies to be determined on a case by case basis. A progress LEED® point chart and preliminary LEED® letter templates with narratives for each design submittal credit shall be submitted with the Design Development package. The progress LEED® point chart (score card), using the current rating system that will be in force when project is registered with the United States Green Building Council. A minimum of four credits above required LEED® Gold standards will be identified and costs associated with these credits shall be included in the Estimated Construction Cost.

Estimated Construction Cost

An estimate of probable construction cost moderately detailed, with quantified material and labor costs or other unit costs should be carefully prepared. The estimate shall include detailed and quantified costs for individual building rooms, site work items, LEED® credit elements and furnishings to be included in the contract, general conditions, contractor mark-up, design contingency and escalation where applicable. In the event the estimated construction cost exceeds the County’s construction budget, the A/E team shall provide recommendations and options to bring the project into budget as part of the base A/E Service Fixed Fee amount.

Prepare a list of all items indicated as work “not-in-contract” or “County furnished” and include a justification for each item. Carefully coordinate each item with the County Project Manager and PDT.

Perspective Rendering

When requested by the County project manager for publicity purposes, the Design Team shall provide a minimum of one each digital and printed perspective rendering of the building. The specific method or medium of rendition is left to the choice of the architect, but should be suitable for easy viewing at a distance of 20 feet.

Design Development Submittal Copies

Several copies, hardcopy and digital, of the design development submittal material shall be prepared, the number to be determined by the County project manager and all persons directly concerned.

Design Development Review Process

Design Development drawings and related materials will be carefully studied and reviewed by the County's representative, the PDT, Salt Lake County's Insurance Agency, and all persons directly concerned with the project. The floor plan will be need to receive official sign-off by County PDT. The Architect will be given redlined drawings and specifications and a written critique. The County's Insurance Agency shall provide comment, and the Architect team shall incorporate. A meeting will be held where various questions can be discussed and resolved. The agreed upon changes must be completed and returned to the County's representative as soon as possible. Until written approval of the design development drawings has been received, the Architect should not proceed with working drawings.

Payment for Design Development Phase

Design development or preliminary drawing stage payment fee is due after the architect receives the written approval of the Design Development submittal, in accordance with the architect's agreement. Request for this payment should be submitted on printed forms furnished by the County.

CONSTRUCTION DOCUMENTS

After receiving written approval of design development drawings and outline specifications, the architect is authorized to proceed with the preparation of bid or construction documents.

Identify, organize and assemble an appropriate compilation of complimentary indexing, contract conditions, technical specifications, construction drawings, and other miscellaneous documents to be utilized in conjunction with the County's standard bidding documents to fully describe the project and to accurately identify the full contractual obligation of each project participant throughout all project phases. Include summary of construction phasing and work under different contracts.

Coordination

Coordination is extremely important during the preparation of construction drawings and specifications. The architect shall coordinate closely with the consulting engineers (including the commissioning agents) and the consulting engineers with each other to prevent interference of air ducts, electrical and plumbing lines, thermostats, electrical outlets, audio controls, equipment, etc.

Building Codes and Related Recommendations

The Architect is responsible for reviewing plans and specifications with the appropriate governing building inspection agency and other authorities having jurisdiction to ensure that all applicable codes and ordinances are complied with. In this drawing phase, the architect should review the design with the governing agency personnel. The Architect will be responsible for producing specifications and plans that meet or exceed all applicable codes and regulations prior to completion of the construction drawings.

Floor Area Comparison

Associated with the floor plan, include a floor area comparison showing updated square footage for each component of the project, noting differences from the design development phase, schematic design phase, and the original program allocations.

Structural Design Information

The gravity and lateral load resisting structural systems and their connections shall be clearly shown on the drawings. The allowable floor and roof loads shall be indicated on the drawings. The structural engineer shall submit complete calculations to the County. The calculations must be bound and include a cover sheet and table of contents.

Construction Drawings

The architect shall provide construction drawings to accurately define the character, configuration, limitations, size, quantity and overall intent of the design sufficient to guide a contractor in completing the intended project. These minimum drawings shall consist of:

1. Title sheet complete with project name, project number, and design criteria, index of drawings, design team members and project location map.

2. Site development drawings showing grade changes, retaining walls, drainage structures, utilities, parking, walks, landscaping, irrigation, etc.

3. Architectural plans, elevations, sections, schedules and details.

4. Structural engineering drawings, schedules and details showing footings, foundations, floor framing, roof framing etc. The design floor loads as noted in the program or as previously agreed upon shall be prominently recorded on the working drawings.

5. Mechanical plans, diagrams, schedules and details.

6. Plumbing plans, diagrams, schedules and details.

7. Electrical plans, diagrams, schedules and details.

8. Other special engineering or allied discipline design documents required to fully define the intent of extent of the project.

9. Each drawing sheet shall have project name, project number, architect's name, architect's/engineer's stamp, sheet number and date.

Specifications

Consistency with approved preliminary drawings and outline specifications is expected.

The architect shall provide technical specifications for each and every material, architectural system, engineering system, piece of equipment, piece of furnishing, construction system or other item to be utilized in the construction. These shall clearly define the materials, systems, methods and quality standards by which all phases of the work are to be completed. They shall be identified, listed and organized according to the AIA's Masterspec and/or the CSI's Masterformat unless approved otherwise by the County.

Performance standards for both materials and labor shall be carefully detailed and referenced to the most widely known associates of the American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), Factory Mutual (FM) and Underwriter's Laboratories (UL). Other professionally recognized standards shall be utilized as may be unique or appropriate to critical phases of the work.

The architect shall endeavor to select and specify at least three (3) variables in each category of materials and/or systems utilized on the project. Proprietary products may only be specified when the architect and County jointly agree that such a usage is required to insure the integrity of the design, compatibility with an existing system, availability within critical completion period or execution to other conditions unique within the project. In all instances, a written justification shall be prepared by the architect and approved by the County before inclusion in the specification.

General index of specification shall list all parts and divisions in the document.

Trade classifications shall be so written that each may be bid separately. Do not print two major trade classifications on any one sheet.

The term "base bid" shall be understood to include all work contained in the contract documents, excluding any substitutes. The contractor shall bid on only those materials, equipment and methods that are contained in the contract documents. Except for a few proprietary items, the construction documents are prepared to give the contractor a multiple choice of manufacturers.

Standard County Boiler Plate Forms and printed instructions are to be included in the specification documents. Refer to Bidding section for reference to standard County boiler plate information required (in Appendix or as indicated in RFP). Coordinate specific project requirements as necessary.

Supplemental Information may be provided by the Architect in the form of an additional summary of the Work, or Special Conditions Sections as may be deemed necessary by the County to assure the successful description and completion of the project only.

Furnishings, Fixtures & Equipment (FF&E)

Development of an FF&E Manual: The design team shall assist in the selection and specification of new furniture, fixtures and equipment and/or reuse of existing furniture, fixtures, and equipment for Owner approval. This shall include furniture, fixture and equipment layouts for all spaces and areas of the building. Provide the Owner with an FF&E schedule that includes item name, manufacturer, series, style, dimensions, finish, fabric, yardage, color, quantity, owner or contractor supplied and pricing for bidding purposes. Utilize state contracts where possible. Provide a detailed cost estimate for the FF&E package.

Compile and design a sign package for all interior and exterior signage. Way finding will be a critical component of the facility and signage should clearly delineate the flow of the building and its services. It is anticipated that the following will be but not limited to the sign package: interior and exterior building signage.

Not-In-Contract List

The architect shall submit a list to the owner of all work that will not be included in the contract at the time of the working drawing review.

High Performance Building Standards (HPBS) Design

All documentation associated with HPBS Design shall be submitted. A design submittal credits with completed LEED® letter templates should be submitted to USGBC for evaluation. An additional progress LEED® point chart with construction submittal credits, preliminary letter templates, and narratives should be completed. A minimum four extra points shall be included in point charts (score cards) and construction estimates as previously defined.

Design Criteria

The following design criteria are to be included on the cover sheet of the construction drawings:

1. Building Code (year of UBC)
2. Construction Type:
3. Occupancy:
4. Seismic Zone:
5. Square Footage- Basement
   First Floor:
   Etc.

Drawing Format

All Construction Drawings shall be uniform in size, format and of a permanent material acceptable to the County; all appropriately drafted with standard architectural scale, symbols, dimensions, orientation and fully legible notations; all being fully reproducible by direct print methods utilized by the County; computer-aided drafted and, all appropriately stamped with the Utah State “certified” licenses required by the building authority of the area in which the facility is to be constructed. Submission in both physical and digital format (pdf) required. Five physical copies shall be provided unless otherwise noted.

Building Signage

Provide separate Exterior and Interior Building Signage Drawings.

Identify Exterior Signage Marques or Monuments, building address identification acceptable to AHJ’s, Salt Lake County Logo and directional signage as necessary.

Identify ALL interior signage, whether code required, room identification, directional or specific facility conduct requirements. Coordinate ALL interior signage to provide a complete, building signage package.

Ownership of Documents

All construction documents, drawings, addenda and specifications are the property of the County and shall be completely and digitally modified to the “As-built” condition at the conclusion of the project and prior to final delivery to the county. They shall incorporate all deviations from the bidding set as recorded by various project participants, Contractors or Sub-Contractors performing work.

Alternatives

Provide direction to the County relative to the current advantages and disadvantages relative to project financing options, construction systems, methods and trends, project delivery options and alternative Construction Phase services.

Cost Estimate for Design/Bid/Build Project Procurement

Provided a complete and detailed Final Cost Estimate of the final design based on the completed Construction Documents prior to the project going out to bid. In the event the estimated construction cost exceeds the County’s construction budget, the architect team shall provide recommendations and options to bring the project into budget as part of the base architect Service Fixed Fee amounts.

Payment for Construction Document Phase

Construction document phase payment of the architect’s fee will be made in accordance with provisions of the architect’s agreement. FF&E package progress payments shall be made in accordance with provisions of the architect’s agreement. Final payment for the FF&E package(s) shall be made upon completion of bid package documents and review and recommendation of all bids.

BIDDING

Distribution of Plans and Specifications

Digital copy of plans and specs in PDF format and up to four (4) hard copies for Agency and PM use.

Pre-Bid Conference

The County may elect to hold and conduct a pre-bid conference at the project site or other location. The Architect shall attend the conference and explain special conditions and requirements. The Architect shall answer questions, take notes and provide non-binding answers to questions raised during the conference.

Amendments (Addenda)

During the bidding period, any and all additional instructions, clarifications, interpretations or modifications to the construction documents shall be made by an amendment prepared by the architect and delivered to the County project manager.

The amendment shall be available electronically and hand delivered, mailed or faxed as agreed upon by the Architect and the county project manager.

No one is authorized to make any clarifications, interpretations, modifications or give any instructions to the bidders during the bidding period except by addendum as described above. Salt Lake County Contracts and Procurement will issue all amendments and has the right to extend the bid date. Architect to advise Project Manager if it is believed a bid date extension is in the best interest of the County.

Bid Recommendation

Evaluate submitted bids, schedule of values and list of subcontractors to provide appropriate recommendation for contract award.

FURNITURE, FIXTURES AND EQUIPMENT REQUIREMENTS

Furnishings, Fixtures & Equipment (FF&E)

Development of an FF&E Manual: The design team shall assist in the selection and specification of new furniture, fixtures and equipment and/or reuse of existing furniture, fixtures, and equipment for Owner approval. This shall include furniture, fixture and equipment layouts for all spaces and areas of the building.

Provide the Owner with an FF&E schedule that includes item name, manufacturer, series, style, dimensions, finish, fabric, yardage, color, quantity, owner or contractor supplied and pricing for bidding purposes. Indicated equal products if known and readily available. Utilize state contracts where possible. Provide a detailed cost estimate for the FF&E package to include cost of furniture, fixture and/or equipment, freight and installation.

Compile and design a sign package for all interior and exterior signage. Way finding will be a critical component of the facility and signage should clearly delineate the flow of the building and its services. It is anticipated that the in addition to code compliance science, the design team will design interior and exterior building signage. Building Directory signage may be necessary in certain project types as identified in RFP.

During the Construction portion of the project, meet with project stakeholders and determine:

a. Timeline and schedule for bidding and procurement of required furniture, fixtures and equipment
b. Include required lead times and delivery periods
c. Coordination requirements for bidding and delivery in respect to construction completion
d. Work with Salt Lake County to provide required bid documents for procurement of required furniture, fixtures and equipment
e. Provide Bidding services, including any addenda work
f. Develop a schedule of required lead times for ordering/delivery and coordinate installation of furniture, fixtures, equipment
g. Provide on-site services as required during furniture installation
h. Provide inspection and punch-lists of furniture post installation
i. Support Owner's requirements during FF & E procurement and installation

CONSTRUCTION SERVICES

Building Permit

It is the architect's responsibility to prepare plans and specifications that will qualify for all required building permits prior to the distribution of bid documents. It is the contractor's responsibility to make application for the building permit and either the County's or contractor's responsibility to pay for the building permit depending upon the method chosen by the County project manager.

Substitute Materials during Construction

Approval of materials not listed in the contract documents (including addenda) will be granted only under extenuating circumstances. The Architect shall not authorize a change in materials independently, without the County Project Manager's approval. Authorized changes must be described on a Change Order form or ASI.

High Performance Building Standards (HPBS) & Commissioning

Commissioning Agents will be separately contracted by the County to commission selected portions of the building. The Contractor and Architect Team will be expected to comply with submittals required with the LEED® process during and after construction, as indicated, and required by Division 1 of the specifications.

Architects Supplement Instructions

A request for clarification or similar type form shall be used to transmit information from the Architect to the contractor. Electronic format is expected. All forms should be numbered consecutively, beginning with number one on each project. All communications shall be copied to the County's representative. The architect shall maintain a log for request for clarification throughout the entire construction administration phase. Requests for information will be responded to by an ASI (Architects Supplemental Instruction).

Proposal Request Form

A proposal request or similar type form shall be used to request prices for changes in the work. All forms should be numbered consecutively, beginning with number one on each project. The architect shall maintain an electronic log for proposal requests throughout the entire construction administration phase.

Construction Change Authorization Form

A construction change authorization form will be issued by the County, under special circumstances, to authorize immediate completion of changes in the work. The form will be prepared and completed by the County Project Manager because of procurement requirements when time limits are such that the formal change order process will cause unreasonable delays or additional costs to the project. The form will include a fixed or estimated cost to be included as part of a change order at the earliest possible date. All forms should be numbered consecutively, beginning with number one on each project. Electronic format shall be utilized unless determined otherwise by the County Project Manager. The architect shall maintain a log for construction change authorizations throughout the entire construction administration phase.

Change Order Form

A change order form shall be used to authorize all changes that will increase or decrease the contract amount or contract time. Electronic Change Order forms and contractor's back-up shall be prepared by the contractor and reviewed by the Architect and shall be submitted to the County project manager for review and issuance by the County Change Orders must be submitted with contractor's back-up cost documentation, including General Contractor cover letter and sub-contractor original invoices showing material and labor break-down. Each Change Order form must be numbered consecutively, beginning with number one on each project. After necessary approvals and signatures are obtained, all copies of the Change Order form should be returned to the owner, who will then make the necessary distribution, including to the contractor authorizing him to proceed with the change. Payment will not be made for

change order items until the change order form has been fully executed by the County. The Architect shall maintain a log for change orders throughout the entire construction administration phase.

Shop Drawings

Provide a review and approval of all product data, samples, color selections, material mock-ups, test results, guarantees, warranties, shop drawings, maintenance agreements, workmanship bonds, field measurement data, project photos, operation and maintenance manuals or other similar information required by the construction contract, documents or process. The review shall be sufficient to ascertain compliance with the design standards and specifications of the project. Provide a duplicate copy of all approved submittals to County. The CONTRACTOR shall maintain a log for shop drawings and submittals throughout the entire construction administration phase, which will be reviewed at each regularly scheduled construction period meeting and as a whole at the completion of the project.

Letter of Transmittal

It is required that plans, shop drawings, change orders, requests for information, etc., be sent with a cover letter of transmittal.

Construction Phase Payments

Requests for construction phase payments, including final payment, shall be submitted on printed forms available from the County. Additional architect fees will not be considered for preparation of change order item documentation. A fee for this service has already been calculated in the architectural fee percentage.

Color and Material Approvals

Provide a materials color selection board identifying all proposed colors, textures and finishes for all materials exposed to view. Achieve consensus and approval of all material color selections in a timely manner so as not to delay the work of the contractor. Present final selection of all materials mounted on a display board and labeled by type of material and area used. Contractor to coordinate and facilitate sample procurement.

Pre-Construction Conference

Fully participate in a Pre-Construction Conference which will be organized and managed by the County project manager. Provide a representative who will be the official spokesperson for the architect in all project meetings and all other architectural administration activities throughout the construction phase of the project. Review all Contract obligations by the architect, the Contractor and the county during this project phase. (Identify and provide a directory of all engineering consultants who will be assisting in those architectural responsibilities for the entire project period).

O.A.C.

Fully participate in the regularly scheduled Construction meetings with the Contractor’s representative and the County Project Manager. Prepare a regular project agenda for each meeting. Direct, guide and record the resolution of all identified issues, both prepared and discovered, throughout the construction phase. Distribute timely summaries of all such meetings using County template, accurately registering and reporting all actions and resolutions of those meetings to the main project participants.

Review Special Testing Reports

It is the responsibility of the Architect to review the special testing reports and provide recommendations to the County Project Manager.

Site Visits

At the time of fee proposal, architect and County project manager agree on frequency and overall amount of construction administration site visits, which may differ from project to project. Provide both regular and selective visits to the construction site to observe, monitor and evaluate the work of the Contractor. These

visits shall be sufficient to observe all the major construction activity, to measure the quality of both labor and material against the criteria of the construction documents and to evaluate the overall progress of the Contractor. Assist the Contractor and the County in the interpretation of those documents without assuming the responsibility for either the methods or delivery of the actual work. Make an official report of all on-site observations on a minimum weekly basis describing critical site factors, weather conditions, types of activities in progress, issues requiring action or resolution and instructions given in respect to identified issues. Note and report any and all conditions which may appear irregular, substandard or outside the standards required by the contract without assuming the liability for such.

Contractor Payments

Based on site observations, receive, review, evaluate, recommend and certify the Contractor's Applications for Payment complies with the County's contract terms and conditions. Make adjustments as required from a Schedule of Values and report on the progress in terms of percentage of the project complete with each application. At the completion of the project, issue appropriate Certificates of Substantial completion and other documents as may be required for Occupancy for the project facility.

Changes in the Work

Provide assistance to the County in identifying, quantifying, documenting and justifying all required design and construction Changes in the Work. Issue Requests for Proposals to the Contractor along with other appropriate documentation of all desired changes; evaluate the complete proposal or individual response utilizing standard estimating techniques; prepare a justification and analysis of each item; and, prepare a recommendation for acceptance of all Changes to the County.

Record Drawings

Regularly prepare or review the preparation of on-site record documents by the Contractor and Sub-Contractors to aid in the correct and complete documentation of the as-built project condition. At the conclusion of the project, obtain all of these documents from the Contractor and prepare the final record documents to be submitted to County as a condition of project close-out. Record documents shall be delivered to the County in their native format as well as PDF.

County Occupancy

Respond to various inquiries, issues and discovered conditions relating to occupancy, operation and maintenance of the completed facility during the specified guarantee and warranty periods of all space, materials, equipment and furnishings. Investigate, gather data, perform analysis and provide recommendations for corrective action to resolve those identified elements of concern. Assist in securing a positive response from the contractor to the identified needs and goals of contracted performance standards.

BUILDING COMMISSIONING

Building Commissioning

Commissioning (Cx) is a systematic process of verifying that building systems perform interactively according to the design intent and the owner's operational needs. This is achieved beginning in the design phase by documenting the design intent and continuing through construction, acceptance, and the warranty period with actual verification of performance, operation and maintenance (O&M) documentation verification and the training of operating personnel.

When is Building Commissioning Required?

High Performance Standard and LEED® Gold Standard Projects:
Building systems commissioning will be implemented by the County on all projects. It is at the County's discretion to determine what systems will be commissioned, but HVAC Systems, Electrical Systems and Building Envelop Systems are typical. Check with the County Project Manager for specific requirements. Refer to the Building Systems Commissioning Checklist in the County Documents Reference section for additional information.

Building Commissioning Guidelines

Refer to other sections and the Appendix FF in the building design standards for specific building commissioning guidelines and requirements, and Appendix HH for the HPBS Worksheet. It is the responsibility of the architect to coordinate closely with the Commissioning Agent(s) through the design and construction process.

ACCESSIBILITY REQUIREMENTS

Summary

A. This Section includes Salt Lake County's requirements for Accessibility in addition to all applicable codes standards, including but not limited to:

1. American National Standard ICC/ANSI A117.1

2. ADA Standards for Accessible Design – Most recent enforceable version (found on the Department of Justice website, www.ada.gov)

B. Salt Lake County Criteria shall be the same for all accessibility standards. The Design Team's approach is encouraged to seek design solutions which integrate accessibility requirements in a seamless and aesthetically pleasing manner.

C. Particular requirements of this section are in addition to those required within specific Division sections of this document. If conflict does occur, the Design Team shall bring it to the attention of the County Project Manager.

D. The Design Team shall consider the use of a hearing loop or portable hearing loop system for all spaces subject to special accommodations under codes indicated above. The County Project Manager shall direct scope of this element to promote "Effective Communication" without compromising privacy concerns.

E. Additional County requirements are listed by specification section below:

Division 8 - Doors

A. Salt Lake County shall have final approval of exact location of the door actuator pads proposed final installation.

B. Before building is turned over to the Owner for occupancy, all interior doors shall be balanced to operate with 5lbs of force, with a sweep period of 5 seconds minimum.

Division 9 - Carpet

A. Carpet shall be installed with the weave going in the predominate direction of pedestrian travel. (This avoids causing non-motorized wheelchairs, catering carts, etc. from having to propel down a continuous "side-hill" and being thrown toward the wall or oncoming traffic.)

Division 10 - Signage

A. Exceed ICC/ANSI requirements for sign contrast. All signs, primary building exterior identification as well as interior room signage, must have a minimum 60% contrast between characters and background, or other open area.

Division 10 - Toilet and Bath Accessories

A. Locate automatic hand dryer or paper towel dispenser immediately adjacent to the lavatory with proper clear floor space area for approach. Location across the room, on wall opposite of lavatory(ies) shall not be accepted, unless accepted by the County Project Manager.

B. Toilet seat protector dispensers shall not be mounted above toilets. Locate at open side of stall, above or below handrail.

C. Accessible toilet stall door handles shall not be flush or recessed type, and shall be mounted on inside and outside door faces.

D. In facilities that are prone to vandalism, a fixed shower head will be used in lieu of the required hand held shower wand per exception allowed by ANSI. Park Operations will provide specifications for the acceptable fixed shower head unit.

E. If showers are provided in facilities built for the Parks and Recreation Division, Park Operations will provide information for a concrete shower bench to be used in lieu of a folding shower bench.

Division 14 - Wheelchair Lifts

A. The use of Wheelchair Lifts to provide vertical circulation in a facility should be avoided and use must be approved by the involved Agency and the County Project Manager.

DIVISON 01 GENERAL REQUIREMENTS

SUMMARY OF WORK (SECTION 011000)

GENERAL

A. The following information shall be included, as contained herein, in the Summary of Work or Supplemental Conditions section of the Architect's specifications. Each item should be carefully reviewed with the County's project representative for relevance to each specific project.

B. County Logo is required on all projects.

PERMITS AND FEES

A. County's responsibility:

1. The Architect will submit the construction documents for plan review. The County will pay the following costs to be paid directly to the governing agency and entity upon request from the contractor:
    a. Plan check fees (completed prior to bidding).
    b. Building Permits.
    c. Impact Fees (i.e. – hydrology)
    d. Conditions Use Permit Fee (i.e. – gas, sewer, water, power, phone)
    e. Utility unit labor and material costs for work not included with connection fees and normally performed by the utility company.
    f. Testing
    g. Commissioning

B. Contractors responsibility:

1. The contractor will make arrangements to secure the building permit and will notify the County's project representative, in a timely manner, of the fee amount required to obtain the building permit. The contractor will research, coordinate and schedule all work required by the utility companies, special service districts and subcontractors to complete all work shown on the construction documents. The contractor will be responsible for all work not normally performed by the utility companies or special service districts (i.e. – trenching and backfilling) even if this work is not indicated in the construction documents. The contractor will be responsible for notifying the County Project Manager, in a timely manner of all costs to be paid by the County.
2. The contractor will be responsible for all bonding requirements and deposits that might be required by utility or government entities to perform the work.

SPECIAL INSPECTIONS, TESTING AND COMMISSIOING

A. The County will engage an independent, qualified testing agency, as defined in the construction documents. The contractor will be responsible for coordinating and scheduling all inspections and disseminating all required reports to the proper parties.

B. The testing agency representative shall meet with the Architect, County Project Manager and contractor to establish the testing requirements and frequency of testing including, but not limited to, the testing and inspection specified in the contract documents. Other testing and inspections will be performed at the discretion of the County Project Manager.

C. All retesting for previously failed tests shall be paid for by the contractor.

D. The County will engage an independent qualified commissioning agency(s) as defined in the construction documents.

E. The commissioning agency representative shall meet with the Architect, County Project Manager and contractor to establish the testing requirements and frequency of testing including, but not limited to, the testing and inspection specified in the contract documents. Other testing and inspections will be performed at the discretion of the County Project Manager.

CHANGES IN THE WORK

A. Any changes in the work of this contract due to discovered conditions or project scope modifications are subject to the following requirements:

1. A “Request for Proposal” shall be issued to the Contractor by the Architect clearly stating the exact conditions of the proposed change in the work or a “Request for Change” shall be issued to the Architect by the Contractor for review and acceptance.
2. The Contractor shall provide a written “Proposal” identifying the specific material and labor required to complete the change in the work. The Proposal shall completely itemize all material quantities, unit costs, labor estimates, hourly rates, and mark-up factors calculated in the overall cost. Material costs shall not exceed those listed at established market levels and labor costs shall not exceed those listed at Journeyman schedules as established for this region by current year R.S.Means.
    a. Direct subcontractor and/or contractor mark-up for profit, overhead and administrative costs shall not exceed a combined total of 15% of the itemized costs for material supplied and labor directly performed by that individual firm. Additional contractor mark-up on subcontractor work is limited to 5% of the work of those other subcontractor amount. A maximum additional performance bond mark-up of 1%, or the actual bond cost rate as verified by the bonding company, will also be allowed as valid mark-up as part of the Contractor’s submittals.
    b. No other mark-ups are allowed. (i.e. project management, supervision)
3. The Architect shall review and certify all Contractor’s proposals and shall issue to the County a justification statement for all proposed changes.
4. Execution of formal change orders is a time consuming process which could delay action on critical work. Any work performed prior to the issuance of the official change order is at the contractor’s risk. However, the County Project Manager will endeavor to minimize that risk through the expeditious processing of all change order items. Full, complete and detailed information on each item by the contractor will aide in that process.
5. Change Authorizations: A construction change authorization form will be issued by the County under special circumstances, to authorize immediate completion of changes in the work. The form will be prepared and completed by the Architect when time limits are such that the formal change order will cause unreasonable delays or additional costs to the project. The form will include a fixed or estimated cost to be included as part of a change order at the earliest possible date. All forms should be numbered consecutively, beginning with number one of each project. Electronic format shall be used. The Architect

shall maintain a log for construction change authorizations throughout the entire construction phase.

PRIOR APPROVALS

A. Where possible, three or more acceptable brands of equipment, manufactured articles or methods of construction have been identified in the contract documents in order to establish a standard and allow for competition. The intent of this process is not to exclude the use of other brands, articles or methods which may be acceptable and deserving of consideration. However, only explicitly specified or prior approved items are acceptable to the County. To be considered for a prior approval the bidder must during the bidding period:
   1. Submit fully detailed technical data, samples, installation methods, test reports and certification, references and all other supporting documentation as may be requested by the Architect.
   2. Prove to the Architect and the County that items held up as equal or superior to specified items meet project specification design and intent. Obtaining prior approval does not relieve the contractor from meeting the project specifications or any portion thereof.

B. Specification Sections: For convenience or reference and to facilitate letting of subcontracts, the specifications are separated into respective divisions and sections. The forming of these separations shall not operate to make the Architect or the County or any of its representatives an arbiter to establish subcontract limits between contractor and subcontractor or suppliers.

SCHEDULE OF VALUES / LIST OF SUBCONTRACTORS

A. After the bid opening, the apparent low bidder, and if deemed advisable, the apparent second or third low bidders shall submit the schedule of values and the entire list of subcontractors, used in formulating their respective bids, to the County Project Manager and the Architect within twenty-four hours.
   1. If a bidder has any doubt regarding the correctness or acceptability of any subcontract proposal, the bidder may submit the names and amount of other competing subcontractors, making sure that the bidder clearly states which one was used in formulating his proposal.

B. No changes to the original Schedule of Values will be allowed except by change order. Changes to the original List of Subcontractors involving major subcontractors will not be allowed except with the approval of the County Project Manager.

CONTRACTOR SUPERVISION

A. The contractor shall designate and keep continuously on the project, during its progress and until the project is finally accepted, an experienced and competent superintendent and any necessary assistants, all satisfactory to the County's project representative. The superintendent shall not be changed except with the consent of the County's project representative unless the superintendent proves to be unsatisfactory to the contractor and ceases to be in his employ.

B. The superintendent shall represent the contractor in his absence and all notices, requests and instructions given to the superintendent shall be considered as having been given to the contractor.

C. The contractor shall give efficient supervision to the work, using his best skill and attention. The contractor shall carefully study and compare all drawings, specifications

and other instructions giving prompt notice to the Architect of any errors, inconsistency, or omission which have been discovered, but shall not be held responsible for their existence or discovery.

CONTRACTOR DAILY RECORD

A. The contractor, at each scheduled progress meeting, shall provide the county project manager with a copy of their daily work log. This refers to the daily report that documents the number of staff on site, materials delivered, sub-contractor activity, etc. This report will provide information to be compared against the approved work schedule.

LIQUIDATED DAMAGES

A. It is recognized and agreed by the contractor and County that it is of importance to the County to have this project completed within the time schedule contained in the contract documents. Should the contractor fail to complete the work within the time stated in the Agreement or within such additional time as may have been allowed by change order extension, there shall be deducted from any moneys due, or that may become due the contractor, the sum per day (as defined in each contract), for each and every calendar day beyond the agreed or extended completion day, that the work remains uncompleted. Such sum is fixed and agreed upon by the County and the contractor as liquidated damages due the County by reason of the inconvenience and added costs of administration, loss of use and/or revenue and supervision resulting from the contractor's default, and not as penalty.

1. Permitting the contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion, or after the date to which the time for completion may have been extended, shall in no way operate as a waiver on the part of the County or any of their rights under the contract.
2. Said liquidated damage provision shall remain in effect and continue until substantial completion and acceptance of the project by the County. The contractor hereby authorizes the County to retain sufficient amounts of money due it and remaining in the hands of the county to pay the damages caused by any such default or defaults.

ALLOWANCES – (SECTION 012100)

GENERAL

A. General allowances are not allowed by the County with the exception of allowances established for special inspection and testing. Any allowances must receive the approval of the County Project Manager.

B. Allowances should be written such that amounts not used are to be credited back to the County at the completion of the project. Any overages will be compensated to the contractor by change order, that will also include a complete accounting of amounts used including detailed quantities and labor.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL – (SECTION 017419)

SUMMARY

A. This Section includes Salt Lake County preferences for responsible construction waste management and disposal for High Performance Building System (HPBS) design.

B. LEED®/ High Performance Submittal: LEED® letter template for related credits, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

SUBMITTALS

A. Waste Management Plan: At the beginning of the contract, submit a proposed waste management plan complying with above noted requirements to be reviewed and accepted by the County Project Manager.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Waste Management Conference: Conduct conference at Project site.

WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification and waste reduction. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan at start of construction.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Forms: Prepare waste management plan on format required by the current LEED® version.

PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property.

DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Do not allow waste materials that are to be disposed of to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

CLOSEOUT PROCEDURES – (SECTION 01770)

PART 2 - GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

SUMMARY

B. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals including digital submittal.
4. Warranties. (Include digital).
5. Instruction of Owner's personnel. (Include digital).
6. Final cleaning.

C. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
3. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request. Coordinate with all requirements listed in the High Performance Building Standard for Commissioning and verification.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Complete startup testing of systems.
8. Submit test records.
9. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
10. Complete final cleaning requirements, including touchup painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion after completing contractor preliminary inspection. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. Cost for reinspections after initial and on follow up reinspection may be back-charged to contractor
2. Results of completed inspection will form the basis of requirements for Final Completion.

FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit digital copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of areas in sequential order, starting with exterior areas first and proceeding to the interior.
2. Include the following information at the top of each page:

   Project Name

   Date

   Name of Architect

   Name of Contractor

   Page Number

PROJECT RECORD DOCUMENTS

General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings. (Include CD with PDF files of each sheet and BIM drawings with each drawing digitally “bound” so all pertinent information displays when file is opened and each file drawn to meet the current version of the National BIM Standard.)

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
   b. Accurately record information in an understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

A. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Note related Change Orders, Record Drawings and Product Data, where applicable.

B. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

C. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

OPERATION AND MAINTENANCE MANUALS

Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data as required below:

A. Hardcopy Requirements

The following table of contents should be common to all O & M Manuals and is based on ASI388 2 and Industry Best Practice.

Introduction and Scope

This is a basic introduction about the project, the builder, and the scope of work documented in the manual

Assets Record Information

Describing items of equipment, assets, or elements of the work.

Maintenance Documents:

The maintenance schedules and tasks required to maintain a piece of equipment/assets and hence prevent breakdown and/or meet compliance and manufacturer requirements.

Operations

This section should be used to record relevant information on the Operations of the system and/or assets. It should also include safety instructions, special tools, cleaning

and operating instructions and trouble-shooting to assist in solving problems to prevent expensive call outs.

Warranties and Certificates

Record specific warranty and certificate reference information. Important test results and performance criteria relating to commissioning and operations should also be included.

Spare Parts

Record any relevant information on the Spare Parts data for assets provided as part of the contract. It may also include information on spare parts suppliers.

Help and Contact

This section should be used to record information to allow the Client to call for expert assistance in relation to the assets included in the project. This would include the main contractors, sub-contractors and suppliers.

Drawings and References

This section allows you to attach/bind and or upload information like as-built plans, copies of specifications, complete product manuals and other documents relevant to the works and the O&M.

B. Operation & Maintenance Manual Digital

1. An intuitive digital instructional manual shall be provided to give the owners representative the information they need to care, adjust, maintain and operate all of the equipment within the building, to include but not limited to, the heating, air conditioning, ventilating, plumbing automatic temperature control systems, kitchen equipment, stage and theatrical equipment, electrical equipment and building products requiring maintenance.
2. An orientation date shall be set up to instruct the owner's representative on the use of the operation and maintenance digital copy. A written report specifying times, dates, and names of personnel instructed shall be forwarded to the owner's representative.
3. O & M Digital data preparation shall be under the direction of an individual or organization that has demonstrated expertise in the preparation of comprehensive and complete digital products. Qualifications shall be submitted for approval.
4. All digital copies shall be authored with Adobe Acrobat and shall not be limited to include the following:
    a. All design drawings and documentation shall be included on the digital copy in a PDF format. These drawings shall be provided in an electronic format to the company contracted to create the digital copy and shall include the civil engineering, architectural, structural, electrical and mechanical and any specialty engineering sections.
    b. Icons shall be located on the PDF plans to link test and balance reports and mechanical operation and maintenance information to the design drawings.
    c. All information on the digital copy shall be printable on 8.5" x 11" plain paper with the design drawings and automatic temperature control

drawings printable on 11” x 17” plain paper.

d. Linked information such that the user can key word search for information.

e. Provide a hyper-text alphabetical index of all equipment and building products as outlined in item 1 above.

f. Use of multimedia formatting (text, pictures, graphics and sound etc.) will be used to make the information more accessible and understandable.

g. All documentation shall be converted to an unchangeable Portable Document Format (PDF).

5. Digital file shall include a General Information Index screen to direct the user to the portion of the data desired. This index screen will consist of four (4) major groups. The groups will include:

   a. Contract Developers: This section is to include:

      i. Names of architects, engineers and contractors with address and telephone numbers.

   b. Equipment List: This section to include:

      i. A job specific alphabetical list of all items supplied to the project with names of the manufacturer, Item description including the plan number, model number and local supplier with current address and telephone number.

   c. Design drawings

   d. Manufacturer’s Operation and Maintenance Manuals:

6. Architectural section: This section to include:

   a. Building products, applied materials and finishes: Include product data with catalog number, size, composition, color and texture designations. Provide information for reordering custom manufactured products. Data shall include, but not limited to, information on finishes, builders hardware, etc.

   b. Instruction for care and maintenance to include manufacturer=s recommendation for cleaning agents and methods, precaution against detrimental agents and methods and recommended schedule for cleaning and maintenance.

   c. County’s O.P.R. and B.O.D.

7. Mechanical/Plumbing section:

   a. A general description of the mechanical system.

   b. A step by step procedure to follow in putting each piece of mechanical equipment into operation.

   c. Schematic control diagrams for each separate fans system, heating system, control panel, etc. Each diagram shall show locations of all control and operating components and devices.

   d. Test and balance report

   e. Valve tag schedule

   f. All manufacturers operation and maintenance manual information

   g. Maintenance instructions: This portion shall include:

8. A summary list of mechanical equipment requiring lubrication showing name of equipment and type and frequency of lubrication.
9. Special Maintenance Instructions to be summarized as follows:
    a. Preventative Maintenance Procedures
    b. Seasonal start-up and shut-down maintenance
    c. Periodical inspection requirements
    d. Water treatment procedures
10. Electrical section:
    a. Building products, applied materials and equipment: Include product data with catalog number. Provide information for reordering custom manufactured products.
    b. Instruction for care and maintenance to include all manufacturers' recommendations.
11. Warranty section: Include all product warranties.
12. Training films and videos: Include all training films and videos.
13. Four (4) of the CD or USB drives will be provided to the owner's representative.

DEMONSTRATION AND TRAINING – (SECTION 017900)

SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
    1. Demonstration of operation of systems, subsystems, and equipment.
    2. Training in operation and maintenance of systems, subsystems, and equipment.

SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' name for each training module. Include learning objective and outline for each training module.
    1. At completion of training, submit two complete training manual(s) for Owner's use.
B. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses or architects and owners and other information specified.
C. Attendance Record: For each training module, submit list of participants and length of instruction time.
D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
E. Demonstration: Submit two written copies within seven days of end of each training module.
    1. Identification: On each copy, provide an applied label with the following information:
        a. Name of Project
        b. Name of Architect and Construction Manager.

c. Name of Contractor.

2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with label information. Include name of Project on each page.

INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, included, but not limited to as follows:

1. Motorized doors, including overhead coiling doors and automatic entrance doors.
2. Equipment, including projection screens, loading dock equipment, food-service equipment, and residential appliances.
3. Fire-projection systems, including fire alarm and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including elevators and wheelchair lifts.
6. Heat generation, including boilers, feed water equipment, pumps and water distribution piping.
7. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
8. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
9. HVAC instrumentation and controls.
10. Electrical service and distribution, including transformers, switchboards, panel boards, uninterruptible power supplies and motor controls.
11. Packaged engine generators, including transfer switches.
12. Lighting equipment and controls.
13. Communication systems, including intercommunication, surveillance, clocks and programming, scoreboards, voice and data and television equipment.
14. Special Construction such as Swimming Pool Systems and Pool Amenities
15. Chemical Systems

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operation Requirements, and Criteria: Include the following:
    a. System, subsystem and equipment descriptions
    b. Operating standards
    c. Regulatory requirements
    d. Equipment function
    e. Operating characteristics
    f. Limiting conditions
    g. Performance curves

2. Documentation: Review the following items in detail:
    a. Emergency manuals
    b. Operation manuals
    c. Maintenance manuals
    d. Project Record Documents
    e. Identification systems
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments
3. Emergencies: Include the following, as applicable:
    a. Instructions on meaning of warnings, trouble indications, and error messages
    b. Instructions on stopping
    c. Shutdown instructions for each type of emergency
    d. Operating instructions for conditions outside of normal operating limits
    e. Sequences for electric or electronic systems
    f. Special operating instructions and procedures
4. Operations: Include the following, as applicable:
    a. Startup procedures
    b. Equipment or system break-in procedures
    c. Routine and normal operating instructions
    d. Regulation and control procedures
    e. Control Sequences
    f. Safety procedures
    g. Instructions on stopping
    h. Normal shutdown instructions
    i. Operating procedures for emergencies
    j. Operating procedures for system, subsystem, or equipment failure
    k. Seasonal and weekend operation instructions
    l. Required sequences for electric or electronic systems
    m. Special operating instructions and procedures
5. Adjustments: Include the following:
    a. Alignments
    b. Checking adjustments
    c. Noise and vibration adjustments
    d. Economy and efficiency adjustments
6. Troubleshooting: Include the following:
    a. Diagnostic instructions
    b. Test and inspection procedures
7. Maintenance: Include the following:
    a. Inspections Procedures
    b. Types of cleaning agents to be used and methods of cleaning
    c. List of cleaning agents and methods of cleaning detrimental to product

d. Procedures for routine cleaning
e. Procedures for preventive maintenance
f. Procedures for routine maintenance
g. Instruction on use of special tools

8. Repairs: Include the following:
   a. Diagnosis instructions
   b. Repair instructions
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions
   d. Instructions for identifying parts and components
   e. Review of spare parts needed for operation and maintenance

HIGH PERFORMANCE BUILDING SYSTEM (HPBS) DESIGN REQUIREMENTS – (SECTION 018113)

SUMMARY

A. This Section includes Salt Lake County requirements for High Performance Building System (HPBS) design.

1. County project manager shall designate whether project is to meet High Performance Building System (HPBS) Design Requirements, prior to request for proposals for design services from Design Teams.
2. All projects will be submitted to USGBC. Any change to this requirement will be made prior to request for proposals for design services from Design Teams.
3. Design Team shall incorporate requirements of this section into construction documents for all High Performance buildings.
4. LEED® Scorecards (Version 4) are in Appendix EE.

DEFINITIONS

A. Refer to the definitions in the current version of the LEED® Reference Guide

SUBMITTALS

A. Provide items required by the County-issued checklist for each High Performance project. Submittals shall include certificates which guarantee material content.

MINIMUM PROGRAM REQUIREMENTS

A. Site and building planning and design shall result in a reasonable LEED® Project Boundary. For new construction projects that have only one structure on the site the Boundary shall be the Contract-Limit-Line. For projects that include multiple buildings or are located in a campus setting all buildings (both existing and new) shall be afforded their responsible share of parking, open space, etc., so as to afford each building the opportunity to meet LEED® Gold standards in the future.

STORAGE AND COLLECTION OF RECYCLABLES

A. Provisions for recycling waste associated with building operations shall be provided. This includes distributed collection points for occupants as well as an aggregated collection point for waste haulers. These provisions shall support the diversion of mixed paper, corrugated cardboard, glass, plastics, metals, **batteries, mercury-containing lamps and electronic waste** from the landfill.

ENVIRONMENTAL TOBACCO SMOKE

A. Comply with current LEED® and County requirements.

LOW-EMITTING MATERIALS

A. For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
   1. Aromatic Compounds: Paints and coatings shall not contain aromatic compounds.
   2. Restricted Components: Paints and coatings shall not contain acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, or vinyl chloride.

B. Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.

REFRIGERANT AND CLEAN-AGENT FIRE-EXTINGUISHING-AGENT REMOVAL

A. Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based. Replace or adjust existing equipment to accommodate new refrigerant.

B. Remove clean-agent fire-extinguishing agents that contain HCFCs or halons and replace with agent that does not contain HCFCs or halons.

GENERAL COMMISSIONING REQUIREMENTS – (SECTION 019113) GENERAL

A. Commissioning (Cx) is a systematic process of verifying that building systems perform interactively according to the design intent and the owner's operational needs. This is achieved beginning in the design phase by documenting the design intent and continuing through construction, acceptance, and the warranty period with actual verification of performance, operation and maintenance (O&M) documentation verification and the training of operating personnel.

RELATED DOCUMENTS

A. Documents referenced in paragraph below should be prepared during schematic design phase or earlier and updated as design progresses. They should be provided to Contractor Project.

B. Owner's Project Requirements and Basis of Design documentation are included by reference for information only.

SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

B. Related Sections:

These sections are to be added by the owner on the checklist provided in the appendix for "High Performance Building System." This form is to be included in the design team's programming documents.

1. Division 01 Section "Facilities Exterior Enclosure Commissioning" for commissioning process activities for building exterior enclosure, roof, and foundation systems, assemblies, equipment, and components.
2. Division 01 Section "Interiors Commissioning" for commissioning process activities for building interiors construction, stairways, and finish systems and assemblies.
3. Division 14 Section "Commissioning of Conveying Equipment" for commissioning process activities for conveying systems, assemblies, equipment, and components.
4. Division 21 Section "Commissioning of Fire Suppression" for commissioning process activities for fire-suppression systems, assemblies, equipment, and components.
5. Division 22 Section "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
6. Division 23 Section "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
7. Division 25 Section "Commissioning of Integrated Automation" for commissioning process activities for integrated automation systems, assemblies, equipment, and components.
8. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, assemblies, equipment, and components.
9. Division 27 Section "Commissioning of Communications" for commissioning process activities for communications systems, assemblies, equipment, and components.
10. Division 28 Section "Commissioning of Electronic Safety and Security" for commissioning process activities for electronic safety and security systems, assemblies, equipment, and components.

DEFINITIONS

A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, communication channels, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority. Owner's representative responsible for facilitating the commissioning process.

D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Coordinate activities specified in paragraph below with Owner-Architect and Architect-Consultant agreements.

D. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.

6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority.
7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
8. Complete commissioning process test procedures.

CxA's RESPONSIBILITIES

A. Organize and lead the commissioning team.
B. Document The OPR and BoD in the Cx manual.
C. Perform Design Review for compliance with the OPR and BoD.
D. Perform Submittal Review for compliance with the OPR and BoD.
E. Include CxA responsibilities in this article that have an impact on Contractor's activities and responsibilities.
F. Provide commissioning plan.
G. Convene commissioning team meetings.
H. Provide Project-specific construction checklists and commissioning process test procedures.
I. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
J. Prepare and maintain the Issues Log.
K. Prepare and maintain completed construction checklist log.
L. Witness systems, assemblies, equipment, and component startup.
M. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

STORMWATER MANAGEMENT PLAN

A. County’s most recent Stormwater Management Plan and comply with requirements.

DIVISION 03 CONCRETE

SUMMARY

A. This Section specifies cast-in-place architectural concrete including form facings, reinforcement accessories, concrete materials, concrete mixture design, placement procedures, and finishes.

SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED

B. HIGH PERFORMANCE SUBMITTALS

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Design Mixtures: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements and for equivalent concrete mixtures that do not contain portland cement replacements.
3. Product Certificates: for products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

DIVISION 04 UNIT MASONRY

SUMMARY

C. HIGH PERFORMANCE BUILDING SYSTEM (HPBS) DESIGN

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Product Certificates: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Product Data, including printed statement of VOC content, for products and materials required to be low-emitting. Products that apply may include, but are not limited to: adhesives, sealants, paints, & coatings.

DIVISION 05 METALS

STRUCTURAL STEEL FRAMING (051200)

PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand LRFD loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Load and Resistance Factor Design," Volume 2, Part 9.

HIGH PERFORMANCE SUBMITTAL

A. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

B. Product Certificates: for products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Product Data, including printed statement of VOC content, for products and materials required to be low-emitting. Products that apply may include, but are not limited to: adhesives, sealants, paints, & coatings.

QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."

C. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges 303-10 or current addition" and AISC 360-10 or current addition.

D. Preinstallation Conference: Conduct conference at Project site.

DIVISION 07 THERMAL AND MOISTURE PROTECTION

GENERAL (070000)

Building infiltration is tested per ASTM STP719, which requires the building be negatively pressurized to 75 Pascal, at which the infiltration rate is measured in CFM/FT2 of envelope area. Actual building infiltration varies considerably, and is affected by a wide variety of factors including, building construction, stack effect, wind speed, outside and inside temperature, different HVAC systems, and occupant behavior.

Utah Division of Facilities Construction & Management (DFCM) contracted with Colvin Engineering Associates Inc. (CEA) and Architectural Testing Inc. (ATI) to determine the feasibility and energy cost savings of including an infiltration requirement in the State of Utah's High Performance Building Standard (HPBS). Through a series of meetings with DFCM, ATI, and CEA it was determined that an infiltration rate of 0.1 CFM/FT2 of envelope area was readily achievable without unnecessary burden on the design or construction team and would be used as the Baseline measurement for the study.

A. For all roof designs use of FM approved roof assemblies. County requires submittal of a RoofNav Contractor Package or an APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM (FM form EMV 2688 with detailed installation plans and materials and submittals to FM Global for review prior to installation. Design and install roofs in accordance with the FM Global on-line RoofNave application at www.roofnav.com and FM Global Property Loss Prevention Data Sheets 1-54 (Roof Loads for new Construction), 1-28 DESIGN WIND LOADS, 1-29 ROOF DECK SECUREMENT AND ABOVE-DECK ROOF COMPONENETS, 1-49 PERIMETER FLASHING and 1-31 METAL ROOF SYSTEMS as applicable. The RoofNav data base application at www.roofnav.com can be used to access and apply the above references to roof designs.

HIGH PERFORMANCE BUILDING SYSTEM (HPBS) DESIGN

BEnergy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 for a low-sloped roof and 29 for a steep-sloped roof, when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

SEnergy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List".

A. Energy Performance: Provide roofing system with initial solar reflectance not less than **0.70** and emissivity not less than **0.75** when tested according to CRRC-1.

B. Install a vegetated roof for at least 50% of the roof area.

SUBMITTALS

A. High Performance Building System (HPBS) Design

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Product Certificates: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
3. Product Data, including printed statement of VOC content, for products and materials required to be low-emitting. Products that apply may include, but are not limited to: adhesives, sealants, paints, & coatings.

4. Product Test Reports for roof, indicating that materials comply with solar reflectance index requirement.

SHEET WATERPROOFING (071300)

A. For basements and occupied levels below grade provide sheet waterproofing products which have been produced and installed to establish and maintain watertight continuous seals.

B. Types of sheet waterproofing specified may include the following:
   1. Neoprene sheet waterproof membranes.
   2. Butyl sheet waterproof membranes.
   3. EPDM sheet waterproof membranes.
   4. PVC sheet waterproof membranes.
   5. Polyethylene sheet waterproof membranes.
   6. Bituminous sheet waterproofing, premolded.
   7. Rubberized asphalt sheet waterproofing.
   8. Copper fabric sheet waterproofing.

WARRANTY

A. Provide written warranty, agreeing to replace/repair defective materials and workmanship. Warranty includes responsibility for removal and replacement of other work which conceals sheet waterproofing. Warranty period shall be minimum 3 years after date of substantial completion.

TESTING

A. In-place Testing: Before completed membranes on horizontal surfaces are covered by protection course or other work, test for leaks with 2” depth of water maintained for 24 hours. Repair any leaks revealed by examination of substructure and repeat test until no leakage is observed.

EXTERIOR INSULATION AND FINISH SYSTEMS (072400)

A. It is required that the manufacturer supply a current compliance report from the National Evaluation Service (US), BOCA Evaluation Services, ICBO Evaluation Services, SBCCI Public Safety Testing and Evaluation Services or an equivalent report (outside the US) which shows the durability, fire performance, system structural performance and component performance. Fire performance should be demonstrated by a large-scale fire test (example: UBC 26-4 [formerly UBC 17-6], FM Approvals Corner Test, CAN/ULC-S134, UBC 26-3, UBC 26-9).

   In the absence of an independent evaluation service, individual test reports conducted by recognized, independent testing agencies, should be submitted for review.

B. The substrate should be acceptable to the system manufacturer and should be noncombustible (i.e. brick, masonry, concrete) or minimum 1.2 in. (12mm) water-resistant core gypsum sheathing. Plywood, oriented-strand board (OSB) or other combustible sheathing materials should not be used as a substrate for EIFS unless the EIFS has been specifically tested (large-scale tests indicated in 2.3) or Approved with them and the system manufacturer finds them acceptable for the adhesives/mechanical fasteners to be used.

C. When the insulation is adhered to gypsum board, only glass mat-faced gypsum board should be used. Paper-faced gypsum board (ordinary and water-resistant core) should not be used.

D. Systems where the insulation board is secured directly to metal or wood studs (i.e., without a sheathing substrate over the exterior of the studs) should not be used.

E. The total heat content of insulation in EIFS systems should not exceed 6,000 Btu/ft2 (68 MJ/m2) in any portion of the wall. The insulation thickness should not exceed the maximum thickness tested and listed in the compliance report (see A).

F. Install only as much insulation as can be covered with a layer of base coat in a single working day, or prior to expected start of inclement weather. Seal unfinished edges at the end of each day to minimize potential moisture damage.

G. System shall be resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building which results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind system including substrates, supporting wall construction, and interior finish.

H. System shall be designated and installed to be free from bond failure within system components for between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

I. Reinforcing Fabric shall be used and shall be of heavy-duty and installation for all areas subject to impact and damage. Reinforcing shall be of the following minimum design. Balanced, alkali-resistant open weave glass fiber fabric treated for compatibility with other system materials; made from continuous multi-ended strands with tensile strength of not less than 120 lbs. and 140 lbs. in warp and fill directions, respectively, per ASTM D 1682 and complying with ASTM D 578.

J. Expansion joints shall be designed and installed at minimum intervals recommended by EIMA or the manufacturer.

ASPHALT SHINGLES (073113)

A. Asphalt shingles shall only be used on a limited basis and only with the approval of the County Project Manager. Shingles used shall be Class ‘A’ of minimum thirty year wear rating. Architectural, three-dimensional laminated style shingles are preferable.

B. Because of fire hazards wood shakes shall only be used on a limited basis where there is an existing facility with existing wood shakes and only with the approval of the County Project Manager.

BUILT-UP ASPHALT ROOFING SYSTEM (075113)

A. Built-up asphalt roofing is only to be used on a limited basis where there is an existing facility with existing built-up roofing and there is a need to tie into the existing roof. Asphalt roofing may only be specified with the approval of the County Project Manager.

FLEXIBLE SHEET ROOFING SYSTEM (075300 & 075400)

ROOFING SYSTEM

A. All roofing, insulation, flashings and accessories shall be applied in strict accordance with the approved roofing materials manufacture’s latest printed specifications for a 20-year bonded type roof.

B. Use full coverage 20-year bond roofing specification with reinforcing for the type of deck upon which the roofing is to be applied.

C. Specifications for roofing installation shall be formulated by the architect after consultation with the County Project Manager. Specifications shall include the following:

1. General contractor and roofing sub-contractor jointly agree, for a period of two (2) years after the date of substantial completion, in inspect and make immediate emergency temporary repairs as required to stop leaks or correct defects in the roofing system work, including attachments to metal flashings forming an integral part of the roofing, within three working days of notice received from the owner by telephone, telegram or letter; and further agree to make permanent repairs to restore the affected items to the standards of construction required by these specifications within a reasonable time and as weather conditions permit; and further agree to make such temporary and permanent repairs without reference to or consideration of the cause or nature of such leaks or defects in the waterproofing work. In case of defective roofing system work, damage caused by leaks or by their repair shall also be repaired. Work required within the period shall be completed without cost to the owner, except that repair work required because of Acts of God, abuse, alterations or failure of the substrate or supporting structure (other than that caused by defects in the roofing work), will be paid for by the owner, promptly after completion of the required repair work in each instance. However, this agreement and the enforcement of its provisions shall not deprive the owner of any action, right or remedy otherwise available to him.

D. Acceptable roofing systems include the following:

1. Polyvinyl Chloride (PVC.)
2. Ethylene Propylene Diene Monomer (EPDM.)
3. Elastomeric Membrane
4. Thermoplastic Membrane
5. Thermoplastic Polyolefin (TPO)

Roofing system selection shall be coordinated with County project manager.

E. All roofing membrane systems to be installed in strict accordance with the manufacturer's printed instructions.

ROOF DECKS (Coordinate with Division 5 & Division 6)

A. All roofs shall be designated so that there is a minimum slope of 2½ % to a roof drain or minimum of ¼" slope per foot. The roof shall not have any flat spots or ponding of water on the surface of the roof. Supplemental slopes shall be provided by crickets utilizing tapered insulation.

B. Cant strips, if any, on flat roof decks shall be at least 4" high (preferably 6") and shall slope toward a drain not less than 3" per foot (25%).

C. Roof insulation shall comply with current recommendations of ASHRAE Utah State and Federal Regulations.

ROOF PENETRATIONS AND FLASHINGS (076000 & 077000)

A. Two or more objects shall not extend through the roofing closer than 18" unless both objects are flashed with integral flashings. No objects shall extend through the roof closer than 18" from cant strips of firewalls, etc.

SHEET METAL FASCIAE AND COPINGS (076200)

A. Sheet metal fasciae and copings shall be minimum 24 gauge metal and heavier where subjected to impact. Sheet metal shall be prefinished with manufacturer's standard baked-on or flouropolymer coating.

B. Other exposed sheet metal fabrications such as window sills and trim shall be minimum 22 gauge metal and heavier where subjected to impact. Sheet metal shall be prefinished with manufacturer's standard baked-on flouropolymer coating.

ROOF HATCHES (077200)

A. Roof hatches will be needed for the following two circumstances:

1. For mechanical equipment on roofs needing servicing; and
2. For roof heights above 16 feet with or without mechanical equipment.

B. Roof hatches should be 30" square minimum size. Where major mechanical systems placed on the roof are involved, hatches should measure 34" x 72" and should be accessed by a ship's ladder-type stairway.

C. If the roof of a building has several levels, ladders on the roof will be needed extending between levels or a roof hatch for each level will be necessary.

DIVISION 08 OPENINGS

Comply with requirements associated with High Performance Building Envelop Commissioning Requirements (see Appendix) and Division 07 Requirements.

BUILDING ENTRANCES (SECTIONS 081000 & 084000)

A. All major building entrances shall have two sets of doors with at least seven feet between the inner and the outer doors as required by ADA.

B. Glass panels in doors or at the side of the doors must have a horizontal bar or other high contrast visual marking the same height as the panic device to prevent people from walking through.

C. All public entrances provided in accordance with Paragraph F206.4.1 (Public Entrances) of the ABAAS shall have at least one entrance door complying with Section 404.3 (automatic and Power-Assisted Doors and Gates) of the ABAAS. Where a public entrance has a vestibule with exterior and interior entrance doors, at least one exterior door and at least one interior door shall comply with Section 404.3. or revisions adopted after 2017.

D. Before project is turned over to the Owner for occupancy, all interior doors shall be balanced to operate with 5lbs of force, and a sweep period of 5 seconds minimum.

EXTERIOR DOORS AND FRAMES

A. Exterior doors on all public entrances shall be three feet wide or wider.

INTERIOR DOORS AND FRAMES

A. Interior doors may be wood or metal of institutional quality. Styles and rails shall be reinforced to adequately support hinges, locks and closers. All interior doors must comply with National Fire Protection Association regulations.

B. Interior door frames shall be metal. Wood door frames are not acceptable.

DAYLIGHTING

A. Provide direct line-of-sight vision glazing for building occupants in a minimum of 75% of all regularly occupied spaces, unless directed otherwise for security or functional purposes by the County Project Manager.

HIGH PERFORMANCE DESIGN

A. Provide direct line-of-sight vision glazing for building occupants in 90% of all regularly occupied spaces, unless directed otherwise for security or functional purposes by the County Project Manager.

B. The“glazing orientation, and glazing amount” be evaluated through simplified energy modeling, during the schematic design (SD) phase. Exceptions are permitted through approval of the Energy Program

C. Require glazing performance (U-value & Solar Heat Gain Coefficient (SHGC)) conform to the more stringent minimum requirements of either the International Energy Conservation Code 2012 (IECC) or ASHRAE 90.1-2010. I.e. no trade-off is permitted with the thermal/energy performance of other building envelope components. (Glazing requirements are specified by location, and are not identical for all locations.)

D. Require, by reference to IECC Section C402.3.1, that total glazing area does not exceed 30% of above grade gross wall area (horizontal skylights may not exceed 3% of gross roof area). Spandrel sections are not considered toward the calculation of glazing percentage, but must meet the insulation/thermal performance requirement(s) of other typical opaque wall assemblies.

GLAZING U-VALUE

A. U-value becomes increasingly more important to energy performance and thermal comfort, as the climate becomes colder. This, in part, is due to the fact that conductive heat transfer is a function of temperature difference, i.e. the absolute temperature difference between the ambient outdoor temperature and the indoor (conditioned space) temperature.

B. U-values can be used to define/describe the glazing only, or the entire glazing assembly.

C. Glazing only U-value is typically referred to as Center-of-Glass (SOG) U-Value. This value is provided by the glass manufacturer (i.e. PPG, Guardian, Pilkington, Viracon, etc.) and is used, in part, to define the glazing (only) performance, typically Specification 08 80 00 - Glazing. Also see Glazing Specifications & Glazing Energy Code Compliance.

D. Assembly U-value, in reference to glazing, describes the thermal conductance performance of the entire glazing assembly, i.e. frame, mullions, glass, gas fill, thermal break, etc. Assembly U-value is always greater than (performs worse than) SOG U-value, due to fact that the conductance of the framing is greater than that of the glazing, alone. This U-value must be determined through standardized testing and/or calculations, per National Fenestration Rating Council (NFRC) or

American Architectural Manufacturers Association (AAMA). Assembly U-value is used, in part, to define the glazing assembly performance in construction documents, typically Specification 08 41 13 – Aluminum-Framed Entrances & Storefronts, and Specification 08 44 13 – Glazed Aluminum Curtain Walls. Assembly U-value is also the appropriate quantity used for energy code compliance reporting, i.e. COMcheck. Also see Glazing Specifications & Glazing Energy Code Compliance.

E. Consider minimizing the framing dimensions and use of mullions, and maximizing the glass-to-frame area ratio, to result in improved glazing assembly U-value performance. Additionally, glazing assemblies should strive toward achieving length-to-width ratio equal to 1.0, i.e. avoid thin strips of glazing, where possible.

GLAZING SHGC

A. Consider improving SHGC which will have a greater impact, than U-value, due to expenses related to building cooling loads.

B. Assembly SHGC describes the solar radiation performance of the entire glazing assembly, and is always slightly less than (performs better than) SOG SHGC, due to fact that the assembly's framing provides some minimal shading to the glazing, itself. The assembly SHGC must be determined through standardized testing and/or calculations, per National Fenestration Rating Council (NFRC). Assembly SHGC is used, in part, to define the glazing assembly performance in construction documents, typically

Specification 08 41 13 – Aluminum-Framed Entrances & Storefronts, and Specification 08 44 13 – Glazed Aluminum Curtain Walls. Assembly SHGC is also the appropriate quantity used for energy code compliance reporting, i.e. COMcheck. Also see Glazing Specifications & Glazing Energy Code Compliance.

C. Shading devices are capable of having a pronounced impact on the effective SHGC, by limiting the direct incident solar contact on a glazing assembly. Particularly in warmer climates, consider utilizing light shelves, in order to preserve daylight harvesting potential, while minimizing incident solar radiation on glazing assemblies.

D. Glazing SHGC is tested/calculated with consideration that the solar heat gain is a direct function of the angle of incident solar radiation, i.e. the angle at which the sun hits the window. Therefore, surface orientation should be considered as part of the design, where North (and somewhat South) exposures are less important, as the angle of incidence is lower, and East and West exposures are more important, having more direct angle(s) of incidence. Additional attention should be paid regarding the seasonal changes of the solar path, with regard to the glazing surface orientation, and incorporation of shading devices and/or light shelves.

GLAZING VISIBLE LIGHT TRANSMITTANCE (VLT)

A. Higher VLT (potential for daylight harvesting) relates to higher SHGC (adverse impact of incident solar radiation). Projects should be evaluated on a case by case basis to determine and balance the relative impact(s) of these, somewhat, conflicting consequences of this glazing design.

GLAZING AIR LEAKAGE

A**.** Air Leakage describes how much outside air is permitted through a glazing assembly. (Air leakage is not applicable to glazing independent of an assembly.)

B. The lower the leakage rate, the lower the flow of unwanted outside air infiltration and/or exfiltration.

C. Glazing air leakage describes the glazing assembly, only, and does not consider air leakage that may occur at the transition(s) from the glazing assembly to other neighboring building envelope components.

D. Air leakage (rate) is used, in part, to define the glazing assembly performance in construction documents, typically Specification 08 41 13 – Aluminum-Framed Entrances & Storefronts, and Specification 08 44 13 – Glazed Aluminum Curtain Walls.

GLAZING SPECIFICATIONS

A. SOG thermal/energy performance data, as described above and provided by the glass manufacturer, is appropriate only for the glazing specification, typically Specification 08 80 00 – Glazing.

B. Assembly thermal/energy performance data, as described above, is required for all glazed building envelope assemblies, typically Specification 08 41 13 – Aluminum-Framed Entrances & Storefronts, and/or Specification 08 44 13 – Glazed Aluminum Curtain Walls. These specifications will reference the glazing specification (08 80 00), for the glass to be used in the assemblies.

C. The glazing assembly U-value & SHGC must be determined by the standardized tests and/or calculations indicated above, and are the responsibility of the glazing assembly product representative and/or installer to provide. These standardized tests and/or calculations are performed using standardized sample (glazing assembly) sizes/dimensions, and therefore, will not necessarily correlate with the glazing assembly thermal/energy performance data used for whole building energy performance assessment (i.e. energy models per ASHRAE 90.1 Appendix G). This is due to the fact

that whole building energy performance protocol allows the designed glazing assembly performance to be defined/calculated per the actual dimensions/configuration, not necessarily per standardized test sample size/dimensions.

D. Assembly U-value & SHGC should be edited correctly in the appropriate construction documents, such that the basis of design is accurately represented, to ensure that the as-built performance meets the design intent.

E. Do not rely on using energy code/standard minimum allowable window assembly thermal/energy performance criteria in construction documents (specifications). Even if the glazing specification (08 80 00) accurately represents the glass-only basis of design, the use of energy code minimum performance criteria in the glazing assembly specifications will allow the glazing assembly contractor/installer leeway regarding the performance of the framing members provided, in terms of thermal performance. As such, the design intent regarding thermal/energy performance of glazing assemblies will likely be compromised.

GLAZING ENERGY CODE COMPLIANCE

A. Energy code compliance reporting (i.e. COMcheck) provides three options for the reporting of glazing assembly thermal/energy performance data. All three options require glazing assembly thermal/energy performance data, not SOG data.

B. NFRC Site-Built Certified Product. This option requires that the glazing assembly being installed/reported has been previously tested, in the as-built condition, and is listed in the Certified Products Directory (CPD) of the NFRC. This option requires reporting of the CPD identification number, otherwise, this option for reporting compliance is prohibited.

C. Product Performance Evaluated in Accordance with NFRC. This option, which is most typically used, requires that the glazing assembly be evaluated in accordance with NFRC 100 & 200 (for U-value & SHGC respectively), and are typically the same values used in glazing assembly specifications. An identification number is also required, which should be provided with the NFRC test results/report.

D. Energy Code Defaults. It is important to note that, for this option, Code Defaults are not the same as the code minimum allowable values provided in the envelope requirement tables of the IECC or ASHRAE 90.1. In this case, the Defaults are much worse, in terms of thermal performance, than the code minimum allowable values in the envelope requirement tables. This option is used when no appropriate testing or calculations have been performed in order to determine the glazing assembly thermal/energy performance data, and demonstrating energy code compliance for the entire envelope, and hence the entire project, will be very difficult.

E. Shading devices can benefit the demonstration of energy code compliance for glazing assemblies, utilizing Projection Factor; a method to describe the contribution to improved SHGC with use of shading devices, which is permitted.

F. Prescriptive minimum criteria for glazing assemblies (U-value & SHGC) are provided in the IECC Section C402 (v. 2012 see Table C402.3) and ASHRAE 90.1 Tables 5.5-1 thru 5.5-8 (all versions).

1. The following institutions & organizations provide a plethora of resources and educational information related to glazing design approach options and implications.
2. National Fenestration Rating Council - http://www.nfrc.org/
3. National Institute of Building Sciences http://www.wbdg.org/design/env_fenestration_glz.php

4. Efficient Window Collaborative - http://www.commercialwindows.org/
5. U.S. Department of Energy (white paper) - https://windows.lbl.gov/pub/selectingwindows/window.pdf

KEYING AND LOCKSETS (SECTION 087100)

A. Key schedule shall be prepared by the contractor and approved by the owner prior to keying. Keying shall be according to the specification provided. Complete keying shall be turned over to owners' representative.

B. Locksets and all keying cylinders shall comply with the following performance specifications:

1. Twin 6000 classic 851 profile with sidebar
2. Grade 1, UL Listed quality
3. Allow multiple brands of lock types to accept ASSA 851 profile.
4. Allow owner key control.
5. Pick resistant and will not allow key bumping.
6. All entries to have ASSA cylinders.
    a. All ASSA keying to end user current system. Shall use part number list for respective lock types

COUNTY LOCK REQUIREMENTS
ALL LOCKSETS TO BE YALE STANDARD CAM UNLESS OTHER INDICATED

TYPE	FUNCTION	PART NUMBER
1-1/8" Mortise Cylinder Standard	Choose different cam types for respective lock functions	CS110698 ASSA INC E65515626SUB232 E6551-5 626 SUB 232-851 Exclusive, 1-1/8" Yale Cam, SIB Mortise Cylinder
1-1/8" Rim Cylinder Standard		C5110697 ASSA INC E6551H626SUB 232 E6551-H 626 SUB 232-851 Exclusive 1-1/8" HORI TP, SUB Rim Cylinder
IC Core		ASSA E80600IC 626 ASSA E80600IC 626 SUB 232-851 YALE LFIC, SUB ASSEM, 232 SIDEBAR US26D
Key in Knob/Lever/DB	Can order different tail piece types for respective lock types	ASSA E65611 626 SUB ASS E6566 626 SUB 232-851 Schlage Cyl, SUB ASSEM, 232 SIDE US26D
Mortise Housing	Can choose different cam types for respective lock types	C5634188 YALE SECUR 2221 626 2221 626 HSG F/2196 6P I/C MORT, SATIN C
Rim Housing		C5636050 YALE SECUR 1212 626 1212 6265 F/ 1193 RIM CYL, 6-PIN, SATIN CHR
1-1/4" Mortise Cylinder Standard	Can choose different cams for lock types	ASSA INC E6552-5 626 SUB ASSA E6552-5 626 SUB 232-851 Exclusive 1-1/4" Yale Cam, SUB Mortise Cylinder
1-3/8" Mortise Cylinder Standard	Can choose different cams for lock types	ASSA INC E6554-5 626 SUB ASSA E6551-5 626 SUB 232-851 Exclusive 1-3/8" Yale Cam, SUB Mortise Cylinder
1-1/2" Mortise Cylinder Standard	Can choose different cams for lock types	ASSA INC E6554-5 626 SUB ASSA E6554-5 626 SUB 232-851 Exclusive, 1-1/2" Yale Cam SUB Mortise Cylinder

C. Contractor shall use construction cylinders for all construction period keying. Permanent keying cylinders shall be installed just prior to completion.

DOOR CLOSERS (SECTION 087100)

A. Where door closers are required for functional or safety reasons, they shall be from an acceptable manufacturer's heavy-duty, overhead, surface-mounted type or concealed overhead closer.

B. Closer must be made of cast iron, providing superior burst and yield strength, and must be tested to over 10 million cycles, demonstrating durability, elimination of internal leaks, and minimum porosity, additionally minimizing expansion and contraction.

C. Closers shall have forged steel arms, providing maximum strength, including tensile and side loading.

D. Closers must have a minimum 1 ½" piston bore diameter to minimize abusive pressure spikes and achieve less psi of hydraulic pressure.

E. Closers must have a double heat-treated pinion 11/16" with large teeth, and use full complement bearings.

F. All-weather hydraulic fluid must be provided in closers where temperature differential spans -30 degrees Fahrenheit to 120 degrees Fahrenheit, thus eliminating seasonal adjustments.

G. Powder-coated finish to be provided, passing a 100 hour salt spray test 4-times the standard.

H. High use doors shall have closers with a 20 year warranty. Moderate use doors shall have closers with a 10 year warranty.

I. Attaching screws shall bolt through doors; wood screws pull out and are, therefore, not acceptable

J. Floor-mounted closers are not acceptable.

K. Pressure relief valves in closers are not acceptable.

L. Door closers shall not have hold-open devices, unless otherwise considered by the County Project Manager.

M. Closers shall be located on the inside of doors.

DOOR OPERATORS (SECTION 087100)

A. Where door operators are required for accessibility entrances, provide a door operator that has metal rollers. Nylon rollers are not acceptable. Switches shall be mounted on walls, columns or special posts at 36" above adjacent floor or exterior walkway surface with sufficient clearance for wheelchair footrests and without requiring the user to lean forward.

B. Automatic ADA operators shall include performance features described for door closers, as well as a digital control suite, complete on-board diagnostics and power supply to actuators or strikes, back-up default memory, quick plug and play sensor integration, and a "no destruct" feature (motor clutch).

DIVISION 21 FIRE SUPPRESSION

WET-PIPE SPRINKLER SYSTEMS (SECTION 211313)

A. Qualifications: Designer shall be a licensed fire protection engineer or fire protection system designer certified by NICET to level three minimum and engaged in design of fire protection systems.

B. Design: Conform to applicable FM Global Property Loss Prevention Data Sheets. Use FM approved equipment and materials where applicable. Factory mutual (FM) approved is required on all projects. Contractor shall provide owner's project manager with copies of submittals for FM review.

C. Contractor shall make adjustments as necessary to meet FM insurance requirements.

D. CPVC piping material is not acceptable.

E. Alarm devices will include:

1. Water-motor-operated alarm.
2. Electrically operated alarm bell.

DIVISION 22 PLUMBING

COMMON WORK RESULTS FOR PLUMBING – (SECTION 220500)

A. O&M Manual data: If requested, contractor shall submit sections of manual on specific equipment 2 weeks prior to start up for review by engineer, Cx agent and/or owner's representative.

B. Dielectric fittings: Required at all changes in piping material. Factory-fabricated combination fitting of copper alloy and ferrous materials with threaded, solderjoint, plain, or weld-neck end connections that match piping systems materials.

C. Escutcheons: Brass with polished, chrome plated finish.

D. Piping Connections:

1. Install unions at each valve and at final connection to each piece of equipment and plumbing fixture having 2" diameter and smaller connections.
2. Install flange connections at each piece of equipment larger than 2" diameter.
3. Use dielectric connections for dissimilar metals.

E. Pipe Chases: Design plumbing systems in chases accessible thru main doors at least 18" wide. Coordinate installation of one light fixture for maintenance work.

METERS AND GAGES FOR PLUMBING PIPING – (SECTION 220519)

A. Thermometers: Use liquid-in-glass type with aluminum or brass metal case, with organic-liquid. Thermowells shall be installed to hold thermometers.

B. Pressure Gages: Use liquid-filled type with drawn steel or cast aluminum case with needle valve fittings.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT – (SECTION 220553)

A. All plumbing equipment, valves, and piping shall be identified with labels per scheduled below:

1. Equipment Labels: Stamped or Engraved Metal or Plastic.
2. Warning Signs and Labels: 1/8 inch thick with fasteners.
3. Pipe Labels: Self-adhesive.
4. Valve Tags: Brass, 0.032-inch minimum thickness.
5. Warning Tags: 3 by 5-1/4 inches minimum; brass grommet and wire fasteners.

DOMESTIC WATER PIPING – (SECTION 221116)

A. Under-building-slab, domestic water piping: Use type K soft copper tube.

B. Aboveground domestic water piping: Use type L hard copper tube

C. Provide calibrated balancing valves on hot-water circulation piping.

D. Below grade installations protect piping with 1/2" thick "Armaflex" continuous. Set wrapped pipe in 6" sand or pea gravel all around.

E. Isolation of Water Piping Distribution: Install water piping complete with isolation valves located such that separate buildings and logical portions of one building may be shut-off for servicing without disrupting the entire water distribution system. Where the main

water shut-off valve is located within a building and not near the exterior install a shut-off valve at the point where the line initially enters the building.

F. The entire domestic water systems shall be thoroughly sterilized with a solution containing not less than 250 parts per million of available chlorine. The chlorinating materials shall be introduced into the system in a manner approved by the Owner's representative. The sterilization solution shall be allowed to remain in the system for a period of 24 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution is not greater than 0.2 parts per million. Water system will not be accepted until a negative bacteriological test is made on water taken from the system, and dosing will be repeated as necessary until such negative test is accomplished.

G. Tests shall be conducted in the presence of the Owner's representative. A written report (letter form) of all tests shall be submitted to the Owner's representative.

   1. Domestic water systems shall be water tested to a pressure drop not to exceed 5 psi in a six-hour period, with no visible leaks.

H. If inspection or test shows defective or leaks such defective work or material shall be replaced or corrected and inspection and tests repeated. All repairs to piping shall be made with new materials. No caulking or screwed joints or holes with be acceptable.

I. Test results shall be included in the project systems manual.

DOMESTIC WATER PIPING SPECIALTIES – (SECTION 221119)

A. Hose Bibbs shall be chrome plated for indoor applications and provided with a vacuum breaker.

B. Non-freeze Wall Hydrants shall be provided with recessed lockable enclosure and vacuum breaker.

C. Drain Valves shall be stop and waste type.

D. Water System Shock Absorbers:

   1. Each hot and cold water connection to a fixture or faucet shall be equipped with a full size vertical air cushion not less than 12" long. In addition to the air cushions, provide stainless steel bellows type shock absorbers for hot and cold water at each fixture group.

   2. Approved Manufacturers: Zurn "Shocktrol", Smith, Josam or Wade.

DIVISION 23 HEATING VENTILATING AND AIR CONDITIONING

TESTING, ADJUSTING, AND BALANCING FOR HVAC – (SECTION 230593)

A. Provide testing, adjusting, and balancing for the following:
   1. Air Systems
   2. Hydronic Systems
   3. Steam systems
   4. Heat exchangers
   5. Motors
   6. Chillers
   7. Cooling towers
   8. Condensing units
   9. Boilers
   10. Heat-transfer coils
   11. Temperature measurements
   12. Commercial kitchen, laboratory fume and exhaust hoods
   13. Space pressurization measurements and adjustments
   14. Vibration measurements
   15. Sound-level measurements
   16. Stair-tower pressurization system measurements and adjustments
   17. Smoke-control system testing
   18. Indoor-air quality measurements
   19. Existing systems
   20. Temperature-control verification

B. Test & balance provider shall provide technical assistance with commissioning activities as required for the project.

C. Testing, Adjusting, and Balancing Agent Qualifications: AABC or NEBB certified.

D. Guarantee: AABC national project performance or NEBB guarantee that a certified agent has performed TAB and optimum performance capabilities have been achieved.

E. Test & Balance provider will submit the following reports:
   1. Initial Construction-Phase Report: Based on examination of the Contract Documents, on adequacy of design for systems' balancing devices.
   2. Submit a testing, adjusting, and balancing plan for review by engineer, Cx agent, and/or owner’s representative.
   3. Status Reports: As Work progresses.
   4. Submit Deficiencies report.
   5. Final Report: Certification sheet with content and format according to AABC or NEBB standard forms.

F. Test & Balance provider will perform the following inspections:
   1. Initial Inspections: Random checks by TAB firm to verify final TAB report.
   2. Final Inspections: Random checks by Owner or Architect to verify final TAB report.

HVAC INSULATION – (SECTION 230700)

A. Heating systems insulation shall include heating water supply and return piping, heat exchangers, converters and air separators.

B. Cooling systems insulation shall include chilled water, chiller cold surfaces not factory insulated, cold condensate drains, refrigerant suction, refrigerant hot gas, and chilled water pump bodies.

C. Air distribution system insulation shall include interior surfaces of outside air and mixed air plenums and ducts, exterior surfaces of supply air plenums not indicated to be lined and rigid spiral supply air ductwork.

D. Other systems insulation shall include heat traced piping.

E. Insulation jacketing shall be a high impact polyvinyl chloride pipe covering on insulated piping. Thickness to be 30 mil. Jacketing shall be Ceel-co Ceel-Tite 300 Series, Schuller Zeston 300 Series or approved equal.

   1. Jacketing shall be color coded according to piping contents.

F. Piping insulation exposed to weather shall be jacketed with a 0.016-inch thick corrugated aluminum jacket. The seam shall be installed on the bottom of horizontal and angled piping.

G. All piping in equipment rooms shall be covered with a protective insulation jacketing.

INSTRUMENTATION AND CONTROL FOR HVAC – BACNET – (SECTION 230900)

A. Refer to Salt Lake County automatic control specification included in the appendix.

FACILITY NATURAL-GAS PIPING – (SECTION 231123)

A. Natural-Gas System distribution pressure within buildings shall be 2lb.

B. Piping Specialties: Provide appliance flexible connectors, quick-disconnect devices, strainers, and weatherproof vent caps.

C. Earthquake valves with switch and cast-aluminum body as manufactured by Koso. Other manufacturers require approval by Salt Lake County Facilities.

HYDRONIC PIPING – (SECTION 232113)

A. Provide valves using the following schedule:

   1. Bronze, Calibrated-Orifice, Balancing Valves: Ball or plug type.
   2. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves: Ball, plug, or globe pattern.
   3. SDPressure-Reducing Valves: Bronze or brass.
   4. Safety Valves: Bronze or brass.

B. Valve type applications shall use the following schedule:

   1. Shut off-duty valves are for each installation in branch connection to supply mains, and at supply connection to each piece of equipment.
   2. Calibrated-orifice, balancing valves are for installation in each branch connection to return main.

3. Calibrated-orifice, balancing valves are for installation in return pipe of each heating or cooling terminal.
4. Check valves are for installation in each pump discharge and elsewhere as required to control flow direction.
5. Safety valves are for installation in hot-water generators.
6. Pressure-reducing valves are for installation in makeup-water connection to regulate system fill pressure.

C. Air control devices shall include manual and automatic air vents, ASME labeled replaceable bladder type expansion tanks, and tangential type air separators.

D. Hydronic piping shall be one of the following materials:
1. Copper tubing and soldered, brazed or pressure-seal joints.
2. Steel pipe, cast or malleable-iron fittings, and threaded joints.
3. Steel pipe; steel, pressure-seal couplings and fittings; and pressure-seal joints.

E. Makeup-water piping installed aboveground shall be the following:
1. Copper tubing, wrought-copper fittings, and soldered or brazed joints.

F. Condensate-Drain Piping: Copper tubing, wrought-copper fittings, and soldered joints.
1. Chemical Treatment
a. Chemical Treatment shall be provided by WEST.
b. Where propylene glycol solutions are used for freeze protection, the minimum concentration shall be 30% by volume.
2. Hydronic Pumps
a. For projects utilizing in-line pumps, pumps with greater than 2hp motors shall be floor mounted.

STEAM AND CONDENSATE HEATING PIPING – (SECTION 232213)

A. Pressure-reducing valves shall be pilot operated, diaphragm type with cast iron body.

B. Steam and condensate piping shall be steel pipe, with cast-iron fittings, and threaded or flanged joints.

STEAM CONDENSATE PUMPS – (SECTION 232223)

A. Condensate pumps shall be duplex style for redundancy.

B. Pressure-powered steam condensate pumps operating media shall be compressed air or steam.

REFRIGERANT PIPING – (SECTION 232300)

A. Refrigerant piping shall be ACR copper with brazed joints.

B. Nitrogen shall be circulated in pipes during soldering or brazing. If it is observed that refrigerant lines are being or have been brazed without proper circulation of nitrogen through lines, all refrigerant lines installed up to that point in time shall be removed and replaced at no additional cost to Owner.

C. Perform evacuation and leak testing on refrigerant piping systems. Tests shall be performed in presence of engineer, Cx agent and/or owners representative after

completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.

a. Draw vacuum on each entire system with two-stage vacuum pump. Draw vacuum to 500 microns using micron vacuum gauge capable of reading from atmosphere to 10 microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum.

b. Break vacuum with nitrogen and re-establish vacuum test. Vacuum shall hold for 30 minutes at 500 microns without vacuum pump running.

c. Conduct tests at 70 degree F ambient temperature minimum.

d. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule starting and testing if prevented by outdoor conditions before this time.

e. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.

f. Recover all refrigerant in accordance with applicable codes. Do not allow any refrigerant to escape to atmosphere.

METAL DUCTS – (SECTION 233113)

A. All ducts shall be galvanized steel with G90 coating except as scheduled below.

1. Commercial Kitchen Hood Exhaust Ducts: Type 304 stainless steel with welded seams and joints.
2. Dishwasher Hood Exhaust Ducts: Type 304 stainless-steel with welded seams and flanged joints with watertight EPDM gaskets.
3. Acid-Resistant (Fume-Handling) Ducts: Type 316 or 304, stainless-steel sheet.
4. Moist Environment Duct Material: Aluminum.
5. Underground Ducts: PVC-coated galvanized steel with thicker coating on duct exterior or fiberglass.

WATER-TUBE BOILERS – (SECTION 235233)

A. Warranty:

1. Materials and Workmanship for Heat Exchangers: 20 years.
2. Materials and Workmanship for Vent Dampers: Five years.
3. Materials and Workmanship for Drums, Tubes, Headers, Cabinets, and Burner: Five years.
4. Materials and Workmanship for Pressure Vessel: 20 years.

B. Approved boiler manufacturer shall be Bryant.

C. Boiler shall be started by factory-trained technician in presence of County Mechanical Operations Manager.

D. Start-up form shall be submitted to owner's representative and included in project systems manual.

FURNACES – (SECTION 235400)

A. Furnaces shall be as manufactured by York or Carrier. Other manufacturers require approval by Salt Lake County Facilities.

PACKAGED COMPRESSOR AND CONDENSER UNITS – (SECTION 236200)

A. Air-cooled units, 1 to 5 tons (13 seer minimum) shall be as manufactured by York or Carrier and include the following features:
   1. Accessories: low ambient controller, crankcase heater, automatic reset timer, and PE mounting base.
   2. Casing: Galvanized steel.
   3. Must use HFC refrigerant.

B. Air-cooled units, 6 to 120 tons shall be as manufactured by York or Carrier and include the following features:
   1. Accessories: Low ambient controller, and crankcase heater.
   2. Casing: Galvanized or zinc-coated steel, with non-fused, factory-mounted and -wired disconnect switch.
   3. Compressor: Hermetically or semi-hermetically sealed.
   4. Capacity Control: Cylinder unloading and/or Hot-gas bypass.
   5. Condenser: Copper-tube, aluminum-fin coil with sub-cooler.
   6. Controls: Factory mounted and wired.

CENTRIFUGAL WATER CHILLERS – (SECTION 236416)

A. Water cooled centrifugal chillers shall be as manufactured by York, Carrier, or Daikin.

B. Refrigerant: High Performance Design Projects must be free of HCFCs
   1. For Chillers Using R-134a: ASME-rated, spring-loaded, pressure relief valve.

C. Controls: Microprocessor based with BACnet compatible communication interface.

D. Chiller shall be started by factory trained technician in presence of County Mechanical Operations Manager.

E. Chiller start-up report shall be submitted to the Owner's representative and included in the project systems manual.

AIR COOLED WATER CHILLERS – (SECTION 236419)

A. Air cooled water chillers shall be as manufactured by York. Other manufacturers must be approved by Salt Lake County Operations Manager.

B. Provide unit with the following accessories:
   1. Factory-installed, hot-gas bypass capacity control.
   2. Low ambient control.
   3. Chilled-water flow switch.
   4. Suction and discharge pressure gages.

C. Controls: Microprocessor based with BACnet compatible communication interface.

D. Chiller shall be started by factory trained technician in presence of County Mechanical Operations Manager.

E. Start-up forms shall be turned into Owner's representative and included in operations manual.

HELICAL ROTARY-SCREW WATER CHILLERS – (SECTION 236426)

A. Water cooled screw chillers shall be as manufactured by Carrier. Other manufacturer's must be approved by Salt Lake County Operations Manager.

B. Provide unit with the following accessories:

1. Flow Switch
2. Vibration Isolation: Neoprene pads.
3. Sound Barrier: Removable and reusable sound-barrier covers over the compressor housing, hermetic motor, compressor suction and discharge piping, and condenser shell.

C. Controls: Microprocessor based with BACnet compatible communication interface.

D. Chiller shall be started by factory trained technician in presence of County Mechanical Operations Manager.

E. Submit startup form to Owner's representative and include in systems manual.

COOLING TOWERS – (SECTION 236500)

A. Open circuit cooling towers shall be counter-flow configuration as manufactured by Baltimore Air Coil. Other manufacturer's must be approved by Salt Lake County Operations Manager.

B. Towers shall be provided with a 5-year warranty covering materials and workmanship.

C. Tower construction shall include the following features:

1. Casing: Galvanized steel.
2. Collection Basin: Polymer-coated galvanized steel.
3. Collection basin water-level control: Mechanical float assembly and valve or Electric/electronic water-level controller with solenoid valve.
4. Electric basin heater.
5. Pressurized Water Distribution Piping: PVC pipe with non-clogging nozzles.
6. Fill: PVC.
7. Drift Eliminator.
8. Air-Intake Screens: Removable-steel wire mesh.
9. Fan: Centrifugal, double-width, double-inlet, with grease-lubricated bearings or fan axial blade.
10. Personnel Access Components: Ladders and cages, platforms, and handrails, constructed of galvanized steel.

D. Cooling tower shall be started by factory trained technician in presence of County Mechanical Operations Manager.

E. Submit startup form to Owner's representative and include in systems manual.

MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS – (SECTION 237313)

A. Factory custom-built air handling units shall be as manufactured by Governair, Temtrol or Haakon.

B. Packaged indoor air handling units shall be as manufactured by York, Trane or Carrier.

C. Air handing units shall include the following features:

1. Internal vibration isolation on supply and return fans.
2. Minimum MERV 8 extended surface, disposable panel prefilters (where required by project)
3. Minimum MERV 13 extended surface, disposable panel filters
4. Filter gages.
5. Lights: Provide lights in accessible sections with wire guards, factory wired to an illuminated switch mounted on the exterior.

D. Unit shall be started by factory trained technicians in presence of County Mechanical Operations Manager.

E. Submit startup form to Owner's representative and include in systems manual.

F. Replace filters immediately prior to occupancy.

PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS – (SECTION 237413)

A. Packaged outdoor air handling units shall be as manufactured by York, Carrier or Aaon.

B. Casing shall be insulated galvanized steel panel with baked enamel finish and galvanized shell liner:

C. Filters shall be minimum MERV 13 extended surface, disposable panel filters

D. Electrical Power Connection: Single with unit-mounted disconnect.

E. Unit controls shall be BACnet compatible and include the following:

1. Safety controls
2. Scheduled controls
3. Unoccupied period controls
4. Supply fan controls
5. Refrigerant circuit controls
6. Hot-gas reheat-coil controls
7. Gas furnace controls
8. Electric-heating-coil controls
9. Fixed minimum outdoor-air controls.
10. Economizer dry-bulb or (if required) enthalpy-based controls
11. Carbon dioxide sensor

F. Provide units with the following accessories:

1. Gas burner compartment heater
2. Duplex electrical outlet
3. Low-ambient kit
4. Filter differential pressure switch

5. Coil guards
6. Roof Curb

G. Unit shall be started by factory trained technician in presence of County Mechanical Operations Manager.

H. Submit startup form to owner's representative and include in systems manual.

I. Replace filters immediately prior to occupancy.

SPLIT SYSTEM AIR CONDITIONERS (SECTION 238126)

A. Units shall be as manufactured by Mitsubishi or Friedrich

B. Warranty shall be for 5 years.

FAN COIL UNITS – (SECTION 238219)

A. Fan-Coil Units shall be provided with the following minimum features:

1. Drain Pans: Insulated galvanized steel with plastic liner.
2. Cabinet: 1" insulated steel with baked-enamel finish in manufacturer's standard paint color as selected by Architect.
3. Outdoor-air damper.
4. Filters: Pleated disposable, MERV 13.
5. Unit Control: DDC BACnet compatible.

DIVISION 26 ELECTRICAL STANDARDS

Designers should work with county development team to decide which requirement(s) to comply with based on project scope and site, prior to schematic submittal. There may be exceptions to these requirements for technical and budgetary reasons; however, those design exemptions will only be at the discretion of the County Project Manager. For facilities with minor renovations, the County will mandate the use of the most efficient design and construction techniques wherever possible. **Refer to High Performance Building System in Division A for additional electrical requirements.**

FEEDERS AND BRANCH CIRCUITS (SECTION 260519)

A. Aluminum feeders to electrical panelboards (100 Amp and larger) and stepdown transformers (30KVA or larger) are acceptable. All other conductors shall be copper. All aluminum feeders shall use compression lugs and connectors. Feeders shall have type THHN/THWN insulation except where extreme heat or water conditions exist requiring special insulation.

B. Main Secondary feeders to lighting and power panel board shall be sized to include 30% future additional capacity.

C. Branch circuit conduits between outlets and between outlets and distribution panel boards shall not have more than six wires (Plus ground). Run a separate neutral conductor per phase conductor for single phase circuit. Do not share neutral conductor.

RACEWAYS AND BOXES (SECTION 260533)

A. Conduit systems:
   1. Rigid Metal Conduit (RMC)**:** Provided Zinc- coated, hot-dipped galvanized, rigid metallic conduit in wet locations or areas subject to damage.
   2. Electric Metallic Tubing (EMT): Provide electric metal tubing with insulated throat, non-indenter, set screw, malleable steel fittings.
   3. Flexible Metal Conduit: Provide zinc-coated, Flexible Metal conduit for connections to motors, transformers, or other equipment subject to movement or vibration.
   4. Liquid Tight Flexible Metal Conduit: Provide Galvanized, flexible metal conduit with liquid tight, PVC coated, moisture and oil proof cover for connections to motors where exposed to moisture or in mechanical rooms.
   6. Provide PVC conduit, schedule 40, where buried below grade in exterior application, or where buried below slab on grade. Do not bend PVC conduit more than 25 degrees. For larger bends, provide RMC with PVC wrap. Do not use PVC conduit for suspended slabs or for interior application.

SCHEDULE 1 - Electric Nonmetallic Tubing (ENT) shall not be used.

SCHEDULE 2 - MC Cable is only allowed in concealed area for connection to the light fixtures (Maximum MC Cable length of 6 feet.) Other than connection to the light fixtures, Metal Clad (MC) or Aluminum Clad (AC) cabling shall only be used when approved by Salt Lake County in writing.

SCHEDULE 3 - Minimum size conduit shall be ¾” for interior application, and 1" for conduit buried below grade in exterior application.

SEISMIC SUPPORT OF ELECTRICAL EQUIPMENT (SECTION 260548)

A. Supporting Devices: Securely anchor and seismically brace all electrical equipment in accordance with regulations contained in the most recently adopted edition of the IBC, and the guideline for Seismic Restraints for Electrical Systems (SMACNA). Provide all materials to meet such requirements for complete raceway support systems, including, but not necessarily limited to steel channel, support clips, clamps, bracket supports, hangers, nuts, bolts, fittings, brackets, expansion anchors, threaded rods, and all associated accessories.

B. Bolt all switchboards, transformers, generators, and other floor mounted electrical equipment securely to a raised housekeeping pad.

C. Provide seismic support wires for all lighting fixtures.

D. Provide lateral and longitudinal diagonal bracing for all conduit racks, cable tray, and busduct exceeding 20 feet in length, or as otherwise calculated by the design engineer.

IDENTIFICATION AND LABELING (SECTION 260553)

A. Mark buried conduit with a magnetic yellow marker ribbon 8" to 12" below finished surface.

B. Directories for panel boards and the like shall be made after the buildings permanent room numbers are installed on the doors and shall use these numbers rather than the area numbers on the construction drawings. Information to be typewritten.

C. Consistent labeling of panels throughout the County is required. Therefore, the following method of labeling shall be adhered to.

1. Branch panels:
   Identify the floor level-B, 1, 2, Etc.
   Identify the voltage- High 277/480 or Low 120/208, etc.
   Identify the panel-A, B, C, etc.
   Example: Panel ‘HBA’ = Basement level, High voltage – 277/480, Panel A- First panel on basement level
2. Distribution Panels: Example: ‘HDP1A’ = level 1, Distribution Panel, High voltage – 277/480, Panel A- first distribution panel on first level
3. Main Panels: Example: ‘MDP’ = Main Distribution Panel. ‘EMDP’= Main Emergency Panel.
4. All emergency panel names shall use the letter ‘E’, i.e. Panel “EH1A”, etc. (Emergency High Voltage,277/480V Panel on level 1)
5. All UPS panels shall be labeled with Orange labels and white letters, and use the letter ‘U’, i.e. Panel “UL1A”, etc.
6. Apply Equipment identification labels of engraved plastic laminate on each major piece of electrical equipment. Normal power equipment shall be labeled with a black field and white lettering. All emergency panels shall be labeled with Red labels and white letters. All UPS panels shall be labeled with Orange labels and white letters.

D. All panel circuit directories are to be typewritten with specific circuit designation.

E. Provide Power Single Line Diagram, sealed in plastic at the main switchboard. Verify location with the County Representative.

F. Mark with a permanent marker the circuit and panel numbers on all outlet and switch boxes- inside device boxes, outside j boxes.

LIGHTING CONTROL DEVICES (SECTION 260923)

A. Design a Relay Based lighting control system with astronomical time clock, Nonvolatile memory and battery backup for all new construction and major remodel of all buildings. Lighting control system shall comply with the version of Energy Code used for the project. A minimum of two lighting zones shall be provided for exterior lighting. Alternatively, buildings smaller than 5,000 sf. may be controlled by occupancy sensors in every space.

B. Provide two data jacks by the Lighting Control Panel.

C. The lighting control system shall be capable of being monitored/controlled through Web Browser and local network. Coordinate with SLCO during Design Development.

D. Factory-authorized service representative shall Re-programing the Lighting Control System (LCS) three months after occupancy. Schedule this work with SLCO. Also factory-authorized service representative to provide four hour training to SLCO's maintenance personnel.

E. Provide continuous dimming system for day light harvesting system.

F. The only approved manufacture for the lighting control system is Watt Stopper.

ELECTRICAL UTILITY SERVICE (SECTION 261000)

A. Main power service to the utility transformer, utility metering, and/or building shall be underground. Service entering a building shall be in conduit.

B. In most cases, the service shall be designed at 277/480 volt 3 phase, 120/208 3 phase, or 120/240 single phase, depending on available service and size of building or service. Provide 3 phase power where feasible. Depending on the type of building and power requirement, design engineer shall consider 277/480 Volt system for buildings larger than 50,000SF.

SWITCHBOARDS, PANELBOARDS AND TRANSFORMER (SECTION 262400)

A. Switchboards shall be provided with 30% spare capacity and spaces.

1. Minimum size panel to be 100 amp with 100 amp rated feeder conductors Size conductors to each panel to the size of the buss i.e. 100 A #1, 225A #4/0. (Up size feeder conductors for voltage drop as required)
2. Flush-mounted panels should be provided with spare conduits stubbed into accessible areas above and/or below sufficient to wire in spare capacity of the panel.
3. Where feasible, door in door construction may be considered for branch panels.

B. Motor Control Centers shall be provided with 30% spare capacity and spaces

WIRING DEVICES (SECTION 262726)

A. Provide typed label for outlets and light switched to indicate what circuit they are tied to.

B. Provide Duplex outlet with USB where appropriate.

ENCLOSED CONTROLLERS (MOTOR STARTERS) (SECTION 262913)

A. Provide enclosed combination motor controllers with pilot light, hand-off-auto switch, and fused disconnect

VARIABLE FREQUENCY MOTOR CONTROLLERS (VFD'S) (SECTION 262923)

The design team shall consider the following depending on the type of project.

A. Provide adjustable speed drives in sizes exceeding 10 HP with bypass.

B. Provide adjustable speed drives in sizes exceeding 25 HP with harmonic filter.

D. Specifications shall require commissioning and testing of all VFD's.

PACKAGED GENERATOR ASSEMBLIES (SECTION 263200)

A. Fuel source shall have on-site storage. Minimum capacity of fuel system shall be 24 hours.

B. Where located outdoors, generator shall have block heater, battery warmer, battery charger, and fuel line insulation to allow cold weather start.

C. Specifications shall require commissioning and testing of all packaged generator systems. A minimum of 4 hours load bank test shall be required. Startup forms to be submitted to owner's rep and included in project systems manual.

D. Provide lugs for connection to future load bank.

E. Provide a minimum 4-hour training to SLCO personnel.

BATTERY UNITS (SECTION 263319)

A. Individual Battery units intended for egress lighting or exit signs shall only be used for buildings smaller than 5,000 SF and buildings with existing individual battery units. Central Inverter for emergency lighting is encouraged where feasible.

CENTRAL BATTERY EQUIPMENT FOR EMERGENCY LIGHTING (SECTION 263323)

A. Central Battery equipment or Emergency Generator shall be considered for all facilities over 5,000 SF.

B. Central battery equipment shall have a minimum efficiency of 97% at full load.

C. The system shall have self-testing feature with local alarm. The system shall have provision for remote monitoring through contact closure.

D. Coordinate with the mechanical engineer to ensure proper cooling is provided.

E. Provide a minimum of 20% capacity for future load.

F. The Central battery equipment shall be able to handle 100% LED light fixture load.

G. The batteries shall have a minimum lifetime rating of 10 years.

UNINTERRUPTIBLE POWER SUPPLY EQUIPMENT (SECTION 263353)

A. Coordinate with the mechanical engineer to ensure proper cooling is provided for the UPS if used in the project.

B. UPS shall be capable of sending notifications (text and email) if problems are detected.

POWER FACTOR CORRECTION (SECTION 263533)

The design team shall consider the following for projects with large motor loads.

A. On service sizes exceeding 1200 amp at 120/208 volt or 600 amp at 277/480 volt, the power factor shall be maintained at a minimum of 95 percent lagging for all load conditions at the metering location. This may require the addition of power factor correction capacitors.

B. On large services where loads are expected to change dramatically, automatic switching power factor correction equipment shall be used.

TRANSFER SWITCHES (SECTION 263600)

A. Where used on generator systems, separate transfer switches shall be provided for life safety devices, and for optional backup systems.

B. For larger systems exceeding 225 amps, 4 pole transfer switches shall be specified.

C. For large data centers and critical applications such as emergency centers, provide bypass isolation type transfer switches.

FACILITY LIGHTNING PROTECTION (SECTION 264100)

A. On new facilities exceeding 20,000 SF, the designer shall provide a lightning analysis per NFPA 780, and discuss results of analysis with the County representative. Where requested by the County, specify a Master UL labeled lightning protection system.

SURGE PROTECTION DEVICE (SECTION 264313)

A. All services, regardless of size, shall be provided with Surge Protection Device (SPD), with illuminated indication of function, and audible alarm capable of silencing, and transient counter. Include contacts for future interface with remote monitoring systems.

INTERIOR LIGHTING (SECTION 265100)

A. Utilize LED light fixtures for interior lighting.

B. LED light fixtures shall have a minimum of 5 year warranty on the entire fixture (Not just the LED's). The LED manufacture shall provide a letter indicating the 5 year warranty for each type of fixture used on the project. The light fixtures shall have Minimum of 50,000 lamp life and be tested with LM 79 and LM 80 testing procedure. The light fixtures shall also be listed in DLC (Design Lights Consortium).

C. Interior light fixtures shall have a minimum of 80 CRI

D. Light fixtures other than LED source shall only be used if approved by the SLCO.

E. Light all areas per IESNA Standards. Foot-candle levels listed are only a guideline. Other factors include uniformity, glare control, vertical illumination, age of patrons, etc. Where appropriate, lower general illumination and higher task lighting is encouraged.

F. Sole sourcing is not allowed, unless a specific valid reason (such as matching an existing adjacent fixture) is required. Designer shall specify a minimum of 3 manufacturers for each fixture type, unless approved in writing in advance from the County representative.

G. Night lights shall be considered and implemented depending on the type of project. Coordinate with the project manager.

H. Tritium powered, self-illuminated signs shall not be used.

I. All individual occupant spaces shall have occupancy sensor with built-in continuous dimmer (0-10V protocol is recommended) down to 10% (or lower).

J. All multi-occupant spaces shall have at least 3 scene lighting, on, off, and mid (30%-70%). Consider using dimmer switches to comply. All switches shall be located in the same space as the controlled luminaires.

K. As a minimum, designer shall require commissioning for electrical, including service, distribution, lighting, lighting controls, daylighting controls, and renewable energy systems.

EXTERIOR LIGHTING (SECTION 265600)

A. Utilize LED light fixtures for exterior lighting. Light fixtures other than LED shall only be used if approved by the SLCO.

B. LED light fixtures shall have a minimum of 5 year warranty on the entire fixture (Not just the LED's). The LED manufacture shall provide a letter indicating the 5 year warranty for each type of fixture used on the project. The light fixtures shall have Minimum of 50,000 lamp life and be tested with LM 79 and LM 80 testing procedure. The light fixtures shall also be listed in DLC (Design Lights Consortium).

C. Exterior light fixtures shall have a minimum of 70 CRI.

D. LED pole mounted light fixtures shall have a built in Occupancy/Photocell. The Occupancy sensor shall dim the lights to 40% light output (Gradually over 60 second) when it does not detect any movement for 15 minutes. Re-programing may be required for a trouble free installation. The sensor shall be mounted within its rated height.

E. Where located in residential neighborhoods, the Designer shall specify Cutoff Luminaires. Where light exceeds 0.05 FC at property line, designer shall specify house side shields to control light trespass.

F. Light all areas per IESNA Standards. Foot-candle levels listed are only a guideline. Other factors include uniformity, glare control, vertical illumination, etc.

DIVISON 28 ELECTRONIC SAFETY AND SECURITY STANDARDS

ACCESS CONTROL SYSTEMS (SECTION 281300)

A. Description: System shall be fully integrated and installed as a complete package by the Access controls/Security contractor.

B. System shall be based on a distributed, standalone controllers, operating in a local network. System shall monitor, record, and display card access activity on a real time basis.

ACCESS CONTROL MISC. SYSTEM REQUIREMENTS (SECTION 281301)

A. Coordinate and interface with elevator control systems, if necessary.

B. System shall be based on Windows operating platform.

C. Access Cabinets shall be installed in electrical or telecommunications rooms.

D. Specifications shall include system commissioning and owner training.

E. 1” Minimum size Conduit run from each reader back to reader controllers.

F. Shall have a minimum of 3 cables to each door, (1) 7 Conductor cable 20 gage and (2) 4 conductor cable 18 gage

ACCESS CONTROLS QUALITY ASSURANCE (SECTION 281302)

A. Installer Qualifications: Experience with systems of the type and scope indicated, minimum 3 years experience.

B. Comply with UL Standard 1076, “Proprietary Burglar Alarm Units and Systems.”

C. System shall have enough capacity for 10% future expansion

ACCESS CONTROLS APPROVED MANUFACTURERS (SECTION 281303)

A. TAC/CSI – I-Net 2000 as distributed by Utah Controls, Inc.

B. Equals will not be considered as approved by the County.

INTRUSION DETECTION SYSTEMS (IDS) (SECTION 281600)

A. Description: System uses a central microprocessor, remote intrusion sensors and detection devices, and a communications link to perform monitoring and alarm functions.

System is physically and electronically modular and has provisions for the field expansion. System is self-monitoring and self-diagnostic.

B. Communications Link: Multiplexed and dedicated to intrusion detection, alarm service, and control of security related functions.

C. All systems will be monitored via AES Radio or Cell with standard phone line as back up.

IDS FUNCTIONAL PERFORMANCE (SECTION 281601)

A. Intrusion Detection: Performed by indicated intrusion detection devices. Each device is assigned to an individual zone.

B. Alarm Indication: Audible signal sounds and a plain-language identification of the zone originating an alarm appears on a liquid crystal display or L.E.D. at the alarm control panel.

C. Control systems includes one or more remote addressable microprocessor control units operating in a multiplexed distributed control system or as part of a network under signal transmission from a central microcomputer. Control units receive programming by multiplexed signal transmission from a central microprocessor or microcomputer and hold data in nonvolatile memory. System reboots program automatically without error or loss of status or alarm data after a power outage.

D. An alarm message displayed at the annunciator with an audible tone for trouble conditions.

IDS QUALITY ASSURANCE (SECTION 281602)

A. Installer Qualifications: Experience with systems of the type and scope indicated.

B. Comply with UL Standard 1076, “Proprietary Burglar Alarm Units and Systems.”

IDS APPROVED MANUFACTURERS (SECTION 281603)

A. Control Panels-Digital Monitoring Products-XR 500

B. Door Contacts- to be specified by designer.

~~C.~~ Expansion Modules-Digital Monitoring Products 714-16 loop expander Located next to DMP XR500 panel.

D. Key Pads- Digital Monitoring Product Model 7060-W with back boxes.

E. Dual Phone Module Expansion Module- Digital Monitoring Products-893-A

F. Motion Detectors: Microprocessor based; dual IR and MW thermal frequency detection with L.E.D. Display. Must be Bosh Blue Line Gen 40' or greater range.

G. Exp. Components may be required for additional Exp. Modules. Must have their own power supply with backup battery power.

IDS ELECTRICAL POWER (SECTION 281604)

A. Normal System Power Supply: Dedicated 120 V 60 Hz feed to 16.5 volt A.C. transformer to supply power through the system control panel.

B. Power Source Transfer: When normal power is interrupted, system is automatically switched to backup supply without degradation of critical system function or loss of signals or status data.
   1. Backup Source: Batteries in power supplies of individual system components. Such Batteries are an integral part of power supplies of the components. 12 Volt 7 AH.
   2. Annunciation: Switching of the system or any system component to backup power is indicated on the system control panel as a change in system condition.

C. Phone Line Requirements: Two dedicated phone lines shall be provided to the D.M.P. XR 500 Security panel to provide UL listing for the fire protection and NFPA standard 72 Fire Marshall Standard.

IDS MISCELLANEOUS (SECTION 281605)

A. Door Switches:
   1. Comply with UL Standard 634, Connectors and Switches For Use With Burglar-Alarm Systems."
   2. Description: Balanced magnetic type. Magnet part is designed for installation on the door; the magnetically operated switch is installed recessed when possible or on the door frame when not possible with E.O.L. Resistor on device. Note: Auto entry doors shall be equipped with door contact as part of door opener. Unit employs a bias magnet and a sensitive reed switch to resist comprise by introduction of foreign magnetic fields.
      a. Flush- Mounted Units: Unobtrusive, flush with surface of door frame and door.
   3. Door Switch for Overhead Door: Balance magnetic type with door-mounted magnet and floor-mounted switch. Unit is listed for outdoor locations.

B. Wire and Cable:
   1. Cable for Low-Voltage Control and Signal Circuits: Unshielded, 4/C solid 22.
   2. Provide one 3/4 inch conduit homeruns to security equipment. Plenum based wiring systems is not acceptable for security systems.
   3. Colors will be yellow and green for each device.

IDS INSTALLATION (SECTION 281606)

A. General: Install system according to NFPA 70, applicable codes, and manufacturer's printed instructions.

B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so media are identified and coordinated with system wiring diagrams. Red = Pos. Black = Neg. Yellow and Green for device.

C. Install power supplies and other auxiliary components for detection devices and the alarm control panel or at a data-gathering panel except as otherwise indicated. Do not install such items in the vicinity of the devices they serve.

D. Conduit raceways are required size ¾" EMT for all system wiring.

E. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common mode returns, noise pickup, cross talk and other impairments.

F. Testing: Provide at least 10 days' notice of acceptance test performance schedule. Testing to be performed in presence of County personnel.

G. Motion detector devices and all magnetic door contacts shall be installed with end of line resistor on the device.

IDS DEMONSTRATION (SECTION 281607)

A. Coordinate User's training with County personnel. Train User's maintenance personnel in the procedures and schedules involved in preventive maintenance and in programming, operating, adjusting, troubleshooting, and servicing of the system.

B. Provide a minimum of 8 hours training.

C. Schedule training with advance notice of at least 7 days.

VIDEO SURVEILLANCE SYSTEMS (VSS) (SECTION 282300)

A. Description: System uses a NVR based IP recording system.

B. System includes color cameras, fixed and/or Pan-Tilt-Zoom (PTZ) as required for particular project. Recreation centers and library's will generally be provided with fixed cameras. Larger facilities may require PTZ. Consult with County representative prior to Design Development to determine type of system and quantity/location of cameras.

C. Specifications, part numbers, approved manufacturer's and the county's vendors tend to change from year to year. Designer shall coordinate exact system specifications with the County's most current master specification.

VSS FUNCTIONAL PERFORMANCE (SECTION 282301)

A. Indoor/Outdoor PTZ, IP camera dome, Manual control speed: 80 degree pan per second standard, 150 degree pan per second in turbo mode.

B. IP Camera, Domed, 2.0 MP minimum.

C. Monitor: 32" LCD color computer monitor.

D. Exacqvision or Video Edge Recorder with minimum 16 TB storage

E. Equipment Rack: Provide rack to house all equipment.

F. Provide one inch minimum conduit, homerun to VSS equipment. Open plenum wiring will not be acceptable for security systems.

G. Power supply and cable: as appropriate for installation. (Belden Cat6 cable that has been Certified)

H. Vigitron 1GB POE network switch VI3026

VSS QUALITY ASSURANCE (SECTION 282302)

A. Installer Qualifications: Experience with systems of the type and scope indicated.

B. Comply with NFPA 70, “National Electrical Code.”

C. Comply with UL Standard 1076, “Proprietary Burglar Alarm Units and Systems.”

VSS APPROVED MANUFACTURERS (SECTION 282303)

A. Axis, American Dynamics, Exacq, Bosch

FIRE ALARM GENERAL SYSTEM DESCRIPTION (SECTION 283100)

A. General: Systems shall be addressable, microprocessor-based fire detection and alarm system with manual and automatic alarm initiation, analog addressable smoke detectors, heat detectors, and pull stations and automatic alarm verification for alarms initiated by certain and pull stations zones as indicated.

B. Signal Transmission: Hard wired, using separate individual circuits for each zone of alarm initiation and alarm device operation.

C. Audible Alarm Indication: By sounding of horns, or speakers.

D. System connections for alarm-initiation and alarm-indicating circuits: Class A wiring.

E. Fire alarm shall be connected to Security panel for monitoring trouble and alarm conditions.

F. Functional Description: The following are required system functions and operating features:
1. Priority of Signals: Accomplish automatic response functions by the first zone initiated. Alarm functions resulting from initiation by the first zone are not altered by subsequent alarms. The highest priority is an alarm signal. Supervisory and trouble signals have second-and third-level priority. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all alarm signals regardless of priority or order received.
2. Non-interfering: Zone, power, wire, and supervise the system so a signal on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored

to normal. Systems that require the use of batteries or battery backup for the programming function are not acceptable.

3. Resound capabilities: Provide resound capabilities.
4. Signal Initiation: The manual or automatic operation of an alarm,-initiating or supervisory- operating device causes the FACP to transmit an appropriate signal including:
   a. General Alarm
   b. Fire Suppression system operation alarm.
   c. Smoke detector alarm
   d. Valve tamper supervisory
   e. System trouble.

5. Transmission to Remote Central Station: Automatically route alarm, supervisory and trouble signals to a remote central station service transmitter using listed and approved equipment.
6. Silencing at FACP: Switches provide capability for acknowledgement of alarm; supervisory, trouble, and other specified signals at the FACP; and capability to silence the local audible signal and light and light emitting diode (LED). Subsequent zone alarms to cause the audible signal to sound again until silenced in turn by switch operation. Restoration to normal of alarm, supervisory, and trouble conditions extinguish the associated LED and cause the audible signal to sound again until the restoration is acknowledged by switch operation.
7. Loss of primary power at the FACP sounds trouble signal at the FACP and indicates at the FACP when the system is operating on an alternate power supply.
8. Annunciation: Manual and automatic operation of alarm –and supervisory-indicating the location and type of device.
9. General Alarm: A system general alarm includes:
   a. Indication the general alarm conditions at the FACP
   b. Identifying the device that is the source of the alarm at the FACP
   c. An audible and visible alarm signals to remote central station.
10. Manual station alarm operation initiates a general alarm.
11. Water-flow alarm switch operation:
    a. Initiates a general alarm
12. Smoke detection initiates a general alarm
13. Sprinkler valve tamper switch operation causes or initiates the following:
    a. A supervisory audible and visible “Valve Tamper” signal indication at FACP.
    b. The location-indicating LED display for the device that has operated.
    c. Transmission of supervisory signal to remote central station.
14. Fire pump power failure, including a dead phase or phase-reversal condition causes or initiates the following:
    a. A supervisory audible and visible “fire pump power failure” signal indicated at FACP and annunciator.
    b. Transmission of trouble signal to remote central station.
15. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. The same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors.

FIRE ALARM QUALITY ASSURANCE (SECTION 283101)

A. Installer Qualifications: A factory-authorized installer is to perform the Work of this Section.

B. Compliances with Local Requirements: Comply with the applicable building code, local ordinances, and regulations, and the requirements of the authority having jurisdiction.

C. Comply with NFPA 70, “National Electrical Code”

D. NFPA Compliance: Provide fire alarm and detection systems conforming to the requirements of the following publications.
1. NFPA 72

E. UL Listings: Provide system and equipment that are UL listed and labeled.
1. Terms “Listed” and “Labeled”: As defined in the “National Electrical Code,” Article 100.
2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA regulations 1910.7.

F. FM Compliance: Provide fire alarm systems and components that are FM-approved.

G. Single- Source Responsibility: Fire alarm components all come from a single source who assumes responsibility for components all come from a single source who assumes responsibility for compatibility for system components. Only products which comply with the installed system’s UL Listing shall be connected to the system.

FIRE ALARM MISCELLANEOUS (SECTION 283102)

A. Wire
1. Twisted, #16 or larger installed in raceways.
2. Color Coding: Color-Code fire alarm conductors differently from the normal building power wiring. Use Red/Black for Initiating Devices, Yellow/Purple for Horn Strobes, and Blue/Orange for Speakers. Use one color code for alarm circuits wiring and a different color code for supervisory circuits.

B. Provide (2) 2-C 22 solid conductors from fire alarm panel to XR500 DMP security panel for alarm and trouble conditions.

C. Tags
1. Tags for identifying tested components: comply with NFPA 72

D. Raceway
1. ¾” minimum conduit for all fire alarm system wiring, or larger as required for wire fill.
2. Paint covers of fire alarm boxes red.
3. Paint couplings or paint conduit with red stripe, 1-1/2 inches wide, every 10 feet on concealed conduit.

E. Fire Alarm Power breaker: Paint red and Label “Fire Alarm.” Provide with lockable handle or cover.

F. Ground equipment and conductor and cable shields. For audio circuits, minimize to the greatest extent possible ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

FIRE ALARM CONTROL EQUIPMENT (SECTION 283103)

A. Fire Alarm Control Panel: Provide solid-state, modular design with integral static protection and features as follows:
   1. Acceptable panels NFS 320 or 640 as building size requires. Notifier FACP 6 AMP.
   2. Fire panel shall have a minimum of 25% additional loop expansion for future demands.

B. General: Comply with UL 864, “Control Units for Fire-Protective Signaling System.

C. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing of for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of panels as well as field wiring. Identify each enclosure by an engraved, red- laminated, phenolic resin nameplate. Lettering on the enclosure nameplate shall not be less than 1-inch high. Identify individual components and modules within the cabinets with permanent labels.

D. Alphanumeric Display and System Controls: Arrange to provide the basic interface between human operator and FACP and addressable system components, including annunciation and supervision. A display with a minimum of 40 characters displays alarm, supervisory, and components status message. Arrange keypad for use in entering and executing control commands. Located by main entrance.

FIRE ALARM EMERGENCY POWER SUPPLY (SECTION 283104) FCPS – 24S8

A. General: Components include valve-regulated, recombinant lead acid battery, charger, and an automatic transfer switch. Battery nominal life expectancy is 10 years minimum.

B. Battery capacity is adequate to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. At the end of this period, the battery has sufficient capacity to operate the system, including alarm-indicating devices in either alarm or supervisory mode for a period of 15 minutes. Provide, in addition, 25% spare capacity.

C. Battery charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged, the charger recharges then fully within four hours. Charger output is supervised as part of system power supply supervision.

D. Automatic transfer switch transfers the load to the battery without loss of signals or status indications when normal power fails.

FIRE ALARM INITIATING DEVICES (SECTION 283105)

A. Manual Pull Stations: Double-action type, fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color. Stations requiring and breaking of a glass panel are not acceptable. Stations requiring the breaking of a concealed glass rod may be provided.

B. Smoke Detectors: Comply with UL 268, “Smoke Detectors for Fire Protective Signaling Systems. “Include the following features:
   1. Factory Nameplate: Serial number and type identification.
   2. Operating Voltage: 24-V d.c., nominal.
   3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   4. Plug-in Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection requires no springs for secure mounting and contact maintenance. Terminals in the fixed base accept building wiring.
   5. Visual Indicator: Connected to indicate detector has operated
   6. Addressability: Detectors include a communication transmitter and receiver having unique identification and capability for status reporting to the FACP.
   7. Remote Controllability: Individually monitor detectors at the FACP for calibration, sensitivity, and alarm condition, and individually adjust for sensitivity from the FACP.
   8. Ionization-Type Smoke Detector: Multiple-chamber-type operating on the ionization principal and actuated by the presence of invisible products of combustion.

C. Addressable Thermal Detector: Rate-Compensated/Fixed-temperature type with plug-in base and alarm indication lamp. Detectors have communication transmitter and receiver with unique identification and capability for status-reporting to the FACP.

FIRE ALARM AUDIO-VISUAL EVACUATION SYSTEMS (SECTION 283106)

A. General: provide terminal blocks for system connections.

B. Fire Alarm Horns: The appliance shall be listed by Underwriters Laboratories Inc. for use with Fire Protective Signaling Systems, (Hearing Impaired) in accordance with NFPA 72, UBC standards and the local authority having jurisdiction. The appliance shall produce a minimum 82 db at 10ft. The appliance shall be of solid state construction and be polarized to allow for supervision. All models shall have an operating range of 21-30V.

C. Visual Alarm Devices: Shall be A.D.A approved 24-volt D.C. strobe lights with clear poly carbonate lens and zenon flash tube. Mount lenses on an aluminum face plate. The word “Fire” is engraved in minimum 1-inch-high letters on the lens.
   1. Lamps have a minimum peak intensity of 8,000 candle power. Strobe leads are factory-connected to screw terminals.

G. Combination devices consist of factory-combined, audible and visual alarm units in a single mounting assembly.

H. Speakers may be required instead of horns for evacuation purposes for certain location depending on type of facility.

I. Voice EVAC System as Design Requires.

J. Remote Annunciator.

FIRE ALARM INSTALLATION, GENERAL (SECTION 283107)

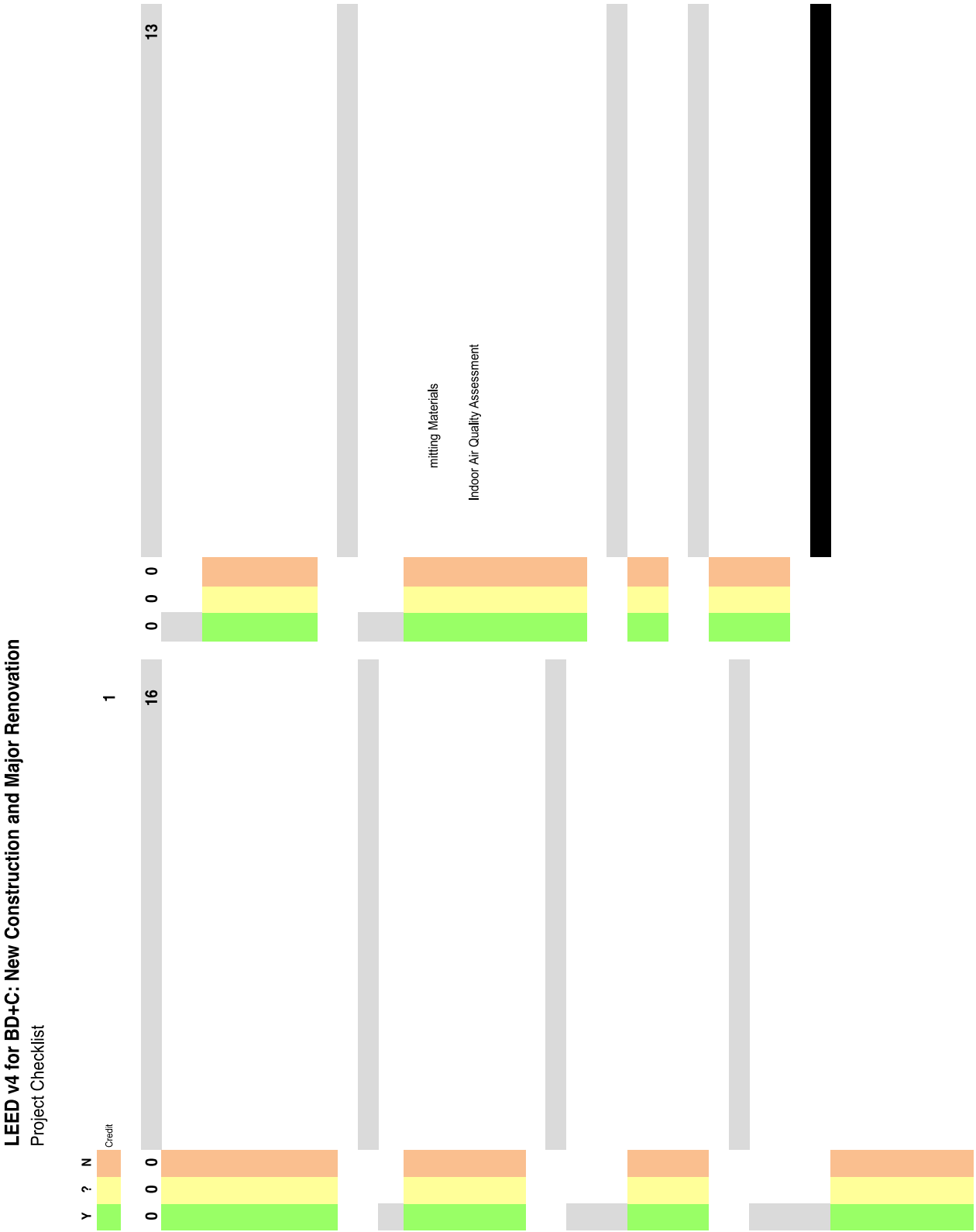
A. Install system according to NFPA Standards.

B. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing and adjustment of the system.

C. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72, Chapters 2 and 4, and NFPA 72, Chapter 8.

FIRE ALARM TESTING AND DEMONSTRATION (SECTION 283108)

A. Provide the services of a factory-authorized service representative to demonstrate the system and train County maintenance personnel as specified below.
   1. Train County maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing and preventative maintaining of the system. Provide a minimum of 8 hours' training.
   2. Schedule training with the County at least seven days in advance.


LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist
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Indoor Air Quality Assessment

Division	Category	Section	Division Name	HPBS
01	91	15	BECx Specification	Provide a specific and separate Building Enclosure Commissioning (BECx) section (01 19 15) separate from the General Commissioning Requirements section (01 19 13) for all High Performance Structures.
01	91	15	BECx Specification	The Owner shall contract directly with the Building Enclosure Commissioning Authority (BECxA) to maximize independence.
01	91	15	BECx Specification	Specification sections, 01 91 15 "Building Enclosure Commissioning" shall be drafted by the BECxA for review, comment, and ultimately incorporation into the contract documents by the Architect of Record (AOR).
01	91	15	BECx Specification	The BECx process shall be in general compliance with ASTM E 2813-12 "Standard Practice for Building Enclosure Commissioning" for Fundamental BECx as defined within the standard. The BECx process may deviate from the requirements of ASTM E 2813-12 with the acceptance from DFCM, AOR, and BECxA of a technical justification provided for each deviation.
01	91	15	BECx Specification	This specification section must provide the roles and responsibilities of each team member within the BECx process, address the general timeline of the process, outline key building enclosure milestones/deliverables, and outline how the building enclosure commissioning process fits into the requirements of the contract for construction.
01	83	16	Exterior Enclosure Performance Requirements	Acoustic Controls: STC-45/OITC-40 based on standard performance values reported for assemblies.
01	91	17	BECx FPT Spec.	Specification sections, 01 91 17 "Building Enclosure Functional Performance Testing" shall be drafted by the BECxA for review, comment, and incorporation into the contract documents by the AOR.
01	91	17	BECx FPT Spec.	Provide a Building Enclosure Functional Performance Testing (FPT) requirements for: 1) the laboratory or on-site-off-building performance mock-up(s) and 2) the phased in situ field specimen for all High Performance structures.
01	91	17	BECx FPT Spec.	The Building Enclosure Functional Performance Testing (FPT) shall be in general compliance with ASTM E 2813-12 "Standard Practice for Building Enclosure Commissioning" for Fundamental BECx as defined within the standards Annex A2, "BECx Performance Testing Requirements". The BECx process may deviate from the requirements of ASTM E 2813-12 with the acceptance from DFCM, AOR, and BECxA of a technical justification provided for each deviation.
01	91	17	BECx FPT Spec.	The BECxA may be the same agency the building enclosure testing agency (BETA) or the BETA may be a subcontractor to the BECxA.
01	91	17	BECx FPT Spec.	The costs for specified Building Enclosure FPT shall be the responsibility of DFCM as a direct cost or within the scope of the contract for construction. Costs to the project in time and/or money due to retesting or reinsertion as a result of non-conforming FPT results will be the responsibility of the Contractor.
01	91	17	BECx FPT Spec.	The Building Enclosure FPT protocol shall identify the minimum size, number of specimen, and progression phasing for each system and interface for each test protocol required by the contract for construction.
01	91	17	BECx FPT Spec.	The Building Enclosure FPT protocol shall identify the number of additional successful FPT specimen required as a result of each non-conforming FPT result. Additional test specimen shall not be tested until the source and cause of the non-conformance is identified; documented; repaired; and successfully retested. Upon successful retesting of the specimen the repair procedure shall be formally documented by the Contractor and installed as required on the remaining installed portions of the system. The Contractor shall also provide documentation of a revision to the system and/or processes for the remainder of the system to be fabricated or installed in response to the non-conformance FPT.
01	91	17	BECx FPT Spec.	Mock-up testing per ASTM E 1105 or AAMA 501.1 and ASTM E 783 is required for both High Performance and Standard structures.
01	91	17	BECx FPT Spec.	The performance mock ups for High Performance structures shall require the installation of complete water, air, thermal, and vapor control systems as designed, specified, and approved through the submittal process with project specific detailing. If the assemblies and systems of the structure include the use of an interior air or air and vapor barrier to achieve the performance of the wall assembly the interior air or air and vapor barrier systems shall also be included in the performance mock-up. The interior air and/or vapor barrier may be fully or partially removed for to conduct portions of the FPT.

01	91	17	BECx FPT Spec.	Water testing on a facade surface, including fenestration and opaque walls, shall be in general accordance with ASTM E 1105 or AAMA 511. A minimum 6.24 psf differential pressure should be used for Standard structures with 8.00 psf being the minimum for High Performance structures. Individual project test pressures will be based on the exterior environment and rated performance of specified products. High Performance structures should test a minimum of 10% of windows and surface area unless otherwise dictated by the building envelope commissioning Authority. Standard structures shall test a minimum of one typical fenestration assembly. Water penetration resistance testing for High Performance Structures shall be provided at the full test pressure without the typical 1/3 reduction allowed by industry standards.
01	91	17	BECx FPT Spec.	High Performance structures should test a minimum of 10% of windows and opaque wall surface area unless otherwise recommended by the BECxA and documented in the BECx FPT Specification section. Standard structures shall test a minimum of one typical specimen for each unique fenestration assembly.
01	91	17	BECx FPT Spec.	Roofs on High Performance Structure which include a continuous air and vapor barrier (i.e. a vapor barrier or temporary roof to remain within the assembly) separate from the roof membrane, the air and vapor barrier portion of the assembly shall be tested with Electronic Leak Detection (ELD), ASTM D5957-98(2003) Flood Testing, or ASTM E 1186-03(2009) utilizing the *Chamber Pressurization in Conjunction with Leak Detection Liquid.* Standard structures do not require testing of this portion of the roof assembly.
01	91	17	BECx FPT Spec.	High Performance structures require flood testing in accordance with ASTM E5957-98(2013) or Electronic Leak Detection (ELD) to be performed on all green roof, plaza deck, or roof assembly with substantial overburden on membrane when installed over occupied space.
01	91	17	BECx FPT Spec.	High Performance structures shall have long duration (minimum 8 hour) modified ASTM E1105-00(2008) test at a specimen of each type of below grade waterproofing with occupied space to the interior. There are no in situ blow-grade waterproofing testing requirements for Standard structures.
01	91	17	BECx FPT Spec.	Field measurement of air leakage through facade surfaces, including fenestration and opaque walls, is required to be in general compliance with ASTM E783-02(2010). Test chamber shall be constructed air tight and sealed to the air barrier plane of air tightness when practicable. Test specimen shall include minimum of 75 square feet of opaque wall and an interface with a representative fenestration assembly. Test chamber typically encompasses entire punched opening and out of sequence installations may be necessary to accommodate testing. All penetrations shall be installed through the air barrier (masonry ties, girts/cladding supports, etc.). High Performance structures require a minimum of 1 test per building, which may be accomplished on the mock-up. Quantitative air testing on opaque wall assemblies is encouraged on Standard performance structures, but only fenestrations are required to be verified.
01	91	17	BECx FPT Spec.	Field testing of air leakage through facade surfaces, including fenestration and opaque walls, is also required per ASTM E 1186-03(2009) per section 4.2.6 Chamber Pressurization or Depressurization in Conjunction With Smoke Tracers. This testing program should include representative specimen of each typical interface between systems (claddings, fenestrations, roofing, etc.) that exists on High Performance structures. Standard structures require testing a minimum of one specimen, which represents the most common fenestration and cladding type.
01	91	17	BECx FPT Spec.	Air testing of opaque roof/wall assemblies are required to comply with ASTM E 1186-03(2009), per section 4.2.7*Chamber Depressurization in Conjunction with Leak Detection Liquid,* without evidence of air penetration. The testing is performed on penetrations through the air barrier and laps, patches, etc. at single ply roofing membranes. At a minimum, perform the test at 20 locations for High Performance Structures. Air testing of opaque roof/wall assemblies is encouraged on Standard performance structures, but only fenestrations are required to be verified
01	91	17	BECx FPT Spec.	Field measurement of air leakage through fenestration is required to comply with ASTM E783-02(2010). Testing can typically be performed on entire fenestration assemblies less than 12' by 12' (i.e., testing may not be effective on portions of continuous systems without significant coordination). This test can often be accomplished simultaneously with opaque wall assemblies and interface with fenestration testing above. If test cannot be performed due to specimen size, testing per ASTM E 1186-03(2009) section 4.2.6 Chamber Pressurization or Depressurization in Conjunction With Smoke Tracers may be specified as an alternative. At a minimum, perform one test for each type of fenestration for all High Performance structures and one representative specimen for Standard structures.
01	91	17	BECx FPT Spec.	The AOR shall design a mockup to be built by the contractor and shall include drawings for such mockup in the construction documents. The mockup shall be used to establish a standard for appearance, workmanship and approval of installation methods in addition to functional performance testing for air and water penetration resistance. The AOR and DFCM must approve the installation of all the systems on the mockup for workmanship, performance and appearance. All High Performance structures require a laboratory or off-building-on-site field mock-up. Standard structures may use in-situ (on-building) mock-up specimen.

01	91	17	BECx FPT Spec.	The mockup design shall meet the following criteria: -Dimensions shall be 5' minimum in each horizontal direction and 7' tall and sufficient in size and scope to include representative details. -Built on a concrete pad or other structurally sound, air tight substrate of sufficient design to remain in place through the construction period. -Mockup shall be fully sealed to allow for quantitative air testing; this often requires construction of "chamber walls" to contain the space. - Access must be accommodated through a door or reasonable access opening so that a person or persons may enter to evaluate performance during FPT or observe installation. -Environmental control layers (water, air, vapor and thermal) shall be installed per the building details and product specifications, complete with flashings and seam tape. -All conditions (wall types, roof types, parapets/cornices, windows, etc.) must be represented in the mockup with transition and penetration details that occur on the building. Refer to the building details in the mockup drawings so that installation is completed in the same manner as it will be on the building. - Building doorways should not be installed on the mockup. -A minimum of two adjoining sides of the mockup shall be completed with exterior finishes as well as the roof. The other two sides have to be enclosed by the Contractor to accommodate pressure testing. -All penetrations that occur on the building shall be represented including structural attachments and masonry/ veneer ties and connections. -No interior finishes are to be installed prior to baseline air and water testing so as to help identify potential problems. - Passed mock-up testing is required prior to proceeding with fabrication or installation of included assemblies.
01	91	17	BECx FPT Spec.	Building Pressure / Air Leakage Testing: - All High Performance structures that are not additions or contain significant connectivity with existing buildings shall be whole building air tested in accordance with USACE Air Leakage Test Protocol for Building Envelopes, incorporating ASTM E779-10. - For all High Performance structures, design and construct the building enclosure such that a whole building pressure test results do not exceed 0.10 cfm/sq. ft. of building enclosure surface area at 1.57 lb./sq. ft. (0.30 in. wc. or 75 Pa). The building enclosure surface area shall be equal to sum of roof area, wall area including below grade, and floor area including slab on grade separating interior conditioned space of the building from the outside environment. - Standard performance structures are required to meet 0.25 cfm/Sq. ft. of surface area at 1.57 psf. - Care must be taken to ensure integrity at all penetrations and at window, door, floor, and roof connections. - If air leakage requirements are not met, determine air leakage pathways using ASTM E1186-03 Standard Practices for Air Leakage Site Detection in Building enclosures and Air Barrier Systems and perform corrective work as necessary to achieve air leakage rate specified. - DFCM to provide periodic isolated smoke and pressure tests during construction phase of the project to assist the contractor in the identification of potential problem areas. - Contractor to facilitate coordination of in progress testing between DFCM, the Contractor, and the Building Enclosure Testing Agency. - The Contractor's final payout for project completion is subject to compliance with air leakage standard; penalties may be identified in the contract documents in the event that the air leakage standard is not met.
01	91	17	BECx FPT Spec.	Masonry through-wall flashing should be tested to confirm watertight construction in general conformance with ASTM C1715-09 *Standard Test Method for Evaluation of Water Leakage Performance of Masonry Wall Drainage Systems.* At selected specimen locations, after three (3) courses of masonry has been installed above the level of the flashing, apply water on top of the flashing at each lap joint and end dam.
01	91	17	BECx FPT Spec.	During the initial installation process, perform periodic testing of the air barrier system, including pull adhesion testing and Air Leakage Site Detection Testing per ASTM E 1186-03(2009), per section 4.2.7 Chamber Depressurization in Conjunction with Leak Detection Liquid. The number and frequency of testing shall be recommended by the BECxA for review, comment, and ultimately incorporated into the contract documents by the AOR
01	91	17	BECx FPT Spec.	During the installation process, perform testing of the fenestration systems, including air infiltration (ASTM E783), water penetration testing using both static (ASTM E1105) and dynamic (AAMA 501.1) test methods.
03	00	00	Concrete	For building designated as high performance where Architectural Precast Concrete is selected to serve as the primary air, water, and vapor control layer, the Precast shall be either fully insulated without concrete edge returns or installed with an air and vapor impermeable thermal insulation in direct contact with and fully adhered to the inside face of the architectural precast system, including anchors and detail that may constitute a thermal bridge, to mitigate interior condensation concerns and energy loss.

03	00	00	Concrete	Continuous concrete from interior to exterior that bisects more than 30% building insulation R-Value, shall not be permitted on High Performance structures. Measures are taken to minimize thermal bridging in structural concrete penetrations, such as including a structural thermal break. All locations of thermal bridging should be identified by the energy modeler such that appropriate U-Factor reductions may be applied or thermal bridging otherwise accounted.
04	00	00	Masonry	Concrete Masonry Units: ASTM C 90, Lightweight, minimum unit strength of 2800 psi average or stronger. (fm=2000 psi). High Performance Structures shall not incorporate single wythe CMU exterior wall assemblies that separate interior and exterior conditions. In structures where singly-wythe construction has been approved by DFCM, a high build vapor permeable elastomeric coating shall be provided on the exterior in conjunction full depth through wall flashing, including a back leg and end dams, and an interior air and vapor impermeable thermal control layer is provided in direct contact with and fully adhered to the interior face of the CMU.
04	00	00	Masonry	Mortar Joints: Joints shall be "concave", "V-joint" or "weathered raked" for structural members and surfaces exposed to weather. When CMU forms the substrate for an air barrier or coating, mortar joints shall be struck flush.
04	00	00	Masonry	The exposed face of all embed plates shall be set flush with the face of masonry wall or column.
04	00	00	Masonry	Stainless steel anchor ties should be used for all buildings with a services life in excess of 50 years. All anchors should be installed prior to installation of the exterior air barrier, such that the penetration of the air barrier can be evaluated prior to concealment. Anchors applied after the air barrier shall include sealant applied to the threads prior to installation and sealant applied over the fastener head, under the fastener head, under the anchor, and additionally detailed per the air barrier manufacturer recommendations. Fastening anchors through insulation and then through the air barrier blindly is not permitted on High Performance Structures. For all High Performance structures, the performance expectations of the veneer ties should meet or exceed the life expectancy of the building.
04	00	00	Masonry	Masonry Veneer Attachment and Reinforcing: Other methods of attachment may be used after written acceptance by the AOR and structural engineer. Stainless steel anchor ties should be used for all buildings with a service life in excess of 50 years. All ties should be either embedded in the substrate or shot in prior to installation of the exterior air barrier, such that the penetration of the air barrier can be evaluated prior to concealment. For all High Performance structures, the performance expectations of the veneer ties should meet or exceed the life expectancy of the building.
04	00	00	Masonry	All buildings with exterior insulation within a masonry cavity shall utilized mechanical attachment in conjunction with the lateral masonry anchors, such as insulation washers, as a secondary means of secured attachment for the exterior insulation. Insulation attachment shall be in stalled in a manner to prevent the attachment from becoming dislodged due to the long term expansion and contraction of the insulation material.
04	00	00	Masonry	Steel Lintels: Provide steel angle lintels at all openings through the masonry veneer. Provide one inch of bearing for each foot of width of opening, with a minimum bearing of six inches. Include a Steel Angle Lintel Schedule on the drawings. For all High Performance structures, the performance expectations of the lintel (including any coating) should meet or exceed the life expectancy of the building. Floating Lintel, that minimize thermal bridging, should be evaluated for use on all High Performance Structures.
04	05	00	Common Work Results for Masonry	Water Penetration Resistance - Design and Detailing Wall System Selection: • Drainage walls provide maximum protection against water penetration and shall be used for all High Performance and Standard structures with masonry veneer. • Drainage wall systems include cavity walls (metal-tied and masonry-bonded hollow walls in historical applications), and anchored-veneer walls • Single-wythe masonry walls to separate conditioned space from exterior conditions are not permitted without approval from DFCM, especially when exposed to rain. • All flashings and cavities shall be sloped to drain.
04	05	00	Common Work Results for Masonry	Water Penetration Resistance - Materials Water-Resistant Barriers: • Install when brick veneer is anchored to wood, steel studs or CMU back-up • Protect from or avoid prolonged ultraviolet (UV) exposure • Coordinate with Division 07 non- and vapor-permeable barrier materials over water-resistant sheathings deemed equivalent or conforming to AC 38 • Weather resistant barriers shall also serve as air barrier and must be either fluid applied or self-adhered. Taped boards, tapered insulation, interior sheet rock, grouted CMU, or mechanically fastened air barrier are not acceptable for High Performance structures.
04	05	00	Common Work Results for Masonry	Water Penetration Resistance - Construction and Workmanship General: • Store materials on the job site to avoid wetting, contamination, and contact with soil • For drainage walls, keep the air space free of mortar droppings • Do not disturb newly laid masonry • Cover tops of unfinished walls until adjacent construction protects them from water entry

04	05	00	Common Work Results for Masonry	Effloresence - Prevention General • Design and construct brickwork to maximize water penetration resistance • Consider materials that contain fewer soluble salts - efflorescence is usually caused by excessive moisture built up on the inside of the brick drying to the outside bringing salts with it • Isolate exterior brick wythe with an air space -provide vents top and bottom for air flow in conjunction with adequate drainage • Waterproof the exterior of walls that extend below grade -provide though wall flashing to avoid rising damp • Store masonry materials off the ground and cover with waterproof materials to protect them from groundwater and precipitation • Protect unfinished masonry from weather during construction • Install through-wall flashing at appropriate locations and intervals to divert water from cavity as soon as practical. • Provide deigned and intentional drip edges at all flashings and under all horizontal projections; slope horizontal projections aware from the exterior wall • Provide adequate hygrothermal design and consideration for the exterior wall design to mitigate efflorescence due to vapor diffusion and condensation • Provide adequate detailing, quality control, and functional performance testing to ensure the air tightness of the structure to mitigate efflorescence due to moisture laden air flow and condensation
04	05	13	Masonry Mortaring	Water Penetration Resistance - Materials: Mortar: • Choose mortar materials and types that are compatible with the brick selected • Use mortar type with lowest compressive strength meeting project requirements
04	05	13	Masonry Mortaring	Water Penetration Resistance - Construction and Workmanship: Mortar: • When mixing mortar, use accurate batching measurements and maximum amount of water that produces a workable mortar • For brick with an IRA exceeding 30 g/min over 30 square inches, increase water or maximize water retention by increasing lime proportions within limits of ASTM C 270 • For brick with an IRA lower than 5 g/min over 30 square inches, reduce water or minimize water retention by decreasing lime proportions within limits of ASTM C 270
04	05	13	Masonry Mortaring	Water Penetration Resistance - Construction and Workmanship: Joints: • In exterior wythes, completely fill all mortar joints intended to have mortar • Minimize furrowing of bed joints and prohibit slushing of head joints • Fill collar joints completely with grout; do not slush collar joints, do not use mortar • Tool mortar joints when thumbprint hard with a concave joint
04	05	13	Masonry Mortaring	Mortars for Brickwork General: • Use mortar complying with ASTM C270 • For typical project requirements, use proportion specifications of ASTM C270 • Use Type N mortar for normal use, including most veneer applications • Do not combine more than one air-entraining agent in mortar • Use Portland cement-lime-sand mortar
04	05	13	Masonry Mortaring	Mortar Materials Cementations: Use Portland Cement • Use cement complying with ASTM C150 (Portland cement), ASTM C595 (blended hydraulic cement), or ASTM C1157 (hydraulic cement) in combination with either hydrated lime complying with ASTM C207, Type S, or lime putty complying with ASTM C1489 • Use mortar cement complying with ASTM C1329 • Use masonry cement complying with ASTM C91
04	05	13	Masonry Mortaring	Mortar Materials Aggregate: • Use natural sand complying with ASTM C144
04	05	13	Masonry Mortaring	Mortar Materials Water: • Use potable water, free of deleterious materials
04	05	13	Masonry Mortaring	Mortar Materials Mortar Admixtures: Only as required • Use admixtures complying with ASTM C1384 • When using a bond enhancer admixture, do not use an air-entraining agent • When using a set retarding admixture, do not re-temper mortar • Do not use water-repellent admixtures

04	05	19.1	Masonry Anchors	WATER PENETRATION RESISTANCE - MASONRY MATERIALS Ties and Anchors: • Use galvanizing, stainless steel, or epoxy coatings to provide corrosion resistance • Ensure that the life of the tie/anchor and corresponding warrantee matches the life expectancy of the building.
04	05	23.1	Masonry Control and Expansion Joints	Water Penetration Resistance - Materials: Sealant Joints: • Use backer rods in joints wide enough to accommodate them • Use sealants meeting the requirements of ASTM C920 for joints subject to large movements -use only closed cell baker rod, unless a dual joint is used in combination with a moisture cure sealant. In this case an open cell rod is permissible only for the interior joint. -use primer on all porous substrates:-required on all horizontal -use silicone on non-porous substrates, use urethane on porous -used plural component sealants in temperatures below 45F and dropping • Ensure that masonry sealant joint prevents bulk water intrusion, but does not interfere with primary sealant joining between air barrier and fenestration/penetrations
04	05	23.1	Masonry Control and Expansion Joints	Accommodating Expansion of Brickwork Vertical Expansion Joints in Brick Veneer: • For brickwork without openings, space no more than 25-feet on center • For brickwork with multiple openings, consider symmetrical placement of expansion joints and reduced spacing of no more than 20-feet on center • When spacing between vertical expansion joints in parapets is more than 15-feet, make expansion joints wider or place additional expansion joints halfway between full-height expansion joints • Extend to top of brickwork, including parapets • Place as follows: - at or near corners - at offsets and setbacks - at wall intersections - at changes in wall height - where wall backing system changes - where support of brick veneer changes - where wall function or climatic exposure changes
04	05	23.1	Masonry Control and Expansion Joints	Accommodating Expansion of Brickwork Horizontal Expansion Joints in Brick Veneer: • Locate immediately below shelf angles • Minimum 1/4-inch space or compressible material recommended below shelf angle • For brick infill, place between the top of brickwork and structural frame
04	05	23.1	Masonry Control and Expansion Joints	Accommodating Expansion of Brickwork Brickwork Without Shelf Angles: • Accommodate brickwork movement by: - placing expansion joints around elements that are rigidly attached to the frame and project into the veneer, such as windows and door frames - installing metal caps or copings that allow independent vertical movement of wythes - installing jamb receptors that allow independent movement between the brick and window frame - installing adjustable anchors or ties
04	05	23.1	Masonry Control and Expansion Joints	Accommodating Expansion of Brickwork Expansion Joint Sealants: • Comply with ASTM C 920, Grade NS, Use M • Class 50 minimum extensibility recommended; Class 25 alternate • Consult sealant manufacturers' literature for guidance regarding use of primer and backing materials
04	05	23.1	Masonry Control and Expansion Joints	Accommodating Expansion of Brickwork Bond Breaks: • Use flashing to separate brickwork from dissimilar materials, foundations and slabs -Use only through wall flashing not building paper
04	05	23.1	Masonry Control and Expansion Joints	Accommodating Expansion of Brickwork Load-bearing Masonry: • Use reinforcement to accommodate stress concentrations, particularly in parapets, at applied loading points and around openings • Consider effect of vertical expansion joints on brickwork stability -use primer on all porous substrates:-required on all horizontal -use silicone on non-porous substrates, use urethane on porous -used plural component sealants in temperatures below 45F and dropping

04	05	23.1	Masonry Embedded Flashing	Water Penetration Resistance - Design and Detailing: Through Wall Flashing Locations: • Install at wall bases, window sills, heads of openings, shelf angles, tops of walls, roofs, parapets, above projections such as bay windows, and at other discontinuities in the cavity • Ensure that air barrier runs continuously with through wall flashing subsequently stripped in.
04	05	23.1	Masonry Embedded Flashing	Water Penetration Resistance - Design and Detailing: Through-Wall Flashing Installation: • Lap continuous flashing pieces at least 6-inches and seal laps • Turn up the ends of discontinuous flashing to form end dams at the next head joint beyond the end of the area needing protection • Extend flashing beyond the exterior wall face • Use a metal drip edge to extend flashings that degrade when exposed to UV light; consider full metal pan flashing for added durability • Provide a continuous air barrier with the through wall flashing subsequently striped in
04	05	23.1	Masonry Embedded Flashing	Water Penetration Resistance - Materials: Flashing: • Select flashing that is waterproof, durable, UV resistant and compatible with adjacent materials • Flashing materials should conform to applicable ASTM specifications • Do not use aluminum, sheet lead, polyethylene sheeting or asphalt-saturated felt, building paper or house wraps • Where flashings are anticipated to experience elevated temperatures (e.g. in contact with metal) ensure that flashings are high temperature rated
04	05	23.1	Masonry Cavity Drainage, Weepholes, and Vents	Water Penetration Resistance - Design and Detailing: Weeps: • Design open head joint weeps spaced at no more than 24-inches on center • Most building codes permit weeps no less than 3/16-inch diameter and spaced no more than 33-inches on center • Design weep spacing at no more than 16-inches on center. • Rope weeps are not permitted
04	05	23.1	Masonry Cavity Drainage, Weepholes, and Vents	Water Penetration Resistance - Construction and Workmanship: Flashing and Weeps: • Do not stop flashing behind face of brickwork • Where required, turn up flashing ends into head joint a minimum of 1-inch to form end dams at head joint beyond the area being protected • Lap continuous flashing pieces at least 6-inches and seal laps at edges and with two continuous beads of sealant • Where installed flashing is pierced, make watertight with sealant or mastic compatible with flashing. No blind penetration of flashings are permitted • Install weeps immediately above flashing
04	21	13	Brick Masonry	Water Penetration Resistance - Masonry and Materials: Brick: • Select brick from the appropriate ASTM standard, designated for exterior exposures, with a rating of "no efflorescence".
04	21	13	Brick Masonry	Water Penetration Resistance - Masonry Construction and Workmanship: Brick: • Pre-wet brick with a field measured initial rate of absorption (IRA) exceeding 30 g/min over 30 square inches
05	00	00	Metals	Stud Gauge: Non-load bearing steel studs shall be minimum 18 gauge where the unsupported stud length exceeds 10'-0". Non-load bearing steel studs shall be minimum 20 gauge where the unsupported stud length is less than 10'-0"
05	52	00	Metal Railings	All hand rail penetrations should be through vertical not horizontal surfaces. If horizontal surfaces are mandated, an "island" should be created to prevent water accumulation at the anchor penetration location
05	52	00	Metal Railings	Exterior Handrails: All exterior ferrous handrails and railings shall be hot-dip galvanized after fabrication. Galvanizing holes shall be filled in before installation.
07	00	00	Thermal and Moisture Protection	For roof drain lines that do not enter into conditioned space, an ice melt system, including its associated power, sensors, and controls, will be required for primary and secondary roof drain lines. Coordinate with electrical requirements for ice melt system.
07	00	00	Thermal and Moisture Protection	Secondary Roof Drains: -Secondary roof drains shall be located adjacent to primary drains. Scuppers or overflow off roof are not acceptable for secondary drainage unless servicing very limited roof areas for areas such as entrance canopies. All scupper or overflow-type secondary drainage must be approved by DFCM -Secondary roof drains shall daylight just above grade near a prominent entrance of the building so they are easily visible. An appropriate means of diverting/collecting water from a secondary drain shall be made so as to prevent excessive flooding or ice on walkways in the event of discharge.

07	00	00	Thermal and Moisture Protection	Building Wall / Enclosure Modeling: AOR shall provide Hygrothermal performance evaluation of typical wall section assemblies and interface details and all proposed wall types and other building enclosure systems. Evaluation shall include considerations for local weather data, unique microclimate considerations, and interior design conditions including operating conditions such as setbacks and shutdown scenarios as applicable. If necessary based on the unique nature of the design conditions or assemblies analyze the transient Hygrothermal and thermal behavior of the various multilayer building components utilizing software modeling e.g., Transient Heat and Moisture Transport (WUFI) or THERM. In the event that Hygrothermal or thermal modeling is utilized, material properties and boundary conditions shall be provided for each comparative scenario utilized in decision making or to show compliance. Analysis should demonstrate bi-directional drying of the assembly unless all thermal controls are located exterior of the WRB and air control layer or moisture accumulation is acceptable due to other means such as material storage capacity (also code compliance is mandated). In many cases material testing of the proposed components of the assembly maybe required due to variations in various products. Approval of wall types and modeling is subject to review by DFCM, AOR, and BECxA.
07	00	00	Thermal and Moisture Protection	Energy Models should accommodate for building enclosure thermal point and linear bridging (e.g. steel protrusions or protruding concrete slabs) by reducing the overall facade or roof U factor correspondingly. The building enclosure commissioning agent shall provide input to the energy modeler as to the extent of anticipated thermal bridging.
07	00	00	Thermal and Moisture Protection	Moisture Control: Design against water penetration, above and below grade, with clearly conceived redundant systems. The A/E is responsible for the integrity of the overall moisture control system. Construction documents must clearly define continuous air, water, thermal and vapor barriers for the entire building enclosure (e.g. Facade, roofs, below grade) Detail in three dimensions where practical, indicating critical corner terminations, interface of all differing systems, proper sealant methodologies, etc.
07	00	00	Thermal and Moisture Protection	Wall Assembly: A typical wall assembly would be comprised of the following layers (see additional guideline information for each component): 1-Exterior finish (brick, metal, stone, precast, etc.) acting at weathering layer and initial drainage plane. 2-Exterior Insulation/Thermal Control Layer 3-WRB/Air Control Layer/Vapor Control Layer 4-Sheathing (as required) 5-Structure layer (without cavity insulation) 6-Interior finishes *Environmental control layers (water, air, thermal, and vapor) may vary in location within assembly depending on type of barrier and overall wall assembly but the wall system above shall be used when feasible.
07	00	00	Thermal and Moisture Protection	Environmental Barriers: -Design and drawings shall clearly identify continuous environmental barriers (air, water, vapor, and thermal) in all components that comprise the building enclosure (walls, roofs, soffits, etc.). Attention to the barrier location within an assembly and connection to the barrier in adjacent assemblies is fundamental (e.g. transitions, terminations and penetrations). The environment separation barriers shall be shown graphically on all plans. -Design should allow for the barrier layers to be continuous throughout the entire building enclosure. All applicable details and wall/roof types shall clearly show each barrier and demonstrate this continuity. -One material/layer may serve as multiple types of barrier when properly specified and located within an assembly. -All environmental barriers shall be incorporated in the building mockup and tested for air and water prior to construction on the project. -Barrier layers are subject to repeated inspections and testing by DFCM and/or the BECxA. -Air and weather barriers should be sealed to the fenestrations prior to concealment by claddings. Technical justification is required whan claddings are installed prior to fenestrations.
07	00	00	Thermal and Moisture Protection	Silicone sheet should be used where a flashing can be glazed into a curtain wall. For storefront assembles, utilize a min. 40 min. rubberized asphalt to treat all window surrounds. Fluid applied flashings are only permissible on Standard structures.
07	00	00	Thermal and Moisture Protection	For air barrier assemblies, the following performance criteria must be met: -For both liquid applied and self adhered air barrier materials, the air permeability of the material cannot exceed 0.004 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. pressure difference per ASTM E 2178. -For all air barrier assemblies, leakage cannot exceed 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., ASTM E 2357. For the entire structure, which includes opaque wall air barriers, fenestration products, roofing materials, and below grade barriers, the air permeability of the whole building should not exceed 0.1 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., ASTM E 779 for moderate and high performance structures. Leakage rates for Standard structures shall not exceed 0.25 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., ASTM E 779. -Air barrier products without the required testing above will not be acceptable or used on DFCM projects.

07	00	00	Thermal and Moisture Protection	• Weather resistant barriers shall also serve as air barrier and must be either fluid applied or self-adhered. Taped boards, taped insultaion, interior sheet rock, grouted CMU, or mechanically fastened air barrier are not acceptable to serve as air barriers for High Performance structures. • Barrier EIFS systems and barrier metal panel systems are not permited to serve as the sole air and water barriers.
07	00	00	Thermal and Moisture Protection	Roof Vapor Barrier / Wall Air Barrier Interface: Roof and wall air and vapor retarder systems must interface and seal together at the appropriate interfaces, including but not limited to parapet walls. For the vapor retarder to function properly it must be designed in an airtight manner This continuity between the roof and wall control layers shall be shown in all applicable details and the AOR shall specify compatible transition materials.
07	01	00	Operation and Maintenance of Thermal and Moisture Protection	Roof Access: -Access to roof is required in the following circumstances: (1) To provide access to mechanical equipment on roofs for servicing, and (2) For roof surfaces 16-feet or higher above grade (with or without mechanical equipment). -If the roof of a building has several levels, access must be provided to each level. Access must be provided by (in order of general preference): stairways within the building and roof access doorways, stairs or ladders on the roof extending between levels, or a roof hatch. -Roof access is preferred through a doorway of 36" minimum width unless access for larger equipment is required. -Where doorway access is not practical for the building design and location, roof hatches may be used. -Roof access shall be reviewed and DFCM-approval obtained at DD
07	21	00	Thermal Insulation	Thermal Barrier Integrity: Specify and detail on drawings a complete and continuous thermal barrier for roofs, walls, windows, etc., including interfaces and miscellaneous penetrations. Design should provide thermal breaks where feasible to avoid thermal conduction between interior and exterior to mitigate energy loss and condensation potential. Special attention should be paid to limit thermal conduction at structural penetrations/connections through the facade and cladding attachments connections.
07	21	00	Thermal Insulation	Wall Insulation: Wall insulation types that will be considered by DFCM include XPS, spray-applied closed-cell polyurethane, high-density rock wool, and fiber glass, in the appropriate locations. In locations of possible high heat build-up from the exterior materials and geometries, special care should be taken to protect affected insulation materials from exposure to temperatures above their published in service limitations during construction and within the final assembly to avoid excessive deformation and/or damage to the materials.
07	21	00	Thermal Insulation	Wall Parapet Insulation / Air Barrier: All parapet walls shall be capped at deck level with closed cell spray polyurethane foam (e.g. assuming fire codes requrements are met) or other acceptable manner to prevent thermal bridging and conditioned air transport into the parapet cavity to mitigate energy loss and condensation potential.
07	21	00	Thermal Insulation	Provide laboratory testing per ASTM 1503 of manufacture's typical assemblies, to be included in both High Performance and Standard structures to confirm the NFRC 500 modeling, as necessary.
07	21	13	Board Insulation	Exterior Wall Insulation: All wall systems shall have insulation on the exterior side of the air, water and vapor barrier unless technical justification is provided. The thickness of the exterior insulation shall be such that the dew point occurs within the exterior insulation. Any gaps greater that 1/8" shall be filled with expanding foam or insulation slivers. In locations of possible high heat build-up from the exterior materials and geometries, special care should be taken to protect affected insulation materials from exposure to temperatures above their published in service limitations during construction and within the final assembly to avoid excessive deformation and/or damage to the materials.
07	24	19	Drainage EIFS	EIFS shall be installed as a drainage system; no barrier EIFS allowed on High Performance or Standard Buildings.
07	25	00	Weather Barriers	Weather Barrier Integrity: Specify and detail on drawings a complete and continuous weather barrier for all roofs, walls, doors, windows, etc., including miscellaneous penetrations. Particular emphasis shall be placed on the continuity of barrier at transitions of windows/openings to vapor and/or air barrier, between the barriers located on the roof and walls and the assembly connections of associated components. Moisture which may penetrate the finish layer and reach the weather barrier must have a means to exit the system to the exterior through weeps and flashings located at material transitions, soffits, wall bases, etc.. "Condensation Pans" without weeps to the exterior are not an acceptable design strategy.

07	26	00	Vapor Retarders	Vapor Barrier Integrity: Where a vapor barrier or retarder is utilized, specify and detail on drawings a complete and continuous vapor barrier. Particular emphasis shall be given to properly detail all transitions between differing materials, wall types, windows, doorways, floor/wall, roof/wall, etc. Include details for miscellaneous penetrations and attachments where the vapor barrier is also serving as an air barrier. Sealing around/over attachments and penetrations shall be provided. Location of the vapor barrier, when recommended or required within the wall/roof assembly, shall be appropriate per the Hygrothermal analysis.
07	27	00	Air Barriers	Air Barrier Integrity: Specify and detail on drawings a complete and continuous air barrier for entire building enclosure including roofs, walls, soffits, etc.. Particular emphasis shall be given to properly detail all transitions between differing materials, wall types, windows, doorways, floor/wall, roof/wall, etc. Include details for miscellaneous penetrations and attachments. Sealing around/over attachments shall be provided. The air barrier may also serve as the vapor barrier provided that it is properly specified as vapor impermeable and located appropriately within the wall assembly per the Hygrothermal analysis. (see 07 00 00 for additional air barrier requirements)
07	27	00	Air Barriers	Air Barrier: -Air penetration performance of 0.001 cfm/ft2 at 1.56 psf or 0.3-inches of water is to be specified per ASTM E2128. -An air barrier that also serves as the vapor barrier (preferred) shall be specified as vapor non-permeable, as determined by Hygrothermal analysis. Air barriers that do not serve as the vapor barrier shall be specified as vapor-permeable. -Air barrier installation shall be subject to repeat periodic and representative testing throughout the construction process to ensure performance. -Contractor shall coordinate with DFCM to schedule testing.
07	27	00	Air Barriers	Air barrier shop drawings are required on all projects.
07	50	00	Membrane Roofing	Roof Assembly: A typical membrane roof assembly would include the following layers: 1. Metal Deck (could also be a concrete deck) 2. Roof Board (typ. gypsum hardboard; optional) 3. Air/vapor Barrier (peel & stick, self sealing, per membrane roofing manufacturer, must not contact single ply membrane; if used over concrete, ensure a vented metal deck is used) 4. Stainless steel wire screen (for ELD testing) 5. Minimum 3" providing a minimum slope of 0.25 inch per foot (where roof deck is flat) of Polyiso Rigid Insulation in a minimum of two layers with all joints staggered. Non-organic facer on the rigid insulation is required of high performance structures. 6. 1/2" Cover Board (typ. gypsum hardboard; optional) 7. Single-ply Membrane (fully adhered) 8. Filter fabric or drainage composite
07	50	00	Membrane Roofing	Roof Drainage / Slope: All roofs shall be designed so that there is a minimum slope of 0.25-inch slope per foot. It is preferred to provide roof slope through sloping of the structure. In High Performance structures, roof membranes shall be fully adhered to the sloped structural deck whenever practical. Tapered insulation may be used where sloping the structure is not practical. The roof design and construction shall not have any flat spots or ponding of water on the surface of the roof at initial construction or with anticipated design load deflection, creep, or other movements with may create ponding. When practical drains shall be located away from columns and structural support to mitigate detrimental effects of structural movement over time. Supplemental slopes shall be provided by tapered insulation. Crickets shall be installed at all large penetrations (such as mechanical equipment and screen walls) for drainage around the obstruction.
07	50	00	Membrane Roofing	Roof surfaces that are highly visible from inside of the building may need to be ballasted with gravel or have pavers installed over membrane. Review with DFCM visible roof surfaces and determine what treatment is desired for these roofs.
07	50	00	Membrane Roofing	Walking system (pavers or walking pads) shall be installed on unprotected roof membrane providing access to all rooftop equipment, roof access points, or other maintenance locations.
07	50	00	Membrane Roofing	Review with users possible rooftop use for research activities and provide necessary access and fall protection.
07	50	00	Membrane Roofing	Roof Penetrations: -Two or more objects shall not extend through the roofing closer than 18-inches unless both objects are flashed with integral flashing. -No objects shall extend through the roof closer than 18-inches from parapets, firewalls, etc. where there is a height transition on the roof. -Roof penetrations include structure, pipes, chases, roof hatches, equipment, etc. -All flashing, counter flashing, roof jacks, etc. are to be installed by the roofing contractor and shall be installed per roofing manufacturer's recommendations.

07	50	00	Membrane Roofing	Roofing Type: DFCM preference is minimum 200 mil fully reinforced, monolithic membrane directly adhered to the sloped structural deck. Minimum 60-mil reinforced single ply membrane with welded seams may be acceptable with DFCM approval if technically justified. Attachment Method: Fully adhered membrane roofing shall be used unless specific reasons merit mechancial attachement. All other attachment methods must be approved by BECxA and DFCM.
07	50	00	Membrane Roofing	BECxA to verify installation and witness testing per ASTM C1601-05 or NRCA Manual Guideline: "Quality Assurance and Water Test".
07	50	00	Membrane Roofing	Roofing Specifications/Warranty: Specifications shall include the following: 1-Full coverage 20-year bonded roofing warranty, non-prorated, no dollar limit is required 2-All installation of roofing, insulation, flashings, and accessories shall be applied in strict accordance with the approved roofing materials manufacturer's latest printed specifications for the 20-year bonded-type roof for the applicable substrate and deck type. 3-"General contractor and roofing sub-contractor shall jointly agree, for a period of two (2) years after the date of substantial completion, to inspect and make immediate emergency temporary repairs as required to stop leaks or correct defects in the roofing system work, including attachments to metal flashings forming an integral part of the roofing, within three working days of notice received from the owner; and further agree to make permanent repairs to restore the affected items to the standards of construction required by these specifications within a reasonable time and as weather conditions permit; and further agree to make such temporary and permanent repairs without reference to or consideration of the cause or nature of such leaks or defects in the waterproofing work. In case of defective roofing system work, damage caused by leaks or by their repair, shall also be repaired. Work required within the period shall be completed without cost to the owner, except that repair work is required Because of Acts of God, abuse or alteration by owner, alterations or failure of the substrate or supporting structure (other than that caused by defects in the roofing work). This agreement and the enforcement of its provisions shall not deprive the owner of any action, right or remedy otherwise available to him."
07	00	00	Below Grade Waterproofing	Design Requirements: - Relieve hydrostatic pressure on substructure walls and allow water drainage to the level of the drain. - Membrane waterproofing must be fully bonded to the substrate and seamless. - Below-grade waterproofing must be applied to the positive pressure side and must be covered by a protection drainage and protection course. - In the presence of water table, completely encapsulate the structure in waterproofing and drainage medium to minimize hydrostatic head.
07	00	00	Below Grade Waterproofing	Testing Requirements: High Performance structures shall have long duration (minimum 8 hour) hydrostatic water test at a specimen of each type of below grade waterproofing with occupied space to the interior, which often requires the fabrication of a temporary dam. There are no in situ blow-grade waterproofing testing requirements for Standard structures.
07	00	00	Metal Panels	Metal Panels shall be installed as a drainage system; no barrier systems allowed on High Performance or Standard Buildings.
08	00	00	Openings	Glass areas shall be reasonably minimized to conserve energy during winter and summer. Glazing area in excess of prescriptive table allowances of IECC or ASHRAE 90.1 shall be reviewed by the BECxA and approved by DFCM. Higher SHGC or U-Factor (lower R-Values) than those required in the IECC and ASHRAE 90.1 prescriptive tables shall not permitted without review by the BECxA and DFCM and approval by DFCM.
08	00	00	Openings	Contractor Points Coordinate a walkthrough with BECxA within 24 hours before the first framework and before the first glass is set.
08	01	40	Operation and Maintenance of Entrances, Storefronts, and Curtain Walls	All buildings must be designed with a maintenance plan for cleaning and maintenance of inside and outside glass areas. Plan may include a built-in system or a portable lift system as is most appropriate for the circumstances. Also consider cleaning of exterior painted or anodized surfaces (in accordance with the MFG recommendations and warranty requirements. Maintenance plans include survey or building condition reports. These observations are performed to evaluate the performance of weather seals.
08	01	40	Operation and Maintenance of Entrances, Storefronts, and Curtain Walls	Windows Sidewalks used as pathways for the window washing lift should be 12-ft wide or as required and approved by DFCM based on project specific requirements or configuration for future maintenance. Sidewalks should be designed to support the weight and operating forces of a typical lift required to access project specific geometry.
08	40	00	Entrances, Storefronts, and Curtain Walls	All glazed systems shall include a project specific written and detailed deglaze and re-glaze procedure with step-by-step photographic documentation which shall be executed on a minimum of one IGU prior to any pre-construction performance mock-up test procedure; excluding periodic field performance testing during installation.

08	40	00	Entrances, Storefronts, and Curtain Walls	All submittals and warranties are to be included in O & M manuals
08	50	00	Windows	Aluminum thermally broken frames and sashes are to be used in all windows. Wood or steel is not acceptable. Standard Performance structures shall utilize windows with a minimum performance rating of CW40 per AAMA 101-2011*North American Fenestration Standard/Specification for Windows, Doors, and Skylight;* High Performance structures shall utilize a minimum performance rating of AW40.
08	80	00	Glazing	IGU's shall be double-glazed and dual sealed with minimum 1" IGU thickness. Typical IGU basis of design shall consist of PPG Solarban 70XL #2 (outboard F2), clear (inboard), spandrel coating: F4 when concealed, F3 when visible. Project specific IGU lay up may vary based on performance requirements and design intent with approval of DFCM and review by the BECxA. All low e coatings shall be edge deleted. Maximum acceptable roll wave distrortion is 0.006".
08	80	00	Glazing	Tempered glass shall be utilized as required by code for safety glazing. Heat strengthened (non-tempered) glass or laminated glass shall be utilized in locations above walking surfaces where potential glass fragmentation is not captured or otherwise prevented from impacting the walking surface below upon breakage.
09	70	00	Wall Finishes	Wall coverings are generally not acceptable. Limited applications may be allowed when approved by DFCM. Vapor permeability of wall coverings on interior portions of exterior wall or of interior partitions designed and constructed to function as a air or vapor barrier shall conform with the recommendations or assumptions of the appropriate Hygrothermal analysis.

OWNERS PROJECT REQUIREMENTS & BASIS OF DESIGN

The purpose of the OPR is to provide a clear and concise document of the Owner's goals, expectations and requirements for the building. It provides the design team with the information to develop the Basis of Design (BOD) during schematic design, serving as a road map for the development of the design and construction documents. Additionally, OPR and BOD provide the owner and commissioning agent with tangible benchmarks to measure success, quality and confirm that the building and systems constructed align with the Owner's expectations and requirements.

A concise OPR must be developed by the design team and owner during the project programming phase, or by the midpoint of schematic design, for projects without a programming phase. For projects with a programming phase, the OPR is required to be complete and included in the project program. For projects without a programming phase the, the OPR is required to be complete and included in the schematic design review set.

As the project develops, it is expected that many of the elements of the OPR and BOD will evolve. Once the initial OPR and BOD are developed by the design team and the Commissioning Agent (CxA) has been integrated into the project, it is to be reviewed by the CxA at the SD, DD and CD submittal. Changes to the OPR and BOD, from one design phase to the next, must be documented by the design team.

Additionally, the OPR and BOD should serve as a foundation for the projects systems manuals delivered to the Owner as part of the "as-built" documents.

The following sections must be included in the OPR.

- Project information
    - Project name
    - Project site address
    - Building typology
    - Utility bill/account information
        - Rate schedule
        - Meter number (if known)
    - Project team contact information (emails, addresses, phone numbers) per programming and design phase teams
        - Owner Information
            - DFCM Project Manager
            - DFCM Energy Program Director
            - Agency Project Manager
            - Agency Energy Manager
            - Facility Operator - if this is unknown, identify who in the agency will represent the interests of the person(s) who will operate and maintain the building, through the design and construction period. Identify the date in which the Facility Operator will be known.
        - Architect
            - Principle In Charge
            - Project Architect
        - Mechanical Engineer
        - Electrical Engineer
        - Cost Estimator
        - Kitchen Designer
        - Lighting Engineer
        - Civil Engineer
        - Landscape Architect
        - Other project consultants

        - General Contractor
            - Project Executive
            - Project Manager
            - Superintendent
            - Project Engineer
            - Cost Estimator
- Project background
    - General building information including but not limited to the following
        - Square footage
        - Number of floors
        - Construction Costs (soft and hard)
        - Location
        - Design schedule
        - Construction schedule
        - Project delivery method
        - Estimated occupancy
        - Code occupancy schedules
        - Abatement (if necessary)
    - General project background
        - Brief summary of the project
            - Intended use
            - Occupancy
            - Construction type
            - Other
        - Mission
        - Objectives
        - Possible needs for flexibility and expansion
- Code & standards
    - Building codes
    - DFCM standards
    - Agency standards
    - Other
- Building performance
    - See Section 5.0 – High Performance Building Standard, for applicable requirements
        - Context sensitive design
        - Site design
            - Open space
            - Landscape
            - Storm Water
            - Heat Island Reduction
            - Light Pollution
        - Energy performance
            - Performance requirement
            - New Construction vs Major Remodel
            - Energy Model vs Qualitative Energy Engineering
            - Design Build Competitions

- Life Cycle Cost
  - Identify anticipated energy costs for all sources to project
- Life cycle expectations
  - General building
  - Building envelop systems
  - HVAC systems
  - Electrical systems
  - Plumbing systems
  - Warranty expectations
- Equipment performance
- Controls strategies
- Economizers
- Premium efficiency motors

- Transportation management
  - Parking requirements
  - Alternative parking requirements
  - Alternative transportation provisions
- Water Efficiency
  - EPA Water Sense Requirement
- Materials and Resources
  - Recycling
  - Sourcing
- Indoor environmental quality
  - Air quality measures
  - Views
    - Identify areas in the space program to have visual access to the outdoors.
  - Daylighting
  - Outside air
  - Ventilation
  - Lighting levels
  - Occupancy sensor for lighting and thermal controls
  - Filtration
  - Building flush
  - VOCs
- Education and Outreach Program
- Building envelope
  - See Section 5.13 – Envelope Commissioning
  - Internal, external and thermal loads in conjunction with mechanical and electrical criteria
  - Façade
  - Fenestration
  - Assemblies
  - Roof
  - Subgrade
  - Warranty expectations

        - Incentives and Rebates
            - Identify rate schedules
            - Identify utility providers
            - Identify anticipated energy costs for all sources
            - Include final incentive documentation in final OPR and O&M manuals
- Spaces program
    - Occupancy schedules
        - Daily on a weekly and monthly basis per space program
        - Consider weekend uses and summer uses for educational projects
    - After hours schedules
    - Cleaning schedules
    - Set points
- Architectural criteria
    - Identify unique design features that may impact building performance
        - Atriums
            - Smoke Evacuation expectations
            - VFD's for supply and exhaust fans
            - Code requirements for controls, testing and detection
        - Clerestory
        - Mixed occupancies
        - Interior garages
        - Kitchens
        - Tunnels
        - Bridges
        - Future expansions
- Electrical & Lighting criteria - per space program
    - Per space program
    - Light power density (LPD)
    - Foot-candle levels
    - Controls
    - Remote BMS access needs, notifications and clearances
    - Occupant controls
    - Controls interface requirements
    - Lighting strategies
        - Task
        - Ambient
        - Emergency
        - Daylighting & outdoor views
    - Special requirements
    - Exterior requirements
    - Emergency requirements
    - UPS
    - Distribution
    - Metering
    - Equipment types
    - Power quality control
    - Peak demand control

    - Redundancy requirements
    - Warranty expectations
    - Identify internal, external and thermal loads
- Mechanical criteria - per space program
    - Design conditions for summer and winter including tolerances
    - Acoustical isolation criteria
    - Pressurization
    - Ventilation
    - Humidity
    - Passive strategies
    - Zoning
    - Controls
    - Remote BMS access needs, notifications and clearances
    - Occupant controls
    - User interface requirements
    - Metering
    - Analytics
    - Equipment types
    - Refrigeration needs
    - Domestic hot water
    - Peak demand control
    - Redundancy requirements
    - Warranty expectations
    - Identify internal, external and thermal loads
- BAS/BMS requirements
    - Accessibility
    - Type
    - Integration
    - Metering, see Section 5.10 - Metering
    - Points, see Section 5.11 – Data Points
- Security requirements
- Audio Visual requirements
- Integration into existing campus infrastructure systems
    - Consult campus hydraulic flow analysis
    - Consider capacity
    - Diversity
    - Identify possible campus infrastructure implications
        - Electrical distribution systems
        - Building heating and cooling distribution systems
        - Interface with existing BMS and controls systems
        - Add meters when possible to existing systems to further energy management efforts on older systems
    - Identify existing campus systems performance levels
        - Provide existing energy performance data
        - Metering levels of existing systems related to the project
        - Clarify billing arrangements of building tenants
    - Identify opportunities for renewables or site based resources

        - Solar
        - Wind
        - Ground source
        - Water wells
        - Other
- Greenhouse Gas Emissions performance implications
    - If applicable or requested by the owner identify GHG reporting requirements and tracking metrics.
        - Carbon dioxide – CO2
        - Methane – CH4
        - Nitrous Oxide – N2O
    - Track throughout the design process
    - Identify direct emissions contributors
    - Identify indirect emissions contributors
- Renewable systems
    - LCC considerations
    - Offsite generation considerations
    - Onsite generation considerations
    - Alternative and additional financing mechanisms
        - Power Purchase Agreement
        - Donor funds
        - Student fees
        - Agency funding
        - Grants and incentives
    - Renewable Energy Certificates
- LEED® Requirements
- Acoustical criteria
    - Per space program
    - Internal considerations
    - External considerations
- General systems to be commissioned. With the Facilities Operator identify which systems and which equipment is to be commissioned as well as the commission scope
    - See Section 5.12 – Commissioning
    - See Section 5.13 – Building Envelop Commissioning
    - HVAC
    - Electrical
    - Controls
    - Lighting Controls
    - Life Safety
    - Security
    - Plumbing
    - Elevator
    - Equipment
    - Telecom
    - Remote BMS access needs and clearances
- Post-occupancy and warranty
    - 5 Month Walk Through Meeting

        - Onsite meeting five to six months after Substantial Completion to review performance and quality of the facility with the following in attendance (minimum)
            - Facility Operators
            - Agency Energy Manager or DFCM Energy Program Director
            - Commissioning Agent
            - Mechanical Engineer
            - General Contractor
            - Mechanical Subcontractor
            - Architect
            - User Representative
    - 10 Month Walk Through Meeting
        - Onsite meeting 10 months after Substantial Completion to review warranty, performance and quality issues with the following in attendance (minimum)
            - Facility Operators
            - Agency Energy Manager or DFCM Energy Program Director
            - Commissioning Agent
            - Mechanical Engineer
            - General Contractor
            - Mechanical Subcontractor
            - Architect
- Operations and maintenance
    - Benchmarking requirements per ENERGY STAR Portfolio Manager
    - Requirements and expectations by Facility Operators
        - Training
            - HVAC systems
            - BMS & Controls
            - Electrical systems
            - Lighting systems
            - Security systems
            - Identify who is to be trained
            - Number of training sessions
            - Follow up training sessions
            - Other as deemed necessary by Facility Operators and Owner
        - Systems Manuals
            - As-Builts
            - Single line schematics
            - Controls As-Built
                - Drawings
                - Sequences
                - Set points
                - Recalibration schedule
            - OPR
            - BOD
            - Commissioning functional test reports
            - Must be organized, electronic and searchable

        - Other as deemed necessary by Facility Operators and Owner
    - Preventative maintenance program expectations
        - Recommended re-commissioning schedule
        - Attic Stock expectations
    - Education and Outreach Program, see Section 5.9 – Education and Outreach Program
- Building occupant expectations
    - Additional areas beyond areas previously discussed in the OPR
- Possible behavioral implications of HPBS goals and strategies
    - Occupants role in energy efficiency and sustainability
    - Facilities operators role in energy efficiency and sustainability
- Budget considerations
    - Balance efficiency, quality, budget, comfort and maintenance
- Specific building typology requirements must be developed during programming in conjunction with the design team, Authority Having Jurisdiction, specialized design consultants, building occupants, and commissioning agent
    - Labs
    - Vivarium
    - Courthouses
    - Acute care hospitals
    - BioSaftey Level (1,2,3) type facilities
    - Prisons and Jails
    - Libraries
    - Museums
    - Data Centers
    - Others as necessary

5.0 Appendices

1.0

A. Data Points List – Section 5.11
B. Energy Modeling Spreadsheet – Section 5.5
C. Life Cycle Cost Worksheet – Section 5.5
D. HPBS Sustainability Worksheet – Section 5.6, 5.7, 5.8, 5.
E. HPBS Workshop Suggested Agenda – Section 5.1
F. OPR Required Sections – Section 5.15
G. Envelope Commissioning Matrix – Section 5.13
H. Incentives and Rebates Process Guidelines – Section 5.14
I. Incentives and Rebates Responsibility Matrix – Section 5.14