



2010

Architect / Engineer Design Guide

The Department of Health & Human Services
Indian Health Service
Division of Engineering Services





2010

Architect / Engineer Design Guide

The Department of Health & Human Services
Indian Health Service
Division of Engineering Services



Contents

Preface	9	3.1.9 Facility Room Numbers	20
1 Introduction	11	3.1.10 Drawing Media	20
2 Responsibilities of the A/E	13	3.1.11 Title Blocks and Borders	20
2.1 General Responsibilities	13	3.1.12 Drawing Title	20
2.1.1 Quality	13	3.1.13 Abbreviations and Symbols	20
2.1.2 Reviews and Approvals	13	3.1.14 General Notes and Key Notes	20
2.1.3 A/E Project Manager	13	3.1.15 Quality Control Review	20
2.1.4 Document Distribution	13	3.1.16 Drawing Numbers	20
2.1.5 Scope Changes	13	3.1.17 A/E Certification and Signatures	21
2.1.6 Document Ownership	13	3.1.18 Record Drawings	21
2.1.7 Errors and Negligent Performance	13	3.2 Specifications	21
2.1.8 Public Disclosure	14	3.2.1 Format	21
2.2 General Design Requirements	14	3.2.2 Boiler Plate	21
2.2.1 Site Investigation	14	3.2.3 Specifications & Drawings Coordination	21
2.2.2 Codes, Standards, and Guidelines	14	3.2.4 Cover Sheet	22
2.2.3 Code Conflicts	15	3.2.5 Bid Items	22
2.2.4 Unique Conditions	15	3.2.6 Quality Control Reviews	22
2.2.5 Deviations	15	3.2.7 Proprietary, Restrictive, or Approved Equal Specifications	22
2.3 Metric	15	3.2.8 Selection of Materials	22
2.4 Sustainability	16	3.2.9 Testing	22
2.5 Life Cycle Cost Analysis	16	3.2.10 Product Submittal Details	22
2.6 Value Engineering	16	3.2.11 Utility Markings	23
2.7 Commissioning	16	3.3 Facility User Manual	23
2.8 Testing, Adjusting & Balancing (TAB)	17	3.4 Cost Estimate	23
2.9 Systems Testing	17	3.4.1 General Requirements	23
3 Submittals Preparation	19	3.4.2 Cost Estimate Detail	24
3.1 Drawings	19	3.5 Sustainability Reports	25
3.1.1 Format	19	3.5.1 General Requirements	25
3.1.2 Quality of Drawings	19	3.5.2 Projected Consumption	25
3.1.3 Placement of Drawings on Sheets	19	4 General Requirements for Submittals	27
3.1.4 Floor Plans	19	4.1 General Requirements	27
3.1.5 Elevations and Sections	19	4.1.1 Government Review Comments	27
3.1.6 Scales	19	4.2 Calculations	27
3.1.7 Floor Plans Name of Spaces	19	4.2.1 General Requirements	27
3.1.8 Space Identification Numbers	19		

4.2.2 Civil	28	6.2.1 Program Verification	43
4.2.3 Structural	28	6.2.2 Site Analysis	43
4.2.4 Mechanical	28	6.2.3 Geotechnical Study	43
4.2.5 Electrical	29	6.2.4 Pre-Design Survey Report	43
4.3 Documents and Drawings	29	6.2.5 Record Drawings	43
4.3.1 Architectural	29	6.2.6 Results	43
4.3.2 Civil	30	7 Concepts Submittal	45
4.3.3 Structural	31	7.1 Purpose	45
4.3.4 Mechanical	31	7.2 Requirements	45
4.3.5 Electrical	32	8 Schematic Design Submittal	47
4.4 Life Cycle Cost (LCC) Analysis	32	8.1 Purpose	47
4.5 Value Engineering	34	8.2 Requirements	47
4.5.1 Requirements	34	8.2.1 Drawings	47
4.5.2 Value Engineering Report Contents	34	8.2.2 Other Documents	48
4.6 Commissioning	35	8.3 Value Engineering Study	50
4.6.1 Overview	35	9 Design Development Submittal	51
4.6.2 Design Phase Services	36	9.1 Purpose	51
4.6.3 Construction Phase Services	37	9.2 Requirements	51
4.7 Medical Equipment & Furnishings Planning	38	9.2.1 Drawings	51
4.8 Security	38	9.2.2 Other Documents	54
4.9 Heliport	38	10 Construction Documents Overview	57
5 Sustainability	39	10.1 Phases	57
5.1 Purpose	39	10.2 Requirements	57
5.2 General Requirements	39	10.2.1 Overview of Drawings	57
5.3 Documentation	39	10.2.2 Specific Requirements	57
5.4 Sustainable Design Certification	39	10.2.3 Elevations and Sections	57
5.5 Guiding Principles	40	10.2.4 Details	58
5.5.1 Employ Integrated Design Principles	40	10.2.5 Ceiling Space Coordination	58
5.5.2 Optimize Energy Performance	40	10.2.6 Schedules	58
5.5.3 Protect and Conserve Water	41	10.2.7 Materials	58
5.5.4 Enhanced Indoor Environmental Quality	41	10.2.8 General Notes	58
5.5.5 Reduced Environmental Impact of		10.2.9 Consistency of Nomenclature	59
Materials	42	10.2.10 Coordination of Construction Documents	59
5.5.6 Renewable Energy	42	10.2.11 Accessibility of Mechanical and	
5.5.7 Fossil Fuel Reduction	42	Electrical Equipment	59
6 Pre-Design Submittal	43	11 CD Submittal 65 Percent	61
6.1 Purpose	43	11.1 Purpose	61
6.2 Requirements	43	11.2 Requirements	61

11.2.1 Drawings	61	15.11.1 Commissioning Agent Responsibilities	78
11.2.2 Other Documents	65	15.12 Project Completion and Closeout	79
12 CD Submittal 100 Percent	67	15.13 Post Construction Services	79
12.1 General	67	15.14 Warranty Phase Services	79
12.2 Requirements	67	Definitions	81
12.2.1 Drawings	67	Abbreviations	83
12.2.2 Other Documents	67	Appendix 1 Submittal Checklists	89
13 Final CD Submittal	69	Appendix 2 Program and Space Accounting	99
13.1 General	69	Appendix 3 Design Intent / Basis of Design	109
13.2 Requirements	69	Appendix 4 Supplemental and Example Material	117
14 Bidding	71	Appendix 5 Technical Manual Reference Index	125
14.1 Printing and Distribution	71	Appendix 6 List of Electronic Attachments	129
14.2 Pre-Bid Conference	71		
14.3 Post-Bid Analysis	71		
15 Construction Contract Administration	73		
15.1 General Requirements	73		
15.2 Pre-Construction Meeting	73		
15.3 Request for Information Evaluation	73		
15.4 Contractor Submittal Review	73		
15.5 Change Order Evaluation	74		
15.6 Contractor Request and Proposal Evaluation	74		
15.7 Construction Field Observation Services			
(Site Visits)	74		
15.7.1 General	74		
15.7.2 Structural	75		
15.7.3 Mechanical	75		
15.7.4 Electrical	75		
15.8 Contractor's Application for Payment			
Review	75		
15.9 Project Site A/E Representative Services	75		
15.9.1 Qualifications	76		
15.9.2 Duties And Responsibilities	76		
15.9.3 Limitations Of Authority	77		
15.9.4 Project Site Representative Office Space	77		
15.10 Construction Phase Sustainable Design			
Certification Services	77		
15.11 Construction Phase Building			
Commissioning Services	77		

Preface

Background

After the initial notification of the review cycle to update the A/E Design Guide for 2009 more than 240 individual comments were received from users for consideration. During the course of the evaluation of the submitted comments additional issues were captured and incorporated by the workgroup as action items for the review process.

Follow up investigation of each of the comments was led by assigned primary reviewers who were responsible for researching the specific issue, drafting text, and presenting findings back to the workgroup for consideration. This process often involved the formation of additional task groups drawing on expertise from both within and outside of the A/E Design Guide workgroup membership.

Multiple edits of the provided responses were distributed in an iterative process that lead to a global reorganization of the guide to provide better clarity and overall usability.

As the updated organization has been fully implemented there has been a significant effort to provide consistency in the presentation of material throughout the document, with special attention to the relationship of required deliverables from one submittal phase to the next.

History

The guide is a living document with a broad user base that will continue to build on the efforts in place to address current policy, practice, and lessons learned through design and construction activities throughout the IHS that strive to expand and enhance the availability of healthcare services through facilities construction projects.

Changes in this update

This update cycle focused on addressing collected comments from users, general code updates, along with updated sustainability guidance.

Organization

Organizationally the document follows the anticipated progression of design. Each of the specific design submittal sections are stand alone chapters; definitions and abbreviations sections are at the end of the

document. Submittal sections are organized to highlight specific requirements with drawings and other documents broken out by engineering discipline.

Layout

The document is formatted in a code style layout similar to current healthcare and life safety codes. Throughout the document there are highlighted *blue box* sections providing additional explanatory detail requirements.

Use of guide

The document is presented in anticipation of direct federal construction managed by the IHS and includes requirements and nomenclature that are generally familiar throughout the target organization. Definitions that have a specific organizational meaning are included along with a comprehensive list of abbreviations.

Electronic Distribution

This document, along with any electronic attachments or supplemental information, is available through the DES Document Access Portal at <http://www.des.ihs.gov/index.cfm?module=dap>.

Error and Change Submittal

Any identified errors or proposed changes should be forwarded for consideration during the next regular review of the guide to AEDesignGuide@ihs.gov.

2009 AE Design Guide workgroup

Suresh Shah, PE, *chair*

CDR Stephen Christopher, PE

Lewis Faulkner, RA

Paul Ninomura, PE

Ramón Ortiz, PE

Dwight Packer, RA

Hank Payne, PE

Pedro Valverde, PE

CDR Michael Young, PE

1 Introduction

The A/E Guide has been prepared as a requirement for the design of Indian Health Service (IHS) government projects and is intended to capture current federal, departmental, and IHS requirements, policies, and best practices for health care construction projects that support the mission of the IHS. This A/E Guide provides guidance for the development of design documents, specifications, and contract documents, architectural and engineering design features, submittals, and supplemental information. Modifications to the requirements of the A/E Guide will be addressed for specific projects in the scope of work and contract documents for the project as appropriate.

For other users it represents a benchmark that can be utilized directly by reference or as a basis for good management practices for the administration of A/E services for health care design projects. Tribal users should incorporate this document in its entirety or may consider developing an addenda list to highlight any proposed changes to the A/E Guide when referenced as a contract requirement for Public Law 93-638 agreements with the IHS.

The A/E Guide defines the minimum requirements for each submission in the production of Indian Health Service pre-design, concept design, schematic design, design development, and construction documents. The design requirements are defined by the scope of work, the design criteria, and the program of requirements, including templates developed under the IHS health system planning program.

This guideline is designed to give the A/E an understanding of what is required and what must be completed before the final construction documents are approved. This guideline does not relieve the A/E of their professional responsibility to produce a correct, complete, and fully coordinated set of construction documents in accordance with the industry standard practice and government criteria.

2 Responsibilities of the A/E

2.1 General Responsibilities

2.1.1 Quality

The A/E is responsible for the professional quality, technical accuracy, and coordination of all designs, drawings, specifications, and other contracted services.

2.1.2 Reviews and Approvals

- (1) The A/E's work shall be subject to the Government's oversight, direction, control, review and approval.
- (2) Government reviews are to assure all programs, statutory and regulatory provisions are included or met. The review is not intended to indicate a complete or detailed check of all documents, calculations, codes, etc. It does not relieve the A/E of any responsibility for checking their own work; verifying existing conditions; complying with the codes, standards, and the program of requirements (POR); and producing a complete coordinated set of documents.
- (3) Reviews and approvals will be provided by Governmental Agencies on a standardized comment form provided by the Project Officer. All review comments will be coordinated through the DES for submission to the A/E. The review comment form, with the A/E's responses, will be incorporated in the design documents before work on the next design submission begins.

2.1.3 A/E Project Manager

The A/E shall designate a project manager who shall be familiar with the requirements in the A/E contract, performance schedule, scope of work (SOW), and this A/E guide.

The project manager is responsible for reviewing the IHS DES Lessons Learned Program (www.des.ihs.gov/index.cfm?module=lessons) for relevant issues to be considered in developing the design.

The project manager will provide necessary design guidance for the successful completion of this work and coordinate with the government.

2.1.4 Document Distribution

The A/E shall distribute documents as required in the

contract.

2.1.5 Scope Changes

Any proposed deviation from the project SOW must be reviewed with the Project Officer and approved by the Contracting Officer (CO) before any action can take place. When major changes in the SOW are required, the CO according to the changes clause of the contract will negotiate appropriate contract modifications with the A/E. During the progress of the work, if minor changes within the general project scope are required, the A/E will make the adjustments when directed by the CO.

2.1.6 Document Ownership

All drawings, designs, specifications, cost estimates, notes, computer-aided design (CAD) files, and other related work shall become Government property.

2.1.7 Errors and Negligent Performance

The A/E shall correct or revise any errors, omissions, or deficiencies in designs, drawings, specifications, estimates, and other services without additional compensation. The A/E shall remain liable in accordance with applicable laws for all damage caused by the A/E or its consultants, negligent performance of any of the services furnished under the A/E's contract,

Box 2a - Design Within Funding Limitations

The contract clause FAR 52.236-22 Design Within Funding Limitations is, with limited exceptions, required in all Federal design contracts and requires the A/E to accomplish the design so that a construction contract can be awarded at or below the estimated construction cost listed in the clause.

The clause also requires prompt notice to the Government if the A/E determines that the design requirements cannot be met within the budget. Such notices should be made as soon as the problem is identified and not wait for the next design submittal. Otherwise, the A/E is expected to continuously monitor the budget and adjust the design as necessary so that accurate construction cost estimates submitted for each design phase do not exceed the limit stated in the contract or task order.

or failure to comply with any applicable legal or contractual obligations.

Design errors or omissions or other failures that constitute negligent performance or breach of a contractual obligation, resulting in damages or extra cost to the Government will be evaluated for potential A/E financial liability. If the Government determines the A/E is liable for any such deficiency, the CO will notify the A/E. Any damages or extra costs incurred by the Government resulting from any such deficiency will be actively pursued.

2.1.8 Public Disclosure

The A/E shall make no public disclosure of pending construction contracts without written consent of the CO.

2.2 General Design Requirements

In all design projects, the *Guidelines for Design and Construction of Health Care Facilities* is the primary source of design criteria for health care facilities. The *Life Safety Code NFPA 101* shall be used for determining and maintaining life safety requirements for all occupancies in new and existing buildings.

2.2.1 Site Investigation

It is the A/E's responsibility to visit the site, inspect the location of the work, become acquainted with all local conditions, verify and identify existing conditions, review existing drawings, and consult with the Project Officer and facility personnel.

The A/E shall conduct a detailed geotechnical investigation. The geotechnical investigation shall explore, analyze, and document subsurface conditions at the project site to provide the A/E with conclusions and recommendations for the design and construction of the facility.

2.2.2 Codes, Standards, and Guidelines

The design shall conform to the latest published edition of the following nationally recognized codes, standards and guidelines:

- (1) *National Fire Codes* (with the exception of *NFPA 5000 – Building Construction and Safety Code*), as published by the National Fire Protection Association shall be used exclusively for determining and maintaining life safety requirements for all occupancies in the new and existing facilities. If a conflict should arise between the *National Fire Codes* (NFC) and any other model codes on an issue of life safety, the NFC shall take precedence.
- (2) *International Building Code* (IBC) as published by the International Code Council unless another model building code is specified in the contract. The International Residential Code (IRC) will be used as it applies to staff quarters.
- (3) *Guidelines for Design and Construction of Health Care Facilities* as published by the American Institute of Architects and the Facility Guidelines Institute.
- (4) Comprehensive Accreditation Manuals, as published by The Joint Commission for the following, as appropriate for the project occupancy:
 - *Hospitals: the Official Handbook* (CAMH)
 - *Critical Access Hospitals* (CAMCAH)
 - *Ambulatory Care* (CAMAC)
- (5) *The ADA Accessibility Guidelines* (ADAAG) as published by the Access Board.
- (6) National Historic Preservation Act, 36 CFR 68. The A/E shall become familiar with the conditions surrounding the approval of the construction site and any existing structures with the State Historic Preservation Office, or the Tribal Historic Preservation Office, and shall comply with the terms of the approval. At all times, the A/E shall maintain communication with the Government regarding issues of historic preservation, where applicable.
- (7) The Clean Water Act, section 402, National Pollutant Discharge Elimination System
- (8) EPCRA, Energy Policy Act of 2005
- (9) Energy Independence and Security Act (EISA) of 2007
- (10) Radon Gas – Indoor Radon Abatement Act (IRAA) and/or state/local indoor radon requirements, including the *Technical Handbook for Environmental Health and Engineering*, Volume III, Part 21-2.4 - Radon Control and Mitigation, whichever is more stringent.
- (11) Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise Residential Buildings - 10 CFR Parts 433, 434, and 435

Box 2b - Executive Orders Referenced

- 1 Executive Order 12491, Seismic Safety of Existing Federally Owned or Leased Buildings
- 2 Executive Order, 12699 Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction
- 3 Guidelines and Procedures for Implementation of the Executive order on Seismic Safety of New Building Construction, Department of Commerce, May 1992
- 4 Executive Order 13112, Invasive Species
- 5 Executive Order 13221 Energy Efficient Standby Power Devices
- 6 Executive Order 13327, Federal Real Property Asset Management.
- 7 Executive Order 13287, Preserve America
- 8 Executive Order 13423, Strengthening Federal Environment, Energy and Transportation Management
- 9 Executive Order 13514 Federal Leadership in Environmental, Energy and Economic Performance

- (12) ASHRAE/IESNA 90.1-2004 Energy Standard for Buildings Except Low-Rise Residential Buildings.
- (13) ASHRAE/IESNA 90.2-2004 Energy Standard for Buildings and Low-Rise Residential Buildings
- (14) ASME Boiler and Pressure Vessel Code, Section II
- (15) ASHRAE 62.1 - 2004 Ventilation & Acceptable Indoor Air Quality
- (16) ASHRAE 62.2 - 2004 Ventilation & Acceptable Indoor Air Quality in Low-Rise Residential Buildings
- (17) *IHS Technical Handbook* reference sections in appendix 5.
- (18) National Council for Radiation Protection and Measurement (NCRP) Reports #145 (*Radiation Protection in Dentistry*) and #147 (*Structural Shielding Design for Medical X-Ray Imaging Facilities*)
- (19) ASCE 31-03 Seismic Evaluation of Existing Buildings
- (20) ICSSC RP-6 Standards of Seismic Safety for Existing Federally Owned or Leased Buildings,

2002

- (21) ASHRAE Standard 111-2008 Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems
- (22) All applicable IEEE Standards
- (23) All applicable UL Standards
- (24) All applicable Telecommunications Industry Association/Electrical Industries Alliance (TIA/ETA) Standards
- (25) American National Standards Institute (ANSI) A17.1, Safety Code for Elevators and Escalators.
- (26) ASHRAE Guideline 0 - Commissioning
- (27) ASHRAE Guideline 12 - Minimizing the Risk of Legionellosis Associated with Building Water Systems.
- (28) Guidance for Protecting Building Environments from Airborne Chemical Biological or Radiological Attacks (CDC)

These requirements are considered the minimum necessary to comply with PL 100-678. More restrictive requirements may be established should they be required by a state and/or local authority having jurisdiction or by IHS. It is the practice of IHS to comply with state, local, or tribal codes and ordinances whenever feasible.

2.2.3 Code Conflicts

When more than one code, standard, or guideline covers the same field, the jurisdiction for the project will determine the code, standard, or guideline to be utilized. Where there is a conflict between the required NFPA codes and another code, standard, or guideline, NFPA Codes shall govern unless determined otherwise by the AHJ. Conflicts between code requirements shall be documented and copies submitted to the AHJ for consideration.

2.2.4 Unique Conditions

Problems arising from unique project conditions shall be resolved through sound design practices and recognized standards and submitted for the record to the AHJ.

2.2.5 Deviations

When deviations from the criteria and standards are required to meet special conditions or concerns, determinations shall be the responsibility of the AHJ.

2.3 Metric

The A/E shall utilize the International System of Units (SI) in the design of new construction projects.

- (1) All measurements shall be in Hard Metric format, using rounded and rational metric units.
- (2) Dual measurements utilizing SI and inch-pound units shall not be permitted.
- (3) Design calculations shall be in metric.
- (4) Show quantities of air in metric units for each run or branch. This will aid the testing, adjusting, and balancing contractor in setting the dampers or balancing cocks to the proper quantities.
- (5) Refer to ASTM E621, Standard Practice for the Use of Metric (SI) Units in Building Design and Construction, for preferred symbols and standard conventions.
- (6) Additional information concerning the use of metric may be found in the IHS Technical Handbook.

2.4 Sustainability

The A/E shall integrate sustainable design principles into the design addressing site development, energy performance, water conservation, indoor environmental quality, and the reduction of the environmental impact of materials.

The A/E is responsible for evaluating energy consumption benchmarks and designing to meet reduction requirements.

2.5 Life Cycle Cost Analysis

The A/E shall utilize Life Cycle Cost analysis where called for in the scope of work, where needed to justify critical decisions regarding capital expenditures, and

to demonstrate long-term savings in operation and maintenance costs.

The A/E shall follow standard procedures for preparing and presenting this information, as outlined in this A/E Design Guide.

The A/E is responsible for the technical accuracy of all life cycle cost estimates, and shall not be compensated for additional work as a result of insufficient effort in conducting previous life cycle cost analyses.

2.6 Value Engineering

The A/E shall use value engineering principles throughout the design phase of the project, thereby making efficient and effective use of the construction and operational budgets.

Depending on the size of a project, DES may require a formal value engineering (VE) study. This determination shall be made prior to award of the A/E contract.

Critical decisions regarding mechanical systems and components, architectural elements, site configuration, etc. shall be made through a comprehensive VE evaluation, and shall include life cycle cost principles as part of the analysis. Consideration shall be made so as to make efficient and effective use of the construction and operational budgets.

2.7 Commissioning

Commissioning of building systems shall be incorporated into the design and construction of new health care facilities and be performed in compliance with sustainability requirements.

The commissioning process is intended to assist in successfully transitioning the project from construction to operations by facilities maintenance staff by ensuring that systems are maintainable and work as intended, that adequate training is provided, and that adequate clearances for the maintenance and operation of selected equipment are available.

Commissioning should be performed in accordance with the Building Commissioning Association's standards or the ASHRAE Guideline 0.

The commissioning process shall begin no later than the design development phase and continue through the one-year warranty period.

Box 2c - Types of Value Engineering Teams

Formal VE studies may be accomplished by IHS via one of the following types of VE teams:

- 1 Specialized VE consulting firm subcontracted through the A/E design contract
- 2 Specialized VE consulting firm contracted directly by IHS
- 3 IHS engineering staff

The type of VE team shall be determined prior to award of the A/E contract.

2.8 Testing, Adjusting & Balancing (TAB)

HVAC testing, adjusting, and balancing shall be performed in accordance with ASHRAE 111-2008. The A/E shall coordinate the requirements of testing adjusting and balancing (TAB) system for HVAC and other building systems with the commissioning requirements. Before any testing or balancing are performed, all systems must be complete; all controls must be installed and operational. All test and balance work shall be performed under the supervision of a certified NEBB or AABC manager by an independent subcontractor. System testing, adjusting, and balancing shall be accomplished before final inspection and shall include:

- (1) HVAC, air and water systems:
 - air-conditioning system
 - boiler system
 - chiller system
 - chemical feed system (water treatment)
 - domestic hot water system
 - distilled and deionized water
 - (2) The adjustment of all equipment within the system such as air terminal boxes, coils of all types, heat converters, pumps, fans, unit heaters, and air handling units.
- (10) Lightning Protection System (test per LPI 175 and NFPA 780)
 - (11) Power quality testing for the main switchboard and all electrical panels. Minimum voltage imbalance in three-phase systems panels shall be 1% line-to-line volts. (test per NETA)
 - (12) Infrared survey of electrical switchboard and electrical panels. (test per NETA)
 - (13) Advanced metering system (test per design specs)
 - (14) Cable TV systems (test per manufacturer's specs)
 - (15) X-ray machine and dental equipment (test per UL 60601 and references NCRP 145 and 151).
 - (16) Other systems:
 - medical gas system (test per NFPA 99)
 - dental air and vacuum systems (test per NFPA 99)

2.9 Systems Testing

The following items shall be tested as indicated.

- (1) fire alarm system (test per NFPA 72)
- (2) lighting control system (test per NETA)
- (3) nurse call system (test per manufacturer's specs)
- (4) security system (test per manufacturer's specs)
- (5) voice/data system (test per TIA/EIA standards)
- (6) public address system (test per manufacturer's specs)
- (7) normal power distribution system (test per NETA)
- (8) emergency generator system (test per NETA)
- (9) building grounding system (test by fall of potential method from IEEE 141 standard. Grounding resistance value shall be equal or less than 10 ohms.)

3 Submittals Preparation

3.1 Drawings

3.1.1 Format

- (1) Sheet size: Within a single project, all contract drawings shall be uniform in size. Standard sheet size is A1 (594mm x 841mm).
- (2) Match Lines. Plans requiring division onto more than one sheet shall be provided with match lines. These shall be cross-referenced on each sheet.
- (3) Key Plan. Projects requiring more than one sheet for each plan shall include a key plan on each plan sheet. The key plan shall show the location of the partial plan in relation to the whole plan. The key plan shall be located near the title block and oriented to match the plan. All partial plans shall be oriented the same direction on the sheets.
- (4) Standard Details. Reference details that are typical and apply to the specific project are to be incorporated into the drawings by computer-aided design (CAD) equipment. However, such standard details must be applicable to the specific project.

3.1.2 Quality of Drawings

All drawings submitted for review shall represent the best professional quality of graphic presentation. Drawings shall be legible, accurate, and properly coordinated. If, in the Government's opinion, the quality of the drawings does not meet these requirements, the drawings will not be accepted.

3.1.3 Placement of Drawings on Sheets

Drawings shall be arranged on sheets with economical use of space, without crowding or overlapping, and shall be legible at half size, A3 (297mm x 420mm).

3.1.4 Floor Plans

One or more floor plans may be placed on a single sheet depending on the size of the project. If the entire project is shown on one sheet or if the plans and elevations are drawn on the same sheet, the plans should be placed at the bottom of the sheet.

3.1.5 Elevations and Sections

Several elevations and sections may be placed on one sheet as long as they remain legible. When more than

one sheet is used, the elevation showing the main entrance should be placed on the first sheet.

All details, elevations and sections shall be identified including the drawing number where the detail, elevation or section is taken along with the drawing number where the section, detail or elevation is drawn.

3.1.6 Scales

Scales shall be appropriately selected to clearly depict all aspects of the required work. Conventional Scales shall be placed under the title of each Plan, Elevation Detail, etc. (e.g. SCALE = 1:100). Graphic scales including every scale used on the sheet shall be located at the lower right hand corner of each sheet.

3.1.7 Floor Plans Name of Spaces

On the floor plan in the center of each space, the name and number for the space should appear and be underlined. If the space is too small for space name and number, they should be placed in a clear area outside the space with an arrow pointing to the space. On mechanical and electrical floor plans, names may be omitted from the spaces to allow clarity of utility systems. Names should then be placed in schedules located adjacent to the plans.

3.1.8 Space Identification Numbers

Unique identification numbers shall be assigned in the schematic design phase. All design spaces shall be identified with a departmental identifier and sequential POR number.

No space number shall be duplicated (i.e., PC-01 where 11 is for the Primary Care Nursing department and 01 is the first room/space in the POR space allocation list for the Primary Care Nursing department. Also, PH-01 where PH is the Pharmacy department and 01 is the first room/space listed in the POR space allocation list for the Pharmacy department.)

This numbering system will be replaced with "the Facility Room Numbers" after the design development phase documents are approved.

On the project record drawings provide a conversion sheet that labels the facility final room numbers as reflected on the General Contractor's or Construction Manager's "as-built" drawings.

3.1.9 Facility Room Numbers

- (1) All room/spaces shall be numbered with a floor identifier, a corridor/departmental identifier, and a sequential room number, or other approved numbering system. The first digit or letter indicates the floor level (B101, 1101, 2101, P101, etc.), the second digit indicating the corridor or department, and the third indicating a sequential room number.
- (2) All rooms with access to a building or departmental corridor shall only have a numerical identifier. Rooms accessed through another room shall have an alpha character appended to the main room number (for a patient bedroom numbered 1101 the interior bathroom would be 1101a.)
- (3) Room numbering shall follow a logical progression promoting wayfinding on each floor. Space numbers shall be assigned to stairs, elevators, dumbwaiters, escalators, and major duct shafts. The same space number shall be repeated on each floor (Stair No. 1, Elevator No. 1, etc.).
- (4) Room numbers shall not be assigned until after the floor plan is fixed (after the design development phase is approved).
- (5) No room number shall be duplicated.

3.1.10 Drawing Media

- (1) Working drawings shall be printed in both full and half-size in the quantity identified in the SOW and submitted in PDF together with required paper submittals.
- (2) Final drawings shall be submitted in source AutoCad DWG format along with PDF of the stamped drawings and specifications. All schedules within the drawings shall also be provided in a separate editable file.

The included files shall be capable of being loaded by the approved version of AutoCAD without any modifications to the standard installation.

Layer designation shall conform to the AIA Guidelines included in the National CAD Standard.

For each drawing sheet a similarly named single file shall be provided, including all externally referenced files (xrefs), base plan drawings, fonts, plot styles, and graphics associated with the production of the final hard copy drawing set.

3.1.11 Title Blocks and Borders

Title Block: The DES standard title block shall be used.

Provide last name in the “Drawn by” and “Checked by” lines, rather than initials.

3.1.12 Drawing Title

Each drawing (floor plan, roof plan, elevation, section, detail, etc.) shall have a title. All site, floor, and roof plans shall have a project North Arrow.

3.1.13 Abbreviations and Symbols

Legends for abbreviations and symbols shall be included in the construction documents and shall be provided for each discipline separately, such as architectural, civil, HVAC, DDC controls, fire protection system, plumbing, electrical, fire alarm system, nurse call/paging/security system, etc.

3.1.14 General Notes and Key Notes

All general sheet notes and keynotes placed on a drawing sheet shall be edited and apply to that sheet.

3.1.15 Quality Control Review

The A/E shall perform a quality control review of all drawings before each submittal. Reviews for technical accuracy, coordination of work within each discipline, coordination of work among disciplines, and coordination between drawings and specifications shall be included.

3.1.16 Drawing Numbers

The standard drawing numbering system is as follows (optional drawing numbering systems may be submitted to DES for approval):

Civil (Site)	C-1, C-2, etc.
Landscaping	L-1, L-2, etc.
Architectural	A-1, A-2, etc.
Structural	S- 1, S-2, etc.
Mechanical	M-1, M-2, etc.
Plumbing	P-1, P-2, etc.
Medical Equipment	EQ-1, EQ-2, etc.
Fire Protection	FP-1, FP-2, etc.
Electrical	E-1, E-2, etc.
Fire Alarm Control	FA-1, FA-2, etc.

Life Safety Plan	LS-1, LS-2, etc.
Design intent furnishings plan	FFE-1, FFE-2, etc.
Lightning protection system and electrical distribution grounding	LP-1, LP-2, etc.
Special systems (telephone, data, nurse call, security, paging, etc.)	SP-1, SP-2, etc.
Demolition: annotate trade-specific sheets with discipline, for example for mechanical drawings:	DM-1, DM-2

3.1.17 A/E Certification and Signatures

The design of architectural, civil, structural, mechanical, electrical, or other engineering features of the work shall be accomplished, reviewed and approved by registered professional architects and engineers. The architects and engineers shall be registered to practice their respective disciplines in a state, the District of Columbia, or an outlying area of the United States.

The title and/or index sheet shall be signed and sealed by a registered professional architect or engineer of the A/E firm having the contract with DES. The specifications and each drawing, other than the title and/or index sheet, shall be signed and sealed by the registered professional architect or engineer in charge of the work depicted on that drawing. Drawings prepared by a consultant to the prime A/E shall be signed and sealed by the consultant. Final drawings at full size shall bear original signatures and seals.

3.1.18 Record Drawings

The A/E shall prepare and certify record drawings from information that has been provided as “as-built” by the General Contractor (GC) or Construction Manager (CM) for the project.

Record drawings shall be prepared by the A/E to reflect on-site changes the GC or CM has noted in the red-line drawings. They are to be compiled as a set of on-site changes made during the construction process including equipment schedules.

The record drawings shall be documented in CAD format on the original construction documents and noted “Record Drawings” with the information provided by the GC or CM as appropriate. A final CD of the record drawings in CAD along with a set of record drawing prints, full size, shall be provided to the IHS Project Officer upon final approval.

3.2 Specifications

3.2.1 Format

- (1) To produce written specs, the A/E shall use CSI Master Format, 2004 edition MF04, or CSI Green Format.
- (2) Contract specifications shall be based upon materials and performance characteristics established by the ANSI, ASTM, and the American Concrete Institute, and other federal government and national industry standards. All references shall be the latest edition.
- (3) Contract specifications shall be provided in a searchable PDF. The font shall be common throughout the document with a minimum point size of 11. Hard copies of the specifications shall be printed two-sided for government review and comments. The final construction document shall be printed single-sided.

3.2.2 Boiler Plate

Boiler plate documents (contracting format and clause documents) will be provided by the government. The construction documents for each project are to be coordinated with the boiler plate by the A/E. The boiler plate includes general conditions, bidding forms, FAR and DHHSAR provisions and clauses, and other preprinted forms and text for inclusion in the contract documents.

3.2.3 Specifications & Drawings Coordination

The contract drawings and specifications shall be coordinated for respective functions. Specifications shall include testing, materials, referenced standards,

Box 3a - Registration & Licensing Requirements

In areas of moderate to very high seismic vulnerability (seismic design category “C” or greater as defined by the IBC), or any other special conditions such as permafrost or wind, state licensing and local professional registration requirements shall be followed to insure responsible and adequate system design.

If the project is for a facility that is not Government-owned, professional registration is to be in compliance with the applicable laws of the State where the project is located.

shop drawings, descriptive literature, samples, certifications, performance requirements, descriptive characteristics, finishes, workmanship, installations, and related work.

3.2.4 Cover Sheet

The A/E shall provide covers with a DES approved design for each volume of specifications.

3.2.5 Bid Items

The A/E shall coordinate all bid items and the bid schedule with the CO.

3.2.6 Quality Control Reviews

The A/E shall perform a quality control review of all specifications before each submittal. Reviews for technical accuracy, coordination of work within each discipline, coordination of work among disciplines, and coordination between drawings and specifications shall be included.

3.2.7 Proprietary, Restrictive, or Approved Equal Specifications

- (1) Whenever possible, ensure that references in specifications refer to widely recognized standards or specifications promulgated by Governments, industries, or technical societies.
- (2) Trade names and proprietary systems and designations may be referenced to establish required characteristics and level of quality. Whether or not trade names are used, specifications must include a complete description or listing of all major salient features.
- (3) Specifications shall be developed to ensure competitive bidding without proprietary or sole-source restrictions in accordance with FAR Part 11, except where a proprietary or sole-source procurement is approved by the CO. When identification of material or equipment by manufacturer's name, trade name, or catalog number is unavoidable, three acceptable brands should be listed and the essential physical and functional characteristics required should be set forth.
- (4) When the use of a brand name is unavoidable, it shall be qualified by the words "or equal." When brand name or equal descriptions are necessary, specifications must clearly describe those salient physical, functional, or performance characteristics of the brand name item that an "equal" item must

meet to satisfy the requirements.

- (5) Proprietary or sole-source procurement is allowed in specific situations only if justified to and approved by the CO.

3.2.8 Selection of Materials

Selection of materials and procedures shall be based on project location, design requirements, cost analysis, and availability. Readily available material and equipment should be specified whenever possible. In no case shall materials or equipment containing components excluded by law, such as asbestos or lead paint, be selected, specified, or installed.

The North America Free Trade Agreement (NAFTA) applies to construction, alteration, and repair projects.

3.2.9 Testing

Testing shall be in accordance with the appropriate codes, standards, and general design requirements on testing, testing and balancing, and commissioning.

3.2.10 Product Submittal Details

The A/E shall include a section in the specifications that instructs the construction contractor to provide the following information in three-ring binders organized in tabbed sections. The project manual shall include the following requirements for project submittals:

- (1) Record product data: One copy of each product data submittal shall be marked to show significant variations in actual work performed in comparison with information submitted. Include variations in products delivered to the site. Also, include variations from the manufacturer's installation instructions and recommendations.
- (2) Record sample submitted: Samples of material used for record purposes.
- (3) Maintenance manuals: Operation and maintenance data that includes the following information:
 - (a) Required written warranties and related documents together with documentation of warranty duration and verification of compliance with construction documents.
 - (b) Emergency instructions
 - (c) Recommended maintenance cycles
 - (d) Inspection procedures
 - (e) Fixture lamping schedule

- (f) Spare parts list
- (g) Wiring diagrams
- (h) Shop drawings and product data
- (i) Field test reports, such as those for testing, adjusting & balancing of HVAC system, grounding, fire alarm system, etc.
- (j) Training video, such as nurse call system, fire alarm, DDC, etc.
- (k) Commissioning report
- (l) CMMS data for maintainable equipment

3.2.11 Utility Markings

The following color codes shall be used for utility piping and physical hazards:

- (1) Piping - American National Standards Institute - A13.1, Scheme for Identification of Piping Systems
- (2) Medical Gases Signage - National Fire Protection Association - 99, Health Facilities, Information and Warning Signs for Gas Systems
- (3) Gas Cylinder - CGA Pamphlet C-9, Standard Color Marking of Compressed Gas Cylinders intended for Medical Use
- (4) Physical Hazards - Occupational Safety and Health Act - 29 CFR 1910.144, Safety Color Code for Marking Physical Hazards

3.3 Facility User Manual

- (1) Prior to project completion, the A/E shall prepare a user manual that will explain how the new health facility is intended to be operated. The manual shall address the use or functional organization of the health facility and explain how to use the health facility in plain language. Major considerations in planning, layout, and design are highlighted. Significant design features, cultural aspects, major pieces of equipment, and potentials for flexibility and expansion are to be made clear.
- (2) The manual is intended for all staff members working within the health facility. Since the informational needs will vary among staff, the manual will provide information on the functions and systems at different levels of detail. The manual also needs to be flexible for both its day-to-day use and for the addition of updated material as it is developed.

- (3) The manual shall include, but not be limited to the following topics: introduction/executive summary; an overview of the facility design and operational concept; building circulation/individual department review; HVAC systems; plumbing systems; electrical systems; fire protection systems; communication systems; site design; energy conservation; code conformance/waivers; signage/way finding; and any supplemental information.

The facility user manual is not intended to be an excerpt of the operations and maintenance manual, for building systems it should present the intended strategy of operations that guides specific equipment sequences.

3.4 Cost Estimate

3.4.1 General Requirements

- (1) The A/E shall design the project so that construction costs will not exceed a contractually specified dollar limit (design within funding limitation.) If the price of construction proposed in response to a Government solicitation exceeds the construction funding limitation in the architect-engineer contract, the A/E shall be solely responsible for redesigning the project within the funding limitation. These additional services shall be performed at no increase in price to the government. If the cost of proposed construction is affected by events beyond the A/E's reasonable control, such as an increase in material costs which could not have been anticipated, or an undue delay by the Government in issuing a construction solicitation, the firm shall not be obligated to redesign at no cost to the Government.

To ensure that the planned design does not exceed project funding, the A/E shall submit accurate cost estimates. The final cost estimate will be used to evaluate bids, plan negotiations, and serve as a guide in establishing a schedule of payments.

The estimate shall be summarized to reflect the bid schedule.

- (2) Cost estimates shall address general conditions, utility and site development, demolition, including removal and disposal of hazardous materials, building costs, fixed equipment, and construction management. Direct costs, such as labor, material, equipment rentals, etc., should be shown separately from indirect costs, including overheads, profit, bonds, taxes, insurance, TERO fees, etc.

- (3) Each cost estimate submittal shall contain at least one summary estimate and one detail estimate for each building and facility as required. All cost estimates shall be developed based on the submitted specification format. All units of measure shall be metric (SI) units.
- (4) The cost estimates shall be summarized to provide discreet costs for each physical structure; costs shall be grouped by building.
- (5) Cost estimates shall be prepared using MS Excel, or provided in an exported file format fully compatible with the current version of Excel.
- (6) Cost estimates prepared by the A/E at any project submittal are proprietary and shall not be released outside the Government.
- (2) Pre-Design/Concepts Estimate. This is a lump sum budget estimate; cost is per square meter.
- (3) Schematic Design Estimate. This estimate shall be based on schematic design sketches and documents and shall include the major components (i.e., site, building, and fixed equipment).
- (4) Design Development Estimate. This estimate shall be based on design development drawings and documents and shall be prepared using the cost of major project components (i.e., site, building, plumbing, heating and air conditioning, electrical, outside utilities, fixed and movable equipment).
- (5) 65 Percent Construction Document Estimates. This estimate shall be based on intermediate construction drawings and documents. It shall be prepared from quantity takeoffs by CSI format for the complete project. The estimate shall be divided into the standard divisions including taxes (such as state & tribal), bonds, insurance and other fees, and Contractor overhead & profits. It should be recognized that the cost breakdown for any features shall be commensurate with the design status. Lump sum and allowances prices are to be avoided. Special feature costs incorporated in the facility design are to be included in the estimate as separate line items.

3.4.2 Cost Estimate Detail

- (1) Cost Estimate Narrative. As a part of the submission of cost estimates at all submission phases, the A/E shall provide a brief narrative description of the methodology used in the development of the estimate, including any factors that may have a significant impact on the estimate and the sources of data used in the estimate. If estimating software is used to produce the estimate, provide summary details of the software.

Box 3b - Cost Estimate Pricing

A detailed estimate shall be developed for each facility or system in the estimate summary. The detailed estimate shall be a breakdown of all items of work required to construct the facility or system. Avoid lump sum pricing. Where lump sum pricing is unavoidable, establish a basis for the assumption of the price. The unit price for each item of work shall be broken into labor, equipment, and materials.

The price for labor shall be the basic cost of labor plus fringe benefits including travel pay, overtime, insurance and taxes. Labor wage rates shall be developed using applicable DOL labor rates. The A/E shall estimate the number of labor-hours required for each item of work and apply the cost per labor hour to the total labor hours required for each facility or system.

The unit price for materials shall be current catalogue prices or prices quoted from a supplier and will be documented. Items of work which are normally subcontracted shall be estimated as stated above plus an allowance (percentage) for

subcontractor overhead and profit. The subcontractor total will then be included in the direct cost to the prime contractor. Costs for labor, materials, equipment, and subcontractor items shall be individually totaled and then added together for each facility system. Allowances (percentages) for prime contractor overhead and profit shall be added to arrive at a total facility or system cost.

Equipment costs may be included in each item or at the end of the estimate at the A/E's option. Where there are significant equipment hours, the equipment costs will show number of work hours with an appropriate operating rate. Operator cost will be shown separately.

The unit prices shall be exclusive of overhead and profit. Apply all state and local taxes as appropriate for the locale. TERO fees shall be shown as separate items. Overhead and profit shall be shown as separate items.

The cost of construction shall be escalated to the mid-point of construction considering award of a construction contract 6 months after completion of design.

- (6) 100 Percent Construction Documents Estimate. This estimate shall be based on the final construction documents. Unit prices or Assemblies prices shall be avoided. If assembly price is used then the detail of each assembly price shall be provided. This estimate will be considered the “Government Estimate” after it has been reviewed and accepted by DES. The estimate shall provide detailed labor and material cost of each item.

3.5 Sustainability Reports

3.5.1 General Requirements

- (1) The A/E shall provide sustainability reports with each design submittal. These reports shall include a narrative section, providing commentary and analysis for each of the Guiding Principles as stipulated in Section 5.5 of the Design Guide. This report shall identify ongoing issues including, but not limited to: individuals/entities involved, local/regional considerations, feasibility and cost considerations, time constraints, and cultural priorities.
- (2) The A/E shall establish a list of milestones, specific to achieving a sustainable design certification.
- (3) Reports shall include an updated matrix, including all credits specific to the certifying entity selected (LEED, Green Globes, etc.) including a summary of each design/construction credit, a brief narrative of the requirements pertaining to each credit, identification of person(s) responsible for achieving the credit, an assessment of the likelihood of achieving the credit (i.e. “likely”, “possible”, or “unlikely”), status of credit-specific submittals to the certifying entity, and a narrative explaining the actions currently being taken by the A/E to pursue the credit further.
- (4) The sustainability report shall include an active updated cost matrix, identifying the cost premiums associated with each credit being pursued. A cost premium is costs incurred to the project by virtue of each sustainability credit being pursued, and shall not include costs associated with the project in the absence of a sustainability certification. In some cases, a lump sum cost for each credit is sufficient; where additional cost data is requested by the Contracting Officer, the A/E shall provide the necessary detailed costs.
- (5) The A/E shall register the project with the certifying entity during the concepts phase of the project,

and shall provide online access to members of the Project Leadership Team as requested by the Project Officer, but shall at a minimum include the Project Officer and the Sustainability Coordinator. The A/E shall provide all design submittals to the certifying entity in a timely fashion, and shall upload the necessary documents to the online template.

3.5.2 Projected Consumption

Include narrative discussion along with projected baseline utility consumption calculations for energy and water use by type for the facility.

4 General Requirements for Submittals

4.1 General Requirements

Construction documents shall be coordinated with all furnishings, equipment, and communication systems.

- (1) All submittals shall be provided in PDF, in addition to the hard copies required in the scope of work.
- (2) Provide the comment “All dimensions are in millimeters unless noted otherwise” on all drawings where millimeters are the base unit of measurement.
- (3) Provide the comment “All dimensions are in meters unless noted otherwise” on all drawings where meters are the base unit of measurement.
- (4) Provide large-scale drawings of showers, toilet rooms, laboratories, utility corridors, mechanical rooms, and all other areas that are too congested to be clearly understood at a smaller scale.
- (5) Coordinate all drawings with other disciplines, such as site utilities, reflected ceiling plans and duct plans. Coordinate service requirements with the civil engineer. Provide the comment “Coordinate with architectural drawings for detailed information” on all drawings.
- (6) Equipment such as meters, piping, and valves to be furnished and installed by the utility company shall be shown and identified on the drawings. Delineate the division of work between the utility companies or Government and the construction contractor.
- (7) Furnish load data and information on equipment capacities. If the design is based on the use of existing equipment, demonstrate the adequacy of the existing equipment.

4.1.1 Government Review Comments

- (1) At the completion of each phase, the A/E shall submit the required materials and documents for review. Reviews shall be for overall design concept and adherence to the POR and previously approved submissions. After receiving a complete submittal, including the “Certified Submission Checklist” (refer to appendix 1) and verification by the Project Officer that the submission is complete, the review period will start. Written comments will be returned to the A/E as stipulated in the A/E contract.

Box 4a - Submittal Stages and Reviews

The number of submittal stages and the number of copies required for each submittal are specified in the A/E contract or the A/E task order. All resubmissions of drawings, specifications, and cost estimates shall include a completed review comment form as shown in the Appendix.

- (2) The Government review is not intended to provide a complete or detailed check of all drawings. It does not in any way relieve the A/E of the responsibility for checking all work; verifying compliance with codes, standards, and POR; and producing a complete, coordinated set of documents.
- (3) After review of any submittal the CO may require changes to the drawings. The A/E shall make these changes before completion of the next submittal.
- (4) The A/E shall submit a written response to the Government review comments after each submittal. The response shall address each comment. Comments requiring additional details, sections, notes, or cross-references to make the drawings more understandable shall be incorporated. If for any reason the A/E believes that a comment cannot be complied with, the A/E shall explain this in a written response.
- (5) The A/E shall not proceed to the next phase until written approval or approval contingent upon the noted changes is received from the CO.

4.2 Calculations

Furnish calculations to support each design phase. Calculations are to be a progressive refinement of the basic design until the final submission.

4.2.1 General Requirements

- (1) All design calculations shall be in metric.
- (2) Calculation sheets shall identify all decisions, data sources, codes, etc., necessary to complete the understanding of the computations.
- (3) Calculation sheets shall have a minimum 25 mm binding border with the remaining borders at least

10 mm wide. Nothing shall be written in these borders.

- (4) Each sheet shall be identified by the project name, date, and page number.
- (5) All lettering shall be legible and all reproductions complete.
- (6) When industry-specific software is used, provide information on the software to explain the input and output parameters so that the results can be easily understood.
- (7) Bind the final calculation submittal. Include catalog information for all equipment proposed for the job. Bind all drawings into correlated sets. All equipment proposed shall have three manufacturers that can meet the specified requirements.
- (8) Code Analysis. Provide a written analysis stating which codes are used in the design of the facility to ensure compliance with each applicable code.

4.2.2 Civil

Civil calculations are to include all paving systems, exterior drainage and utility systems, retaining walls, equipment selection information, exterior fire protection systems, pre/post-development runoff conditions, stormwater detention and treatment, traffic flow analysis and sanitary sewerage. Provide sketches, diagrams, and calculations as per the following:

- (1) For paving systems, provide geotechnical data, coupled with soil bearing data to determine base, subbase, and subgrade soil conditions for establishing appropriate site preparation and pavement thicknesses. Cite methodology for thickness and material selection.
- (2) Stormwater drainage calculations shall include initial assumptions and parameters for establishing design storm data, coupled with USGS storm data (i.e. Frequency-Intensity-Duration curves, isopluvial maps, etc.) Provide site runoff simulation, showing methodology and calculations. Using this data, provide sizing of storm drain piping for all reaches of proposed stormwater discharge system. Analyze storm water systems to which the project is tributary to ensure compatibility. Consider the impacts of impoundment if short recurrence intervals are used.
- (3) Provide a hydraulic analysis as a basis for determining flows and pressures at all critical nodes throughout the potable water system. Simulate fire

flows to establish a worst-case scenario in sizing of pipes and pumps, if necessary.

Provide calculations and/or manufacturer data to support selection of piping materials and schedules. Include pump and system curves.

- (4) For site stormwater management purposes, provide calculations to establish pre-development runoff conditions, coupled with post-development runoff. Include proposed onsite stormwater detention facilities where needed, and support their sizing using approved methods. Include stormwater runoff quality in the sizing and configuration of treatment facilities. State selected best management practices (BMPs) in the design narrative.
- (5) Provide a design narrative to support the sizing, and configuration of all sanitary sewerage. Include flow simulation models, if necessary. Use open channel flow simulation to support all slopes and diameters of pipes. If lift stations are required, provide all calculations to support the pump sizes, discharge pipe diameters, wet well sizing, float settings, emergency storage, etc.
- (6) Where retaining walls are required on the site, provide calculations to establish wall thicknesses, material selection, drainage system, footing dimensions and configuration, etc.

4.2.3 Structural

Structural calculations shall be indexed, with a table of contents provided for major sections. Structural calculations shall show computations for all loads, and combinations of loads used for the design. Sketches used to calculate loading conditions for wind and seismic, and for connection design, shall be furnished. Calculations are to include all structural elements, and a key drawing/sketch is to be provided indicating member locations.

4.2.4 Mechanical

Mechanical calculations are to include all systems and all equipment selection information about HVAC, plumbing, fire protection, and other special systems. Furnish rough sketches used to calculate duct and piping system layouts and sizing. Duct systems shall include supply, return, exhaust, and special systems. Piping systems shall include: domestic cold and hot water, waste and vent, heating water, chilled water, ethylene glycol solutions, oxygen, vacuum, compressed air, refrigerant gas, nitrogen, and other special systems.

- (1) Block load calculations shall be made for both heat loss and gain. The block loads shall be used to determine the size of the primary heating and cooling units for the building or the facility. Block loads are to determine at what time the maximum loads occur and the quantity of these loads.
- (2) Provide individual cooling, heating, and ventilation requirements for rooms. Include suggested equipment to meet these loads.
- (3) The total of all the room loads will usually exceed the cooling block load for refrigerant equipment. Room or terminal unit loads are used for room or zone unit sizing.
- (4) The calculations shall include riser diagrams, room layouts, pump and fan curves, equipment data, pipe and duct sizing, tank capacities, and all pertinent data and sketches to completely clarify the design intent.

4.2.5 Electrical

For electrical calculations, provide the following:

- (1) Illuminance calculations for lighting.
- (2) Load calculations including overcurrent, voltage drop, short circuit and ground fault considerations. (In both preliminary and final load calculations, indicate connected loads and demand factors for each load category.)
- (3) Obtain available short circuit voltage and current data from local power company and include the information with the load calculations.

4.3 Documents and Drawings

4.3.1 Architectural

- (1) Provide drawings to delineate the site plan, each floor plan, exterior and interior elevations, ceiling plan(s), roof plan, building and wall sections, and details necessary to describe the installation and / or placement of materials and components of each construction assembly.
- (2) Provide a narrative code analysis, including, but not limited to the following features (if conflicts exist between NFPA 101 and the model building code, provide a description of the conflict, including the resolution):
 - (a) building occupancy
 - (b) multiple occupancies

- (c) construction type
- (d) height and area limitations
- (e) means of egress
 - (1) components
 - (2) occupant load and capacity
 - (3) occupant loads
 - (4) number of exits
 - (5) dead-end corridors
 - (6) common path of travel
 - (7) travel distance to exits
 - (8) exit discharge
- (f) protection of vertical openings
- (g) protection of hazardous areas
- (h) interior finishes
- (i) fire and smoke detection, alarm, and notification
- (j) automatic sprinkler systems
- (k) corridor construction
- (l) smoke compartments and smoke barriers
- (m) fire resistant rated separations
- (3) Provide a Life Safety Code Plan within the drawings identifying in tabular format the Life Safety Code and model building code features discussed in the narrative code analysis. Graphically indicating the following features on a floor plan sheet:
 - (a) location of multiple occupancies (if any)
 - (b) suites (location, size, and occupant load)
 - (c) means of egress
 - (1) components
 - (2) horizontal exits
 - (3) dead-end corridors
 - (4) common paths of travel
 - (5) longest travel distances to exits
 - (6) exit discharge to public way
 - (d) automatic sprinkler systems
 - (e) smoke compartments and smoke barriers

- (f) fire resistant rated separations
- (4) Record Drawings. If required by the contract. The A/E shall, prepare and certify record drawings from information that has been provided as “as-built” by the General Contractor (GC) or Construction Manager (CM) for the project.
- (5) Space Comparison Report. The comparison process begins in the concept phase of design, with submission of a space comparison report.

4.3.2 Civil

- (1) Provide a separate drawing for each of the following with a drawing scale of 1:250 or as acceptable to the Project Officer:
 - (a) Site location map
 - (b) Site Topography and Demolition Plan, including location and instructions for identified hazardous materials.
 - (c) Site development plan
 - (d) Erosion control, for use in application for NPDES phase II permit; the construction contractor and/or owner will be responsible for filing the NOI and NOT.
 - (e) Site grading and drainage plan
 - (f) Site Utilities Plan (domestic water, exterior fire protection, sanitary sewer and gas, etc., as appropriate)
 - (g) Legal description
- (2) Provide the following documents:
 - (a) Fire hydrant flow test results with flows rates, static pressures, and residual pressures for existing hydrants within close proximity of the site. The local jurisdiction shall be notified and a letter secured indicating that the local system is adequate to handle the proposed loads; both in terms of pressure/flow relationships as well as fire suppression storage. If the existing water system is not large enough to handle the proposed loads then the design should include an upgrade that has been coordinated with all concerns. The cost estimate shall include the necessary costs to upgrade and extend the system to the site.
 - (b) Size and capacity of all pumped or gravity sewers. The local jurisdiction shall be notified and a letter secured indicating that the local

system is adequate to handle the proposed additional loads. If the existing infrastructure, including sewerage and treatment/disposal is insufficient to handle the proposed loads then the design should include an upgrade that has been coordinated with all concerns. Refer to the SSER for requirements on upgrading the system. The cost estimate shall include the necessary costs to upgrade and extend the system to the site.

- (c) Sizing of all tanks and service lines to buildings.
- (d) NPDES permit application and related correspondence.
- (3) Geotechnical Investigation Report

The detailed geotechnical investigation report shall include at a minimum:

 - (a) Soil conditions.
 - (b) Recommended design for soil percolation rates at the surface and approximately three feet deep.
 - (c) Seasonal Groundwater elevations for both wet and dry periods.
 - (d) Research historical locations of any springs or creeks relevant to the site.
 - (e) Location and type of rock identified through site borings.
 - (f) Estimated rock elevations throughout the site.
 - (g) Recommendations for excavation, trenching, and backfill.
 - (h) Appropriate foundation types for the new structures.
 - (i) Design criteria for the recommended foundation types.
 - (j) Site grading and excavation including criteria for fill quality and compaction.
 - (k) Subgrade preparation.
 - (l) Lateral pressures for design of retaining walls.
 - (m) Site seismicity and hazards.
 - (n) Construction considerations and potential construction problems.
 - (o) Suitability of on-site excavation to be used as

fill.

- (p) Pavement section recommendations: conventional asphalt, concrete and porous concrete and asphalt.

Recommendations regarding the number of borings required to obtain the above information shall be determined by the A/E.

4.3.3 Structural

- (1) Provide a separate drawing for each of the following when the drawing scale is 1:100 or less.
 - (a) General structural notes, including design criteria, and abbreviations sheet: Sheet shall include all design loads and other information pertinent to structural design in accordance with Section 1603 CONSTRUCTION DOCUMENTS of the IBC.
 - (b) The statement of special inspections required by Section 1705 of the IBC shall be included with the General Structural Notes; a note should be included requiring the Contractor to provide timely notification when the work is to be performed, and to make the work available for inspection.
 - (c) Foundation/Slab-on-Grade Plan. Plans for concrete slabs on grade shall identify all equipment isolation pads, housekeeping pads, sumps, vaults, trench drains, and depressions for tile or other equipment. Plans shall also include a layout for all construction and control joints.
 - (c) Framing plan (floors and roof)
 - (d) Elevations
 - (e) Sections and details
 - (f) Schedules
- (4) Process piping, including:
 - (a) Chilled water supply & return (CHWS & CHWR)
 - (b) Cooling tower water supply & return (CWS & CWR)
 - (c) Heating system water supply & return (HWS & HWR)
 - (d) Steam and condensate (S&C)
- (5) Plumbing (domestic water, waste, vent, gases, vacuum, compressed air, etc.)
- (6) Fire protection, including:
 - (a) Fire and smoke damper
 - (b) Smoke detector, heat sensor
 - (c) Fire alarm control panel and annunciation panel
 - (d) Fire alarm pull station
 - (e) Fire alarm (strobe light & alarm)
 - (f) Fire extinguisher
 - (g) Fire hydrant
 - (h) Back flow preventer
- (7) Special systems, including:
 - (a) Medical gas
 - (b) Dental air and vacuum
 - (c) Nitrous oxide
- (8) Provide riser diagrams for all systems including ductwork, domestic water, steam, heating and/or chilled water, waste, drainage, vent, fire standpipe, and process piping. Each component shown on a riser shall also be shown in plan view. Provide cross-identification.
- (9) Control sequences for all systems shall be included.
- (10) Schedules for all equipment shall be shown on the drawings.

4.3.4 Mechanical

4.3.4.1 Mechanical Drawings

Provide a separate drawing for each of the following when the drawing scale is 1:100 or less.

- (1) Demolition (including location and instructions for identified hazardous materials)
- (2) Ductwork
- (3) Piping (other than process piping)

4.3.4.2 Mechanical Documents

- (1) Provide fixture unit factors for water, waste, and vent.
- (2) Furnish equipment piping hookups and details for installation of special systems such as engine-generator sets, unit heaters, and steam for sterilizers, deionized water, and gases (air, oxygen, nitrous oxide, nitrogen, etc.) Provide sizing of all

tanks and service lines to and within buildings for gases and liquids such as propane, natural gas, fuel oil, oxygen, and water.

4.3.5 Electrical

4.3.5.1 Electrical Drawings

Provide a separate drawing for each of the following when the drawing scale is 1:100 or less.

- (1) Demolition
- (2) Power
- (3) Lighting
- (4) Special systems, including:
 - (a) Communications, public address systems, and data systems – all telephone and data outlet location and typical conduit with pull wire or pull cord details.
 - (b) Nurse call system – location of all call system outlet and required equipment.
 - (c) Security system
 - (d) Fire protection system – show all equipment per paragraph 4.3.4.1(6)
 - (e) Grounding system, including:
 - (1) Building grounding system
 - (2) Lightning protection grounding system
 - (3) Telecommunications/data grounding system
- (5) Advanced metering system
- (6) Renewable energy systems

4.3.5.2 Electrical Documents

- (1) Identify all circuits with panel and branch designation. Circuits requiring two or three-pole protection shall be clearly identified in the panel schedules. All wiring shall be easy to follow on the drawings and easy to identify the branch circuit or home run for each device or circuit and the related panel and circuit number or switch leg.

Provide a minimum of 20 percent future load connection capacity on each panel. Identify grounded conductors, graphically or in schedules, similar to phase or neutral conductors. Do not rely on separate notes or specifications to identify these conductors.

- (2) Provide larger scale drawings and/or elevations of electrical equipment layout on pads and in electrical rooms when appropriate for legibility.
- (3) Show interrupting capacities for switchboards, motor control centers, and panel boards. In panel board schedule, separately identify each special single-pole load and each multi-pole load.
- (4) Provide riser diagrams (block diagram will not be accepted) for all systems. Provide a one-line diagram of the incoming service and the secondary distribution system. When necessary show, in plan view, each component shown on the riser or the one-line diagrams. Provide cross-identification.
- (5) Show and identify the equipment to be furnished and installed by the utility company. Delineate the division of work between the utility company (or Government) and the construction contractor. Coordinate with the local utility.
- (6) Identify load requirements (kW, volts, phase) for each outlet such as motor, heating device, or special equipment on the equipment schedules.

4.4 Life Cycle Cost (LCC) Analysis

- (1) The A/E shall devote sufficient time and attention to assure that the cost data is adequate and accurate. LCC analysis reports shall be submitted no later than two weeks prior to a design review in order to provide the Government sufficient time to review the parameters and findings prior to making any critical decisions.
- (2) Life cycle cost analyses shall include, but not be limited to the following: a summary of alternatives being compared, cost data (including capital cost, O&M, salvage value and replacement cost), frequency of replacement, discount rates, inflation rates, savings to investment ratio (SIR), discounted payback period (DPP), discounting conventions, period of analysis, start/base years, and assumptions.
- (3) The A/E shall have the latitude to utilize independent LCCA software, however the analysis must be presented in a format that is easily readable, with the parameters clearly stipulated in each report.

An acceptable model for LCC analysis is the US Army Corps of Engineer's ECONPACK. The latest version of this software is available for download at: <http://www.hnd.usace.army.mil/paxspt/econ/download.aspx>

- (4) The parameters for Life Cycle Cost Analysis are summarized below:
- (a) **Primary versus Secondary Analysis.** Primary analysis will be used when a status quo alternative is available. Secondary analysis will be used when a requirement is not currently being met (no status quo available). In primary analysis, the objective is to demonstrate economic justification for replacing the status quo. In secondary analysis, LCCA is conducted in order to demonstrate the most economically viable alternative.
 - (b) **Project Viability.** For primary analyzed systems alternatives to be considered viable, the savings to investment ratio (SIR) should be 1.5 or greater, and the discounted payback period (DPP) should be in the single digits. Where economic viability cannot be demonstrated, additional justification is required.
 - (c) **Discount Rate.** The real interest rates shall be used for the discount rate in LCCA. Appendix C of OMB Circular A-94 provides current real interest rates used for discounting real (constant dollars) flows for effective cost analysis.
 - (d) **Objective.** Economic analysis objectives will be stated in clear, concise, unbiased, and quantitative terms.
 - (e) **Discounting Conventions.** For all costs, use middle-of-year (M-O-Y) convention, and for residual values use end-of-year (E-O-Y) convention.
 - (f) **Period of Analysis.** Usually 25 years + lead time (design and construction time). In the case of alternative energy systems fulfilling EISA 2007 requirements (reduction in fossil fuel usage), a 40 year analysis shall be used.
 - (g) **Start/Base Years.** Must be the first year funds included in the analysis are to be expended on the project (or system).
 - (h) **Constant Dollars.** Should be a constant dollar analysis, using the real discount rate (i.e. no inflated numbers).
 - (i) **Salvage Value Calculations.** For new construction, assume the physical life is 40 years, the method is straight-line, the begin year is the first year after the facility is completed, discounting convention is E-O-Y, and constant dollars are applied. For renovation projects, assume the life of the system is 25 years, and hold all other parameters the same as in new construction.
 - (j) **Wash Costs.** Costs that are equal (magnitude/cost and timing/same year) across all alternatives can be excluded from the life cycle cost report because they do not affect the alternative selection. Discuss all wash costs in the Assumptions section.
 - (k) **Assumptions.** Should contain information such as the sources of the discount rates, residual/salvage calculation parameters, important data concerning the project, assumptions concerning the scope of the project, local conditions, ordinances, etc. Cost assumptions must be clearly specified and should include; construction, installed equipment other than building equipment, operation (including utilities) and maintenance (including potential modifications and component/equipment restorations/replacements), component or facility failures, and facility downtime, all based on center's operational experience. All wash costs are also to be discussed.
 - (l) **Utilities Cost.** Normally 10-15% lower for new construction vs. renovation; however, each situation should be assessed individually.
 - (m) **Source and Derivation of Costs.** Emphasis is required for this most critical part of the analysis and it must be checked for accuracy and logic. An "audit" trail and explanation for each cost must be provided in the analysis; for example: Utilities - Includes all water, sewer, gas and electric costs associated with the project and from where and how the costs were derived. All costs associated with the life-cycle of each alternative must be included unless it is a wash cost, see discussion of wash costs above.
 - (n) **Non-Monetary Benefits.** Should be discussed, if applicable.
 - (o) **Savings.** Total present value of savings will be determined for primary analysis and discussed in Results and Recommendations section.
 - (p) **Results and Recommendations, or Discussion.** A recommendation with justification should be provided. Although the primary criterion

for selecting an alternative is least cost (i.e., lowest net present value), an alternative that is not least cost may be selected based on other factors.

- (q) **Cost Sensitivity Analysis.** Must be performed by varying initial investment cost and all of the associated costs (all of the alternative's costs) of the selected project alternative up and down by at least 25%, and keep the next closest alternative constant; do not vary any of its costs.
- (r) **Discount Rate Sensitivity.** Must be performed by applying to all alternatives, and vary the rate up 10.0% and down by at least 1.0%.
- (s) **Where There is Only One Feasible Option.** Must contain the project objective, a description and listing of the alternatives considered, and a recommendation; this must be completed, even though a full-blown analysis is not necessary.
- (t) **Additional Paragraph.** Should contain one of the following sets of statements in the first paragraph of the results and recommendations:
 - An economic analysis has been prepared and utilized in evaluating this project. This project or system is the most cost-effective method to satisfy the requirement. Use when a full economic analysis is prepared, and the least cost alternative was selected.
 - Alternative methods of meeting this requirement have been explored during project development. This project or system is the only feasible option to meet the requirement. Use when there is only one viable alternative available due to non-monetary reasons.
 - An economic analysis has been prepared and utilized in evaluating this project or system. This project or system is the best method to satisfy the requirement. Use when a full economic analysis has been prepared but the alternative selected was not based on least cost, but on non-monetary issues.

4.5 Value Engineering

4.5.1 Requirements

- (1) The VE study shall be conducted at the conclusion

of the schematic design phase and prior to commencement of the design development phase. In certain circumstances, additional VE studies may be needed during other design phases.

- (2) The A/E shall brief the VE team about the project requirements and design concepts, provide copies of design documents to the VE team, and review and comment on the VE team's recommendations.
- (3) The A/E shall modify the design documents to incorporate all accepted VE recommendations at no additional cost to the government.
- (4) The VE team shall be lead by a certified value specialist (CVS) registered with SAVE International. VE team members are required to have, at a minimum, experience in health care and must have participated in related VE studies previously. All disciplines applicable to the project at each phase shall be represented on the team.
- (5) The VE study shall be conducted independently from the A/E contract. Under no circumstances shall the A/E be a team member for the VE study. This condition shall apply even should the VE study be conducted through a subcontract to the A/E. The A/E's only involvement in the study shall be to provide information to the VE team and to attend the oral presentation.
- (6) The VE team shall give an oral presentation of the VE study results at the end of the study.
- (7) Further VE study reporting requirements are identified in the Technical Handbook for Environmental Health and Engineering, volume III, chapter 23-3 Value Engineering. The standards for conducting value engineering study are provided by SAVE International.

4.5.2 Value Engineering Report Contents

The VE study report shall contain the following:

- (1) A summary of the functional analysis phase, including:
 - (a) A list of critical functions
 - (b) A functional analysis system technique (FAST) diagram.
 - (c) A cost-function worksheet, and
 - (d) A value index for all critical functions.
- (2) A summary of the creativity phase, including a list of all ideas discussed, whether accepted by the

value engineering team, or not. If a significant concept was rejected by the VE team, the reasons shall be provided in the findings of the report.

- (3) In conjunction with all submitted VE proposals, a T-chart shall be submitted, consisting of two columns: 1) advantages, and 2) disadvantages. Where disadvantages can be overcome, a third column shall be included, to present concepts to mitigate them.
- (4) Prepare an idea selection worksheet, consisting of weighted evaluation criteria in each row, and concepts in each column. For each concept, multiply the relative weight factor for each evaluation criteria, and sum the raw scores. Then, divide the summary score by the estimated cost to obtain a value ratio for each concept.
- (5) A description of differences between the existing and proposed design, comparison of the advantages and disadvantages of each, justification when an item's function is altered, and changes affecting system or facility requirements. This may include but is not limited to sketches, calculations, models, etc.
- (6) Lists and analyses of design criteria or

specifications that must change if the VE study item is accepted.

- (7) A separate detailed estimate of the impact on project costs for each VE study item. A description and estimate of costs the government may incur in implementing the VE study item, such as design change costs and test and evaluation costs.
- (8) A prediction of any effects the proposed changes have on life-cycle costs and energy savings. All cost comparisons shall use a 30-year building life as a guideline. The discount rate shall be based on the real interest rates on treasury bonds, as presented by OMB Circular A-94.
- (9) The effect the VE study item will have on the design or construction schedule.
- (10) All cost analyses shall use the current dollar or present worth approach. If other methods or assumptions are used, proper justification shall be included with the VE study.

4.6 Commissioning

4.6.1 Overview

Commissioning of building systems shall be

Box 4b - Commissioning Authority (CxA)

- 1 The Commissioning Authority (CxA) shall be independent of the work of design and construction. The CxA shall be contracted via a subcontract through the A/E, contracted directly by IHS, or provided by an IHS employee. In no case may the CxA be a direct employee of the A/E or Construction Contractor.
- 2 When the CxA is provided directly by IHS through direct employment or contract, the A/E shall provide support for all CxA activities described herein.
- 3 When the CxA is provided by subcontract through the A/E contract, the A/E shall assume all responsibility for all CxA activities and responsibilities described herein.
- 4 The CxA shall be a "Certified Commissioning Professional" by the Building Commissioning Association or an equivalent certification. In addition, the CxA shall have a minimum of two commissioning projects for a similar building size and occupancy type, e.g. outpatient health care, etc.
- 5 Responsibilities of the CxA include, but are not limited to, the following:
 - Scheduling and conducting all meetings required by the commissioning plan, and recording and distributing minutes.
 - Coordinating inspection and testing of all interacting building systems, e.g., fire alarm, air-handling, generator start up, building grounding and fire sprinkler systems.
 - Provide the format for documenting systems testing, prefunctional checks, and functional performance testing.
 - Noting conditions of construction in conflict or different than the contract documents which prevent commissioning activities from being completed.
- 6 The CxA is responsible for developing the requirements for the building systems commissioning plan during design, and documenting all requirements to be completed by the construction contractor during construction to ensure that building systems function in compliance with criteria set forth in the Contract Documents for the project. The Commissioning Plan shall combine all system narratives, basis of design (Design Intent), assumptions and calculations for all systems into a single manual.

incorporated into the design and construction of new health care facilities and be performed in compliance with sustainability requirements.

The commissioning process shall begin no later than the design development phase and continue through the one year warranty period.

The commissioning plan shall combine all system narratives, basis of design (design intent provided by the A/E), assumptions and calculations for all systems into a single manual.

Seasonal Performance Tests. The commissioning plan may defer functional performance tests until climatic conditions provide adequate loads, e.g., test chillers in summer, test boilers in winter, etc.

4.6.2 Design Phase Services

The building system commissioning plan shall be developed at the design development phase of the design as a separate submission. The building system commissioning plan shall be updated at the 100% construction document phase of the design as a separate submission.

The intent of commissioning authority (CxA) requirements during design are to:

- (1) Document design decisions, assumptions, calculations and narratives for the building systems.
- (2) Develop construction contract requirements that can be administered during construction for completion of commissioning activities by the construction contractor with participation by the Government.
- (3) Develop a documentation matrix.

The basis of design (design intent) shall be reviewed.

Box 4c - Commissioning Testing

Pre-functional Checklist: A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the Commissioning Agent to the construction contractor. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist.

Seasonal performance tests: Functional performance tests that are deferred until the systems will experience conditions closer to their expected design criteria.

The A/E and/or CxA shall provide construction specification dedicated to building systems commissioning, which will address the various building systems to be commissioned. The level of detail of the specifications shall be commensurate with the design phase.

The specifications shall define the "commissioning team." The team should consist of the following, as appropriate:

- owner, represented by the CO or Project Officer
- O&M Staff: facilities manager
- commissioning authority: qualified person, company or agency (government official or consultant.)
- designers: architect, mechanical, electrical design engineer
- construction contractor and subcontractors: construction contractor, construction manager, mechanical and electrical subcontractor, controls contractor, equipment (boiler, chiller, generator, ATS, switchgear, etc.) vendors, testing adjusting & balancing contractor.

The CxA shall be responsible to identify the building systems to be commissioned. Examples include:

- (1) Air-handling system, including items such as:
 - (a) air handling units (including supply, exhaust, return, and relief fans)
 - (b) terminal units (such as VAV boxes)
 - (c) ductwork
 - (d) chilled and heating water pumping system
- (2) Central plant mechanical systems
 - (a) air-conditioning system, including chiller
 - (b) heating system, including feed water system
 - (c) potable water
 - (d) medical gas systems
 - (e) air compressor (control air etc.)
 - (f) process systems (steam for sterilizers, etc.)
- (3) Building automation system
 - (a) direct digital control (DDC) system
 - (b) pneumatic or electrical control

- (4) Dental air and vacuum systems (NFPA 99)
- (5) Medical gas and vacuum systems (NFPA 99), including but not limited to:
 - (a) oxygen system (NFPA50)
 - (b) medical air system
 - (c) nitrous oxide system
- (6) laboratory gas supply
- (7) on and off site fuel gas or oil systems
- (8) potable water (domestic), irrigation water and other water systems
- (9) backflow preventer, e.g. , potable water, fire protection system
- (10) sanitary, and storm drainage
- (11) medical waste disposal systems
- (12) nurse call system
- (13) public address system
- (14) telecommunication and television cable system
- (15) fire protection system
- (16) fire alarm and control systems
- (17) electrical distribution system
- (18) emergency generator system
- (19) energy management system (EMS)
- (20) advanced metering system per EPC Act 2005 section 103.
- (21) renewable energy generation
- (22) building grounding and lightning protection system
- (23) medical equipment power requirements for x-ray, CT-scanner, MRI, others.
- (24) selective power coordination of circuit breakers and arc flash protection.
- (25) bldg security systems

4.6.3 Construction Phase Services

The CxA requirements during construction are to:

- (1) Ensure completion and verification of component and system testing. Demonstrate that components and systems installed under the contract operate as specified.
- (2) Prepare and provide pre-functional checklist for building systems to be commissioned.
- (3) Ensure the training for each piece of equipment and each system is completed and documented.
- (4) Ensure prior to completion of the construction contract, that the operation and maintenance manuals, commissioning reports, as-built drawings and other required contract information are submitted to provide complete documentation of the proper operation of building systems and successful completion of building systems commissioning.
- (5) Ensure functional performance tests for each system are completed to satisfy the design intent independent of the DDC interface.
- (6) The following shall be used to document system operation: test reports, charts, one-line diagram, control diagram, flow diagram, short circuit, current flow and voltage drop calculations. Circuit breakers power protection coordination.

4.6.3.1 Minimum Requirements for Commissioning:

- (1) Provide 100% commissioning for the following equipment/systems:
 - AHU
 - chiller, cooling tower and boiler
 - chilled water, cooling tower water pumps and hot water pumps
 - DDC or building control system

Box 4d - Commissioning References

- 1 ASHRAE Guideline 0 – Commissioning
- 2 GSA, The Building Commissioning Guide. April , 2005
- 3 National Institutes of Health (NIH) Commissioning Guide
- 4 American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE) HVAC Applications – “Chapter 42: New Building Commissioning”
- 5 ASHRAE Guideline 1-1996, the HVAC Commissioning Process
- 6 ASHRAE Guideline 4-1993, “Preparation of Operating and Maintenance Documentation for Building Systems”
- 7 LEED-NC, Version 2.2

- fire sprinkler system, including pump and controls
 - energy conservation systems
- (2) Provide minimum 25% commissioning for the following equipment/systems
- HVAC terminal units (such as VAV box and VAV box with reheat coil)
 - diffusers/grilles
- (3) Fire Protection system shall include the following as minimum:
- fire alarms - horn/strobe light - 25%
 - manual pull stations - 25%
 - exit light fixtures - 50%
 - fire dampers and smoke dampers - 50%
 - smoke sensors - 50%
 - check fire doors/frames rating - 50%
 - fire alarm control panel and annunciator panel – 100%
- (4) Provide commissioning for an electrical distribution system as follows:
- main switchgear (distribution panel) and all electrical panel boards - 100%
 - regular and K-type transformers - 50%
 - emergency generator system including ATS - 100%
 - lighting control - 50%
 - emergency lighting - 50%
 - building grounding system - 100%
 - surge protectors – 100%
 - power factor correction and power conditioning equipment – 100%
 - arc flash hazard warning signs on power panels – 100%
 - lightning protection system – 100%
- (5) Demonstrate that, at the time of commissioning, power quality levels measured at the point of common coupling between the IHS building and the power company are within the limits specified in IEEE 159 Standard.

4.7 Medical Equipment and Furnishings Planning

The A/E is responsible for identifying and coordinating installation, use, and functional requirements impacting design for all group I, II, III, special equipment, and furnishings that are anticipated to make the facility fully functional as intended.

4.8 Security

- (1) Security issues that affect the design shall be coordinated with the DES Project Officer and the end users of the facility. Special attention must be paid to the design of the pharmacy, medical storage areas, IT equipment rooms, and patient records storage, to ensure that an appropriate level of security is attained for these areas.
- (2) When required, personal identity verification (PIV) card readers and their associated systems shall comply with the requirements that are detailed in the National Institute of Standards and Technology (NIST) Special Publication 800-96 “PIV Card to Reader Interoperability Guidelines.”
- (3) The concepts of Crime Prevention Through Environmental Design (CPTED) should be incorporated in the design of facilities.

4.9 Heliport

When specifically required in the POR the AE shall include the design of a heliport.

The heliport design shall meet the requirements of the Federal Aviation Administration (FAA) Advisory Circular 150/5390. The design recommendations relevant to developing a hospital heliport are found in Chapter 4 of this Circular.

FAA approval is required prior to constructing the heliport. The AE shall submit all required applications to the Regional FAA Office before the final design submittal.

5 Sustainability

5.1 Purpose

The purpose of these sustainability requirements is to ensure that IHS facilities are designed and constructed in a manner that enhances indoor environmental quality for users while reducing the production and consumption of greenhouse gases, and disposal of construction material.

The A/E shall be responsible for implementing the following sustainable design features, activities, and certifications within the project. Sustainability related responsibilities shall continue into the construction phase when required by the contract.

5.2 General Requirements

It is the intent of the IHS to make every reasonable and rational effort to meet these requirements. In the event the A/E concludes that implementation of specific sustainability requirements is not feasible (in that doing so creates major negative impacts on the project, including major overall cost increases, major operational feasibility issues, major technology application issues, etc.) a detailed rationale for limiting the use of the specific sustainability feature in question shall be submitted in writing to the Project Officer for consideration by the IHS. Such rationale shall include discussion of the significant negative impacts to the project.

Cost comparisons and evaluations used in supporting the non-inclusion of required sustainability features must show an overwhelming life cycle rationale. Such exclusions shall not be implemented unless specifically approved by the Project Officer.

The term “LEED” is generally used in this document when discussing Sustainable Design Certification. For projects pursuing Green Globes certification, the term “LEED” herein shall be replaced with “Green Globes.” In this scenario, references to specific LEED credits and certification levels shall be replaced with references to similar Green Globes credits and certification levels in the contract.

- (1) The A/E shall be responsible for designing to achieve sustainable design certification and for implementing within the design the following Guiding Principles found in the *Federal Leadership on High Performance and Sustainable Buildings Memorandum of Understanding*:

- Employ Integrated Design Principles (*Integrated Design, Commissioning*)
- Optimize Energy Performance (*Energy Efficiency, Measurement and Verification*)
- Protect and Conserve Water (*Indoor Water, Outdoor Water*)
- Enhance Indoor Environmental Quality (*Ventilation, Thermal Comfort, Moisture Control, Daylighting, Low-Emitting Materials, Protect IAQ during Construction*)
- Reduce Environmental Impact of Materials (*Recycled Content, Biobased Content, Construction Waste, Ozone Depleting Compounds*)

- (2) Sustainable design features, activities and certifications are part of overall Federal policy to minimize adverse environmental impacts and ensure the environmental compatibility of Federal facilities.

5.3 Documentation

- (1) The A/E shall evaluate status of the Guiding Principles and *Leadership in Energy and Environmental Design* (LEED) certification continuously throughout the design process providing written Sustainable Design Status Reports with each design submittal. Reports shall include an updated LEED checklist along with narrative confirmations of which goals and credits have been achieved and which are at risk. Recommended solutions to goals and credits at risk shall also be provided.
- (2) The A/E shall provide detailed estimates with each design submittal identifying costs associated with implementation of Sustainability. These estimates are intended to identify specific costs related to design features, design activities, and construction activities that would otherwise not have been included in the project.

5.4 Sustainable Design Certification

- (1) The A/E shall design the project to obtain LEED certification from the U.S. Green Building Council. Staff quarters projects and projects with an

estimated construction cost of less than \$10 million may alternatively obtain a third-party Green Globes certification from the Green Building Initiative when explicitly stated as such in the contract.

- (2) The A/E shall be responsible for the coordination of LEED certification into the design and construction process. This coordination includes project registration, preparation of all documentation necessary to achieve certification, submittal of documentation to the certifying organization, and incorporation of certification requirements into the construction documents.
- (3) LEED Silver certification is required. Higher levels of certification are desirable and encouraged when cost effective to do so. At a minimum, LEED Gold certification shall be used as a target in order to create a buffer to ensure LEED Silver certification is achieved.
- (4) The specific version of LEED rating system to be utilized will be identified in the contract. Specific credits identified in the following paragraphs reference LEED v3 for New Construction (2009). These references shall be modified accordingly should another version be utilized.
- (5) The A/E shall evaluate all LEED credits to determine the feasibility of implementing each credit into the design, and make recommendations regarding which credits to pursue for certification. Evaluation shall include consideration of initial and life cycle cost impacts.
- (6) Specific LEED credits identified in the following paragraphs are considered to be of the highest priority for IHS. Should the A/E have cause not to recommend their implementation, a detailed rationale must be provided for consideration to the Project Officer.

5.5 Guiding Principles

5.5.1 Employ Integrated Design Principles

- (1) Integrated Project Team
 - The A/E shall designate a specific LEED Accredited Professional to participate on an IHS led Integrated Project Team (IPT) focused on implementing the sustainable design Guiding Principles into the project design.
 - The IPT will conduct a concept phase sustainable design charette. The charette

shall be led by the A/E and may be combined with other design meetings or may be an independent exercise as identified in the contract.

- Sustainable design performance goals shall be established during the concept phase sustainable design charette. Performance goals shall include siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals and LEED certification. Performance goals shall take into consideration all stages of the building's life cycle including deconstruction.
 - Additional sustainable design meetings will be conducted throughout the design process to evaluate the status of and revise performance goals as necessary. Such meetings may be combined with other design meetings or may be an independent exercise.
- (2) Commissioning - Provide building system commissioning services as identified in paragraph 4.6 Commissioning. Building system commissioning services shall meet the requirements of *LEED EA Prerequisite 1 – Fundamental Commissioning of the Building Energy Systems* and *LEED EA Credit 3 – Enhanced Commissioning*.

5.5.2 Optimize Energy Performance

- (1) Energy Efficiency (Health Care Facilities)
 - Design to achieve energy consumption level 30% or greater below the ASHRAE 90.1-2004 baseline.
 - If a 30% reduction in energy consumption is not feasible, lower reductions may be considered when approved by the Project Officer as per paragraph 5.2(2). In such circumstances, energy consumption reduction levels shall be targeted at 5% intervals (i.e. 25%, 20%, 15%, etc.) until the maximum feasible energy consumption level is achieved. In no case may energy consumption levels exceed the ASHRAE 90.1 baseline.
 - Energy consumption calculation shall include space heating, space cooling, ventilation, service water heating, lighting, laboratory fume hoods, kitchen ventilation systems, and all other energy consuming systems with the exception of receptacle and process loads.

- Energy consumption and baseline levels shall be calculated in accordance with ASHRAE 90.1-2004, Appendix G, Performance Rating Method. The ASHRAE Performance Rating Formula in paragraph G1.2 shall be modified as follows:

$$\% \text{ improvement} = 100 \times (\text{baseline consumption} - \text{proposed consumption}) / (\text{baseline consumption} - \text{receptacle and process loads})$$
- (2) Energy Efficiency (Staff Quarters that are three stories or less, above grade)
 - Design to achieve energy consumption level 30% or greater below the ICC International Energy Conservation Code (IECC), 2004 Supplement Edition, January 2005 baseline.
 - If a 30% reduction in energy consumption is not feasible, lower reductions may be considered when approved by the Project Officer as per paragraph 5.2(2). In such circumstances, energy consumption reduction levels shall be targeted at 5% intervals (i.e. 25%, 20%, 15%, etc.) until the maximum feasible energy consumption level is achieved. In no case may energy consumption levels exceed the IECC baseline.
 - Energy consumption calculation shall include space heating, space cooling, and domestic water heating.
 - (3) Energy Star Rating - Design to earn the U.S. EPA Energy Star by achieving an Energy Star rating of 75 or greater with the Target Finder Rating Tool. Target Finder may be found at: http://www.energystar.gov/index.cfm?c=new_bldg_design.bus_target_finder.
 - (4) Measurement and Verification
 - Include the design of an advanced metering system within plans and specifications.
 - Advanced metering systems shall, at a minimum, measure hourly consumption of electricity and report data on a daily basis.
 - Additional guidance for advanced metering systems may be found in chapter 72-3 of the IHS Technical Handbook.
 - (5) Energy Consuming Products - Specify Energy Star or FEMP designated products when available.

5.5.3 Protect and Conserve Water

- (1) Indoor Water - Design to achieve 20% reduction, relative to the EPA 1992 standard (see LEED WE Prerequisite 1).
 Investigate feasibility to earn LEED WE Credit 3 – Water Use Reduction (30% - 2 points, 35% - 3 points, 40% - 4 points).
- (2) Outdoor Water - Design to earn *LEED WE Credit 1 – Water Efficient Landscaping (4 points – 100% Reduction)*.

5.5.4 Enhanced Indoor Environmental Quality

- (1) Ventilation Control. Design to meet or exceed the minimum ventilation requirements identified in ASHRAE 62.1-2004 for applicable building occupancies.
- (2) Thermal Control. Design to earn *LEED IEQ Credit 7.1 – Thermal Comfort: Design*.
- (3) Moisture Control. Implement a moisture control strategy within the design to control moisture flows (rain penetration and groundwater entry) and condensation to prevent building damage and mold contamination.
- (4) Daylighting
 - Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks.
 - Provide automatic dimming controls or accessible manual lighting controls, and daylight glare controls.
- (5) Low-Emitting Materials
 - Specify all adhesives and sealants to meet the requirements of *LEED IEQ Credit 4.1 – Low-Emitting Materials: Adhesives & Sealants*.
 - Specify all interior paints and coatings to meet the requirements of *LEED IEQ Credit 4.2 – Low-Emitting Materials: Paints & Coatings*.
 - Specify all carpet systems to meet the requirements of *LEED IEQ Credit 4.3 – Low-Emitting Materials: Carpet Systems*.
 - Specify furnishings with low pollutant emissions.
- (6) Protect Indoor Air Quality During Construction

- Design to earn *LEED IEQ Credits 3.1 and 3.2 – Construction Indoor Air Quality Management Plan (3.1: During Construction, 3.2: Before Occupancy)*.

5.5.5 Reduced Environmental Impact of Materials

(1) Recycled Content

- For EPA designated products, specify products that meet or exceed EPA recycled content recommendations. EPA designated products may be found in the EPA Comprehensive Procurement Guidelines.
- Design to earn *LEED MR Credit 4.1 – Recycled Content 10% (post-consumer + ½ pre-consumer)*.

(2) Biobased Content

- For USDA designated products, specify products with the highest content level per USDA's biobased content recommendations.

For other products, specify biobased products made from rapidly renewable resources and certified sustainable wood products.

If these designated products meet performance requirements and are available at a reasonable cost, a preference for purchasing them shall be included in all solicitations relevant to construction in the building. USDA's biobased product designations and biobased content recommendations are available on USDA's BioPreferred web site at <www.usda.gov/biopreferred>.

- Design to earn *LEED MR Credit 4 – Recycled Content (1 point: 10%)*.
- Design to earn *LEED MR Credit 7 – Certified Wood*.

(3) Construction Waste

- Design to earn *LEED MR Credit 2 – Construction Waste Management: (1 point: Divert 50% from Disposal)*.

(4) Ozone-Depleting Compounds

- Specify no refrigerants containing CFCs.
- Design to earn *LEED EA Credit 4 – Enhanced Refrigerant Management*.

Box 5a - Sustainability References

Requirements of this section are based upon the following documents:

- 1 Energy Policy Act of 2005
- 2 Federal Leadership on High Performance and Sustainable Buildings Memorandum of Understanding with various signature dates in 2006
- 3 HHS Policy for Sustainable and High Performance Buildings dated September 8, 2006
- 4 Energy Conservation Standards for New Federal Commercial and Multi-Family High-Rise Residential Buildings and New Federal Low-Rise residential Buildings (Interim Final Rule on Amendments to 10 CFR Parts 433, 434, and 435) dated December 4, 2006
- 5 Executive Order 13423 – Strengthening Federal Environmental, Energy, and Transportation Management dated January 26, 2007
- 6 EISA 2007, Energy Independence and Security Act of 2007
- 7 Executive Order 13514 - Federal Leadership in Environmental, Energy and Economic Performance

5.5.6 Renewable Energy

- (1) Evaluate the feasibility of constructing an on-site renewable energy system capable of providing 7.5% of the annual electrical load. The A/E scope of work shall include an available budget for on-site renewable energy systems. Feasibility shall be based upon this available budget and life-cycle costs. Incorporate the largest capacity feasible on-site renewable energy systems into the design.
- (2) Evaluate the feasibility of constructing a solar hot water heating system capable of delivering 30% of the hot water demand. Feasibility shall be based upon this available budget and life-cycle costs. Incorporate the largest capacity feasible solar hot water heating systems into the design.

5.5.7 Fossil Fuel Reduction

Design so that the fossil fuel-generated energy consumption is reduced by 55%, as compared with such energy consumption by a similar building in fiscal year 2003 (as measured by the Commercial Buildings Energy Consumption Survey [CBECS] or, for residential projects, the Residential Energy Consumption Survey data from the Energy Information Agency).

6 Pre-Design Submittal

6.1 Purpose

This phase includes the review and evaluation of all of the project planning and development leading to the concepts phase.

6.2 Requirements

6.2.1 Program Verification

Review and compare the PJD, POR, SSER, SOW, sustainability requirements, contract, and environmental criteria, provided with the contract document by the CO. Summarize the review in a written report, and list all questions and unresolved issues.

6.2.2 Site Analysis

Prepare a rough sketch to show the character of the site and the surrounding area. The sketch shall show all observations, site conditions, and environmental issues that will affect the project development.

As part of the pre-design site analysis, provide information on the existing potable water and wastewater collection and treatment systems at the proposed site including locations and narrative review of potential project impacts from the available capacity serving the site.

Provide following information as minimum:

- (1) Potable water & fire water systems.
 - Existing Pipe size and piping material.
 - Available existing water flow and water pressure.

- Available existing Fire water flow.
- (2) Sanitary sewer system
 - Existing pipe size.
 - Anticipated total sanitary sewer flow.
 - Capacity of existing piping and treatment for the anticipated additional flow.
 - (3) New facility
 - Sewer system clean out requirement
 - Describe sewer system slope requirement

6.2.3 Geotechnical Study

Review the preliminary geotechnical investigation report provided by the government to prepare the initial recommendations on potential foundation systems.

The final selection of building foundation system shall be based on the detailed geotechnical investigation performed by the A/E.

6.2.4 Pre-Design Survey Report

Review and document existing conditions to establish the basis for work during the design stages. Report all findings regarding the conditions of the existing structures or systems in a format that can be reproduced readily.

6.2.5 Record Drawings

Obtain and verify available Record Drawings or other drawings of existing structures related to the anticipated design effort.

- (1) Investigate and document the condition of existing structures during the field survey. Review available environmental survey documents including asbestos inspections, lead paint and hazardous materials surveys.
- (2) Provide summary of any observed discrepancies from record drawings and include photographs if needed.

6.2.6 Results

Provide pre-design submittal results in a bound booklet with a tab for each of the sections.

Refer to Appendix 1 for submission checklist.

Box 6a - Topographic Survey

Prepare the site analysis using the site survey and a local land map, city map, county map, and/or United States Geological Survey map, as required. Show general topographic survey information such as boundaries, grades, roads, walks, water features, structures, tree masses, major utility lines, including electrical, communications, data and cable TV, and property lines.

Prepare additional sketches or overlays, at a scale of 1:200 or smaller, to show conditions outside the survey area that will affect or be affected by the project development.

7 Concepts Submittal

7.1 Purpose

The purpose of concepts is to investigate alternative organizations and building massing arrangements. The building concepts are to show the most desirable general organization of the project, both internally and on the site.

7.2 Requirements

The A/E shall perform the following:

- (1) Conduct work sessions with IHS and the client staff to develop a level of understanding of the site, the program, sustainability requirements, and departmental concerns among the A/E, the client agencies, and DES. During the work sessions, note the client agencies concerns, discuss the interdepartmental relationships, and review the site constraints, PJD and POR. The overall facility should be sensitive to and reflect the tribal culture.
- (2) Conduct a sustainable design charette, identifying project specific goals in compliance with sustainability requirements.
- (3) Evaluate the feasibility of constructing an on-site renewable energy system capable of providing 7.5% of the annual electrical load. Provide a written feasibility analysis including recommendations for implementation.
- (4) Evaluate the feasibility of constructing a solar hot water heating system capable of delivering 30% of the hot water demand. Provide a written feasibility analysis including recommendations for implementation.
- (5) Examine alternative schemes for site layouts. The alternatives should include major site features such as site contour layouts, buildings, building entrances, recreational areas, yards, walks, drives, loading dock, emergency drop-off, emergency entrance, fuel storage tanks, staff and visitor parking, etc. Unless directed otherwise, develop three schemes.
- (6) Incorporate conceptual design activities with the site planning. Examine the facility building plan and massing arrangement alternatives. Space planning shall be done at departmental level. Identify alternatives for foundation, structural,

Box 7a - NEPA

The National Environmental Policy Act (NEPA) requires all government agencies to obtain environmental clearance prior to beginning a project. The IHS Area Office typically performs this function during the planning phase of a project. If conditions permit, a categorical exclusion is sufficient clearance.

Where additional clearance is required, IHS provides an Environmental Assessment (EA) and/or an Environmental Impact Statement (EIS). The A/E is responsible for compliance with all environmental laws relating to the site, and shall obtain all clearance documents early in the design process in order to meet all requirements, and to be aware of any sensitive environmental issues.

NEPA requires clearance in the following areas: Wetlands/Water Resources (Corps of Engineers Section 404 Permit), Floodplains Executive Order 11988, Endangered Species Act of 1973 as amended, Historic Preservation Act of 1966 (with related acts and executive orders), Wild and Scenic Rivers Act, Coastal Zone Management Act, Wilderness Act, Farmland Protection Act, Safe Drinking Water Act, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

and mechanical systems and their impact on architectural features. Show alternatives for foundations, framing, and building system distribution spaces in simple wall and building sections.

- (7) Provide a topographic survey of the existing project site in such detail as necessary to be used for the analysis of site layout including, but not limited to: property boundaries, site boundaries, topographic features (surface contours and spot elevations for surface features), observed drainage features, existing infrastructure (potable and fire water, sanitary and storm sewer, natural gas, etc.), protected areas, easements, right-of-ways, and any other information affecting the use of the site for the desired development.

Show the locations of boring logs, test wells, and/or percolation test pits.

Identify sanitary sewer tie-in connection point, and coordinate with local utility company.

Identify natural gas tie-in connection point, and coordinate with local utility company.

Show location of existing utility services including electrical, communications, data and any cable TV, prospective connection methods, and access routes.

- (8) Verify and document local utility system capacity for domestic water, sanitary sewer, and natural gas.

Verify domestic water demands and calculate fire flow for the facility incorporating input from all relevant disciplines. If sufficient capacity is not available, provide design concepts for additional requirements to address predicted demands.

Provide documentation from each utility verifying capacity in current system to handle additional demand from the proposed interconnection. Where capacity upgrades are needed, provide status report between interested stakeholders.

- (9) Provide the results of a geotechnical survey of the site, including information required to analyze the site and provide a basis for design of the building foundation systems, retaining walls, slope stabilization requirements, stormwater detention ponds, roads and walks.

- (10) Develop three schemes. Present at least three well developed plans and alternative concepts with distinct alternative general plan features, one for each site layout.

Provide supporting alternative sub concepts for framing, vertical development, mechanical systems, and electrical systems.

Provide preliminary cost data, including operation and maintenance cost implications for each alternative presented. Concepts shall include at least one single-story, and one multi-story plan when practical.

Provide the following for all schemes:

- (a) Interdepartmental proximity diagrams (“scaled blocks”)
- (b) Functional diagrams
- (c) Locations and types of building access

(d) Building massing drawings

(e) Other drawings as directed

(f) Space comparison reports

(g) Cost estimates

(h) Life safety code analysis

- (11) Provide a summary report on the sustainable design charrette, together with a sustainable design status report that addresses all schemes.

- (12) Provide a brief written analysis of all planning and systems concepts and recommend a general overall approach to the next phase, schematic design. Carefully consider consequences for all major building service systems.

- (13) Incorporate comments from the concepts review and provide a record drawing of the final site layout and building organization and massing plan as a separate submittal.

- (14) Refer to appendix 1 for submission checklist.

8 Schematic Design Submittal

8.1 Purpose

The purpose of the schematic design is to establish the size, shape, general construction, framing system and building envelope, site configuration including access roads, driveways, walkways, utilities, drainage, general mechanical and electrical systems, and room-by-room layout. This submittal represents approximately 10 percent of the design phase.

8.2 Requirements

The A/E shall perform the following:

- (1) Integrate all preceding design efforts and all design-related special studies.
- (2) Conduct work sessions with IHS and the client staff to review the type of spaces, interdepartmental relationships, and circulation within the departments developed in the concepts phase.
- (3) Refine the approved conceptual design. Establish the preferred building scheme, integrating a workable structure. Develop the floor plan to include all rooms listed in the POR including non-template spaces. Define all general assemblies, materials, and floor plans to show all walls with double lines. Show general building dimensions (horizontal and vertical).
- (4) Verify capacity of scheme to accommodate all supporting systems and equipment. Establish general concepts of type, location, and distribution of mechanical and electrical systems.
- (5) Develop the site plan sufficient to demonstrate layout and functionality of all critical systems, including (proposed and existing) underground utilities, site drainage, onsite stormwater detention, access roadways, parking lots, storage tanks, overhead or underground power configuration, significant site grading modifications, and retaining walls. Site plans shall contain sufficient detail to convey the proposed design intent. Include an evaluation of the anticipated traffic issues, sufficient to recommend whether a traffic study will be necessary.

(6) Provide the following:

- (a) Design intent / basis of design documentation including written narrative of the design thought process including details regarding the building envelope.
- (b) Provide the completed geotechnical report and the basis for design of the building foundation systems, retaining walls, slope stabilization requirements, stormwater detention ponds, roads, underground utilities, and other site improvements.
- (c) Updated sustainable design status report including baseline energy consumption and renewable energy system information.
- (d) Outline for the technical specification
- (e) Updated space comparison report
- (f) Updated life safety code analysis
- (g) Updated cost estimate
- (h) Preliminary calculations for civil, structural, mechanical, and electrical systems
- (i) Refer to appendix 1 for submission checklist.

8.2.1 Drawings

- (1) Note the name or function, space identification number, and the net area in each individual room or space.
- (2) Verify that adequate space has been provided for mechanical equipment, IT systems, data/telecom, janitors closets, and electrical equipment on floor plans.
- (3) Verify that each space in the POR space schedule and POR functional diagram are shown on the drawings.
- (4) Coordinated with the space comparison report, provide POR space floor plans that graphically highlight all POR spaces at the departmental level showing actual space, POR space, and percent deviation for each department. All spaces shall be accounted for on the plan, including building circulation & envelope, major mechanical, and non-POR spaces.

Box 8a - Program and Space Accounting

Program and space allocations authorized in the POR are closely scrutinized. Deviations require significant review and approval. Generally, additional project dollars are not available and modifications will need to be reconciled within the approved project budget.

The overall building gross space is fixed and cannot be increased without a POR amendment.

Individual and departmental spaces can deviate from the listed POR allocation by +/- 10% to accommodate actual program services defined during design and to make accommodations for building configuration without any overall increase to the building gross.

- (5) Show significant life safety features, including all smoke and fire-rated walls in a life safety plan
- (6) Show all anticipated furnishings and medical equipment in a layout plan.
- (7) Show entrances, circulation areas, stairs, elevators, mechanical equipment space, electrical equipment, toilet rooms, stacks, and wire closets.
- (8) Show typical window arrangement and exterior materials.
- (9) Show all required smoke and/or fire partitions on the floor plans.
- (10) Designate the floor that is approximately on the same level as the main entrance as the “first floor.” If the site slopes downward from the main entrance area, and one or more secondary entrances are below the first floor, designate that level the “ground floor.” Floors below grade are to be designated as “basements.”
- (11) Indicate planned or possible future building expansions by dotted outlines on the plans and elevations. They shall be noted with the words “future expansion.”
- (12) The schematic drawings should indicate space for all major mechanical requirements including space for the maintenance and operation of the equipment.
- (13) Indicate location of major equipment and required maintenance space per NEC including Switchgear, Panels, Transformers, Generator, ATS, Communication panel, Data/LAN servers
- (14) Provide plans, elevations, and building sections at 1:100 minimum. Provide typical wall sections at a larger scale.
- (15) Provide a site plan, floor plans, a roof plan, elevations, and longitudinal and transverse sections.
- (16) Provide sections through the building in both the longitudinal and transverse direction. All major rooms are to be shown and labeled (abbreviated if necessary), with floor-to-floor dimensions noted.
- (17) Provide one-line electrical diagram (block diagram will not be accepted) including all three-phase equipment, 3-pole OCPD size, conduit/wire size, and metering device (Voltmeter, ammeter, Watt-hour meter).
- (18) Provide primary side of the main transformer wiring detail, if transformer supplied by local utility, including concrete pad size.

8.2.2 Other Documents

8.2.2.1 Architectural

- (1) Provide life safety code analysis.
- (2) Medical equipment summary. Provide a room by room tabular list of all anticipated group I, II, III, and special purpose equipment, as projected in the HSP, including estimated cost by item. This initial equipment listing will be the basis of developing detailed equipment lists with users during design development.
- (3) Provide a security system drawing based on the specific security assessment in the IHS-PJD/POR document. Minimum requirements for the security drawing:
 - (a) Electronic Lock on the doors on all Exit doors, all Pharmacy area doors, and all medical records storage doors etc.
 - (b) Card reader as on all IT-rooms doors
 - (c) Camera - Interior locations such as Waiting areas, Pharmacy areas etc.
 - (d) Camera - Exterior locations such as all entrance doors and government vehicle parking areas.

For device locations where specific equipment is not known anticipate a junction box, empty conduit and pull string for future use.

8.2.2.2 Civil

- (1) Provide a basis for design of all underground piping. In addition to proposed horizontal

layouts on the site plan, provide preliminary calculations for sizing these pipes. Include preliminary placement of main potable water valves, water meters, fire protection system water flow requirements, existing water supply (utility) system information, integrated cross-connection control plan (in consultation with mechanical sub-consultants and CxA), hydrants, manholes, cleanouts, and other appurtenances. Also, cite all Standards and codes used as a basis for your design, and include critical details regarding the systems (i.e. gravity versus pressurized sewer, ductile iron versus PVC water main, etc.).

- (2) Show preliminary layouts for all proposed walkways, and driveways.
- (3) Provide a preliminary stormwater analysis, including a narrative regarding erosion control and permitting requirements. In the narrative include a summary of probable best management practices for implementing a stormwater pollution prevention plan during construction. Provide an estimate of pre-development runoff (including peak flow rate and volume) for a 2-year 24-hour storm event. Also estimate post-development runoff based on predictable imperviousness, anticipated stormwater collection/treatment systems, and discharge mechanisms.

Provide a design that ensures that the post-development runoff for a 2-year 24-hour storm event results in no net increase in stormwater flow as compared to pre-development. Properly size stormwater piping and appurtenances consistent with local AHJ requirements, or as local site conditions require.

Identify the agencies which have jurisdiction over the NPDES permit, and the individuals who will take responsibility to apply for, and comply with the permit.

- (4) Submit a traffic code analysis narrative. Identify local codes and regulations, which may impact the layout and configuration of all site access roads. Include correspondence with tribal, city, county, or state authorities, to validate your analysis.
- (5) Identify special site features, which merit additional studies. These include, but are not limited to loading docks, retaining walls, bridges, ground-source heat pump wells, special drainage structures, etc.

Provide a narrative, which identifies design standards to be used as a basis for these features. Where appropriate, include relevant data from the geotechnical report to identify issues of concern.

- (6) Potable and fire water piping distribution systems

Provide hydraulic model output of proposed water distribution system during normal conditions and during fire event.

Indicate size of required site piping (valves, air release valves, fire hydrants, etc.).

Provide all calculations and assumptions for potable water storage tank requirements, onsite chlorination, or other special systems.

- (7) Sanitary sewer collection systems

Provide hydraulic model output for proposed collection system during peak flows to show that proposed collection system will function as designed with no overflows or surcharged conditions.

Determine size and location lift stations that will be required to handle anticipated sewage flows and indicate sanitary sewer collection system pipe sizes, slopes for pipe sizes, manhole sizes, depths, etc.

8.2.2.3 Structural

- (1) Provide a description and economic comparison of

Box 8b - Project Budget, Space, and Program Reconciliation

The schematic design phase concludes with a detailed review of the project design for conformance with the program and space allocations authorized in the POR.

To ensure that the estimated project cost remains closely coordinated with anticipated construction funding as the design moves forward, the project design, scope, proposed value engineering initiatives, including sustainability features, will all be considered to reconcile the estimated project cost with the project budget.

From this review specific direction will be provided to the A/E identifying issues that will be incorporated or modified into the subsequent phases of design.

Generally, additional project dollars are not available.

Program deviations will be closely scrutinized and will require an amendment to the POR.

foundation systems based on recommendations in the geotechnical report. Description shall include a summary of advantages and disadvantages of each system.

- (2) Provide an economic comparison of at least three structural framing systems for each area of the building that has distinct framing requirements. Comparison shall consider requirements for use, occupancy and fire protection requirements.

8.2.2.4 Mechanical

- (1) Submit an economic analysis of at least three HVAC mechanical systems. At least one alternative shall utilize renewable technology, e.g., ground source heat pump system, etc.

Provide narrative of each HVAC mechanical system including diagram/sketches, required equipment, piping, controls, and cost estimates of each system (lump-sum will be allowed). Include performance of the building envelope insulation.

Discuss the pros and cons of each system including system contribution in meeting required building energy reduction goals.

Provide justification and analysis of the mechanical system selected compared to other systems.

Evaluate comparative costs and include recommendations for fuels for heating. Include an economic analysis for a snow-melting system if required.

The economic analysis shall be performed for measuring Life Cycle Cost of the building system in accordance with applicable codes and standards (such as ASTM E917)

The analysis shall be approved and the type of system selected before the design development stage.

- (2) Provide a psychrometric analysis for air handling systems. See appendix 4 for an example.

8.2.2.5 Electrical

- (1) Provide an early building electrical load analysis based on watt/m² basis for each category of load such as lighting, receptacles, miscellaneous equipment, and HVAC equipment. Provide copy of design analysis with support document or identify per NEC article.
- (2) Provide lightning protection requirement

calculation in accordance with NFPA 780.

8.3 Value Engineering Study

The A/E shall facilitate the timely completion of the VE study by providing all requisite design documents to the independent VE firm. As part of the schematic design submittal, the A/E shall include a narrative as to the status of the pending VE Study, shall include VE activities in the design schedules, and shall inform IHS of any developments.

9 Design Development Submittal

9.1 Purpose

The purpose of the Design Development (DD) submittal is to describe the size and character of the project in detail from the owner's point of view and confirm that all engineering requirements can be accommodated in the final design. This submittal constitutes approximately 35 percent of the design phase.

9.2 Requirements

The A/E shall perform the following services:

- (1) Integrate all preceding design efforts and all design-related special studies.
- (2) Begin to integrate commissioning requirements into the design.
- (3) Refine the approved schematic design documents. All interior and exterior systems and materials that the medical staff and patients will use, encounter, see, hear, or are dependent upon for their safety, must be identified.
- (4) Conduct work sessions with DES and the client staff. Specifically,
 - (a) Meet with the client staff to develop detailed locations and connections for all related Group I and Group II equipment, telephone equipment, computers, printers, copiers/fax machines. Determine the layout of cabinet elevations (doors, drawers, heights, shelves, etc.), function of door hardware, finishes, location of power and communication requirements, location and type of lighting, refine room and departmental circulation, etc.

Identify potential locations and quantities of voice/data outlets throughout the facility. Discuss the possibility of digital health care delivery and medical records, radiology, pharmacy, and dental departments.
 - (b) Confer with appropriate client staff to develop keying and room numbering strategies.
 - (c) Meet with designated representatives for final approval of each area or department before completing the DD submittal.
- (5) Implement the design development with accepted value engineering proposals and sustainability requirements.
- (6) Provide all design specialty services needed for a complete facility design including radiation shielding, dietary, trash disposal, medical gas storage and dispensing, including dental, and all storage and internal transportation devices.
- (7) Provide the following:
 - (a) Updated space comparison report
 - (b) Updated cost estimate
 - (c) Updated sustainable design status report including a tabulation of all LEED credits being pursued, likelihood of earning each credit, calculations using USGBC templates (if applicable), narrative for each credit including latest updated information, and a calculation of cost premiums associated with each credit being pursued. The report shall also include a feasibility analysis for solar water heating (as stipulated by EISA 2007), and an updated feasibility analysis of the renewable energy options.
 - (d) Updated medical equipment summary
 - (e) Updated design intent / basis of design documentation
 - (f) Updated calculations
 - (g) Commissioning plan including items similar to those indicated in the Sample Table of Contents contained in Informative Annex G of ASHRAE Guideline 0.
 - (h) Narrative summary of VE changes implemented in the design
 - (i) Project outline specifications, including division 0 and 1, in developmental draft form.
 - (j) Projected energy usage report with calculations
 - (k) Refer to appendix 1 for submission checklist.

9.2.1 Drawings

9.2.1.1 Architectural

Provide general and detailed floor plans, exterior elevations, and major building sections at 1:100.

Provide all major types of wall sections at a larger scale. Revise architectural floor plans and interior elevations at 1:50.

- (1) Areas of potential future expansion shall be indicated by dotted outlines on the plans and elevations, and marked with the words “future expansion.”
- (2) Floor plans. Floor plans shall have the following note: “BASED ON PROGRAM OF REQUIREMENTS DATED _____ AND ON SCHEMATIC DRAWINGS APPROVED _____.” Floor plans shall indicate wall thicknesses, door swings, and door sizes.
- (3) Each room or space shall be identified by name (abbreviated when necessary) and number.
- (4) Materials of all partitions shall be indicated by either symbol or note to agree with those materials described in the supporting data.
- (5) Floor plans shall include section lines showing locations of longitudinal and transverse sections.
- (6) Precisely locate and size vertical structural members and rough size horizontal members to assure there are no conflicts with other systems.
- (7) Show all anticipated furnishings and medical equipment in a layout plan. Utilize as a background base for mechanical and electrical coordination, including room names and numbers.
- (8) Show all required smoke and/or fire partitions on the floor plans.
- (9) Show significant life safety features, including all smoke and fire-rated walls in a life safety plan. This plan will be developed to facilitate fire egress placards and assist with Joint Commission surveys.
- (10) Elevations. Provide elevations with the major features and materials noted directly on the elevations. This shall be in generalities such as brick, stone, granite, architectural cast concrete, bronze, aluminum, etc. Terminology and materials must agree with the supporting data submitted.
- (11) Longitudinal and Transverse Sections. Provide at least one longitudinal and one transverse section through the major portions of the building. All major rooms exposed by the section shall be shown and identified by name. Complete floor-to-floor

dimensions from the lowest floor to the roof shall be given. Ceiling heights throughout the building shall be indicated.

- (12) Wall Sections. Provide one wall section cut on a line through windows and another on a line through the wall proper. A partial elevation and plan section shall be on the same sheet at the same scale. This is required for all substantial variations in wall design. The purpose of these sections is to delineate the fundamental concepts of the proposed exterior wall design.
- (13) Design of special areas. Provide preliminary design sketches, including 1:50 scale plans, interior elevations, reflected ceiling plans of lobbies, auditoriums, kitchens, laboratories, and other areas which are to be given special architectural treatment. Floor plans at 1:50 scale shall be started during this phase. They shall show casework and equipment layouts.

9.2.1.2 Civil

Site Plan and Civil Engineering Elements: Provide a well-articulated site plan showing the location and size of the facility and facility-support systems. The following note shall appear on the site plan: “BASED ON TOPOGRAPHIC SURVEY DATED _____.” The following shall be submitted as supplemental to the site plan:

- (1) Site and Grading Plans. These plans must show the entire site, and must establish the grading and project limits. Also include surface features, which will be removed, or existing buildings to be demolished.
- (2) Roadways and Parking Lots. All proposed access roads and parking lots shall be shown in plan view. Layouts for all curbs will also be required.
- (3) Site Drainage. Include all proposed site drainage features. This shall include: drainage paths, surface drains, storm drain manholes, roof and foundation drains, storm sewer layouts, on-site detention, and discharge.
- (4) Water/Sewer. Show all proposed water and sewer utilities; provide this information in plan view, and profile views where site conditions merit such detail.
- (5) Other Utilities. All other site utilities shall be included in the site plan. These utilities shall be shown with sufficient detail to confirm appropriate

layout and configuration in relation to other site features. Examples of other utilities include: underground gas lines, steam lines, hot/chilled water, underground electric, TV, telephone, T1, etc. Refer to the appropriate specialty section for additional requirements.

9.2.1.3 Structural

- (1) Drawings shall include general structural notes, design criteria, foundation plan, floor and roof framing plans, and typical sections. Schedules and typical details should also be included.

Drawings grouped as follows:

- General structural notes
 - Abbreviations
 - Plan view - Foundation plan, floor and roof structural plans with coordination of all mechanical equipment, duct, piping, and roof opening plans
 - Elevations
- (2) Identify sizes, weights and locations of mechanical, electrical, and other equipment, which will be supported by the structure.

9.2.1.4 Mechanical

- (1) Plumbing. Show location and size of existing utilities and service connections to building(s), the arrangement of all major equipment, and the plumbing layout of typical toilet rooms including drainage and venting systems. Provide schematic diagrams that show completed drainage, venting, and water systems. Include process services, if any.
- (2) Heating. Provide the preliminary layout and description of outside distribution systems from central plant, if utilized. Include the location and size of any existing mains and building connections, and the location and arrangement of all major heating equipment.
- (3) Complete single-line piping diagrams of all heating systems and equipment for the entire building. Diagrams shall include air conditioning and heating coils, perimeter heating systems, and special heating for stairways, lobbies, entrances, garages, etc.
- (4) Indicate the number of control points for major equipment to be included in the DDC system such as boiler, pumps (heating system and domestic

water system), booster pump, etc.

- (5) Complete equipment and piping diagram with heat balance calculations for process hot water system and steam generating system operating over 275 kPa.
- (6) Air Conditioning - Particular attention should be given to insure that the layouts suit the modular space arrangement for the building (Provide the following information).
 - (a) Location and arrangement of all major equipment
 - (b) Single-line layout of ventilating and air conditioning ductwork to indicate number of zones, type of system (i.e., high or low pressure, multi-zone, etc.) and extent of each system. Elevator machine room ventilation shall be included.
 - (c) Sequence of operation and schematic temperature control diagrams.
 - (d) Air outlet location for typical areas.
 - (e) Location of cooling tower including a method for screening from view.

9.2.1.5 Electrical

- (1) Plans shall show space assignment, size and outline of any new, existing or planned future fixed major electrical equipment, including service entrance, transformers, main switchgear, generators, fuel oil or gas tanks, transfer switches, branch panels, FACP, etc., in support of the basic distribution.
- (2) Provide lighting layout plan for all areas, including interior, exterior, and parking. Show all emergency and exit lighting. Include preliminary lighting fixture schedule.
- (3) Provide electrical plan with location of all medical equipment that required electrical connection. Provide equipment list in tabular form with voltage, phase and ampacity requirements.
- (4) Where the occupancy is required by code or criteria to have fire detection and alarm system devices, provide a preliminary layout plan. Provide the location of all fire/smoke damper motor location
- (5) Provide preliminary one-line power distribution diagram with major equipment such as utility's transformer, MDP, surge protector devices, generator and all ATS and panel boards.

- (6) Identify and show location and space for of any proposed telephone and LAN/ fileserver equipment, including switch location and any racks and/or backboards.
- (7) Show general receptacle layout including any proposed special receptacles such as hospital grade, GFCI, etc. All general receptacles must be 20 amp 125 volt unless the special equipment it serves requires higher capacity.
- (8) Show location and size of existing electric/power lines and service connections into the building.
- (9) Electrical and telecom/data support spaces shall be accounted for within the 12% space allowance for major mechanical space as detailed in the POR.
 - Electrical distribution room spaces should show access spaces in front of all electrical equipment accordance with NEC (front and top). Provide large scale electrical room drawing and identified required space for all electrical equipment (Panel, transformer, ATS, MCC, switchgear etc.).
 - Telecom/data distribution rooms shall be sized per TIA/EIA standard 569B considering additional space for housing telecom/data equipment.
- (10) Provide detail Lighting Plan including different type of light fixtures schedule, and emergency “EXIT” fixtures location.

9.2.2 Other Documents

9.2.2.1 Architectural

- (1) Perspective Sketch. Provide perspective sketches (minimum of three external views) showing the desired appearance of the building in its surrounding environment.

9.2.2.2 Civil

- (1) Provide preliminary design parameters for paving systems, including subgrade preparation, subbase materials and thickness, paving materials, drainage systems, thickness of pavement, etc. In the analysis, include walkways as well as driveways, loading docks and parking areas.
- (2) Provide a comprehensive stormwater analysis, including a narrative regarding erosion control and permitting requirements. Establish pre-development and postdevelopment conditions in terms of site runoff for a design storm, as required

under an NPDES permit. Also, provide a schedule designating permit activities, time frames, and individuals responsible for each event. For catch basins and storm sewer designs, provide calculations sufficient to justify pipe diameters based on a 10-year storm, or according to local code, whichever is more stringent. Include a narrative regarding Best Management Practices (BMPs) considered for the design, and state the feasibility of each BMP chosen. For stormwater detention ponds, provide sizing calculations to justify design numbers, and include relevant data from the geotechnical evaluation. In the submitted narrative, include a discussion on the Stormwater Pollution Prevention Plan (SWPPP), and identify probable BMPs for controlling erosion during construction.

- (3) Expand on the traffic code analysis from the schematic submittal by providing calculations to identify critical traffic control elements, and confirm proper sizing of all traffic corridors and placement of signage.

9.2.2.3 Structural

- (1) Narrative discussing basis of design; explanation of framing system used, lateral force resisting system, and load paths.
- (2) Calculations shall identify live and dead loads, and computations of loads on the building system. Calculations for major structural elements preliminary sizes should also be included.

9.2.2.4 Mechanical

- (1) If the health care facility requires rooms to have specific pressurization relationships or airflow requirements, then provide a listing of all rooms and indication of the airflow direction in or out of the rooms.
- (2) Develop a list of rooms, used for clinical purposes, and provide the total air changes per hour and pressurization relationships for these rooms.
- (3) Heating. Provide design narratives including design temperature (indoor and outdoor) per ASHRAE fundamental book, total outdoor-air requirements, heating load calculation for each room, including walls, roof, windows, and infiltration load, and the total heating load, including outdoor-air ventilation load, for entire buildings. Narratives shall also address the domestic water heating load and also the summer/winter process heating, such as kitchen

and other equipment, load for the boiler. Refer to FGI/AIA Guidelines and ASHRAE Standard 62.1 and ASHRAE Standard 62.2 for outdoor air recommendations.

- (4) **Air Conditioning.** Provide design narratives including design temperature (indoor and outdoor) per ASHRAE fundamental book, total outdoor-air requirements, air-conditioning load calculation for each room, including walls, roof, windows, and infiltration load, and the total air-conditioning load, including outdoor-air ventilation load, for entire building for the peak time of day. Refer to FGI/AIA Guidelines and ASHRAE Standard 62.1 and ASHRAE Standard 62.2 for outdoor air recommendations.
- (5) Provide an economic analysis to show comparative costs and recommendations for refrigeration plant. An economic justification should be provided if a high-velocity duct distribution system is proposed.
- (6) Provide preliminary calculations for determining sizes and types of plumbing, HVAC equipment, process equipment, and systems.

9.2.2.5 Electrical

- (1) Provide a general description of the electrical service including proposed voltage and phase, service feed, primary or secondary, and service type (overhead or lateral).
- (2) Provide a description of general interior and exterior lighting systems, indicating types of lighting intensities. Submit catalogue cuts for each major type of fixture proposed.

- (3) Provide a list of medical equipment required for the project that requires electrical connection. Show proposed voltage, phase and ampacity.
- (4) Provide calculations to establish the sizing of major electrical components and equipment.
- (5) Provide building electrical load calculations including lighting, medical equipment, HVAC, receptacles, and other loads in accordance with IEEE, NFPA/NEC. Include specific code reference for specific calculation assumptions.

- (6) Provide a preliminary electrical load analysis for both normal and essential electrical systems, if any. Calculations at this level shall, at least, be based on reasonable unit watt allocations for each category of component load including lighting, receptacle, HVAC, mechanical and fixed medical equipment, alarms, communication/data loads.

For medical facilities, provide an essential electrical system function listing for every room and space as recommended by NFPA 99, Appendix C-3.3.

- (7) Provide lightning protection calculations in accordance with NFPA 780.
- (8) Provide preliminary short circuit analysis. Address electrical system grounding approach and propose a method of installation for this system.
- (9) Provide all proposed electrical schedules, tables, calculation methods, forms, etc. Includes samples such as lighting calculation format, fixture schedule form, panel schedule form, electrical legend, final calculation format, voltage drop calculations format, transformer schedule form, and motor control schedule form.

Box 9a - Use of Copper

The following items shall be of copper material:

- Conductor - phase, neutral and ground
- Motor winding
- Transformer winding
- Panel board bus bars - phase, neutral and ground (may be silver plated on main switchboard)
- Automatic Transfer Switch - phase, neutral, and ground (may be silver plated)
- The building grounding system rod

10 Construction Documents Overview

10.1 Phases

The construction document (CD) drawings and related documents are submitted for review and approval in three phases. Each phase requires a separate submittal package.

- 65 percent construction documents
- 100 percent construction documents
- Final construction documents

10.2 Requirements

The following components are required for each stage of the construction documents:

10.2.1 Overview of Drawings

Each sheet of drawings must show the name, number, and location of the project. Required drawings include:

- cover and index sheets
- site survey and soil borings data.
- site utilities
- site work
- landscaping and planting drawings
- architectural floor and roof plans (a separate plan must be drawn for each floor, basement, mezzanine, and penthouse level.)
- exterior elevations
- longitudinal and transverse building sections
- reflected ceiling plans
- architectural schedules (finish, door, window, etc.)
- exterior and interior details
- life safety plan
- furnishings and medical equipment plan
- structural drawings, schedules, and details
- mechanical drawings, schedules, and details
- electrical drawings, schedules, and details
- additional drawings (e.g., demolition, kitchen equipment, etc.) as warranted by the project

10.2.2 Specific Requirements

- (1) Plans. If floor plans are drawn at 1:100 scale, detailed 1:50 scale plans are required to show spaces that need special architectural treatment.
- (2) Toilets. If floor plans are at 1:100 scale or smaller, additional toilet plans shall be furnished at 1:50 scale to indicate fixture enclosure location and provide other necessary information. Provide toilet room elevations.
- (3) Stairs. Stairs shall be laid out fully at 1:50 scale. All dimensions and necessary enlarged details shall be provided.
- (4) Hazardous Materials. The location of any hazardous material (e.g. asbestos) identified by preliminary inspection shall be noted, with appropriate instructions, on drawings related to any portion of the construction that might disturb the material, unless the material will be removed prior to that phase of construction.
- (5) Cover Sheet and Index. A cover sheet and an index sheet of the same size as the drawings must be provided. The A/E shall provide covers with an DES approved design for the drawings and specifications. All drawings in the 100 percent documents shall be listed by number, title, and in numerical sequence. Titles and numbers listed in the index must be identical to those shown in each title block.
- (6) Topographic Survey. This survey, when required, shall be inserted as the first drawing following the index sheet.

10.2.3 Elevations and Sections

Interior elevations are generally submitted at 1:50 scale.

- (1) The extent of each building material used shall be indicated clearly on the elevations.
- (2) Cutting plane for longitudinal and transverse Sections: A plane shall be chosen which cuts through the most important spaces and reveals the maximum number of different construction conditions. In addition to complete sections, provide other partial sections needed for clarity. The planes through which the longitudinal and transverse sections have been taken shall be

indicated on the related floor plans.

- (3) Exterior details: Provide all details necessary to explain fully the exterior architectural work and how it connects to the structural work. Head, jamb and sill details of exterior door and window openings are required as well as exterior wall sections at openings and between openings. Other necessary architectural features shall also be detailed.
- (4) Wall sections: Complete wall sections of all unique conditions are required. They shall show each type of wall construction from the top member to the lowest floor level, including the footing.
- (5) Anchor details for stone, brick, and other masonry shall be checked for structural adequacy by structural engineers.
- (6) Sections shall be developed to the extent necessary to show roofing and flashing details under all conditions.

10.2.4 Details

Details shall be drawn at a scale sufficient to indicate the desired arrangement of materials. Standard details may be used as an integral part of the drawings; however, they must be tailored to fit the specific project. In case of differences between small and large-scale drawings, the large-scale drawings shall govern.

All details shall be appropriately cross-referenced as well as back-referenced to the plans. When a large scale drawing of a major element is made, it shall be referenced on the floor plans.

Portions of interior plans and elevations may need to be enlarged to 1:20, 1:10, or 1:5 scale to indicate the contract requirements adequately. Window and doorframe details shall be drawn at 1:10 or 1:5 scale.

10.2.5 Ceiling Space Coordination

Provide typical details to show space coordination in ceiling areas, particularly in the corridor area, for maintenance and access of equipment, components, piping, ducts etc. including, but not limited to:

- electrical conduit for lights and power supply
- fire alarm conduit/wiring
- special system - voice/data cable tray, nurse call system cable
- light fixtures

- HVAC system piping - chilled water/Hot water supply and return piping
- HVAC system control valves and accessibility to the valves
- piping - medical air, oxygen, nitrous oxide, dental air, vacuum, domestic hot/cold water, sprinkler system, etc.
- supply and return duct work
- damper and accessibility to the damper

10.2.6 Schedules

Since the construction contract clauses of the specifications state that schedules on drawings shall take precedence over any conflicting notations on the drawings, it is important that schedules be accurately prepared to ensure that the desired finishes and materials are obtained. The following schedules shall be provided:

- interior finish schedule
- interior and exterior color schedule
- door schedule
- window schedule
- equipment schedule, and
- schedules to supplement detail drawings

10.2.7 Materials

A materials legend showing cross hatching examples and corresponding materials shall be provided. On areas of drawings where cross-hatching is needed to indicate materials, only enough area to show the type and extent of the material need be crosshatched. Where cross-hatching is used to indicate the extent or scope of new work, as opposed to existing work, the entire area of the new work shall be crosshatched.

10.2.8 General Notes

General notes for each category of drawings shall be placed on the first sheet of each series, preferably above the title block. These notes should be clear and concise. They may be referred to on other sheets in the same or other series as necessary without repetition. They should complement the drawings and specifications.

Notes shall be directed only to the general contractor. The A/E shall not put any notation or statement on the drawings indicating or designating portions of the work to be done by a specific subcontractor or trade.

10.2.9 Consistency of Nomenclature

In order to guard against conflicts over ambiguous terms and statements, the terms used on drawings and in specifications shall be identical. The A/E shall refer to the POR and design data for proper terms for rooms, spaces or portions of structures.

10.2.10 Coordination of Construction Documents

All construction documents shall be coordinated to ensure coverage and to eliminate contradictions between architectural, civil, structural, mechanical, and electrical drawings and specifications.

10.2.11 Accessibility of Mechanical and Electrical Equipment

The A/E shall ensure that the design is coordinated to provide code required clearance around all machines and equipment for the installation and removal of parts. Door or window openings, removable panels, corridor sizes and locations, and floor or roof load capacities shall be designed so that equipment can be removed without structural changes to the building.

11 CD Submittal 65 Percent

11.1 Purpose

The purpose of the 65% Construction Documents Submittal is to transition the Design Development Submittal into detailed and coordinated plans and specifications sufficient to enter into a contract for construction. The submittal is intended to demonstrate that the plans and specifications are being developed in a manner that is consistent with project requirements, project budget, project schedule, previous submittals, reviews, discussions, and decisions.

11.2 Requirements

The A/E shall integrate all preceding design efforts and all design-related special studies.

The 65 percent construction documents shall be developed in accordance with the approved design development submittal, the approved POR, and the written comments made during the design development review.

Drawings and specifications must define the size, configuration, materials, and complexity of construction, the type and quantity of all medical equipment, and the scope and complexity of all systems. Provide major groups of construction details, schedules and diagrams, and a written report on building construction costs and energy budget status. Identify all systems for which performance specifications are being considered.

Provide the following:

- (1) Updated space comparison report
- (2) Updated cost estimate
- (3) Updated sustainable design status report
- (4) Updated commissioning plan including completed specifications for commissioning coordinated with the construction contract specifications.
- (5) Preliminary Specifications. Specifications shall be prepared by the A/E to substantiate form, arrangement, and procedures for development of all sections.

The preliminary specifications shall include all technical sections prepared with headings that illustrate broad scope contents along with draft non-technical specifications (Division 1 and 0).

Specifications shall be complete, edited for project, and in final format.

- (6) Updated projected energy usage report with calculations.
- (7) Updated medical equipment summary
- (8) Updated design intent / basis of design documentation
- (9) Updated calculations

Refer to appendix 1 for submission checklist.

11.2.1 Drawings

Drawings shall be at final working drawing scale. Each detail, section or elevation shall be identified by a title. All drawings submitted shall be identified by a drawing number, date, and identification of submittal.

Drawings not specifically required to be completed at this stage but are required to prepare a detailed cost estimate, may be submitted in a partially complete state.

If demolition is necessary, provide demolition plans clearly identifying magnitude, scope and phasing of demolition.

11.2.1.1 Architectural

- (1) Floor Plans. A plan of each floor level at 1:100 scale is required. Plans shall be complete, showing materials, dimensions, room names and numbers finishes, ceiling heights, door types, materials and sizes, and any fire retardant walls, partitions and doors. Those areas which are complex and/or require fixed furniture or equipment layout shall be drawn at 1:50 scale.
- (2) Show significant life safety features, including all smoke and fire-rated walls in a life safety plan. This plan will be developed to facilitate fire egress placards and assist with Joint Commission surveys.
- (3) Roof Plans.
 - (a) A complete roof plan, including details of flashings and drains, is required. Roofs shall be sloped at not less than 21 mm per m. Patterns of slope to drains shall be shown on the roof plan. Elevations showing high and low points on the roof shall be included on the drawings.

- (b) Location of all mechanical equipment such as AHU's, exhaust fans, roof drains, roof vents, and condensing unit as shown in the mechanical drawings.
- (4) Elevations and Sections. A complete elevation of each side of the building, at least one complete longitudinal section, and one complete transverse section through the building are required. The elevations and sections shall include notes to indicate materials that are specified.
- (5) Exterior Wall Details.
- (a) A typical wall section for each type of wall construction is required. Wall sections must be complete and show materials, dimensions, structural bonding and anchoring systems, windows, doors, louvers (as shown in the mechanical plan), and flashings.
 - (b) If architectural cast concrete (stone) panels are used, all reinforcing required for a typical panel shall be indicated.
 - (c) Provide 1:5 scale details of all anchors required to secure the exterior facing to the structure, and of the header, jamb, and sill conditions for all openings in exterior walls.
- (6) Interior Details. Interior elevations are required for those spaces that require fixed furniture or equipment, or where elevations are necessary to show the extent of wall material. Elevations shall be drawn at 1:50 scale and shall indicate the design, materials, and major dimensions.
- (a) Partial floor plans at 1:50 scale shall be provided to explain interior elevations or to provide information on equipment layout, floor materials, patterning, etc.
 - (b) Reflected ceiling plans shall show the extent of materials and the coordination of architectural, mechanical, and electrical items.
 - (c) Explanatory sections at 1:20, 1:10, or 1:5 scale should be included where necessary to show the design of an element.
 - (d) The drawings shall show all necessary details for the special areas shown on the DD design. There shall be sufficient detail to allow approval by the agency.
- (7) Elevators, Escalators, Dumbwaiters and Materials Handling Equipment.
- (a) Plans at 1:50 scale of elevators showing floors served, typical floors in blind portions of hoistway, if any, elevator pits, secondary levels, and machine rooms having access. Plans shall include platform size, counterweight space, door space, and clearance dimensions.
 - (b) Sections at 1:50 scale through elevator hoistways, pits, secondary levels, and machine rooms. Show runby dimensions.
 - (c) Details showing elevator hoistway vents when serving four or more floors.
 - (d) Details of trolley beams, trap doors, or other provisions for removal of components of elevator equipment from elevator machine rooms.
 - (e) Details of supports for elevator machine beams. Elevator dead end hitch beams, and escalator trusses, elevator machine and hitch beams shall rest on their support beams rather than frame into the support beams.
 - (f) Elevations of elevator entrances at typical and nontypical floors. Show signal fixtures, elevation of elevator starters, indicator and control panels.
 - (g) Details of special elevator cabs and special hoistway entrances where applicable.
 - (h) Plans and sections showing clearances at 1:50 for escalators, dumbwaiters, adjustable loading ramps, scales, and conveyors.
 - (i) Diagrammatic layout of materials handling systems.
 - (j) Details at appropriate scale of power-operated doors (pedestrian and vehicular), control systems, and space for door operators.
- (8) Schedules. It is crucial that schedules be closely coordinated with the project specifications and that the nomenclature be identical. The following schedules are required and shall be shown on the drawing:
- (a) Interior Finish Schedule. List every material that is exposed in each space, including unfinished walls or undersides of structural slabs. The word "exposed" shall not be used. Instead, use the name of the material. For each space, this schedule shall identify the room

number, room name, substrate, material and finish of floor, base, each wall (i.e., north, east, south, and west), ceiling, ceiling height, and space for remarks.

- (b) Interior and Exterior Color Schedule. Place on the last sheet in the series of schedule sheets. This schedule shall identify the room name, number, material, color, and other pertinent information. Colors, textures, and finishes of specific manufacturers may be used in this schedule or the finish schedule. A note shall be included stating that a manufacturer's name is not intended to limit competition.
- (c) Door Schedule. Include all doors by door number and room number, frame material and detail, door material and elevation, size of door, glazing, other openings and hardware set. The schedule shall refer to detail drawings of jamb and head conditions.
- (d) Window Schedule. Indicate all window sizes, location of operating units, and type of glazing used in each window.

11.2.1.2 Civil

- (1) Site and Grading Plans. These plans must show the entire site, and must establish the grading and project limits. Relevant features on adjacent sites must also be included to establish a basis for assimilating the site (i.e. connecting roads, water/sewer, storm drainage, housing, parks, rivers, lakes, etc.) Where practical, the building on the site plan should be oriented the same as the floor plans so that the entrance faces the same side of the sheet on all plans.
- (2) Roadways and Parking Lots. All proposed access roads and parking lots shall be shown in plan view, and include profiles and section views of all parking areas. Layouts for all curbs will be required, including appropriate details.
- (3) Site Drainage. All proposed site drainage features are required at this submittal. This shall include: finish contours, crowning, drainage paths, area drains, catch basins, storm drain manholes, roof and foundation drains, storm sewer layouts, on-site detention, and discharge.
- (4) Cut and Fill. All finish grading shall be submitted with the drawing set. This shall include: finish contours, existing contours, spot elevations, cut banks, retaining walls, section views, and cut/fill

balancing calculations. If cut and fill cannot be balanced, the site plan shall include information regarding borrow areas, and/or disposal sites.

- (5) Water/Sewer. All proposed underground utilities shall be included with the site plan, and shall be shown both in plan view, as well as in profile. Gravity sewer profiles shall include all rim and invert elevations, as well as pipe slopes.

The site plan shall include all tie-in locations for domestic water, fire water, if separate, and sanitary sewer piping to the utility system piping. Details shall include, but shall not be limited to: manholes, valve boxes, cleanouts, thrust blocks, water/sewer connections, water/sewer crossings, vaults, lift stations, booster pump stations, water storage tanks, building connections, etc.

- (6) Other Utilities. Where applicable, additional site utilities shall be included in the site plan. These utilities shall be shown with sufficient detail to confirm appropriate layout and configuration in relation to other site features. Examples of other utilities include: underground gas lines, steam lines, hot/chilled water, underground electric, TV, telephone, T1, etc. Refer to the appropriate specialty section for additional requirements.
- (7) Demolition and Site Clearing. All existing surface features which will be removed shall be identified on the site plan. The requirements for demolition and removal shall be added for consideration of the review team. Where partial removal of a surface feature applies (i.e. portions of a grove of trees, existing building foundations, existing site utilities, etc.), sufficient detail shall be provided to specify the boundaries for removal, and the conditions for transitioning to new construction.
- (8) Landscaping. The A/E is responsible for providing a landscaping plan coordinated with sustainability requirements.

11.2.1.3 Structural

Provide drawings sufficiently complete to describe the total structural design. Include major sections and connection details.

- (1) General Structural Notes should be mostly complete, identifying all materials and special instructions to the contractor
- (2) Abbreviations and Standard Details should be mostly complete

- (3) Plan Views should show all framing members and columns, and indicate the member sizes.
- (4) Elevations (when required) will show all vertical bracing members, drag struts and connections
- (5) Sections and Details will be referenced from structural plans and elevations, and will be grouped according to the plan view where referenced. Referencing sections and details in Architectural drawings will be avoided.
- (6) Schedules

11.2.1.4 Mechanical

All system details, equipment piping hookup details, piping riser diagrams, controls and equipment schedules shall be shown. In addition to the drawings, calculations and specifications, the following shall be included:

- (1) Heating.
 - (a) Layouts of mechanical room including boilers, chiller, generator, pumps, tanks, AHU's, etc. and other rooms containing maintenance clearances, and main piping.
 - (b) Provide hot water piping and equipment, including boilers, pumps, VAV box reheat coils, AHU coils, etc. on floor plans. Include heating system flow diagrams, riser diagrams, and control diagrams for heating system and major equipment indicating the contemplated design.
 - (c) Layout of underground heat distribution system in details indicating contemplated design.
 - (d) Layout of engine generator sets in details permitting evaluation of contemplated design with regard to fuel, air, exhaust and electrical systems.
- (2) Plumbing
 - (a) Layouts of typical toilet rooms and location of all plumbing equipment in mechanical equipment rooms.
 - (b) Layouts of special spaces such as elevator machine rooms.
 - (c) Typical riser diagrams for water, soil, waste, and vent piping.
 - (d) System and supply piping layout for all standpipe systems and sprinkler systems showing hazards and zoning.
 - (e) Layout of all fuel systems such as propane, natural gas, fuel oils, and/or solid fuels showing locations of storage tanks or other storage areas, all safety and fire precautions.
- (3) Air Conditioning
 - (a) Building air flow system balance diagram, including supply, return and exhaust air flow, and chilled water and hot water systems balance diagram. Provide on the drawing and not in the calculations.
 - (b) Preliminary sequence of operation and automatic temperature control diagram with major control equipment (controller) for boiler, chiller, AHUs, pumps, exhaust fans and connection to monitor the building fire alarm system.
 - (c) Double line ductwork layout including mechanical room, boiler room and typical corridor areas at ductwork crossings.
 - (d) Equipment room layouts developed to the extent of showing clearances for access and showing trolley beams provided for maintenance.
 - (e) Floor plans including chilled water piping with all associated equipment.
- (4) Fire Protection System
 - (a) Includes piping for fire hydrants, fire department connection location, backflow preventer, etc.
 - (b) Provide the following Information on the fire protection plan.
 - Available water pressure
 - Minimum water density per occupancy classification
 - Maximum protection area per sprinkler head
- (f) Layouts of all medical and nonmedical gas and other systems such as: oxygen, nitrous oxide, compressed air, vacuum, nitrogen, etc., and other systems including softened water, deionized water, laboratory water, non-potable water, feed water, ethylene glycol solutions and their feed piping, tanks and other appurtenances as required.

(5) Building Automation System (BAS)

Provide one line diagram which includes the following:

- controller for HVAC equipment, such as AHU, chiller, boiler, VAV box, pumps, VFD, and cooling tower
- type of all alarms, total number of points and any additional points for future use
- type of communicating system, such as backnet and other third party hardware to communicate with HVAC equipment
- type of computer and printer, RS-232 port etc., including web base access
- energy usage information on the panel, such as water flow, gas flow, electrical kWh, etc., and
- life safety alarms, including fire alarm - for information only and operator could inform all employees - auto fire alarm signal can send message to local fire department

(6) Preliminary riser diagrams and equipment schedules.

11.2.1.5 Electrical

- (1) Provide complete drawing (s) showing interior lighting system including lighting controls, and circuit number with panel identification, light fixture schedules (lamp and ballast information), and energy saving light fixture information.

Provide lighting power density (LPD) table for each room and compare with ASHRAE 90.1-2004 LPD requirements.

Provide catalogue cutsheet for each type of light fixture proposed for project design.

- (2) Provide detailed site plan showing power service, site power distribution, communications and cable service, if any, and site lighting. Identify the location of an electrical utility company's connection point, and an electrical utility transformer and metering locations. Differentiate between utility service work and construction contractor's work.
- (3) Provide detailed power plans for all areas including any switchgear, transformers, generators, panels, medical and other equipment and receptacles. Show panel and circuit designations (home runs).

- (4) Provide detailed special system plans showing layout of communication and signal pathways and devices, fire detection and alarm devices, including FACP, smoke detectors, duct detectors, horns/strobes, manual pull stations, etc., and other signal systems, such as nurse call, etc.

- (5) Detailed one-line diagram shall include all connected 3-phase equipment, all panel boards, and feeder conduit and conductor sizes. The panel schedules shall show a minimum of 65% completed branch circuits in each panel. The panel schedule shall show all overload protection, voltage, phase, AIC, MCB/MLO, neutral size, connected load and demand load for both normal and essential power.

Provide power protection coordination calculations and requirements on a one-line electrical power diagram.

- (6) Provide lightning protection design and show all system grounding and equipment grounding and bonding details. Provide the location of all grounding rods on the floor plan and detail showing how to access these rods in future for checking ground connections continuity and testing.

11.2.2 Other Documents

11.2.2.1 Architectural Documents

- (1) Rendered Perspective. The rendering may be produced using traditional artistic methods or with computer aided design rendering tools. The original color rendering and three color copies will be required.

- (a) Medium. Rendering shall be in color suitable for photographic reproduction. The environment of the building as it actually exists or will exist after completion of construction shall be portrayed. Emphasis shall be given to the building instead of its surroundings.

- (b) Scale and Materials Indication. Human figures, familiar to the culture and place of the project location and client, shall be placed at or near the main entrance to understand the scale of the building. The extent to which materials are indicated may be left to the A/E's judgment

- (c) The rendering shall be a minimum of 500 x 400 mm exclusive of mat. It shall be provided with mat, frame, and non-reflective glass.

The exterior perspective rendering shall have a matted overall dimension of 762 x 508 mm

with a framed dimension of 787 x 583 mm, mounted under anti-glare glass surrounded by a good quality 25 mm minimum flat top black metal frame.

- (2) Interior perspective sketch. A preliminary line perspective depicting a proposed typical interior view perspective shall be submitted.

The interior perspective sketch will clearly define the proposed interior materials and overall quality of the major public interior spaces. An eye-level perspective of the main public lobby/waiting area, reception desk, and major pedestrian circulation routes are the preferred perspective views.

- (3) Preliminary color boards: Color boards for two unique color schemes shall be submitted in a standard 280 x 215 mm three ring binder.

The schemes shall be coordinated with elevations for the exterior and by room names and numbers shown on the architectural floor plans for the interior. Materials and colors shall be labeled by manufacturer, source, and product description for color and pattern purposes.

Samples will be presented of all major building interior and exterior finishes. Foldouts may be up to 838 x 647 mm as long as they refold within the standard binder configuration. Actual material samples shall be displayed showing color, texture, pattern, finish, thickness, etc., for all appearance related items where choice exists. These samples shall be large enough to indicate true patterns. Samples shall be organized by color schemes with a separate sample group for each scheme.

11.2.2.2 Civil Documents

- (1) Provide a status report concerning all site-related permit activities. Include a summary of all permits, pending or approved. For pending permit activities, include an estimated date for permit approval, and add narrative for pending activities, and persons responsible for completion.
- (2) Provide design calculations of all major civil elements subject to final review. Present calculations and related narratives in detail consistent to the level of design.

11.2.2.3 Structural Documents

Provide design calculations of all major structural elements consistent to the level of design. Present calculations consistent with the level of design, including connections and collector elements as appropriate.

11.2.2.4 Mechanical Documents

Provide calculations, riser diagrams, and special systems including medical gases.

Provide preliminary load calculations for sizing of air handling units, pumps, chillers, and boilers.

11.2.2.5 Electrical Documents

Provide the following:

- (1) Separate detailed lighting calculations with fixture manufacturer cut sheets, except if isometrics are shown on drawings. All fluorescent lamps shall comply with EPA's TCLP (toxic characteristic leaching procedure) for lowest mercury content.
- (2) Detailed load calculations, short circuit calculations, voltage drops based on drawings. Where used, provide detailed emergency power total load calculations for sizing of generator(s) and transfer switch(es).

Include load calculations for renewable energy systems or other special systems incorporated into the project.

Provide a revised list of all the medical equipment, if any is required, 1-phase or 3-phase, for the project that require electrical connection.

- (3) Provide arc flash calculations per IEEE 1584 for arc flash protection of building staff responsible for electrical maintenance in accordance with OSHA 29 CFR 1910.132(d).

12 CD Submittal 100 Percent

12.1 General

When the contract documents are 100 percent complete, they are submitted to the agency for review. This includes all architectural and engineering drawings and specifications necessary for bidding and required calculations. All components shall be accurate and coordinated among disciplines.

Details shall be incorporated on the drawings.

12.2 Requirements

Provide the following:

- (1) Updated space comparison report
- (2) Updated cost estimate
- (3) Updated sustainable design status report
- (4) Updated building commissioning plan
- (5) Updated design intent / basis of design documentation
- (6) Final calculations
- (7) Specifications. Complete specifications, including non-technical divisions 0 and 1, shall be prepared for submittal to the CO. Specifications shall be complete, edited for the project, and in final format.
- (8) Facility user manual
- (9) Updated design intent and basis of design
- (10) Statements of special inspections for both wind and seismic requirements, where required by IBC chapter 17
- (11) Final projected energy usage report including a complete energy model analysis for the proposed building together with a baseline model (per ASHRAE 90.1 – 2004, Appendix G).

This report shall contain a summary of projected energy savings in terms of both energy consumption (expressed in MMBtus) and energy cost (separated by fuel type).

The report shall include a summary of energy-saving systems implemented in the design, including any on-site renewable energy systems, and shall include a life cycle cost analysis to justify cost premiums.

- (12) Final medical equipment summary

12.2.1 Drawings

12.2.1.1 Architectural Drawings

Drawings complete.

12.2.1.2 Civil Drawings

- (1) Provide completed design drawings sufficient for site development activities. Final documents shall include a site map, storm water pollution prevention plan, grading plan, paving and drainage plan, site layout details, utility plan, detailed civil details sheets, and all other drawings necessary for a complete site design package.

12.2.1.3 Structural Drawings

Provide completed design drawings sufficient for fabrication, construction and erection of the entire structural system.

Annotate all structural columns with grid locator for consistent use in reference during fabrication and construction.

12.2.1.4 Mechanical Drawings

Complete drawings for all mechanical systems.

12.2.1.5 Electrical Drawings

- (1) Complete drawings (light and power distribution), equipment schedules, and panel schedules. Complete lightning protection drawing including equipment grounding and bonding details.
- (2) Complete one-line diagram with minimum cross wiring. Differentiate between single-phase, dual-phase and three-phase equipment, including OCPD size for panel board, transformer, motors, such as exhaust fans, AHU's and condensing units. No block diagram will be accepted.
- (3) Main Electrical room layout in large scale showing maintenance space around equipment.

12.2.2 Other Documents

12.2.2.1 Architectural Documents

- (1) Rendered perspectives of prominent interior architectural spaces. Renderings may be produced

using traditional artistic methods or with computer aided design rendering tools. The original color renderings and three color copies will be required.

- (a) Medium. Renderings shall be in color suitable for photographic reproduction.
- (b) Scale and materials indication. Human figures, familiar to the culture and place of the project location and client. The extent to which materials are indicated may be left to the A/E's judgment
- (c) The renderings shall be an appropriate size to communicate the architect's vision to the client users.

The interior perspective rendering shall have a matted overall dimension of 762 x 508 mm with a framed dimension of 787 x 583 mm, mounted under antiglare glass surrounded by a good quality 25 mm minimum flat top black metal frame.

- (2) Final Color Boards. All changes resulting from the review of the preliminary color boards shall be incorporated in the 100 percent submission. This submission shall be complete with all originally approved and new materials presented in a single revised package.
- (3) Prepare a wayfinding plan detailing signage to route users throughout the facility. Provide sample signage design for the indicated locations with recommended size, placement and layout together with a typical room number placard layout design. Prepare layout and details for all exterior signs to route users to services throughout the campus, include details for building mounted and monumental signage. Provide a construction sign layout.

12.2.2.2 Civil Documents

Provide an updated narrative regarding the status of all associated permits to construct the project.

12.2.2.3 Structural Documents

Provide complete narrative describing design methods, assumptions, theories and technical formulas employed in design solutions.

12.2.2.4 Mechanical Documents

- (1) Provide a bound summary of proposed equipment selection including model number, pump curves, and fan curves with selections indicated.
- (2) Provide final load calculations for heating, cooling, and ventilating, including individual room loads.

12.2.2.5 Electrical Documents

Provide completed building total connected load and demand load calculations, including future demand. Complete emergency power load calculation for sizing the generator.

Provide electrical power selective coordination study.

12.2.2.6 Maintainable Equipment Summary

Provide a tabular summary of all anticipated maintainable equipment.

Where equipment has been specifically identified as the basis of design include identified features from drawing schedules. Other maintainable equipment provided by the contract shall be identified and referenced with a specific equipment tag number.

Include project specification requirements for contractor to provide extracted O&M details for all maintainable equipment including:

- relevant equipment data for replacement or service
- part details for typical service replacement items
- specific tasks and frequencies (weekly, monthly, quarterly, semi-annually, and annually, as required) for performing regular preventive maintenance as identified within the approved O&M documents.

The final approved data shall be provided in a format that is importable to the selected Computerized Maintenance Management System, CMMS, agreed to by the project manager, or entered by the contractor directly into the installed CMMS.

13 Final CD Submittal

13.1 General

All written government review comments shall be resolved and incorporated. The updated drawings and specifications will become the final construction documents. These documents shall be signed, sealed, and dated by the professional architect or engineer with respect to the specific field of registration.

13.2 Requirements

Provide the following:

- (1) Complete construction documents including final project specifications.
- (2) Final space comparison report
- (3) Final cost estimate
- (4) Final sustainable design status report
- (5) Final projected energy use report including energy and water consumption baseline and design projections separated by fuel type and water usage.
- (6) Final building commissioning plan including the maintainable equipment summary.
- (7) Copies of all engineering calculations
- (8) Final facility user manual
- (9) Final Design intent and basis of design report
- (10) Formally concluded project review comment file
- (11) Copies of all other reports and studies required by this contract
- (12) Permitting status summary
- (13) Draft bid support documents, including:
 - bid form
 - statement of work
 - general conditions requirements

14 Bidding

14.1 Printing and Distribution

Print and distribute the bidding documents or amendments, when applicable, to the plan rooms in the area and to prospective bidders as directed by the CO.

- (1) The bidding documents shall be numbered and maintained in a log to show which bidder or plan room received what numbered bid document. The direction will be by telephone or FAX from the CO with a follow-up letter. The A/E is not to accept deposits. All prospective bidders who visit or call the A/E shall be advised to write or to call the CO to request the bidding documents. The CO will advise the prospective bidder about deposits and advise the A/E to distribute documents.
- (2) The number of sets to be printed and distributed will be determined during negotiations. The A/E shall provide printing costs per set during negotiations. If additional sets are required to be printed during the bidding phase, the negotiated printing costs shall be the same to avoid bidding delay.
- (3) In the event prospective bidders call the A/E for technical interpretation of the plans and specifications or contractual questions, the A/E shall refer the bidder to the CO. If the interpretation is considered pertinent to the project, the necessary amendment shall be prepared by the A/E and issued by the CO. If the interpretation requires drawings and/or specifications changes, the A/E shall complete and furnish them to the CO. If the work involved by the A/E was due to A/E error or omission, this task shall be accomplished by the A/E at no cost, including mailing of amendment.
- (4) Notify the CO in writing that the solicitation documents have been mailed to prospective bidders. This written notification shall be furnished within seven (7) calendar days of the mailing. The notification shall include the name and address of contractors and the date that the solicitations were mailed. The mailing date shall be the date directed by the CO.

14.2 Pre-Bid Conference

If a pre-bid conference is held, the A/E shall attend. He shall assist the CO in taking notes and furnish a written report of items discussed. This written report shall be furnished to the CO within four (4) calendar days after the pre-bid conference.

14.3 Post-Bid Analysis

Final cost estimates that are over or under the apparent low responsive bid by more than 15% may require a post-bid analysis by the A/E to determine the reasons for the variance. The A/E shall submit a written response to the CO within seven (7) days after date of request. The response shall identify specific areas of variance and the reasons for the variance. The response shall include a recommendation to either award or reject the bid with full rationale to support the recommendation.

15 Construction Contract Administration

15.1 General Requirements

- (1) The A/E shall provide construction contract administration services (CCAS) as described within this section when required by the contract. The intention of these services is to oversee performance of the construction contractor and report on findings to DES.
- (2) The performance period for CCAS shall extend sixty (60) calendar days after the construction contract completion date, unless otherwise indicated by the contract. This clause excludes post construction and warranty phase services performance periods which shall be explicitly identified in the contract. Extensions to the construction contract provide a basis for adjustment to the A/E contract price only to the extent that the A/E's cost of performance is actually increased.
- (3) The A/E shall not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work, all of which are the responsibility of the contractor.
- (4) All communications between the A/E and contractor shall occur through the Project Officer unless an alternative protocol is established within the contract or otherwise in writing from the Contracting Officer.
- (5) The A/E shall maintain a record of and copies of all contractor submittals and responses. Review the contract for required protocols for the transmittal of contractor submittals, evaluations, recommendations, change orders, change order requests, request for information, and responses, including required time frames for completion.
- (6) The CO has the sole responsibility to approve and communicate approval of contractor requests for information, submittals, change orders, requests for equitable adjustment, requests for time extensions, construction claims, and value engineering change proposals (VECP). The A/E shall make recommendations for action to the Project Officer on these items as described below.

- (7) Within seven days, the A/E shall provide the government with a complete list of the construction phase submittals.

15.2 Pre-Construction Meeting

The A/E shall participate in an onsite pre-construction meeting arranged by the Project Officer.

15.3 Request for Information Evaluation

- (1) The Contractor may prepare and submit requests for information (RFIs) requesting clarification about the construction documents. RFI's shall include a written statement describing the clarification requested and indicate specific related drawings and specifications. Other explanatory sketches may be provided.
- (2) The A/E shall review and prepare responses to all RFIs. Responses shall include narratives and supplemental drawings and specifications as necessary to provide clarification.
- (3) RFI responses shall be provided to the Project Officer for transmittal to the Contractor.

15.4 Contractor Submittal Review

- (1) The A/E shall review required Contractor submittals, including shop drawings, product data, and samples for compliance with construction documents and for conformance with the design concept expressed in the construction documents.
- (2) The A/E shall review other contractor submittals including inspection and testing reports, and operation and maintenance manuals for compliance with construction documents
- (3) The A/E shall recommend to the Project Officer, in writing, an appropriate action on Contractor submittals to the Project Officer. Recommendations may include "Approved," "Approved as Noted," "Disapproved," or "Resubmit."
- (4) The A/E shall provide up to two (2) reviews and responses for each submittal, including initial review and resubmittal review, if necessary, unless otherwise indicated in the contract.

15.5 Change Order Evaluation

- (1) The A/E shall evaluate proposed changes, initiated by the contractor or IHS, to the construction documents and provide recommendations regarding their implementation.
- (2) The A/E shall prepare change orders at the request of the project officer.
- (3) Design changes may include scopes of work, narratives, drawings, and specifications as necessary to describe the work to be added, deleted or modified.
- (4) The A/E shall provide supplemental documentation for design changes, including cost estimates and recommended schedule modifications.

15.6 Contractor Request and Proposal Evaluation

- (1) The A/E shall evaluate Contractor requests for equitable adjustments, time extensions, claims, and VECPs at the request of the Project Officer and provide recommendations regarding their implementation.
- (2) The A/E shall prepare written evaluation of reviewed requests and proposals including narratives, cost estimates, and recommendations for action.
- (4) The A/E shall maintain a record of and copies of reviewed requests, proposals, and evaluations.

15.7 Construction Field Observation Services (Site Visits)

15.7.1 General

- (1) The A/E shall visit the construction site at intervals, usually monthly, described within the contract. Such site visits are intended for the A/E to:
 - (a) Maintain familiarity with the progress and quality of the work completed and report findings to DES,
 - (b) Endeavor to guard IHS against defects and deficiencies in the execution of this work, and
 - (c) Generally determine that the work is being performed in compliance with the construction documents.

- (2) The A/E shall provide certification, in writing, of satisfactory completion of each of the following building systems:
 - (a) foundations
 - (b) concrete forms (location)
 - (c) reinforcing steel
 - (d) framing
 - (e) roof structure and framing
 - (f) roof and roofing
 - (g) building envelope
 - (h) wiring and electrical equipment
 - (i) fire protection equipment including door, frames, dampers, and FACP
 - (j) piping
 - (k) utilities connections
 - (l) landscaping
 - (m) site work
 - (n) all NPDES-related documentation, including NOI, SWPPP, Issued Permit including correspondence, and NOT. The A/E shall coordinate these activities with the Commissioning Agent.
 - (o) parking lots/site access roadways
 - (p) retaining walls and other site structures
 - (q) Group I equipment, including ducting, controls, special equipment and systems
 - (r) finishes and Group II equipment
 - (s) other equipment as required by the construction documents
- (3) The A/E shall monitor field testing and commissioning services required by the construction documents and evaluate compliance by testing and inspection agencies with required scope, standards, procedures, and frequency.
- (4) The A/E shall review the general accuracy of the Contractor prepared as-built drawings and as-built specifications during each site visit.
- (5) The A/E shall participate in monthly project meetings during site visits.
- (6) The A/E shall report, in writing, known deviations

from the construction documents and from the most recent construction schedule submitted by the Contractor.

- (7) The A/E shall make specific recommendations, in writing, to the Project Officer to reject work that does not conform to the construction documents.
- (8) Progress reports shall be submitted within seven (7) calendar days . The report shall include, at a minimum, a summary of the following:
 - Current status and evaluation of overall project percentage completion
 - Number and amount of change orders
 - Problems
 - Accomplishments
 - Recommendations
 - Other pertinent information concerning the work
 - Progress payment recommendations, based on a review of the construction contractor(s) pay request and progress chart
 - Progress photos of the work. Provide a minimum of twelve dated photos, generally representing the overall progress of the work.
 - Verify contractor's redline markup on the construction documents for as-builts

15.7.2 Structural

The A/E shall provide all tests, inspections, and observations required by chapter 17 of the IBC, and included in the statement of special inspections (see paragraph 4.3.2).

15.7.3 Mechanical

The A/E is to inspect and prepare a written report to the project officer detailing the inspection of the following:

- (1) All major mechanical systems; including, but not limited to: chillers, cooling towers, ground source heat pumps, AHU with mark number, per drawing, location and install per specification.

Provide AHU-capacity, manufacturer name and model number, filter information, access door installed, control valve on chilled water or hot water piping information, etc.
- (2) VAV boxes with mark number. Describe location and verify installation per plans, specifications, and

submittals.

- (3) Main duct work. Insure volume dampers are installed and check insulation, supports, etc., per specification.
- (4) DDC system. Check alarms on the system and provide a list of trouble areas. Verify what has been completed since previous visit.

15.7.4 Electrical

The A/E is to inspect and prepare a written report to the Project Officer detailing the inspection of the following:

- (1) Main switchgear or panelboard, volt, amp, phase, main CB, etc., including manufacturer name and model number, location and install per specification.
- (2) Panelboard, volt, amp, phase, main CB etc. including manufacturer name and model number, location and install per specification.
- (3) Light fixture including lamp information and install per specification.
- (4) Conduit support and wiring install per specification.
- (5) Transformer size (KVA) and per specification.

15.8 Contractor's Application for Payment Review

- (1) The A/E shall review the contractor's application for payment and make recommendation, in writing, to the Project Officer for payment.
- (2) The A/E recommendation shall be based upon the A/E's evaluation regarding whether or not the work in place has progressed to the point indicated and has been completed in accordance with the construction documents.
- (3) The recommendation shall be based upon the A/E's best knowledge of the work in place.

15.9 Project Site A/E Representative Services

The project site representative shall be on site throughout construction during normal working hours and is responsible for assisting the project officer in the administration of the construction contract.

The construction project may shut down or may be delayed in startup from time to time due to holidays and otherwise at the discretion of the Government. The A/E shall be provided with a minimum of two (2) days notice

prior to any such shutdown. During such shutdowns, the A/E shall be reimbursed only for the continuation of services that would be impractical to shut down for limited periods such as rent, telephone services, and data connection services.

Communications by the project site representative relating to administration of the construction contract shall, in general, be restricted to the Project Officer, the A/E, and the construction contractor. The project site representative shall communicate with service unit staff and the construction contractor under the direction and knowledge of the Project Officer. The project site representative shall not communicate with subcontractors or material suppliers except with the full knowledge and approval of the construction contractor and project officer.

15.9.1 Qualifications

- (1) The selection of the project site representative shall be subject to approval by the CO. Experience in healthcare facilities is desirable. A summary of the experience of the proposed Project Site Representative shall be provided, listed by project, showing the applicant's responsibilities, type and scope of construction, success of project in terms of cost and schedule, and contact people, with phone numbers, to provide references.
- (2) The project site representative shall be a project design architect/engineer, or a fully qualified inspector with a minimum of three (3) years of construction inspection or project management experience in projects of comparable scope, size, cost, building materials, construction type, and geographical location.

15.9.2 Duties And Responsibilities

The A/E project site representative shall:

- (1) Monitor progress and quality of the work as may be reasonably necessary to determine, in general, if the work is being performed in a manner that, when completed, will be in conformance with the contract documents. Notify the project officer if work does not appear to conform to the contract documents or may require special inspection or testing.
- (2) Monitor the construction contractor's schedules on an ongoing basis and alert the project officer to conditions that may lead to delays in completion of the work.
- (3) Receive and respond to requests from the

construction contractor for information and, when authorized by the project officer, provide interpretations of the contract documents.

- (4) Receive and review requests for changes by the construction contractor, and submit them, together with recommendations, to the project officer.
- (5) Attend meetings as directed by the Project Officer and report to the Project Officer on the proceedings.
- (6) Observe tests required by the contract documents. Record and report to the Project Officer on test procedures, test results and verify testing invoices to be paid by the owner.
- (7) Maintain records at the construction site in an orderly manner, including correspondence, contract documents, requests for information, change orders, construction change directives, reports of site meetings, shop drawings, product data and similar submittals, supplementary drawings, color schedules and requests for payment, and names, addresses and telephone numbers of subcontractors and principal material suppliers.
- (8) Maintain a daily log book of activities at the site, including weather conditions, nature and location of work being performed, verbal instructions and interpretations given to the construction contractor, and specific observations. Confirm that materials used are as submitted. Record any occurrence or work that might result in a claim for a change in contract sum or contract time. Maintain a list of visitors, their titles, and time and purpose of their visit. Transmit the daily log via e-mail to the Project Officer at the conclusion of each work day.
- (9) Assist the Project Officer in reviewing shop drawings, product data and samples. Notify the Project Officer if any portion of the work requiring shop drawings, product data or samples is commenced before such submittals have been approved by the Project Officer. Receive and log samples required at the site, notify the Project Officer when they are ready for examination, record the Project Officer's approval or other action and maintain custody of approved samples.
- (10) Review the construction contractor's record copy of the drawings, specifications, addenda change orders and other modifications at intervals appropriate to the stage of construction and notify the project officer of any apparent failure by the construction contractor to maintain up-to-date records.

- (11) Review applications for payment and forward to the Project Officer with recommendations for disposition.
- (12) Review the list of items to be completed or corrected which is submitted by the construction contractor with a request for issuance of a certificate of substantial completion. Review the work. If the list is accurate, forward it to the project officer for final disposition; if not, advise the project officer and return the list to the construction contractor for correction.
- (13) Assist the project officer in conducting inspections to determine the date or dates of substantial completion and the date of final completion.
- (14) Assist the project officer in receipt and transmittal to the owner of documentation required of the construction contractor at completion of the work.
- (15) Assist sustainable design certification process at the request of the project officer.
- (16) Assist the building commissioning process at the request of the project officer.

15.9.3 Limitations Of Authority

The A/E project site representative shall NOT:

- (1) Authorize deviations from the contract documents.
- (2) Approve substitute materials or equipment.
- (3) Personally conduct or participate in tests or third party inspections except as authorized in writing by the Project Officer.
- (4) Assume any of the responsibilities of the construction contractor's superintendent or of subcontractors.
- (5) Expedite the work for the construction contractor.
- (6) Have control over or charge of or be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work.
- (7) Authorize or suggest that the owner occupy the project in whole or in part.
- (8) Issue a certificate for payment or certificate of substantial completion.
- (9) Prepare or certify the preparation of a record copy of the drawings, specifications, addenda, change orders and other modifications.

- (10) Reject work or require special inspection or testing.
- (11) Accept, distribute or transmit submittals made by the construction contractor that are not required by the contract documents.
- (12) Order the construction contractor to stop the work or any portion thereof except to prevent the imminent loss of life.

15.9.4 Project Site Representative Office Space

- (1) Provide office space such as a trailer, furniture including, but not limited to, individual workstations and chairs for the project site representative and Project Officer, conference table and chairs, layout table, and other miscellaneous furniture deemed necessary by the A/E to properly perform the work such as shelving, tables, and file cabinets.
- (2) Provide all equipment necessary to perform the work, including, but not limited to, telephones, computer equipment, copiers, and cameras.
- (3) The A/E shall be responsible for providing their own telephone and internet service. Likewise, the Government shall be responsible for providing theirs.
- (4) The A/E shall be responsible for the general housekeeping associated with the office space and provide all necessary miscellaneous items such as cleaning supplies, toilet paper, and hand soap.

15.10 Construction Phase Sustainable Design Certification Services

The A/E shall be responsible for the continuing coordination of the LEED certification and sustainability requirements. This coordination includes preparation of all documentation necessary to achieve certification, and submittal of documentation to the certifying organization.

15.11 Construction Phase Building Commissioning Services

The A/E shall provide construction phase building commissioning services under two possible commissioning authority (CxA) scenarios as determined in the contract:

- (1) CxA provided through A/E subcontract. The CxA may not be a direct employee of the A/E.
- (2) CxA provided directly by a DES federal

employee or separate independent contract. In this scenario, the A/E shall provide support for the implementation of the building system commissioning plan. Support shall include responding to inquiries from the Project Officer and CxA regarding the construction documents, design intent, RFI's, contractor submittals, change orders, field observations of work in place, and project site representative activities.

15.11.1 Commissioning Agent Responsibilities

The intent of the CxA requirements during construction phase is to:

- (1) Ensure completion and verification of component and system testing. Demonstrate that components and systems installed under the contract operate as specified;
- (2) Ensure the training for each piece of equipment and each system is completed and documented;
- (3) Ensure prior to completion of the construction contract, that the operation and maintenance manuals, CMMS data, commissioning reports, as-built drawings and other required contract information are submitted to provide complete documentation of the proper operation of building systems and successful completion of building systems commissioning;
- (4) Ensure functional performance tests for each system are completed to satisfy the design intent.
- (5) Required documentation. The following shall be used to document system operation: test reports, charts, one-line diagram, control diagram, flow diagram, short circuit, current flow and voltage drop calculations. Circuit breakers power protection coordination.
- (6) Minimum Requirements for Commissioning. The identified equipment shall be sampled for commissioning at the indicated percentages; equipment samples less than 100% shall be well distributed throughout the facility.
 - (a) Provide 100% commissioning for the following equipment/systems:
 - AHU
 - chiller, cooling tower and boiler
 - chilled water, cooling tower water pumps and hot water pumps
 - DDC (or EMCS) system
 - fire sprinkler system, including pump and controls
 - energy conservation systems
 - implemented renewable energy systems
 - (b) Provide minimum 25% commissioning for the following equipment/systems
 - HVAC terminal units (such as VAV box and VAV box with reheat coil)
 - diffusers/grilles
 - fire protection system shall include the following as minimum:
 - fire alarms - horn/strobe light - 25%
 - manual pull stations - 25%
 - exit light fixtures - 50%
 - fire dampers and smoke dampers - 50%
 - smoke sensors - 50%
 - check fire doors/frames rating - 50%
 - fire alarm control panel and annunciator panel – 100%
 - (c) Provide commissioning for an electrical distribution system as follows:
 - main switchgear (distribution panel) and all electrical panel boards - 100%
 - regular and K type transformers - 50%
 - emergency generator system including ATS - 100%
 - lighting control - 50%
 - emergency lighting - 50%
 - lightning protection system - 100%
 - building grounding system - 100%
 - surge protectors – 100%
 - power factor correction and power conditioning equipment – 100%
 - arc flash hazard warning signs on power panels – 100%
 - lightning protection system per NFPA 780 – 100%
 - as-built drawings – 100%
 - submittals specified in contract specs – 100%

- (7) Demonstrate that, at the time of commissioning, power quality levels measured at the point of common coupling between the IHS building and the power company are within the limits specified in IEEE 159 standard.

15.12 Project Completion and Closeout

- (1) The A/E shall review:
 - (a) Required written warranties and related documents for compliance with construction documents.
 - (b) Contractor closeout submittals including as-built drawings, as-built specifications, operation and maintenance manuals, and implementation of CMMS data.
 - (c) Required contractor bench stock. A/E shall provide a checklist of all items required in the specifications.
- (2) The A/E shall, when required by the contract, arrange for, coordinate, and video-record instruction to IHS employees on the operation and maintenance of equipment with the contractor's and manufacturer's representatives, establishing time, place, dates, and agenda.
- (3) The A/E's inspections shall be conducted with the Project Officer to evaluate conformance of the work with the requirements of the construction documents.
- (4) The A/E shall prepare and submit a written punch list identifying incomplete work items that are not in compliance with the plans and specifications.
- (5) The A/E shall conduct inspections, as identified within the contract, to determine the date of substantial completion and the date of final acceptance, and provide written confirmation to the Project Officer regarding the date that, in the professional opinion of the A/E, the work has been substantially completed in accordance with the construction documents.

15.13 Post Construction Services

- (1) Review the general accuracy of the as-built drawings and as-built specifications submitted and certified by the contractor.
- (2) Provide written notification to the PO if the as-built documents do not accurately reflect known changes in the work made during construction.

- (3) Prepare and provide record CAD drawings and record specifications based upon the as-built drawings and as-built specifications provided by the contractor, including significant changes in the work made during construction. Coordinate with the local utility companies to show the new utility easements and right-of-ways on the record drawings.
- (4) Record Specifications. Record specifications shall update the original specifications to show the actual installation. The update is to include all amendments and modifications issued. Particular attention shall be given to substitutions, selection of options, and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. After the documents are updated, they are to be marked "RECORD SPECIFICATIONS" and dated.
- (5) All drawing changes shall be coordinated between disciplines updating the original drawings. When changes are made to the originals, appropriate change symbols must be used to indicate the changes. The "Revision" section of the title block on the sheet is to be completed with the required information, symbols, signatures, and dates.

15.14 Warranty Phase Services

- (1) The A/E shall conduct a warranty inspection no earlier than nine (9) months after and no later than eleven (11) months after the date of acceptance.
- (2) The A/E shall prepare and submit a written warranty punch list, including corresponding photographs for each item, identifying corrective work required to be performed by the Contractor under the warranty. The warranty punch list shall be provided no later than fourteen (14) days prior to the end of the warranty period.

Definitions

Authority Having Jurisdiction (AHJ): The Division of Engineering Services is the AHJ responsible for implementing and enforcing codes and standards on new construction projects for IHS owned facilities.

Charrette: Refers to an intense period of design activity typically focused on a targeted set of goals. The word charrette may refer to any collaborative session in which a group of designers drafts a solution to a design problem. While the structure of a charrette varies, depending on the design problem and the individuals in the group, charrettes often take place in multiple sessions in which the group divides into sub-groups. Each sub-group then presents its work to the full group as material for future dialogue. Such charrettes serve as a way of quickly generating a design solution while integrating the aptitudes and interests of a diverse group of people. Compare this term with workshop.

Crime Prevention Through Environmental Design (CPTED) is a multi-disciplinary approach to deterring criminal behavior through environmental design. CPTED strategies rely upon the ability to influence offender decisions that precede criminal acts.

Contracting Officer: An employee of the Government with the authority to bind the Government legally by signing a contractual instrument

Equipment:

Group I: Fixed, built-in, attached, and installed equipment normally included in the construction contract.

Group II: Major moveable equipment – items having a useful life of 5 years or more. Moveable equipment does not require attachment to the building or utility service, other than provided by an electrical plug or quick disconnect fitting. Examples include chairs, beds, bassinets, desks, computers and printers, network file servers, typewriters, system furniture, sphygmomanometers, microscopes, centrifuges, portable whirlpool units, exercise bars, refrigerators, and linen carts.

Group III: Minor moveable equipment – items having a useful life of less than 5 years. These items are of relatively small cost and size and lend themselves to on-site storage for replacement of lost or worn out equipment. Examples include

linens, blankets, gowns, washbasins, bedpans, pipettes, surgical instruments, silverware, and chinaware.

Special Purpose Equipment: Group I, II, or III technical, medical, or scientific equipment needed to operate a laboratory, a hospital, a clinic, a clinical research patient care unit, an animal care facility, or equipment which is specific to a single purpose and not generally suitable for other purposes. Examples of such equipment include incubators, electric ovens, sterilizers, vacuum and pressure pumps, centrifuges, water baths, casework, sinks, shelves, patient headboards, workbenches for microscopes, and moveable apparatus for laboratory animals. Special-purpose equipment may be classified as either fixed or moveable equipment.

Final Acceptance: In cases of design and construction contracts, final acceptance is the act of the Government, represented by the contracting officer, which approves specific services rendered as complete performance of a contract, effectively transferring the risk of loss from the contractor to the owner. Final acceptance is conclusive except in cases where there are latent defects, fraud, gross mistakes amounting to fraud, or any right of the Government under warranties.

Joint Commission (formerly JCAHO): The Joint Commission, until 2007 the Joint Commission on Accreditation of Healthcare Organizations (JCAHO, pronounced “jayco”), is a US-based non-profit organization formed in 1951 with a mission to maintain and elevate the standards of healthcare delivery through evaluation and accreditation of healthcare organizations.

Maintainable Equipment: Building equipment that has a specific warranty or preventive maintenance schedule.

Project Officer: The government representative legally designated by the Contracting Officer as the authorized technical representative for administering A/E, construction and/or service contracts on behalf of the Contracting Officer, exclusive of contractual matters. The Project Officer is not authorized to issue any instructions or direction, which effect any increases or decreases in the scope of work or which would result in the increase or decrease of the cost of the contract or a change in performance period of the contract.

Abbreviations

AABC: American Air Balancing Council

ACI: American Concrete Institute

ADA: Americans with Disabilities Act

ADAAG: Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities

A/E: Architect/Engineer. The design and/or technical consulting firm engaged for professional architectural and/or engineering services.

AHJ: Authority Having Jurisdiction

AHU: Air-Handling Unit (but not all mixing or air flow control boxes)

AIA: American Institute of Architects

AIC: Air Interrupting Capacity

ANSI: American National Standards Institute

ASME: American Society of Mechanical Engineers

ASCE: American Society of Civil Engineers

ASHRAE: American Society of Heating, Refrigerating, and Air-Conditioning Engineers

ASTM: American Society for Testing and Materials

ATS: Automatic Transfer Switch

BAS: Building Automation System

BGA: Building Gross Area

BMPs: Best Management Practices

BOCA: Building Officials and Code Administrators International, Inc.

CAD: Computer-Aided Design

CAD Layers: American Institute of Architects CAD Layer Guidelines

CAMH: Comprehensive Accreditation Manual Hospitals: the Official Handbook

CAMCAH: Comprehensive Accreditation Manual Critical Access Hospitals

CD: Construction Documents (includes drawings and specifications)

CEO: Chief Executive Officer (formerly SUD-Service Unit Director)

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act

CMMS: Computerized Maintenance Management System

CO: Contracting Officer

CSI: Construction Specifications Institute

CVS: Certified Value Specialist

CWA: As amended in 1977, commonly known as the Clean Water Act

CxA: Commissioning Authority

DD: Design Development

DDC: Direct Digital Control

DFO: Division of Facilities Operations

DFPC: Division of Facilities Planning and Construction

DGA: Departmental Gross Area

DHHS: Department of Health and Human Services

DHHSAR: Department of Health and Human Services Acquisition Regulations

DNA: Departmental Net Area

DoE: Department of Energy

EA: Environmental Assessment

EIS: Environmental Impact Statement

E-O-Y: End Of Year

EPA: Environmental Protection Agency

EPAct: The Energy Policy Act of 1992

DDC: Direct Digital Control

DES: Division of Engineering Services

DES-D: Division of Engineering Services - Dallas

DES-S: Division of Engineering Services - Seattle

EMCS: Energy Management Control System

FACP: Fire Alarm Control Panel

FAR: Federal Acquisition Regulations

FFE: Furniture, Fixtures, and Equipment

FGA: Floor Gross Area	NIH: National Institutes of Health
FGI: Facility Guidelines Institute	NIST: National Institute for Standards and Technology (Formerly NBS National Bureau of Standards)
GFCI: Ground Fault Circuit Interrupter	NOI: Notice of Intent
HFPM: Health Facility Planning Manual	NOT: Notice Of Termination
HSP: Health System Planning	NPDES: National Pollution Discharge Elimination System
HVAC: Heating Ventilation and Air-Conditioning	NSF: National Sanitation Foundation
IBC: International Building Code (formerly UBC)	O & M: Operation and Maintenance
ICSSC: Interagency Committee on Seismic Safety in Construction	OCPD: Over Current Protection Device
IEEE: Institute for Electrical and Electronic Engineers	OEHE: Office of Environmental Health and Engineering
IESNA: Illuminating Engineering Society of North America	OPH: Office of Public Health
IHS: Indian Health Service	PD: Pre-Design
IHSAR : Indian Health Service Acquisition Regulation	PECI: Portland Energy Conservation, Inc.
LAN: Local Area Network	PJD: Program Justification Document
LCC/LCCA: Life Cycle Cost/Life Cycle Cost Analysis	PJDQ: Program Justification Document for Staff Quarters
LEED: Leadership in Energy and Environmental Design	PM: Project Manager for the Architect/Engineer.
LPI: The Lightning Protection Institute	POR: Program of Requirements
LSC: Life Safety Code (NFPA 101)	PORQ: Program of Requirements for Staff Quarters
M&I: Maintenance and Improvement	PSD: Project Summary Document (Similar to a POR, used for smaller projects.)
M&M: Medicare / Medicaid	RFI: Request for Information
MCB/MLO: Main Circuit Breaker/Main Lugs Only	SBCCI: Southern Building Code Congress International, Inc.
MDP: Main Distribution Panel	SD: Schematic Design
MeV: Mega Electron Volts	SI: International System of Units
M-O-Y: Middle Of Year	SOW: Scope of Work
NAFTA: North American Free Trade Agreement	SSBC: Southern Standard Building Code
NBC: National Building Code	SSER: Site Selection and Evaluation Report
NCS: National CAD Standard	STC : Sound Transmission Coefficient
NEBB: National Environmental Balancing Bureau	SU: Service Unit, usually a hospital, clinic, or care facility operated by Indian Health Services
NEC: National Electrical Code	SWPPP: Stormwater Pollution Prevention Plan
NEMA: National Electrical Manufacturers Association	TAB: Testing, Adjusting, and Balancing
NESC: National Electrical Safety Code	TERO: Tribal Employment Rights Office
NEPA: National Environmental Policy Act	
NETA: InterNational Electrical Testing Association	
NFPA: National Fire Protection Association	

TIA/EIA: Telecommunications Industry Association/
Electrical Industries Alliance

UBC: Uniform Building Code, now IBC

UFAS: Uniform Federal Accessibility Standards

UL: Underwriters Laboratories, Inc.

USGS: US Geological Survey

VAV: Variable Air Volume

VE: Value Engineering

VECP: Value Engineering Change Proposal

VFD: Variable Frequency Drive

project name

Pre-Design

planset date

Submittal Checklist

6.2 Requirements

6.2.1 Program Verification

- [] Summarize the review in a written report, and list all questions and unresolved issues

6.2.1 Site Analysis

- [] Prepare a rough sketch to show the character of the site and the surrounding area
- [] Provide information on the existing potable water and wastewater collection and treatment systems at the proposed site

6.2.3 Geotechnical Study

- [] Provide narrative recommendations on potential foundation systems

6.2.4 Pre-Design Survey Report

- [] Report all findings regarding the conditions of the existing structures or systems

6.2.5 Record Drawings

- [] Provide summary of any observed discrepancies from record drawings and include photographs if needed

6.2.6 Results

- [] Provide pre-design submittal results in a bound booklet with a tab for each of the sections

A/E project manager certifies that the above indicated requirements have been completed as required.

(signature)

(date)

(print name and title)

project name

Concepts

planset date

Submittal Checklist

7.2 Requirements

Key Activities

- 7.2(1) Conduct work sessions with IHS and client
- 7.2(2) Conduct a sustainable design charette
- 7.2(8) Develop three schemes

Deliverables

- 7.2(3) On-site renewable energy system feasibility analysis
- 7.2(4) Solar hot water feasibility analysis
- 7.2(7) Topographic survey of the existing project site
- 7.2(8) Documentation from each utility verifying capacity - if capacity is not sufficient provide design concepts for additional requirements
- 7.2(9) Narrative detail on the results of the geotechnical survey
- 7.2(10) Three complete building organization and massing schemes
- 7.2(11) Summary report on the sustainable design charette
- 7.2(12) Sustainable design status report
- 7.2(13) Written analysis of planning and concepts with suggested approach for schematics

Post Concepts Submittal Requirements

Activities

- 7.2(12) Incorporate comments from submittal review to produce final concept

Deliverables

- 7.2(12) Record drawing of the final site layout and building organization and massing plan

A/E project manager certifies that the above indicated requirements have been completed as required.

(signature)

(date)

(print name and title)

project name

Schematic Design

planset date

Submittal Checklist

8.2 Requirements

Key Activities

- 8.2(2) Conduct work sessions with DES and the client
- 8.2(4) Verify capacity of scheme to accommodate all supporting systems and equipment
- 8.2.1(3) Verify each space in the POR is shown on the drawings
- 8.3 Facilitate a value engineering study

Deliverables

- 8.2(6)a Design intent / basis of design documentation including written narrative of the design thought process
- 8.2(6)b Geotechnical report
- 8.2(6)c Updated sustainable design status report
- 8.2(6)d Outline technical specifications
- 8.2(6)e Updated space comparison report
- 8.2(6)f Updated life safety code analysis
- 8.2(6)g Updated cost estimate
- 8.2(6)h Preliminary calculations
- 8.2.1 Drawings
- 8.2.1(4) Department level graphic POR space floor plans
- 8.2.2.1(1) Life Safety Code analysis
- 8.2.2.1(2) Medical equipment summary
- 8.2.2.1(3) Security system drawing
- 8.2.2.2 (1,3,4,5,6,7) Civil narrative to include basis for design of all underground piping, preliminary stormwater analysis, traffic code analysis, special site features
- 8.2.2.3(1) Structural narrative description and economic comparison of foundation systems
- 8.2.2.3(2) Economic comparison of structural framing systems
- 8.2.2.4(1) Economic analysis of mechanical systems - at least one utilizing renewable technology
- 8.2.2.4(1) Economic analysis of heating systems
- 8.2.2.4(2) Psychometric analysis for air handling systems
- 8.2.2.5(1) Building electrical load analysis
- 8.2.2.5(2) Lightning protection requirement calculation
- 8.3 Narrative status on VE study

A/E project manager certifies that the above indicated requirements have been completed as required.

(signature)

(date)

(print name and title)

project name

Design Development

planset date

Submittal Checklist

9.2 Requirements

Key Activities

- 9.2(2) Begin to integrate commissioning requirements into the design
- 9.2(4) Conduct work sessions with DES and the client, locate Group I, Group II, and other functional user equipment. Develop keying and room numbering strategies.
- 9.2.5 Incorporate accepted value engineering and sustainability requirements

Deliverables

- 9.2(7)(a) Updated space comparison report
- 9.2(7)(b) Updated cost estimate
- 9.2(7)(c) Updated sustainable design status report
- 9.2(7)(d) Updated medical equipment summary
- 9.2(7)(e) Updated design intent / basis of design documentation
- 9.2(7)(f) Updated calculations
- 9.2(7)(g) Building commissioning plan
- 9.2(7)(h) Narrative summary of VE changes implemented in the design
- 9.2(7)(i) Project outline specifications
- 9.2(7)(j) Projected energy usage report with calculations
- 9.2.1 Drawings
 - 9.2.2.1(1) Architectural building perspective sketch
 - 9.2.2.2(1) Civil narrative on preliminary design for paving systems
 - 9.2.2.2(2) Comprehensive stormwater analysis including permitting activities schedule
 - 9.2.2.2(3) Update traffic code analysis
 - 9.2.2.3(1) Structural narrative basis of design for framing systems, lateral force resisting systems, and load paths
 - 9.2.2.3(1) Structural calculations
 - 9.2.2.4 (1,2) Room pressurization relationship and airflow summary
 - 9.2.2.4 (3,4) Design narratives on heating and air conditioning
 - 9.2.2.4(5) Economic analysis for refrigeration plant
 - 9.2.2.4(6) Mechanical preliminary calculations
 - 9.2.2.5(1) Narrative of the electrical service
 - 9.2.2.5(2) Narrative description of interior and exterior lighting systems
 - 9.2.2.5(3) Electrical needs for medical equipment listing
 - 9.2.2.5(4) Electrical calculations for major electrical components and systems
 - 9.2.2.5(5) Building electrical load calculations
 - 9.2.2.5(6) Preliminary electrical load analysis for normal and essential electrical systems
 - 9.2.2.5(7) Lightning protection calculations
 - 9.2.2.5(8) Preliminary short circuit analysis
 - 9.2.2.5(9) Sample of all proposed electrical schedules, tables, ect.

A/E project manager certifies that the above indicated requirements have been completed as required.

(signature)

(date)

(print name and title)

project name

65 Percent CD

planset date

Submittal Checklist

11.2 Requirements

Deliverables

- [] 11.2(1) Updated space comparison report
- [] 11.2(2) Updated cost estimate
- [] 11.2(3) Updated sustainable design status report
- [] 11.2(4) Updated building commissioning plan
- [] 11.2(5) Preliminary specifications
- [] 11.2(6) Updated projected energy usage report with calculations
- [] 11.2(7) Updated medical equipment summary
- [] 11.2(8) Updated design intent / basis of design documentation
- [] 11.2(9) Updated calculations
- [] 11.2.1 Drawings
 - [] 11.2.2.1(1) Architectural building perspective rendering
 - [] 11.2.2.1(2) Interior building perspective sketch(s)
 - [] 11.2.2.1(3) Preliminary color boards
 - [] 11.2.2.2(1) Civil narrative report on the status of all site related permit activities
 - [] 11.2.2.2(2) Civil design calculations
 - [] 11.2.2.3 Structural design calculations
 - [] 11.2.2.4 Mechanical design calculations
 - [] 11.2.2.5(1) Lighting calculations
 - [] 11.2.2.5(2) Electrical load and short circuit calculations and voltage drops based on drawings
 - [] 11.2.2.5(3) Arc flash calculations

A/E project manager certifies that the above indicated requirements have been completed as required.

(signature)

(date)

(print name and title)

project name

100 Percent CD

planset date

Submittal Checklist

12.2 Requirements

Deliverables

- 12.2(1) Updated space comparison report
- 12.2(2) Updated cost estimate
- 12.2(3) Updated sustainable design status report
- 12.2(4) Updated building commissioning plan
- 12.2(5) Updated design intent / basis of design documentation
- 12.2(6) Final calculations
- 12.2(7) Complete specifications
- 12.2(8) Facility user manual
- 12.2(9) Updated design intent and basis of design report
- 12.2(10) Quality assurance plans for wind and seismic requirements
- 12.2(11) Final projected energy usage report
- 12.2(12) Final medical equipment summary
- 12.2.1 Drawings
 - 12.2.2.1(1) Interior building perspective rendering(s)
 - 12.2.2.1(2) Final color boards
 - 12.2.2.1(3) Signage and wayfinding plan
 - 12.2.2.2 Narrative status of all associated permits
 - 12.2.2.3 Complete structural narrative
 - 12.2.2.4(1) Proposed mechanical equipment summary
 - 12.2.2.5 Electrical power selective coordination study
 - 12.2.2.6 Maintainable Equipment Summary

A/E project manager certifies that the above indicated requirements have been completed as required.

(signature)

(date)

(print name and title)

project name

Final CD

planset date

Submittal Checklist

13.2 Requirements

Deliverables

- [] 13.2(1) Complete construction documents including final technical specifications
- [] 13.2(2) Final space comparison report
- [] 13.2(3) Final cost estimate
- [] 13.2(4) Final sustainable design status report
- [] 13.2(5) Final energy and water consumption projections
- [] 13.2(6) Final building commissioning plan including the maintainable equipment summary.
- [] 13.2(7) Record copy of all final calculations
- [] 13.2(8) Final facility user manual
- [] 13.2(9) Final design intent / basis of design documentation
- [] 13.2(10) Record copy of formally concluded project review comment file
- [] 13.2(11) Record copy of other reports and studies required by the contract
- [] 13.2(12) Permitting status summary
- [] 13.2(13) Draft bid support documents

A/E project manager certifies that the above indicated requirements have been completed as required.

(signature)

(date)

(print name and title)

Appendix

2

Program and Space Accounting

A2 Program and Space Accounting

A2.1 POR Space Comparison Report

Through the various phases of a new or major renovation/expansion health care facility construction project, the space allocation provided in the approved Indian Health Service (IHS) Program of Requirements (POR) is to be compared with the actual space designed and/or constructed. The comparison process begins in the Concepts Phase of design, with the submission of a Space Comparison Report. The last submission of a Space Comparison Report is with the submission of the 100 percent construction documents. If any deviation occurs between the first and last submission that exceeds 10 percent, plus or minus, an update is to be submitted at that time. Also, as part of the “Record Drawings”, an update and verification is required.

A2.1.1 Report Content

The report is to be provided in two parts. The first part is to contain tables that provide a summary and a detailed backup. The specific computer programs to be used for the tables portions of this report will be determined during the Predesign Phase. The second part is to contain floor plans that delineate the various components used in the actual space comparison computations. Computer-Aided Design (CAD) is to be used in the preparation of the drawings for the Concepts Phase submittal, including the use of polylines (“P lines”), so that the net and gross areas are calculated by the computer software program.

Part I, Section A, is a summary that shows subtotals for each of the service components included in IHS health care facilities; i.e., Inpatient, Diagnostic, Ambulatory, Administrative, and Support, as applicable to the respective project. Each department within a service component will be subtotaled. For each service component and departmental subtotal, the POR net area, applicable net-to-gross factor, and gross area are to be shown. The actual spaces (designed or constructed) are to be compared with the POR spaces, with the percent of variance for both net and gross areas being shown. See Example “A” for format.

Part I, Section B, is a backup that gives a detailed breakdown for each department. This breakdown is intended to track each individual space in the POR by Criterion Number. The POR portion of the table

is to provide the respective Criterion Number, the space name, quantity (number of units), unit net area, and total net area. The POR net areas for each department are to be totaled. The actual portion of table is to provide the actual space identification numbers (used by the designer for space identification in the early phases of the design prior to room number assignments) (See A/E Guide section IV.B.), room numbers (See A/E Guide section IV.C.), unit net area, and net area. For each POR Criterion Number, the actual net areas are to be compared with POR net areas, with the variance amount being shown as well as the percent of variance and any appropriate comments. Note that a justification comment is required for any variance when the actual exceeds plus or minus 10 percent of that specified in the POR. See Example “B” for format.

Part II, is appropriate floor plans that delineate how the actual area is assigned to each department and the components that make up the building gross area. CAD drawings are to be used with “P lines” and layers reflecting net and gross areas.

A2.1.2 Basis of Computations

Measurements used in the computations shall be taken from the outside face of the exterior walls, disregarding such architectural projections as cornices, buttresses, and roof overhangs; the normal thickness of the exterior wall is included in the gross area.

Normal building overhangs, unroofed courtyards or plazas, bay windows extending outside the building line, catwalks providing access to equipment, mezzanines in the maintenance or central supply department which utilize open metal grating and are used for storage purposes only, cooling towers, other unroofed equipment, and unfinished attics in quarters units are not counted as gross area.

A2.1.2.1 Space Net Area

- 1) For space net area, each actual individual space is measured from the inside face of permanent walls or common lines between spaces. No deductions are to be made for space occupied by interior partitions when it is a wall within a space used to separate functions; or baseboard heating, ventilation and air-conditioning (HVAC) units. However, deductions are to be made for all mechanical shafts

passing through the space, structural columns, and HVAC units other than baseboard type.

- 2) When two or more spaces are combined into a single area, the actual space is to be compared with the combined respective POR spaces.
- 3) When a single space is divided into two or more spaces, the actual space is to be compared with the split respective POR space.

A2.1.1.2.2 Department Gross Area

- 1) For department gross area, each actual department shall be measured from the inside face of any exterior wall, the inside face of permanent corridor (building circulation) walls, or to the inside face of walls common with an adjacent department. (Note: the entire thickness of all walls for permanent corridors are included with the measurements for the permanent corridors.) There are to be no deductions for structural elements, departmental corridors, or partitions that occur within the department. Spaces for structural columns, which have been deducted from the space net area, are to be included in the department gross area. Spaces that have been identified to be included in the calculations for floor and building gross areas are to be deducted from the department gross area measurements and calculations.
- 2) When a space has been approved for location in a department (recipient) other than the department (donor) for which it was programmed in the POR, the gross area for the relocated space is to be deducted from the gross area of the recipient department and reflected in the donor department for comparison with the POR space. (Noting that the gross area is what is moved, then a new net area will have to be calculated based on the conversion factor for the recipient department, if these factors are different. By moving gross areas between departments, the total building gross area is not affected.)
- 3) CAD “P lines” are to be used to determine the departmental gross areas. A CAD layer separate from the one used to develop the space net areas is to be used.

A2.1.1.2.3 Floor Gross Area.

The actual floor gross area is the sum of the items listed below:

- 1) Department gross areas.
- 2) Permanent corridors, lobbies, vestibules (other than

arctic enclosures), malls, and their walls.

- 3) Stairwells on the first level as they occur and their walls on all levels.
- 4) Elevator shafts on the first level as they occur and their walls on all levels.
- 5) Interior walls common to more than one department.
- 6) Exterior walls (walls that follow the building “footprint,” not including roof overhangs, cornices, pilasters, buttresses, etc., which extend beyond the exterior wall face).

A2.1.1.2.4 Crawl Spaces and Mechanical Penthouses

These components do not affect the building “footprint” but are included as components of the mechanical space at the percentage of area indicated below:

- 1) All spaces having a clear height of 2 000 mm or higher are counted as 100 percent in gross area computations.
- 2) All spaces having a clear height of 1 200 mm to 1 999 mm are to be counted as 50 percent in gross area computations.
- 3) All spaces, having a clear height of less than 1 200 mm are excluded from gross area computations.

The clear height of a crawl space is defined as the distance between the surface of the earth or finished floor and the bottom of the predominate framing members (normally the joists or trusses). It is expected that girders, pipes or ducts may protrude into this height.

A2.1.1.2.5 Mechanical Space.

Depending upon the size of the project, the POR will allocate up to 12 percent of the total floor gross area for mechanical space. This space can be used only as mechanical space and can not be added to other areas of the facility. If the area is not required as mechanical space, it is to be deducted from the total building gross area. The actual mechanical space is included in the total building gross area. The various components of mechanical space are to be listed in a summary backup table and compared with the programmed percent for mechanical space given in the POR. Mechanical space includes the following: The actual building gross area is the sum of the items listed below:

- 1) Enclosed and covered space used for major equipment such as boilers, chillers, large pumps and valves, emergency generators, storage tanks, and

large fans.

- 2) Rooms used for electrical switching gear, main electrical panels, main communication terminals, mechanical controls, metering of utility services, and shafts for utilities on the first level they occur and their walls on all levels.
- 3) Crawl Spaces and Mechanical Penthouses.
- 4) The gross area of stand alone mechanical spaces and mechanical penthouses are counted as part of the “gross area for mechanical space.” The net area of mechanical spaces located in a building that houses more than one department is counted as part of the “gross area for mechanical space.”

A2.1.2.6 Building Gross Area.

The actual building gross area is the sum of the items listed below:

- 1) Floor Gross Area.
- 2) Mechanical Space.
- 3) Space associated with energy efficiency, extreme climate response such as arctic enclosures, seismic concerns, and/or innovative construction techniques. (Examples are extra wall thickness for arctic conditions, seismic bracing, and double walls that are a result of placing two modular units together.)

A2.1.2.7 Components Excluded from Building Gross Area Computations, but Included in the Report

- 1) The following components are excluded from the building gross area. They are to be included in this report as separate line items and the actual spaces are to be reported and compared with the POR space requirements when applicable. Each of these components is to be authorized specifically for use in the project in the basic POR or a POR amendment.
 - a) **Equipment access walkways.**
 - b) **Catwalks and mezzanines which utilize open metal floor grating.**
 - c) **Interstitial space (if use of such is approved in accordance with IHS requirements).**
 - d) Loading Dock(s).
 - e) Covered entrances.
 - f) Exterior covered walkways, canopied areas, trellis-type covers and other covered but not

enclosed areas.

- g) Building overhangs exceeding 1 meter in width.
- h) Parking.
- I) Uncovered outside storage areas.
- j) Helicopter ports or helicopter pads.
- k) Unroofed equipment pads.
- l) Locally specified separate traditional healing structures.
- 2) Crawl space having a clear height less than 1 200 mm are excluded from the building gross area and the use thereof does not require authorization before they are used in a design. They are to be included in this report as a separate line item and the actual area is to be reported.

A2.1.2.8 Components Excluded from the Report

The following components are excluded from the building gross area and from this report:

- 1) Building overhangs not exceeding 1 meter in width.
- (2) Bay windows.
- (3) Unfinished and unoccupied attics that do not have floor surfaces. Note, attics that have floor surfaces are treated as a floor and will be counted as such.

PROJECT NAME

Project PHASE

date

Comparison of POR Space Allocation with Actual Space

Part I, Section A - Services Summary

template number	department name	POR			actual			variance gross area	
		net area (m ²)	net to gross factor	gross area (m ²)	net area (m ²)	net to gross factor	gross area (m ²)	difference (m ²)	%
ADDITIONAL SERVICES									
	Diabetes Prevention Program	253	1.35	342	280	1.35	378	36	11%
	DHSA Tribal Health Services	270	1.35	365	265	1.35	358	-7	-2%
	WIC	138	1.35	186	142	1.35	192	6	3%
			1.35			1.35			
			1.35			1.35			
			1.35			1.35			
			1.35			1.35			
			1.35			1.35			
			1.35			1.35			
	Subtotal Additional Services	661		893	687		928	35	4%
ADMINISTRATION									
	Administration	216	1.4	302	224	1.4	314	12	4%
	Business Office	113	1.4	158	124	1.4	174	16	10%
	Health Information Management	320	1.25	400	310	1.25	388	-12	-3%
	Information Management	69	1.2	83	72	1.2	86	3	4%
	Subtotal Administration Services	718		943	730		962	19	2%
AMBULATORY SERVICES									
AU2	Audiology	64	n/a	81	64	n/a	81	0	0%
DCC14	Dental Care	462	1.5	693	462	1.5	693	0	0%
DCC16	Dental Care	500	1.5	750	500	1.5	750	0	0%
ER3	Emergency	230	1.55	357	230	1.55	357	0	0%
EC2	Eye Care	182	n/a	236	182	n/a	236	0	0%
PCP14	Primary Care	1,036	1.45	1,502	1,036	1.45	1,502	0	0%
	Specialty Care	43	1.45	62	43	1.45	62	0	0%
	Subtotal Ambulatory Services	2,517		3,681	2,517		3,681	0	0%
ANCILLARY SERVICES									
DI3	Diagnostic Imaging	314	n/a	427	314	n/a	427	0	0%
LB4	Laboratory	205	1.25	256	205	1.25	256	0	0%
PH_8	Pharmacy	354	1.2	425	354	1.2	425	0	0%
PT3	Physical Therapy	378	1.3	491	378	1.3	491	0	0%
	Respiratory Therapy		1.21			1.21			
	Surgery		1.55			1.55			
	Subtotal Ancillary Services	1,251		1,599	1,251		1,599	0	0%
BEHAVIORAL SERVICES									
	Mental Health	168	1.4	235	175	1.4	245	10	4%
	Social Work	76	1.4	106	92	1.4	129	23	22%
	Subtotal Behavioral Services	244		341	267		374	33	10%

PROJECT NAME

Project PHASE

date

Comparison of POR Space Allocation with Actual Space

Part I, Section A - Services Summary

template number	department name	POR			actual			variance gross area	
		net area (m ²)	net to gross factor	gross area (m ²)	net area (m ²)	net to gross factor	gross area (m ²)	difference (m ²)	%
FACILITY SUPPORT									
CE1	Clinical Engineering	39	n/a	42	39	n/a	42	0	0%
FM_4	Facility Management	205	1.2	246	205	1.2	246	0	0%
Subtotal Facility Support		244		288	244		288	0	0%
INPATIENT SERVICES									
ACB8	Acute Care	394	1.55	611	394	1.55	611	0	0%
	Intensive Care		1.41			1.41			
LD1	Labor & Delivery	228	n/a	326	228	n/a	326	0	0%
	Psychiatric Nursing		1.55			1.55			
Subtotal Inpatient Services		622		937	622		937	0	0%
PREVENTIVE SERVICES									
	Environmental Health	149	1.4	209	160	1.4	224	15	7%
	Health Education	49	1.4	69	52	1.4	73	4	6%
	Public Health Nursing	321	1.4	449	315	1.4	441	-8	-2%
	Public Health Nutrition	47	1.4	66	49	1.4	69	3	5%
Subtotal Preventive Services		566		792	576		806	14	2%
SUPPORT SERVICES									
DT1	Dietary	310	n/a	333	310	n/a	333	0	0%
EGC2	Education & Group Consultation	126	n/a	151	126	n/a	151	0	0%
	Education & Group Consultation	23	n/a	27	22	n/a	27	0	0%
	Employee Facilities	328	1.2	394	357	1.2	428	34	9%
HL2	Housekeeping & Linen	47	1.1	52	47	1.1	52	0	0%
	Housekeeping & Linen	16	1.1	18	17	1.1	19	1	6%
MS2	Medical Supply	99	1.24	123	99	1.24	123	0	0%
PS_4	Property & Supply	398	1.1	438	398	1.1	438	0	0%
	Public Facilities	156	1.1	172	170	1.1	187	15	9%
Subtotal Support Services		1,193		1,373	1,236		1,424	51	4%
Building Totals									
Subtotal - Total Dept. Gross Area				10,153			10,290	137	1.4%
Department to Floor Factor ¹		20%		2,031	20%		2,058	27	1.4%
Subtotal - Total Floor Gross Area				12,184			12,348	165	1.4%
Mechanical Space ²				1,462			1,482	20	1.4%
Total Building Gross Area				13,646			13,830	185	1.4%

¹Department to floor factor varies based on single or multi-story.

²Percentage of mechanical space will vary. See POR.

PROJECT NAME

Project PHASE

date

Comparison of POR Space Allocation with Actual Space

Part I, Section B - Departmental Review

ADMINISTRATION SERVICES

RFN code	space name	room number	room number	POR			actual			variance	
				quantity of spaces	unit net area (m ²)	total net area (m ²)	quantity of spaces	unit net area (m ²)	total net area (m ²)	difference (m ²)	%
ADMINISTRATION											
ALLG1	Alcove Staff Lounge			1	3	3	1	4	4	1	0%
MLRM1	Mailroom			1	10	10	1	11	11	1	10%
OFOC1	Administrative Assistant			9	6	54	9	6	54	0	0%
OFOC1	Clerk, Quality Assurance			1	6	6	1	7	7	1	17%
OFOC1	Employee Health Clerk			1	6	6	1	5	5	-1	-17% ²
OFOC1	Secretary/Clerk			1	6	6	1	5	5	-1	-17% ²
OFSP1	Clinical Director			1	11	11	1	12	12	1	9%
OFSP1	Director of Nursing			1	11	11	1	10	10	-1	9%
OFSW1	Office, Shared Work			1	6	6	1	6	6	0	0%
OFTY1	Administrative Officer			3	9	27	3	9	27	0	0%
OFTY1	Employee Health Supervisor			1	9	9	1	9	9	0	0%
OFTY1	Nursing Quality Assurance			3	9	27	3	10	30	3	11%
STSF1	Unit Supply & Filing			4	4	16	1	17	17	1	6%
TLPS1	Toilet, Staff			1	5	5	1	6	6	1	20% ¹
WRCP1	Duplicating Equip. & Supply			1	11	11	1	12	12	1	9%
WTFN1	Waiting Area			1	8	8	1	9	9	1	13% ¹
Subtotal Administration Department net square meters						216			224	4%	
departmental net to gross						1.40			1.40	calculated net to gross	
departmental gross square meters						302			314	actual department gross	
BUSINESS OFFICE											
ALLG1	Alcove Staff Lounge			1	3	3	1	4	4	1	0%
ALCP1	Duplicating Equip. & Supply			1	4	4	1	5	5	1	25% ¹
ALLG1	Alcove, Staff Lounge			1	3	3	1	3	3	0	0%
OFIN1	Registration & Interview			1	7	7	1	8	8	1	14% ¹
OFOC1	Accounts and Billing			5	6	30	5	7	35	5	17% ¹
OFSP1	Business Manager			1	11	11	1	12	12	1	9%
OFSW11	Office, Shared Work			1	6	6	1	7	7	1	17% ¹
OFTY1	Health Benefits Cord.			3	9	27	3	9	27	0	0%
STSF1	Unit Supply & Filing			3	4	12	1	13	13	1	8%
TLPS1	Toilet, Staff			1	5	5	1	5	5	0	0%
WTGN1	Waiting			1	8	8	1	9	9	1	13% ¹
Subtotal Business Office Department net square meters						113			124	10%	
departmental net to gross						1.40			1.40	calculated net to gross	
departmental gross square meters						158			174	actual department gross	

PROJECT NAME

Project PHASE

date

Comparison of POR Space Allocation with Actual Space

Part I, Section B - Departmental Review

ADMINISTRATION SERVICES

RFN code	space name	room number	room number	quantity of spaces	POR		actual			variance	
					unit net area (m ²)	total net area (m ²)	quantity of spaces	unit net area (m ²)	total net area (m ²)	difference (m ²)	%
DEPARTMENT											
similar room detail for each department within the POR ADMINISTRATION service											
Subtotal Department net square meters											
<i>departmental net to gross</i>											<i>calculated net to gross</i>
<i>departmental gross square meters</i>											<i>actual department gross</i>
Administration Services Totals						POR	actual				
Total Department Net Area (m²)						718	730				
Total Departmental Gross Area (m²)						943	962				

¹A justification comment is required since the actual area exceeds 10 percent of that authorized by the POR.

²A justification comment is not required when the 10 percent variance is less than that authorized by the POR.

A3 Design Intent and Basis of Design

A3.1 Overview

Specifically identifying and developing the design intent and basis of design provides each party involved in building commissioning, at each respective stage, an understanding of the building systems. This allows team members to perform their respective responsibilities regarding the design, construction or operation of the building.

Design documentation includes the salient information from the project planning and programming, conceptual design, and design and construction development to aide in guiding the design, verify compliance during construction and support building operations. Design documentation consists of two dynamic components, the design intent and the basis of design.

The design documentation differs from traditional specifications in that it provides a more narrative description of the system or issue and presents the issue or building component with clear and useful background information. However, design documentation often includes parts of specifications.

In general, specifications detail what is to be done on a component level, while design documentation explains why something is done and, in general terms, how design and operating objectives will be accomplished. Sections of the design documentation can look like specifications, especially where tasks depart from conventional practice, e.g., energy efficient design and construction.

These requirements should be modified for each project and may be streamlined for small projects less than \$100,000 in total construction cost.

A4.3.1.1 Documentation Format and Detail

The format and rigor of the design intent documentation will be similar to the example documentation format found in the Design Documentation Format Form in Appendix 1 of the Peci Model Commissioning Plan. One-line CAD drawings shall be developed to augment the design narratives.

The general outline of the full documentation is:

- design narrative describing the system in general
- objectives of each system and its functional use

- full sequence of operations under all modes and conditions
- setpoints and operating parameters
- performance criteria and applicable codes and standards

A3.2 Design Intent

The design intent is a dynamic document that provides the explanation of the ideas, concepts, and criteria that are considered to be very important to the owner and is developed initially from the outcome of the programming and conceptual design phases. The design intent narrative should cover the following, for each system, major component, facility and area:

- General system description
- Objectives and functional use of the system, equipment or facility
- General quality of materials and construction
- Occupancy requirements
- Indoor environmental quality, IEQ (space temperature, relative humidity, indoor air quality, noise level, illumination level, etc.)
- Performance criteria (general efficiency, energy and tolerances of the IEQ objectives, etc.)
- Energy savings strategies.
- Restrictions and limitations of system
- Budget considerations and limitations
- Restrictions and limitations of system or facility

A3.3 Basis of Design

The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent.

The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.

The following should be included in the basis of design:

- Specific description of systems, components and methods for achieving the design intent objectives.
For example for a rooftop air conditioning unit: discuss why this system was chosen above others, details of size, efficiencies, areas served, capacity control details, compressors, coils, dampers, setpoints, filters, economizers, minimum ventilation control, control type, noise and vibration criteria, tie-in to other systems, sequences of operation under all modes of operation, control strategies, etc.
- Equipment maintainability
- Fire and life safety criteria, general strategy narrative, and detailed sequences
- Emergency power control and function
- Energy performance
- Ventilation strategies and methods
- Complete sequences of operation, including setpoints and control parameters
- Schedules
- Applicable codes and standards

- Primary load and design assumptions
- Diversity used in sizing
- Occupant density and function
- Indoor conditions (space temperature, relative humidity, lighting power density,) ventilation rate per ASHRAE 62.1 and infiltration rates, etc.)
- Outdoor conditions
- Glazing fraction, U-value and shading coefficient
- Building envelope – U values of Roof, exterior walls, and floor
- Other Information of secondary importance to the commissioning and operation of the building should be documented by the design team, but is not included in the design documentation described here or included in the O&M manuals.

A3.3.1 Progression

The detail content of both the design intent and basis of design increase as the design process progresses, as described in Table 1. Progression of design documentation. Initially the design documentation required is primarily a narrative of the building system descriptions, the purpose of the systems, how the

Table 1. Progression of Design Documentation

Stage	Issues Addressed	Responsible Parties
Programming	The owner’s and tenant’s needs are identified in detail. The applicable parts of the programming report become the initial design intent.	Owner and Architect
Conceptual Design and Design Development	Design intent clarified. Basis of design begun: overall system descriptions, objectives of systems, general methods of achieving objectives, etc.	Owner and Architect
Construction Documents and Specification Development	Same as Conceptual Design and Design Dev. above, but in more detail, including complete basis of design: complete system & component description, specific methods of achieving system objectives, design & load assumptions, applicable codes and standards, complete sequences of operation and control strategies	Architect and their Design consultants (Engineers)
As-Built Documentation	Same as Construction Documents and Specification Development, plus: Adjusted sequences with final control parameters	Design Consultants (Engineers), Construction Contractors, Architect, and Facility Manager

systems will meet those objectives and why this system or method was chosen above others.

As the design process progresses the design documentation includes the basis of design with a specific description of the system and components, its function, how it relates to other systems, sequences of operation, and operating control parameters.

Each contributing designer clearly documents in writing the intent behind the chosen design and the operating parameters of the system. The design intent required here is not a substitute for what may be required in the specifications or contract for other systems.

The initial design intent from the programming phase is developed by the architect with review by the design team and commissioning authority. The architect, or other assigned party, acts as the design documentation task leader and coordinates the creation of the full design documentation by the design team.

Each member of the design team provides the system description, the written basis of design, and detailed sequences of operation for the areas of design that are their responsibility. They submit the documentation in parts to the task leader at the pre-determined phases of design. The architect, task leader, and commissioning authority, review, comment on, and approve the submissions. Design intent documentation for other components and systems such as structural, interior design, furnishings, plumbing, etc. may be required, but are not a part of the commissioning work unless listed and checked herein.

A3.3.2 Design Documentation

A3.3.2.1 Architectural

- general building design and function
- building shell efficiency
- environmental sustainable construction
- landscaping / irrigation
- interior design
- other relevant items

A3.3.2.2 Structural

- building foundation systems, retaining walls, slope stabilization requirements, roof structure, and exterior wall system.

A3.3.2.3 Civil

- potable water system including flowrate, storage volume, pipe diameters, available flow and pressure
- fire protection system - supply water to building: pressure and flowrate coordinated with Mechanical & Architectural, fire hydrant requirements, fire flow duration
- sanitary sewer system - daily and peak flows, capacity of existing sewer system, alternatives for treatment and disposal if necessary, code requirements
- stormwater and erosion control - predevelopment runoff analysis, design storm including frequency and duration, method to simulate and assess runoff characteristics of the site for both predevelopment and postdevelopment
- landscaping water supply system
- natural gas system - location and size of existing utility system, utility company requirements, code requirements, LPG tank size if applicable

A3.3.2.4 HVAC Mechanical

- HVAC systems (air and water)
- automatic controls with control sequence of operation including control system architecture
- fire/smoke protection systems
- thermal comfort
- Indoor air quality
- acoustical quality
- one-line CAD drawings of:
 - o chilled and hot water
 - o condenser water
 - o potable water
 - o steam and condensate systems
 - o supply, return and exhaust air systems
 - o medical gas system
- other relevant items

A3.3.2.5 Sequences of Operation

All sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections,

unless the sections are numbered.

Detailed written sequences of operation shall be developed with the following components clearly and completely described for each piece of dynamic equipment.

- overview narrative of the specific system generally describing its purpose, components and function
- listing of all interactions and interlocks with other systems
- detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable
- written sequences of control for packaged controlled equipment (equipment manufacturer generic sequences may be included, but will generally require additional narrative.)
- startup sequences
- warm-up mode sequences
- normal operating mode sequences
- unoccupied mode sequences
- shutdown sequences
- capacity control sequences and equipment staging
- temperature and pressure control, including setbacks, setups, resets, etc.
- detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
- effects of power or equipment failure with all standby component functions
- sequences for all alarms and emergency shut downs
- seasonal operational differences and recommendations
- initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment
- schedules

A3.3.2.6 Fire and Emergency Power Response Matrix

An HVAC fire and emergency power response matrix that lists all equipment and components (air handlers, dampers, valves, etc.) with their status and action during a fire alarm and under emergency power shall be developed. An example of a fire and power response matrix and flow chart are found in Appendix 2 of the PECE Model Commissioning Plan.

A3.3.2.7 Electrical

- interior lighting
- automatic lighting controls (exterior and interior)
- security system
- communications system
- fire and smoke alarm system
- power quality
- emergency power
- one-line CAD drawings of the building electrical system
- building grounding and lightning protection
- renewable energy systems
- other relevant items

A3.4 Documentation Format and Detail

The format and rigor of the design intent documentation will be similar to the example documentation format found in the Design Documentation Format Form in Appendix 1 of the PECE Model Commissioning Plan. One-line CAD drawings shall be developed to augment the design narratives. The general outline of the full documentation is:

- design narrative describing the system in general
- objectives of each system and its functional use
- full sequence of operations under all modes and conditions
- setpoints and operating parameters
- performance criteria and applicable codes and standards

A4 Index	Page
Example Psychrometric Analysis	121
Crime Prevention Through Environmental Design (CPTED) Summary	123

Example Psychrometric Analysis

Extracted from *Schematic Design Sumbittal for Eagle Butte Health Center*

5) Engineering Narrative - Mechanical Egnigeering

Psychrometric Analysis of AHU System

A psychrometric chart will not be included as part of this discussion, however we will address this issue as follows:

- A. As far as can be determined at this time, each air handler will have a significant enough return at all times that a mid-winter situation will provide only a modest need for heating at the air handler. Wintertime mixed air conditions will provide enough cooling air in the duct to cool all internal spaces but allow a reset of the mixed air temperature to make use of as much return air as possible (to offset the situation that during many months in order to maintain a set, say 55 deg. F. mixed air temperature, we would actually be relieving some air that could be returned to the system.) We will utilize controls to allow the mixed air temperature to rise up a little bit during extreme winter conditions so as to maximize utilization of return air.
- B. However in the summertime we will have two different situations psychrometrically at the air handling units. The first situation will be for normal outpatient clinical areas where we will try to achieve a summertime relative humidity of 60 – 65% in the space. This will require a leaving air temperature of 55 deg. F. off the chilled water coil. At a typical condition of approximately 15% fresh air and a design (warm) summer day, we would have the following conditions:

Outside air – 95 deg. Db/76 deg. wb
H = 40.0

Return air – 74 deg. db/64 deg. wb
h = 29.3

Mixed air at 15% fresh air on a design summer day would then be:
77 deg.db/66.5 deg. wb
h = 31.0

Leaving coil temperature would then be:
55 deg. db/54 deg. wb
h = 23.4

- C. At all critical air handling unit areas, of which there will be three air handlers, the leaving air temperature off the coil will be 52 deg. F. so as to produce 50 – 60% relative humidity in patient, diagnostic, and critical healthcare areas.

There will be no specific separation between these clinical and healthcare areas except for the normal closing of doors, etc. but these will be the main conditions that we will seek to maintain.

Crime Prevention Through Environmental Design (CPTED)

Crime prevention through environmental design is a multi-disciplinary approach to deterring criminal behavior through environmental design. CPTED strategies rely upon the ability to influence offender decisions that precede criminal acts.

Strategies for the Built Environment

CPTED strategies rely upon the ability to influence offender decisions that precede criminal acts. Research into criminal behavior shows that the decision to offend or not to offend is more influenced by cues to the perceived risk of being caught than by cues to reward or ease of entry. Consistent with this research, CPTED based strategies emphasize enhancing the perceived risk of detection and apprehension.

The proper design and effective use of the built environment can reduce crime, reduce the fear of crime, and improve the quality of life. Built environment implementations of CPTED seek to dissuade offenders from committing crimes by manipulating the built environment in which those crimes proceed from or occur. The three most common built environment strategies are natural surveillance, natural access control and natural territorial reinforcement.

Natural surveillance and access control strategies limit the opportunity for crime. Territorial reinforcement promotes social control through a variety of measures.

Natural Surveillance

Natural surveillance increases the threat of apprehension by taking steps to increase the perception that people can be seen. Natural surveillance occurs by designing the placement of physical features, activities and people in such a way as to maximize visibility and foster positive social interaction among legitimate users of private and public space. Potential offenders feel increased scrutiny and limitations on their escape routes.

Place windows overlooking sidewalks and parking lots.

Leave window shades open.

Use passing vehicular traffic as a surveillance asset.

Create landscape designs that provide surveillance, especially in proximity to designated points of entry and opportunistic points of entry. Do not use landscape and building design that form hiding

places for perpetrators of crime.

Use the shortest, least sight-limiting fence appropriate for the situation.

Use transparent weather vestibules at building entrances.

When creating lighting design, avoid poorly placed lights that create blind-spots for potential observers and miss critical areas. Ensure potential problem areas are well-lit: pathways, stairs, entrances/exits, parking areas, ATMs, phone kiosks, mailboxes, bus stops, children's play areas, recreation areas, pools, laundry rooms, storage areas, dumpster and recycling areas, etc.

Avoid too-bright security lighting that creates blinding glare and/or deep shadows, hindering the view for potential observers. Eyes adapt to night lighting and have trouble adjusting to severe lighting disparities. Using lower intensity lights often requires more fixtures.

Use shielded or cut-off luminaires to control glare.

Place lighting along pathways and other pedestrian-use areas at proper heights for lighting the faces of the people in the space (and to identify the faces of potential attackers).

Natural surveillance measures can be complemented by mechanical and organizational measures. For example, closed-circuit television (CCTV) cameras can be added in areas where window surveillance is unavailable.

Natural Access Control

Natural access control limits the opportunity for crime by taking steps to clearly differentiate between public space and private space. By selectively placing entrances and exits, fencing, lighting and landscape to limit access or control flow, natural access control occurs.

Use a single, clearly identifiable, point of entry

Use structures to divert persons to reception areas

Incorporate maze entrances in public restrooms. This avoids the isolation that is produced by an anteroom or double door entry system

Use low, thorny bushes beneath ground level windows.

Eliminate design features that provide access to roofs or upper levels

Use waist-level, picket-type fencing along residential property lines to control access, encourage surveillance.

Use a locking gate between front and backyards.

Use shoulder-level, open-type fencing along lateral residential property lines between side yards and extending to between back yards. They should be sufficiently unencumbered with landscaping to promote social interaction between neighbors.

Use substantial, high, closed fencing (for example, masonry) between a backyard and a public alley.

Natural access control is used to complement mechanical and operational access control measures, such as target hardening.

Natural Territorial Reinforcement

Territorial reinforcement promotes social control through increased definition of space and improved proprietary concern. An environment designed to clearly delineate private space does two things. First, it creates a sense of ownership. Owners have a vested interest and are more likely to challenge intruders or report them to the police. Second, the sense of owned space creates an environment where “strangers” or “intruders” stand out and are more easily identified.

By using buildings, fences, pavement, signs, lighting and landscape to express ownership and define public, semi-public and private space, natural territorial reinforcement occurs. Additionally, these objectives can be achieved by assignment of space to designated users in previously unassigned locations.

Maintained premises and landscaping such that it communicates an alert and active presence occupying the space.

Provide trees in residential and commercial areas. Research results indicate that, contrary to traditional views within the law enforcement community, outdoor residential spaces with more trees are seen as significantly more attractive, more safe, and more likely to be used than similar spaces without trees.

Restrict private activities to defined private areas.

Display security system signage at access points.

Placing amenities such as seating or refreshments

in common areas in a commercial or institutional setting helps to attract larger numbers of desired users.

Scheduling activities in common areas increases proper use, attracts more people and increases the perception that these areas are controlled.

Territorial reinforcement measures make the normal user feel safe and make the potential offender aware of a substantial risk of apprehension or scrutiny.

Appendix

5

Selected IHS Technical Handbook Index

A5 Selected IHS Technical Handbook Index

www.oehe.ihs.gov/hb/index.cfm

Volume III

Health Care Facilities Design and Construction

21 Design Criteria Standards

2 General Architectural Guidelines

- 2.1 Introduction
- 2.2 Architectural Design Guideline
- 2.3 Dental Shielding
- 2.4 Radon Control and Mitigation

3 Civil / Structural Guidelines

- 3.2 Flood Plain Management
- 3.3 Construction Site Storm Water Discharge

4 Mechanical Guidelines

- 4.1 Introduction
- 4.2 Nitrous Oxide Guidelines
- 4.3 Color Code, Signage, and Identification of Building Utility Piping Systems
- 4.4 Smoke Damper Use (Toxic Vapor Cases)
- 4.5 Ventilation Design for the Installation of Tuberculosis Control Booth
- 4.6 Ventilating Design for Isolation Rooms
- 4.7 Fire Sprinklers Versus Alternate Provisions (Quarters)
- 4.8 Darkroom Ventilation
- 4.9 Dental Ventilation
- 4.10 Design Requirements For Compounded Sterile And Hazardous Drug Preparation Areas

5 Electrical Guidelines

- 5.1 Introduction
- 5.2 Alternate Power (Emergency Electrical Systems)
- 5.3 Alternate Power (Standby Electrical Systems)
- 5.4 Electrical Power Quality
- 5.5 Building Automation Systems

7 Accessibility Standards

- 7.1 Introduction
- 7.2 Guidelines

8 Metrication

- 8.1 Introduction
- 8.2 Guidelines

9 Seismic Standards

- 9.1 Introduction
- 9.2 Background
- 9.3 New Facilities
- 9.4 Existing Facilities

13 Computer Aided Design

15 Determination of Physical Security Requirements for use in the Design of Federal Facilities

- 15.1 Introduction
- 15.2 Physical Security Assessment Process

16 Standards for Computerized Maintenance Management Systems (CMMS)

17 Sustainability

24 Construction Guidelines

11 Installation of Fire Sprinkler Protection in IHS Owned Installations

- 11.1 Purpose
- 11.2 Definitions
- 11.3 Policy
- 11.4 Methodology

Volume VI Facilities Engineering

72 Utility Resource Management

72.3 Indian Health Service (IHS) Metering Plan

- 3.1 Introduction
- 3.2 Purpose

- 3.3 Objective
- 3.4 Scope
- 3.5 Definitions
- 3.6 Metering Criteria
- 3.7 Responsibilities
- 3.8 Development of Metering Plans
- 72.4 Water Management
- 4.1 Purpose
- 4.2 Scope
- 4.3 Introduction
- 4.4 Law and Policy
- 4.5 Guidelines
- 4.6 Procedures

Appendix

6

List of Electronic Attachments

A6 Electronic Attachments

The following attachments may be downloaded from the DES document access portal, online at: <http://www.des.ihs.gov/index.cfm?module=dap>.

- 1. 2010 Architect / Engineer Guide**
- 2. Design Comment Review Form & Instructions**
- 3. DES Title Block**
- 4. Example Space Accounting Reports**
- 5. Document Version Change Summary**



Department of Health & Human Services
Office
of Contracting Services