SECTION 2.2, PLANNING, DESIGN and CONTRACT DOCUMENT DEVELOPMENT GUIDELINES for DESIGN BUILD DELIVERY METHOD

2.2.0 INTRODUCTION

2.2.0.1 The consultant/contractor shall use the information in this section to plan and design University facilities.

2.2.0.2 The criteria represent minimum levels of performance, quality, and/or standardization that are sometimes different from those accepted in private and commercial industry. This is in recognition that these facilities must be cost effective over the life of the facility, while supporting the academic and research missions of the University.

2.2.0.3 The planning and design criteria compliment the Design Guidelines in Section 3. The consultant/contractors shall familiarize themselves and be responsible for implementing all criteria and guidelines.

2.2.0.4 The consultant/contractor shall plan facilities with consideration given to serviceability and maintainability of these facilities.

2.2.1. GENERAL

2.2.1.1 Provide an experienced Architectural and/or Engineering Project Manager capable of effectively coordinating a multi-disciplined team and with experience in the communication and administrative skills necessary for that role. The same manager will be used for both design and construction unless approved by the University.

2.2.1.2 Design to harmonize architecturally with the buildings upon the University campus and/or as instructed by the PM.

2.2.1.3 The consultant/contractor shall develop and economically justify designs within the prescribed budget and space allocations. Design to obtain the lowest life-cycle cost consistent with a high quality facility.

2.2.1.4 Design to the University's Codes and Standards as listed in section 2.2.2 of this manual.

2.2.1.5 Cooperate mutually with the owner and with any other such consultant/contractors employed by the owner.

2.2.1.6 Make all correspondence between the University and the consultant/contractor during the design phase through the PM.

2.2.2 BUILDING CODES AND STANDARDS FOR UNIVERSITY FACILITIES

2.2.2.1 Basic Building Code Policy

2.2.2.1.1 All University facilities shall comply with the International Code Council [ICC] Codes.

2.2.2.1.2 Codes and standards required by accreditation agencies, such as the Joint Commission for Accreditation of Hospitals (JCAHO) will also be used unless the ICC requirements are more stringent.

2.2.2.1.3 In the event that special design features and/or construction systems are not covered in the ICC codes, the applicable edition of the National Fire Protection Association [NFPA] family of standards and/or the NFPA 101 Life Safety Code shall be used.

2.2.2.1.4 The UM FPD web site contains a list of the versions of the codes and standards that are applicable for the current calendar year.

2.2.2.2 **Codes** that apply to University design & construction.

1. ICC International Building Code and reference standards
2. ICC International Fire Code
3. ICC International Plumbing Code
4. ICC International Mechanical Code
5. ICC Existing Building Code (Requires preapproval from the AHJ or Approved Building Code Official)
6. ICC International Fuel Gas Code
7. ICC International Swimming Pool and Spa Code
8. NFPA 13 Installation of Fire Sprinkler Systems
9. NFPA 14 Standard for the Installation of Standpipe, Private Hydrants and Hose Systems.
10. NFPA 20 Standard for the Installation of Stationary Fire Pumps for Fire Protection
11. NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals
12. NFPA 51B Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
13. NFPA 70 National Electric Code (NEC)
14. NFPA 72 National Fire Alarm Code
15. NFPA 90A Installation of Air Conditioning and Ventilating Systems
16. NFPA 110 Standard for Emergency and Standby Power Systems
17. NFPA 150 Fire and Life Safety in Animal Housing Facilities
18. ADA Standards for Accessible Design (DOJ)
19. NFPA 101 Life Safety Code (as noted in 2.2.2.1.3 above)

20. American Society of Mechanical Engineers (ASME) Safety Code of Elevators and Escalators A17.1 and other codes as adopted by The Missouri Division of Fire Safety, Elevator Safety Unit.

2.2.2.3 **Standards** that apply to University design & construction.

1. National Fire Protection Association (NFPA) standards
2. Missouri Standard Specification for Highway Construction, Missouri State Highway Commission
3. American Concrete Institute (ACI)
4. American National Standards Institute (ANSI)
5. American Refrigeration Institute (ARI)
6. American Society for Testing and Materials (ASTM)
7. Underwriter's Laboratories, Inc. (UL), Federal Specifications
8. National Electrical Manufacturers Association (NEMA)
9. Williams Steiger Occupational Safety and Health Act of 1970 (OSHA)
10. American Society of Heating Refrigeration & Air Conditioning Engineers (ASHRAE)

2.2.2.4 Automatic Fire Suppression Systems. All new buildings will be designed with automatic fire suppression systems throughout. Exceptions to this requirement may be granted by the UM Executive Director of Facilities Planning & Development for facilities such as garages, temporary facilities, etc. Work to existing facilities will be designed to meet code. However, it is highly recommended to provide automatic fire suppression systems as a part of major renovation projects.

2.2.2.5 The Authority Having Jurisdiction [AHJ] as referred to in the building codes is the UM Executive Director of Facilities Planning & Development, University of Missouri System. All requests for the AHJ will be made through the Project Manager to the UM Executive Director of Facilities Planning & Development.

2.2.2.6 Code Change Administration

2.2.2.6.1 Changes to the ICC Code will be implemented by the January 1 following issuance. Changes to the NFPA, and other listed standards, will be adopted similarly as the ICC code. Revisions to ADA Standards will be implemented immediately.

2.2.2.6.2 Projects with Design Development approval will not be required to incorporate subsequent code revisions, with the following exceptions:

(1) Projects where construction does not begin within 18 months of approval of design development documents or within 12 months of approval of final construction documents will be revised to incorporate subsequent code revisions.

(2) Changes, which significantly improve the access, health, and safety of building occupants, will be incorporated into all projects.

2.2.2.6.3 The University will notify Consultant/contractors engaged in University design work of any code revisions in writing. The Consultant/contractor shall promptly advise the University Project Manager of any implications of a code revision to the design work. Any resulting abandoned work resulting from a University code revision may be eligible as an additional service under the Consultant/contractor's agreement.

2.2.2.7 The University's general policy is not to deviate from the adopted codes. Consultant/contractor must certify in writing on the contract document that the project has been designed in compliance with the University codes, see section 2.2.6 Contract Documents for additional information.

2.2.2.8 Variance Procedures

2.2.2.8.1 Consultant/contractor must request approval of any code variances in writing through the University Project Manager (PM) to the UM Executive Director of Facilities Planning & Development. The University AHJ will issue a written ruling on all requests. A code variance request must include:

(1) An explanation of the situation, the applicable codes, and the reason why code compliance is not possible. Copies of referenced codes, informational sketches, drawings, calculations, and other supporting material should be attached to the request.

(2) A discussion and recommendation related to the impact on building use and occupant safety.

(3) A discussion and recommendation of equivalent systems available and cost implications of each.

2.2.2.9 Code Compliance Report

2.2.2.9.1 All projects require a Code Compliance Report. The Consultant/contractor shall perform a project code analysis before the completion of design development, but preferably during the schematic design phase. As the design proceeds, the consultant/contractor shall update the code information. The UM Code Compliance Report may vary in size and detail depending on the size of the project. At a minimum it must include basic information about the project as it relates to the applicable building codes. The basic information required includes the following:

(1) Title Sheet with project name, number, location, list of consultant/contractors
(2) List of applicable codes
(3) Occupancy classification (describe separated or non-separated if mixed occupancy)
(4) Type of construction
(5) Building area (each story and total building area) and height (stories/feet)
(6) Whether fire sprinklers will be installed, and which NFPA sprinkler standard is being followed
(7) Whether incidental or accessory use provisions will be employed
(8) Allowable area calculations
(9) Means of egress information
(10) Fire resistance of structural elements
(11) Seismic Design Category
(12) Plumbing fixture counts and calculations
(13) ASHRAE 90.1 Calculations
(14) ASHRAE 62.1 Ventilation Calculations

2.2.2.9.2 Other Code Compliance Report Requirements:

(1) In a mixed occupancy building, a floor plan showing the different occupancies in a building is required to describe the locations and treatment of the different uses. If the building is a separated occupancy building, the ratio calculations required by the code should be provided. For a non-separated occupancy building, the allowable height and area calculations for the most restrictive occupancy must be provided to support the design.
(2) Means of egress information includes the location, construction, size, and character of the means of egress. Every floor and all rooms and spaces must be shown on egress floor plans. Occupant loads and how they were determined must be provided. Show the number of occupants passing through egress components to confirm the egress capacity. The common path of egress and travel distances must be shown on the egress plans.

(3) Fire-resistance rating construction requirements for the building based on the type of construction must be provided. If the means of egress includes fire-resistance rated construction, the ratings and locations of these components must be shown on the egress plan.

2.2.2.9.3 All calculations shall include all design assumptions.

2.2.2.9.4 The code analysis will note any potential nonconforming construction. The Consultant/contractor may employ a Code Consultant/contractor to

augment their design team. Failure of design work to meet the established University basic building code will result in redesign at no cost to the Owner.

2.2.2.10 The University of Missouri System is the Authority Having Jurisdiction [AHJ] for all University projects. Project Permitting Plan Review and Inspections may be performed by the AHJ, or an independent Plan Review and Permitting firm engaged by the University.

2.1.2.11 The consultant is responsible for ensuring that the project is designed in compliance with Codes and Standards and for leading the plan review permitting process resulting in a building permit prior to construction. This process includes timely application and submission of review documents to the Plan Reviewing entity as well as timely responses and resolution of all plan review comments. The consultant shall include the PM and inform of the progress related to permit plan review efforts

2.2.3 BASIS OF DESIGN

2.2.3.1 General

2.2.3.1.1 The Basis of Design shall be an electronic document created in Adobe Acrobat which contains the pertinent sections as listed in this subsection. The Basis of Design is intended to be a repository for documentation relating to the design of a project. Therefore, not all items will initially be covered, but will be added as appropriate during the design process. Sections to be contained in the Basis of Design are listed below and described in this section:

(1) Description of Construction
(2) Project Schedule
(3) Project Cost
(4) Code Analysis
(5) Energy and Sustainability
(6) Life Cycle Cost Studies
(7) Design Calculations

2.2.3.1.2 Each of the sections above should be updated, where applicable, at each submittal phase of the design documents. Changes in the basis of design shall be noted and dated to document the change. References to emails, correspondence, or meeting minutes shall be used.

2.2.3.2 Description of Construction

2.2.3.2.1 Provide a one to two page Executive Summary summarizing the size and scope of the project including general programmatic information identifying programs and activities.

2.2.3.2.2 Provide background information describing the intent of the project as described and agreed to by the campus. Describe other parameters affecting definition of the problem, such as master planning issues, existing structural limitations, and site conditions. Typical subheadings might include Project Background, Space Program, Planning Issues and Design Objectives.

2.2.3.2.3 Include a table of assignable square footage that clearly illustrates the proposed assignments of space. Column headings similar to those shown below should be used.

Department/ Type of Space	Current Assignments *	Proposed Assignments		
		Renovated	New	Total

2.2.3.2.4 Description of construction. Provide a description of:

(1) Architectural Systems including interior and exterior finishes
(2) Structural Systems
(3) Plumbing Systems
(4) Mechanical Systems
(5) Electrical Systems
(6) Fire Protection Systems

2.2.3.3 Project Schedule

2.2.3.3.1 The project schedule should be developed as part of the initial proposal of the University's consultant/contractor and updated and expanded as the project develops. Typical milestones might be:

(1) Programming
(2) Schematic Design Submittal
(3) Design Development Submittal (multiples if required)
(4) Construction Document Submittal (multiples if required)
(5) Advertise for Bids
(6) Bid Opening
(7) Notice to Proceed
(8) Complete Commissioning
(9) Substantial Completion

2.2.3.3.2 The consultant/contractor will provide a final logic bar chart schedule for project construction and identify the critical path. The schedule will include purchase and delivery activities and durations for all major equipment and building components.

2.2.3.3.3 Each phase should show the actual time used by the consultant/contractor, submittal dates of review documents, and review meeting dates.

2.2.3.3.4 Show Construction Phasing in the project schedule.

2.2.3.3.5 If other dates are needed such as commissioning completion dates, environmental approvals required, or other issues, they should also be included.

2.2.3.3.6 An approved scheduling computer program shall be used unless approved otherwise by the Project Manager

2.2.3.4 Project Cost

Progressively more detailed construction estimates will be submitted as documents are developed.

2.2.3.5 Code Analysis

The Code Compliance Report should be included in the Basis of Design Document.

2.2.3.6 Energy and Sustainability

2.2.3.6.1 Minimum energy conservation requirements are specified in this section. Facility designs should also include energy conservation features beyond what is required by energy conservation standards where those features can be economically justified from a life cycle cost standpoint. Principal considerations are first cost, operational cost, maintenance cost, climatic conditions, site configuration, building orientation, building functional arrangement, building envelope, and mechanical systems as applicable to minimize the use of fossil fuels.

2.2.3.6.2 The consultant/contractor shall develop an energy conservation report for each new building, building addition, or renovation:

(1) When total energy consumption is expected to exceed the 500 million BTU per year or the building is larger than 10,000 gross square feet
(2) Included as a part of the schematic design, where final selection of energy conservation features is made
(3) Updated during the design development and contract document phases
(4) For new buildings, additions, or renovations of existing buildings where total energy consumption is less than 500 million BTU per year. An energy conservation report is not required unless requested by the Project Manager (PM).

(5) An energy analysis comparing at least three (3) different alternatives is required if requested by the Project Manager.

2.2.3.6.3 Evaluate and document compliance with the edition of ASHRAE Standard 90.1 listed in the current list of applicable codes and standards on the University's FPD website.

(1) Compliance must be documented at the conclusion of, design development, and contract document phases. Compliance may be documented using USDOE's COMcheck software where the approach is prescriptive or trade-off within the limits of the COMcheck software.
(2) If compliance is done using a performance approach or features not available in COMcheck, then appropriate computer software listed below must be used.
(3) If compliance is not achieved, then redesign is required.

2.2.3.6.4 The following computer programs are approved where required by the compliance approach selected:

(1) BLAST
(2) DOE-2
(3) TRACE 700
(4) CARRIER HAP

2.2.3.6.5 Energy conversion values, from 10 CFR Part 436 are:

Electricity	3,412 BTU/KWHr
Fuel Oil (#2)	137,000 BTU/gallon
Natural Gas	1,030 BTU/cubic feet
Liquefied Petroleum Gas (LPG) propane	21,560 BTU/pound
Coal	24,500,000 BTU/short ton
Steam (80% boiler and 15% line loss)	1,390 BTU/pound

2.2.3.6.6 Design Conditions by campus:

(1) MU, S&T, UMSL:
  (a) Summer: 95° F db, 77°F wb (78°F wb for 100% OA systems)
  (b) Winter: -1°F db
  (c) Energy Analysis: St. Louis data
(2) UMKC
  (a) Design Conditions same as Columbia
  (b) Energy Analysis: Kansas City data

2.2.3.6.7 Specific criteria listed in this manual supersede both ICC and ASHRAE requirements.

2.2.3.7 Life Cycle Cost Alternatives
Provide Life Cycle Cost Alternatives as directed by the Project Manager.

2.2.3.8 Design Calculations

2.2.3.8.1 Provide a design summary documentation in an indexed report format with all assumptions and references stated. Include:

(1) Architectural design calculations (including occupancy classifications, type of construction, fire resistive ratings, exiting calculations, allowable building height and area, toilet fixture calculations and any unusual provisions or exceptions applicable to the project). Refer to Submittal Requirements for more information.
(2) Structural design calculations (including live load, roof load, snow load, wind load, lateral soils load and seismic load calculations. Also include any unusual provisions, special loads or exceptions applicable to the project). Refer to Submittal Requirements for more information.
(3) Civil design calculations (including storm drainage, sanitary sewer, domestic water service and any unusual provisions or exceptions applicable to the project). Refer to Submittal Requirements for more information.
(4) Mechanical design calculations (including building loadings, equipment sizing, steam pipe stress analysis, annual energy usage and any unusual provisions or exceptions applicable to the project) Building load calculations shall be done using the programs listed in the performance approach method for ASHRAE Standard 90.1 compliance. Refer to Submittal Requirements for more information.
(5) Electrical design calculations (including fault current calculations, transformer loading, circuit sizing, building energy usage and any unusual provisions or exceptions applicable to the project). Refer to Submittal Requirements for more information.
(6) Basis of design equipment and material information (e.g. catalog material, charts, tables, performance curves, etc.). Refer to Submittal Requirements for more information.

2.2.3.8.2 Where applicable design calculations shall be cross-referenced to Code Analysis section of the Basis of Design.

2.2.4 STANDARD FLOOR AND ROOM NUMBERING

2.2.4.1 Floor Plans Room Numbering and Usage **for UMKC, UMSL, and S&T**
Consultant/contractor shall provide floor plans showing room usage and a space for room number to PM who will provide room numbers to consultant/contractor to include on drawings.

2.2.4.1 Floor Plans Room Numbering and Usage **for MU**
Consultant shall provide floor plans showing room usage and proposed room numbers per the numbering standards included in the CPDG **(see Appendix A: Standard Floor & Room Numbering at the end of this Section)**

2.2.5 BUILDING AREAS DEFINITIONS

2.2.5.1 Gross Area

2.2.5.1.1 Gross Area is the sum of the floor areas of the building included within the outside faces of exterior walls for all stories or areas having floor surfaces. Gross area is gross square feet (GSF).

2.2.5.1.2 Calculate gross area by measuring from the outside face of exterior walls, disregarding cornices, pilasters, buttresses, etc., which extend beyond the wall face. Gross area includes basements (except unexcavated portions), attics, garages, enclosed porches, penthouses, mechanical equipment floors, lobbies, mezzanines, balconies (inside or outside) utilized for operational functions, and corridors, provided they are within the outside face lines of the building. Stairways, elevator shafts, mechanical service shafts, and ducts count as gross area on each floor through which the shaft passes. Exclude open courts and light wells, or portions of upper floors eliminated by rooms or lobbies rising above single-floor ceiling height.

2.2.5.2 Net Assignable Area

2.2.5.2.1 Net Assignable Area is the sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant, including every type of space functionally usable by an occupant (except spaces defined as custodial, circulation, mechanical, and restroom areas). Net assignable area is assignable square feet (ASF).

2.2.5.2.2 Calculate assignable area by measuring from the inside finishes of surfaces that form the boundaries of the designated areas. Do not include unusable areas having less than 6'6" clear headroom. Include space subdivisions for offices, classrooms, laboratories, seminar and conference rooms, libraries, file rooms, storage rooms, etc., including those for special purposes (e.g., auditoriums, cafeterias, TV studios, faculty and student locker and shower rooms, maintenance and repair shops, garages), which can be put to useful purposes in accomplishment of the institution's mission. Deductions are not made for columns and projections necessary to the building.

2.2.5.3 Nonassignable Area

2.2.5.3.1 Nonassignable area is the building area that is not available for assignment to building occupants but is necessary for the general operation of the building. By definition, nonassignable area consists exclusively of the following: circulation, custodial, mechanical, and restroom areas. Calculate nonassignable area the same as assignable area.

2.2.6 Contract Documents

2.2.6.1 General

2.2.6.1.1 There shall be no duplication between portions of the contract documents; all documents shall be complementary.

2.2.6.1.2 Contract documents shall be complete and ready for seals and signatures. Contract document originals will be sealed, signed and dated by the architect or engineer of record prior to printing of bid documents.

(1) Exception: Documents prepared by a non-licensed specialty consultant/contractor such as a lab planner, food service consultant/contractor, etc are not required to be sealed. Verify with PM whether these drawings are required to be sealed.

2.2.6.1.3 All corrections to drawings and specifications identified during design development and subsequent intermediate reviews will be completed. Each design submittal phase will not be accepted until these corrections have been made and accepted. All code comments also must be addressed in writing and accepted by the AHJ.

2.2.6.1.4 The consultant/contractor, at the direction of the PM, will incorporate drawings that illustrate the location of any expected asbestos containing materials. The consultant/contractor will not be responsible for the identification and removal of asbestos.

2.2.6.2 Design Documents

2.2.6.2.1 General

(1) The term "Drawings" refers to the graphic portrayal of elements included within the scope of the contract documents.
(2) Do not include names of individuals on sheets. Only show organizations.
Each drawing sheet other than the title sheet will display the following:
(a) Issue date
(b) Title of the project
(c) An individual sheet title

(d) Alphanumerical number indicating discipline and sheet number
(e) Scale and North Arrow
(f) University Project number
(g) For bid and construction sets the seal of a professional architect or engineer registered in the State of Missouri, signed and dated. The date on the seal applied by the registrant shall be the date the seal was applied to the drawing, not any other date. It shall be the responsibility of the registrant to apply his or her seal in a manner that meets all current rules of the Board For Architects, Professional Engineers, Professional Land Surveyors and Landscape Architects. Additionally, a disclaimer shall be added to each drawing sheet as near the seal location as possible stating the architect's or engineer's takes responsibility for the drawing that is sealed and disclaims responsibility for all other sheets in the set.

2.2.6.2.2 Drawing Format

(1) The following are minimum requirements for projects involving construction of new facilities, or renovations of or additions to existing facilities.
(2) The drawing size will be D size sheets (24" x 36"), unless otherwise directed by Project Manager (PM). The consultant/contractor will confer with the PM for drawing sizes.
(3) Scale
(a) Plot, site, & utility plans can be either 1" = 10' or 1" = 20' scale.

(b) Building floor plans and roof plans will be 1/8" or 1/4" = 1'. Odd scales such as 3/8" shall not be permitted on plan views. Location plans and plans showing contractor access routes may be smaller.
(c) Details will be drawn at ½", 1", or 1-½" = 1'.
(4) A graphic scale showing the physical length of a line or graphic will be required on every sheet. The purpose of this scale is to be able to determine the amount of reduction that has been done to a drawing from its original format. If in doubt, the consultant/contractor shall request clarification and approval by the PM.
(5) Completed drawings shall be CAD produced and will be of excellent quality for the production of good duplicates.
(6) Drawings will be divided into disciplines adapted from the U.S. National CAD standard.
(7) The drawings will be labeled and assembled as follows: Cover Sheet, Code Analysis Sheet (designated G-101), G-General, H-Hazardous Materials, V-Survey, B-Geotechnical, C-Civil, L-Landscape, SStructural, A-Architectural, I-Interiors, Q-Equipment, F-fire

Protection, P-Plumbing, M-Mechanical, E-Electrical, TTelecommunications.

(8) Individual drawing numbers will use the following sheet identification methodology: AA-TNN where: The discipline designation consisting of the letter from the discipline is the first character. The second character is optional, but can be used to separate more complex sets. For example, EP would designate Electrical Power drawings as opposed to EL designating Electrical Lighting drawings. After the hyphen, the sheet type designator is used. Sheet type designators are: 0 – General (symbols, legend, notes), 1 – Plans (horizontal views), 2 – Elevations (vertical views), 3 – Sections, 4 – Large Scale Views (plans, elevations, stair sections at larger scale), 5 – Details, 6 – Schedules and Diagrams, 7 – Defined by consultant/contractor for work that does not fit elsewhere, 8 – Reserved, 9 – 3D Representations (isometrics, perspectives, photographs). The last two characters are the sheet sequence number.

(9) Pertinent information should be shown only on discipline drawings applicable to that Division of work. If information must be located on drawings of a different discipline, drawings will be cross-referenced.

(10) Project drawings will only show information pertinent to that project. Any items not specifically used or referenced for that project shall be removed.

(11) Door, window, room finish schedule, HVAC equipment, plumbing equipment, electrical equipment, lab equipment, food service equipment, etc. schedules will be included on the drawings.

(12) Manufacturer and product names will be referenced in equipment schedules on the drawings.

(13) Symbols and abbreviations used on drawings will be explained and shown on legends. Separate legends are required for each discipline and shall be on the first sheet of that discipline's drawings unless approved by the PM.

(14) Design details will be shown on the drawings, not in the specifications.

(15) Sections and details will be numbered and cross referenced.

2.2.6.2.3 Drawings

(1) Title Sheet in each drawing set shall contain the following:

(a) Title of the project and University project number
(b) Owner's name: (University of Missouri - Campus Name, For The Curators of the University of Missouri)
(c) Consultant/contractor's name
(d) Drawing index
(e) Site location plan
(f) Issue date

(g) Professional architect/engineer seal, signed and dated
(h) Consultant/contractor will certify the following on the title sheet of the drawings:

"I hereby certify these drawings and/or specifications have been prepared by me, or under my supervision. I further certify that to the best of my knowledge these drawings and/or specifications are as required by and in compliance with the Building Codes of the University of Missouri".

_____
Signature

(2) Code Analysis Sheet
See the Code Compliance Report in this section of the Consultant Procedures and Design Guidelines and provide specific information as described under design submittals.

2.2.6.2.4 Project Manual

(1) The term "Project Manual" refers to the written portion of the contract documents.
(2) Consultant/contractor will use the six-digit CSI numbering system and section titles for Divisions 2 through 48.
(3) Language of the project manual will be brief and consistent.
(a) Do not repeat information contained in either the General Conditions or the Special Conditions in any other section.
(b) Do not repeat information contained in the specifications, Divisions 2 through 48, on the drawings (except in equipment schedules).
(4) Titles of unused divisions will remain in the table of contents with parenthetical notation on each to state "(Not Used)." No reference will be made to unused divisions in the body of the specifications.
(5) There will be no blank spaces within sentences or within sections in the specifications. The end of each section shall be marked "End of Section".
(6) In any set to be used for construction each architect or engineer who prepares any section of specifications contained in the Project Manual shall seal, date and sign an appropriate disclaimer as required by the statutes of the State of Missouri. This disclaimer shall list the sections of the specifications prepared by the architect or engineer and shall disclaim responsibility for all other sections. This sheet shall immediately follow the title page.
(7) Design details, schedules (other than finish hardware), sketches, and drawings will not be included in the specifications.

(8) Specifications will indicate the type and quality of material to be used. To the greatest extent possible, all colors will be identified on the drawings or in the specifications.

(9) A minimum of three manufacturers will be listed and the words "or approved equal" will be stated. Proprietary items that result in only a single source or manufacturer may be specified only with the approval of the PM. Criteria will specify critical parameters which will identify what constitutes an approved equal.

(10) If asbestos containing materials are expected to be removed during the construction of the project, the University's Asbestos Removal Specifications will be incorporated into Division 2 of the specifications. The current edition of the University Asbestos Removal Specification can be found at the FPD Website.

(11) Consultant/contractor will list all required submittals, shop drawings, operation manuals, warranties and certifications in the Submittals section of the Special Conditions in Division 1. The list must be approved by the Project Manager.

2.2.7 PRE-DESIGN SERVICES

Pre-Design Services can vary greatly from project to project. The consultant/contractor and the PM must clearly identify what shall be included. The following are common pre-design services and what is expected from each:

2.2.7.1 Programming

Programming includes identifying the design objectives' criteria and limitations; verifying program requirements; confirming adherence to Master Plan if applicable; developing initial approximate GSF and space requirements; determining space relationships and functionality; allowing for flexibility and expandability; determining site requirements; developing a project schedule; and developing a project cost.

2.2.7.2 Space Schematics/Flow Diagrams

Converting the programmed requirements to net area requirements; showing the flow and adjacencies of the functional spaces; showing flexibility and expandability.

2.2.7.3 Existing Facilities Survey

Analyze existing design data including existing structural, mechanical, and electrical capabilities and deficiencies; review existing drawings for critical inaccuracies and develop required accurate drawings through field observations and measurements.

2.2.7.4 Site Study

Identify site and utility issues such as structure placement, utility systems location and capacity, surface and subsurface conditions, review of soils report, landscaping, etc.

2.2.7.5 Geotechnical Engineering

The University will generally hire a geotechnical engineer to provide a geotechnical report if required by the project. The geotechnical report will include: Test borings,

test pits, soil-bearing value, percolation test, ground corrosion and resistivity tests, evaluation of subsurface material and conditions, evaluation of necessary operations for anticipated subsoil conditions, and provide professional recommendations.

2.2.7.6 Site Survey

The University will generally hire a separate firm for the site survey. The site will be surveyed by a licensed surveyor. The survey will include description of physical characteristics; legal limitations if applicable; utility locations; written legal description; boundaries; grades and contours; existing building information; streets, alleys, and pavements; trees; inverts and depths, adjoining property and structures; adjacent drainage; right of ways and easements.

2.2.8 **SCHEMATIC DESIGN PHASE SUBMITTALS (15%)**

The following is the basis for the Schematic Design Phase Submission. The Project Manager may require additional information or may waive some of these requirements based on the scope of the project:

2.2.8.1 Code

2.2.8.1.1 Drawings

(1) Show info listed in the Code Compliance Report (section 2.1.2.9) including fire walls, fire areas, smoke zones, travel distance, area of refuge, etc.

2.2.8.1.2 Basis of Design

(1) Provide Code Compliance Report as required in Section 2.1.2.9

2.2.8.2 Site/Landscape

2.2.8.2.1 Drawings

(1) Existing Site Plan

a. Major Landscaping
b. Site Features and conditions (Existing contours, easements, setbacks, utilities, etc.)
c. Pave Surfaces (Streets, Sidewalks, etc)
d. Existing Buildings
e. Proposed Building
f. Proposed contours
g. Proposed utilities

2.2.8.2.2 Basis of Design Report

(1) Analysis/Description of Conceptual Design Solutions

a. Design Objectives
b. Site Utilities
c. Land forms
d. Site Lighting
e. Grading
f. Impact of building on site and site on build

(2) Alternative materials, systems, and equipment
   a. Site Utilities
   b. Paving
   c. Other

2.2.8.3 Architectural

2.2.8.3.1 Drawings

(1) Conceptual Design Plan
(2) Floor Plan of each level (Including room names, dimensions, floor elevation, mechanical rooms, electrical room, telecom rooms, shafts, partition locations, janitor closets, vertical transportation, etc.)
(3) Demo Plan of each floor level
(4) Roofing Plan (show roofing concept and access or detail conditions for a re-roof project, may include photographs of existing conditions)
(5) Roofing Demolition Plan (for re-roof)
(6) Building Exterior Elevations
   a. Indicate surface material for all areas
   b. Indicate finish grades
   c. Demonstrate building accessibility
   d. Indicate floor elevations above and below grade
   e. Indicate any significant site features in close proximity to the building.
   f. Indicate any exterior equipment
(7) Building Sections
   a. Indicate relative thickness of floors and walls
   b. Indicate major floor elevations
   c. Major room names or numbers
   d. Above ceiling zoning analysis

2.2.8.3.2 Basis of Design Report

(1) Architectural Program
(2) Description of interior construction and finishes
(3) Description of exterior finishes
(4) Description of roofing system and method of reroofing
(5) Area Analysis
(6) Gross Area Tabulations for net and gross design areas per floor
(7) Life Cycle Cost analysis of proposed roofing system
(8) Alternative materials, systems, and equipment

2.2.8.4 Structural

2.2.8.4.1 Drawings

(1) Indicate typical bay dimension and structural framing system
(2) Foundation Design
(3) Development of Alternates

2.2.8.4.2 Basis of Design

(1) Describe existing conditions of the structural system for existing buildings.
(2) Describe the proposed structural system for new buildings
(3) Indicate soil bearing capacities
(4) Indicate Seismic design criteria
(5) Indicate design loading
(6) Indicate windloading

2.2.8.5 Mechanical

2.2.8.5.1 Drawings

(1) Locate existing mechanical equipment and show demolition
(2) Layout major components
(3) Verify locations and sizes of the mechanical rooms and shafts shown on the Architectural drawings and confirm they are adequate to meet the design standards.
(4) Identify connections to major utilities (Steam, Chilled Water)
(5) Verify Air Intakes and Exhaust are not an issue

2.2.8.5.2 Basis of Design

(1) Outline existing conditions
(2) Provide design conditions (Outside air temperature, Indoor air temperature, relative humidity, air changes, etc.)
(3) Outline the proposed system including energy recovery system
(4) Note any rooms with special needs
(5) Proposed alternatives or systems for life cycle analysis
(6) Alternative materials and equipment

2.2.8.6 Plumbing

2.2.8.6.1 Drawings

(1) Locate existing plumbing equipment
(2) Layout major components
(3) Verify locations and sizes of the plumbing mechanical rooms and shafts shown on the Architectural drawings and confirm they are adequate to meet the design standards.
(4) Identify connections to major utilities

2.2.8.6.2 Basis of Design

(1) Outline existing conditions
(2) Outline proposed systems including compressed air, natural gas, etc.
(3) Alternative materials and equipment

2.2.8.7 Fire Protection

2.2.8.7.1 Drawings

(1) Locate existing fire protection equipment or systems
(2) Lay out major equipment

2.2.8.7.2 Basis of Design

(1) Outline present conditions
(2) Define requirements for fire protection
(3) Describe overall system concepts
(4) Alternative materials or equipment

2.2.8.8 Electrical

2.2.8.8.1 Drawings

(1) Locate existing connections to utility and transformer location
(2) Locate existing secondary distribution equipment and connections
(3) Locate existing communications systems equipment
(4) Locate existing fire alarm equipment
(5) Layout major components of the existing systems including power, communications and fire alarm systems.
(6) Layout major components of proposed systems including power, communications and fire alarm systems.
(7) Verify locations and sizes of the electrical and communications rooms and shafts shown on the Architectural drawings and confirm they are adequate to meet the design standards

2.2.8.8.2 Basis of Design

(1) Outline existing conditions
(2) Outline the proposed system
(3) Note any rooms with special needs
(4) Proposed alternatives or systems for life cycle analysis
(5) Alternative materials and equipment

2.2.8.9 Cost – Provide Cost analysis in the Basis of Design

2.2.8.9.1 Submit a written quantitative estimate of construction developed from the completed schematic plans and outline specifications.

2.2.8.9.2 Break down the construction estimate into the major architectural, civil, structural, mechanical, and electrical building components by labor and material for major divisions of work.

2.2.8.9.3 Include and identify your design contingency.

2.2.8.10 Schedule – Provide schedule in the Basis of Design

2.2.8.11 Design Standards – Document any University Design Standard that will not be met and an explanation why it isn't possible to meet the standard.

2.2.9 DESIGN DEVELOPMENT SUBMITTAL (35%)

For the Design Development Submittal, all documentation must be a minimum 35% complete, be coordinated with similar activities in other disciplines and address all remarks from Schematic

Design Phase. Where an outline specification is required, show only the section numbers with section titles that will be required based upon the anticipated design. Specifications must use University approved CSI format.

The following is the basis for the Design Development Phase Submission. The Project Manager may require additional information or may waive some of these requirements based on the scope of the project:

2.2.9.1 Code

2.2.9.1.1 Drawings

(1) Show info listed in the Code Compliance Report (section 2.1.2.9) including fire walls, fire areas, smoke zones, travel distance, area of refuge, etc.

2.2.9.1.2 Basis of Design

(1) Provide Code Compliance Report as required in Section 2.1.2.9

2.2.9.2 Site/Landscape

2.2.9.2.1 Drawings

(1) Existing Site Plan
   a. Major Landscaping
   b. Site Features and conditions (Existing contours, easements, setbacks, utilities, etc.)
   c. Pave Surfaces (Streets, Sidewalks, etc)
   d. Existing Buildings
   e. Other Elements
(2) Proposed Site Plan
   a. Existing site Information
   b. Proposed Building (with spot elevations)
   c. Proposed contours
   d. Key Design Elements
   e. Major landscaping
   f. Concept plan for drainage and grading
   g. Proposed utilities
   h. Vehicular access routes
   i. Pedestrian access routes
   j. Service Areas
   k. Project Limits/Phasing
   l. Site Access per ADA Standards
(3) Demolition Plan
   a. Erosion Control Measures
   b. Tree Protection
(4) Alternate Schemes

2.2.9.2.2 Basis of Design Report

(1) Establish Final Scope
(2) Analysis/Description of Conceptual Design Solutions
(3) Site Utilities – Design Calculations for all site utilities
(4) Storm Water Management Report
(5) Erosion Control Report
(6) Site Lighting Photo Metrics and Calculations
(7) Alternative materials, systems, and equipment

2.2.9.2.3 Manual
(1) Develop outline specifications
(2) Provide material info as needed

2.2.9.3 Architectural

2.2.9.3.1 Drawings
(1) Dimensioned Floor Plan of each level with structural grid (Including room names, dimensions, floor elevation, mechanical rooms, electrical room, telecom rooms, shafts, partition locations, janitor closets, vertical transportation, etc. All fire walls, smoke zones etc shall be shown.)
(2) Provide a Demolition Plan for each floor showing work to be removed. For roof demolition plan identify existing components and methods of attachment – provide photos of existing conditions.
(3) Roofing Plan (show all proposed or existing drains, indicate slope [high to low] with direction arrows, show all new or existing equipment, show all significant roof penetrations and structures, show roof access, and typical roofing sections identifying materials.)
(4) Reflected Ceiling Plan for each Floor
(5) Interiors
a. Indicate Materials and Finishes
(6) Building Exterior Elevations
a. Indicate surface material for all areas
b. Indicate finish grades
c. Demonstrate building accessibility
d. Indicate floor elevations above and below grade
e. Indicate any significant site features in close proximity to the building.
f. Indicate any exterior equipment
g. Show all stairs, ramps, railings, etc.
h. Existing and new work clearly identified
(7) Interior Elevations
a. Building Interior elevations of typical spaces, areas of special interest, and areas of special complexity.
(8) Building Sections
a. Set floor to floor dimensions
b. Establish floor elevations

c. Wall sections (at windows, solid walls, parapets, finished grades and footings, etc.)
d. Stairways
e. Elevators
f. Utility coordination cross sections

(9) Detail Sections
a. One section for each type of wall construction

2.2.9.3.2 Basis of Design Report
(1) Area Analysis
(2) Gross Area Tabulations for net and gross design areas per floor
(3) Percentage of glass vs. gross wall area
(4) Provide Outline method of reroofing
(5) Provide narrative report discussing major design features and options (reroof)
(6) Alternative materials, systems, and equipment

2.2.9.3.3 Manual
(1) Develop outline specifications
(2) Provide material info as needed

2.2.9.4 Structural

2.2.9.4.1 Drawings
(1) Conceptual Design
(2) Floor Plans (each level) and Roof Framing Plan
a. Fixed Colum reference lines
b. Basic Structural system and dimensions
c. Bearing Walls
d. Major bracing locations
e. Indicate typical bay dimension
f. Preliminary sizing of major components
g. Identify all framing members
h. Girders, beams, joists
(3) Structural Foundation Design
a. Footings
b. Foundation Walls
c. Grade Beams
(4) Details
a. Foundation Details
b. Typical framing details
c. Sub drainage
d. Waterproofing/Dampproofing

2.2.9.4.2 Basis of Design

(1) Comparative cost analysis of at least two structural systems
(2) Provide Live Loads, Wind Loads and Seismic Criteria used for structural design
(3) Provide design bearing/support capacity (soil bearing, pile capacity, caisson capacity) for foundation system geo-tech design criteria for shallow and deep foundations and earth structures.
(4) Describe the recommended structural system for new buildings

2.2.9.4.3 Manual
(1) Develop outline specifications
(2) Provide material info as needed

2.2.9.5 Mechanical

2.2.9.5.1 Drawings
(1) Indicate existing mechanical equipment and all required demolition
(2) Demolition Plan for each floor showing all required demolition
(3) Indicate service mains, including steam, return, hot water, chilled water, condenser water, etc.
(4) Layout major components in equipment rooms; all equipment shall be drawn to scale and clearance shall be shown – scale should be no smaller than ¼" per 1'-0". Include evaluations to ensure adequate space
(5) Schedules - Preliminary equipment capacities
(6) Floor Plan of each level showing major ductwork, zoning and shafts – major ductwork should be drawn double line
(7) Floor Plan of each level showing major piping
(8) Provide Floor Plans for laboratories show room pressurization for each space and the offset required.
(9) Provide air and water flow diagrams for supply and exhaust air, and water distribution systems. Diagrams are to indicate flow rates in mains and branches to assist in balancing.

2.2.9.5.2 Basis of Design
(1) Block Load calculation for space cooling and heating (must include all inputs and outputs)
(2) Energy Analysis for at least three HVAC systems
(3) Energy Recovery Analysis
(4) Energy Conservation Analysis
(5) Connected Load Analysis
(6) Wind analysis for intakes and exhaust
(7) HVAC Load Calculations including ASHRAE 62.1 Ventilation calcs.
(8) Plant analysis and loads
(9) Proposed alternatives or systems for life cycle analysis

2.2.9.5.3 Manual
(1) Develop outline specifications

(2) Provide equipment cut sheets
(3) Provide material info as needed

2.2.12.6 Plumbing

2.2.9.6.1 Drawings

(1) Indicate existing plumbing equipment
(2) Layout major components in equipment rooms; all equipment shall be drawn to scale and clearance shall be shown
(3) Schedules - Preliminary equipment capacities
(4) Floor Plan of each floor (show all plumbing fixtures, piping mains (sanitary, storm, potable, non-potable, sprinkler, gases, etc. and shafts
(5) Show location of water, sanitary, storm and fire services to the building
(6) Identify connections to major utilities

2.2.9.6.2 Basis of Design

(1) Plumbing load calcs for all systems including but not limited to (domestic cold water, hot water, sanitary sewer, soft water, compressed air, vacuum, natural gas, etc.)
(2) Alternative materials and equipment

2.2.9.6.3 Manual

(1) Develop outline specifications
(2) Provide equipment cut sheets
(3) Provide material info as needed

2.2.9.7 Fire Protection

2.2.9.7.1 Drawings

(1) Indicate existing fire protection equipment or systems
(2) Layout major components in equipment rooms; all equipment shall be drawn to scale and clearance shall be shown
(3) Floor Plan (each level) showing occupancy hazard classifications and coverage requirement
(4) Show all fire mains and standpipes

2.2.9.7.2 Basis of Design

(1) Water flow test data
(2) Description of system(s)
(3) Hydraulic Calculation for system sizing
(4) Alternative materials or equipment

2.2.9.7.3 Manual

(1) Develop outline specifications
(2) Provide equipment cut sheets
(3) Provide material info as needed

2.2.9.8 Electrical

2.2.9.8.1 Drawings

(1) Indicate transformer location

1. Demolition Plans – Show floor plan of each floor with all required demolition.
2. Layout major components of the existing systems including power, emergency power, communications and fire alarm systems. All equipment shall be drawn to scale and clearance shall be shown.
3. Layout major components of new systems including power, communications and fire alarm systems. All equipment shall be drawn to scale and include required clearances.
4. Floor Plan of each level showing power receptacles, J-boxes, occupancy sensors, exit lights, fire alarm devices
5. Floor Plan of each level showing exit lights and fire alarm devices
6. Floor Plan of each level showing telecom
7. Ceiling Plan of each level showing light fixtures
8. Provide single line electrical distribution diagrams showing primary service to substations and secondary service to distribution switchboards, motor control center, and panel boards for power and lighting. Show all conduit sizes and the size and number of conductors. Provide for both existing and new electrical system
9. One line riser diagram of Fire Alarm System
10. Light fixture schedule
11. Indicate the point of connection to external utilities, i.e., high voltage, telephone, and signal systems.

2.2.9.8.2 Basis of Design

(1) Electrical Plant Analysis including all load calculations
(2) Criteria for lighting used and lighting Photo Metrics for all spaces
(3) Criteria for electrical system
(4) Proposed alternatives or systems for life cycle analysis
(5) Alternative materials and equipment

2.2.9.8.3 Manual

(1) Develop outline specifications
(2) Provide equipment cut sheets
(3) Provide material info as needed

2.2.9.9 Energy Analysis

2.2.9.9.1 Building Envelope Analysis

(1) Recommendations for overall building envelope
(2) Review of thermal vapor flow and moisture
(3) Recommendation for vapor barriers
(4) Recommendation for vapor isolation

(5) ASHRAE 90.1 analysis

2.2.9.9.2 Energy Study

(1) ASHRAE 90.1 HVAC calculations

(2) ASHRAE 90.1 Electrical Calculations

2.2.9.10 Cost – Provide Cost analysis in the Basis of Design

2.2.9.10.1 Submit a written quantitative estimate of construction developed from the completed design development plans and outline specifications.

2.2.9.10.2 Break down the construction estimate into the major architectural, civil, structural, mechanical, and electrical building components by labor and material for major divisions of work.

2.2.9.10.3 Show estimated contractor overhead and profit, unit costs applied and materials and labor quantities.

2.2.9.10.4 Include and identify your design contingency.

2.2.9.11 Schedule – Provide schedule in the Basis of Design

2.2.9.11.1 Provide a construction-phasing schedule in bar chart and/or outline narrative form.

2.2.10 CONSTRUCTION DOCUMENT SUBMITTAL (100%)

For the 100% Construction Document Submittal, all documentation must be 100% complete, be coordinated with similar activities in other disciplines and address all remarks from previous submittals. The agreement may require additional Construction Document submittals at 50%, 75%, etc. Those documents must be completed to the percentage indicated.

The following is the basis for the 100% Construction Document Submission. The Project Manager may require additional information or may waive some of these requirements based on the scope of the project:

2.2.10.1 Code

2.2.10.1.1 Drawings

(1) Show info listed in the Code Compliance Report (section 2.1.2.9) including fire walls, fire areas, smoke zones, travel distance, area of refuge, etc.

2.2.10.1.2 Basis of Design

(1) Provide Code Compliance Report as required in Section 2.1.2.9

2.2.10.2 Site/Landscape

2.2.10.2.1 Drawings

(1) Existing Site Plan

a. Major Landscaping

b. Site Features and conditions (Existing contours, easements, setbacks, utilities, etc.)

c. Pave Surfaces (Streets, Sidewalks, etc)
d. Existing Buildings
e. Other Elements

(2) New Site Plan
a. Existing site Information
b. Building Footprint and elevations
c. Contours
d. Key Design Elements
e. Major landscaping
f. Drainage and grading Plan
g. Vehicular access routes
h. Pedestrian access routes
i. Service Areas
j. Project Limits/Phasing
k. Site Access per ADA Standards
l. Parking
m. Project construction limits, construction fencing, and contractor access will be clearly shown on the site plan drawings. Included will be any required tree protection

(3) Demolition Plan
a. Erosion Control Measures
b. Tree Protection
c. Structures

(4) Landscape Plan and Details
(5) Utility Plan and Details (6) Profiles of all utilities and roads
(6) Details – Utilities, Paving, etc.

2.2.10.2.2 Basis of Design
(1) Final Scope
(2) Analysis/Description of Design Solutions
(3) Site Utilities – Design Calculations for all site utilities
(4) Storm Water Management Report
(5) Erosion Control Report
(6) Site Lighting Photo Metrics and Calculations
(7) Alternative materials, systems, and equipment

2.1.10.2.3 Manual
(1) Detailed Specifications

2.2.10.3 Architectural
2.2.10.3.1 Drawings
(1) Dimensioned Floor Plan of each level with structural grid (Including room names, dimensions, floor elevation, mechanical rooms, electrical room, telecom rooms, shafts, partition locations, janitor closets, vertical transportation, etc. All fire walls, smoke zones etc shall be shown.)

(2) Provide a Demolition Plan for each floor showing work to be removed. For roof demolition plan identify existing components and methods of attachment – provide photos of existing conditions.

(3) Roofing Plans shall include all features and elements of the roof. Show all new and/or existing drains, indicate slope [high to low] with direction arrows, show all new or existing equipment, show all significant roof penetrations and structures, show roof access, and roofing sections identifying all materials. On reroofing projects, clearly indicate items to be demolished and/or removed, existing materials to remain and new materials and construction. The following items should be shown on the roof plans, accurately located, and drawn to scale.

a. Mechanical units, exhaust fans, vents
b. Piping, conduit, and related supports
c. Roof walkways, screens, hatches, and ladders.
d. Roof drains, overflow drains, and scuppers
e. Miscellaneous penetrations
f. Expansion joints and area divided curbs
g. Gutters and downspouts
h. Valley, ridges, saddles and crickets

(4) Roof Plan Details shall include complete details of roof system and components:

a. Each roof perimeter condition
b. Each penetration condition, including vent flashing
c. Each roof-related sheet metal fabrication
d. Equipment curbs, skylight curbs, and roof hatches
e. Roof expansion joints and area dividers
f. Piping & equipment supports\
g. Typical roof drain and overflow drain including sumps and flashings
h. Scuppers
i. Flashing details including roof deck and wall substrate and other adjacent materials; insulation including separate layers and vapor retarders; roof and flashing membrane; cant strips; flashing attachment; counterflashing and reglets; sealants; wood nailers and blocking, including adequate attachment

(5) Reflected Ceiling Plan for each Floor – Show ceiling grid layout, coffers, drop soffits and changes in height, light fixtures, HVAC diffusers, sprinklers, speakers, smoke detectors, etc.

(6) Interiors

a. Indicate Materials and Finishes
b. Details of interior and exterior doors, windows, toilet partitions, etc.

(7) Schedules

a. Finish Schedule- Indicate finishes for all spaces including textures, colors, etc, give ceiling heights for each space, use university assigned room numbers
b. Door Schedules – give location, type, size , material, hardware information, and fire rating

c. Window Schedule – Type, size, material, lintel requirements, and elevation of each window

(8) Building Exterior Elevations

a. Indicate surface material for all areas
b. Indicate finish grades
c. Demonstrate building accessibility
d. Indicate floor elevations above and below grade
e. Indicate any significant site features in close proximity to the building.
f. Indicate all expansion and control joints
g. Indicate any exterior equipment
h. Show all stairs, ramps, railings, etc.
i. Existing and new work clearly identified

(9) Interior Elevations

a. Building Interior elevations of typical spaces, areas of special interest, and areas of special complexity.

(10) Building Sections

a. Minimum of one longitudinal and one transverse section
b. Floor elevations
c. Floor to floor dimensions
d. Indicate ceilings in proper relation to floors
e. Method and extent of insulating exterior envelope
f. Wall sections (at windows, solid walls, parapets, finished grades and footings, etc.)
g. Stairways
h. Elevators
i. Utility coordination cross sections for all congested areas

2.2.10.3.2 Basis of Design Report

(1) Area Analysis
(2) Gross Area Tabulations for net and gross design areas per floor
(3) ASHRAE 90.1 Calculations
(4) Provide narrative report discussing major design features (reroof)
(5) Alternative materials, systems, and equipment

2.2.10.3.3 Manual

(1) Detailed Specifications

2.2.10.4 Structural

2.2.10.4.1 Drawings – Structural Drawings shall provide complete details of all structural components so that no additional structural design will be required for the preparation of the shop drawings except for standard connection details and fabrication calculations.

(1) Structural Floor Plans, each level and Roof Framing Plan

a. Fixed Colum reference lines
b. Basic Structural system and dimensions
c. Bearing Walls
d. Major bracing locations
e. Indicate typical bay dimension
f. Sizing of major components
g. Identify all framing members - Girders, beams, joists

(2) Structural Foundation Design
a. Footings
b. Foundation Walls
c. Grade Beams

(3) Sections
a. Typical sections of floor and roof systems, identify materials, thickness, depths, etc. Provide appropriate details to define structure.

(4) Details
a. Typical details for openings in floors, walls with limitations clearly noted
b. Foundation Details
c. Typical framing details
d. Sub drainage
e. Waterproofing

2.2.10.4.2 Basis of Design

(1) Describe existing conditions of the structural system for existing buildings.
(2) Describe the structural system for new buildings
(3) Provide Live Loads, Wind Loads and Seismic Criteria used for structural design
(4) Provide design bearing/support capacity (soil bearing, pile capacity, caisson capacity) for foundation system geo-tech design criteria for shallow and deep foundations and earth structures
(5) Provide material info as needed

2.2.10.4.3 Manual

(1) Detailed specifications

2.2.10.5 Mechanical

2.2.10.5.1 Drawings

(1) Indicate existing mechanical equipment and all required demolition
(2) Demolition Plan for each floor showing all required demolition
(3) Indicate service mains, including steam, return, hot water, chilled water, condenser water, etc.
(4) Equipment rooms - all equipment, ductwork and piping shall be drawn to scale and clearance shall be shown – scale should be no smaller than ¼”

per 1'-0". Include evaluations to ensure adequate space (See design guidelines in Section 3)

(5) Schedules – provide schedules for all mechanical equipment, steam traps, air devices, etc, showing sizes, capacities, HP, CFM, electrical characteristics, locations, features (see design guidelines in Section 3 for more details on schedules)
(6) Floor Plan of each level showing all ductwork, ductwork should be drawn double line, terminal boxes, dampers, diffuser and associated CFM
(7) Floor Plan of each level showing all piping and valves
(8) Provide Floor Plans for laboratories show room pressurization for each space and the offset required.
(9) Provide air and water flow diagrams for supply and exhaust air, and all water and/or steam, condensate distribution systems. Diagrams are to indicate flow rates in mains and branches to assist in balancing.
(10) Control schematics for each type of system, point listing, and sequence of operation
(11) Provide sections as required (and as requested by the Project Manager) to clearly show the Work in 3 dimensions

2.2.10.5.2 Basis of Design

(1) HVAC Load Calculations including ASHRAE 62.1 Ventilation calcs. (Must include all inputs and outputs)
(2) Plant analysis and loads and connected load analysis
(3) Energy analysis for systems requested by the PM
(4) Energy recovery analysis
(5) Energy conservation analysis
(6) Proposed alternatives or systems for life cycle analysis
(7) Alternative materials and equipment
(8) Provide equipment cut sheets
(9) Provide material info as needed

2.2.10.5.3 Manual

(1) Detailed specifications

2.2.10.6 Plumbing

2.2.10.6.1 Drawings

(1) Indicate all existing plumbing equipment and all demolition required
(2) Demolition Plan for each floor showing all required demolition
(3) Indicate service mains, including domestic water, fire protection water, sanitary and storm sewer, etc.
(4) Equipment rooms - all equipment, ductwork and piping shall be drawn to scale and clearance shall be shown – scale should be no smaller than ¼" per 1'-0". Include evaluations to ensure adequate space (See design guidelines in Section 3)

(5) Schedules – provide schedules for all plumbing equipment and fixtures showing sizes, capacities, HP, electrical characteristics, locations, features (see design guidelines in Section 3 for more details on schedules)
(6) Floor Plan of each level showing all piping, valves, and plumbing fixtures
(7) Provide water flow diagrams for water distribution systems. Diagrams are to indicate flow rates in mains and branches to assist in balancing.
(8) Provide riser diagrams for potable water, hot water, sanitary sewer (waste and vent), storm sewer, non-potable water, deionized water, compressed air, vacuum, all gas piping systems, etc
(9) Provide details of water heaters, heat exchangers showing all piping, valves and accessories.

2.2.10.6.2 Basis of Design
(1) Plumbing load calcs for all systems including but not limited to (domestic cold water, hot water, sanitary sewer, soft water, compressed air, vacuum, natural gas, etc.)
(2) Alternative materials and equipment
(3) Equipment cut sheets

2.2.10.6.3 Manual
(1) Detailed specifications

2.2.10.7 Fire Protection
2.2.10.7.1 Drawings
(1) Indicate existing fire protection equipment or systems
(2) Layout all components in equipment rooms; all equipment shall be drawn to scale and clearance shall be shown
(3) Floor Plan (each level) showing occupancy hazard classifications and coverage requirement
(4) Show all fire mains and standpipes
(5) Show location of all valves, flow switches, tamper switch (6) Show drain piping and test location and associated details.

2.2.10.7.2 Basis of Design
(1) Provide load calculations for system sizing
(2) Provide equipment cut sheets
(3) Alternative materials or equipment

2.2.10.7.3 Manual
(1) Detailed specifications

2.2.10.8 Electrical
2.2.10.8.1 Drawings

(1) Indicate transformer location
(2) Demolition Plans – Show floor plan of each floor with all required demolition.
(3) Layout major components of the existing systems including power, emergency power, communications and fire alarm systems. All equipment shall be drawn to scale and clearance shall be shown.
(4) Layout major components of new systems including power, communications and fire alarm systems. All equipment shall be drawn to scale and include required clearances.
(5) Power Distribution Plan showing location of incoming service (transformers and primary switches), generators, main switchgear, motor control centers, and panel boards.
(6) Floor Plan of each level showing power receptacles, J-boxes, occupancy sensors
(7) Floor Plan of each level showing exit lights and fire alarm devices, control panel and auxiliary panels.
(8) Floor Plan of each level showing telecom
(9) Ceiling Plan of each level showing light fixtures
(10) Provide single line electrical distribution diagrams showing primary service to substations and secondary service to distribution switchboards, motor control center, and panel boards for power and lighting. Show all conduit sizes and the size and number of conductors. Provide for both existing and new electrical system
(11) One line riser diagram of Fire Alarm System showing all devices including the fire sprinkler flow and tamper switches, etc.
(12) One line riser diagram for telecom, security and other systems.
(13) Light fixture schedule include at a minimum: fixture type, lamp and ballast information, reflector, lens and louver information, mounting method, etc.
(14) Indicate the point of connection to external utilities, i.e., high voltage, telephone, and signal systems.
(15) Provide Schedules for all panel boards, motor control centers, and distribution panels, main switchgear.

2.2.10.8.2 Basis of Design
(1) Electrical Plant Analysis including all load calculations
(2) Criteria for lighting used and photometric info for all spaces
(3) Criteria for electrical system
(4) Provide equipment cut sheets
(5) Provide material info as needed

2.2.10.8.3 Manual
(1) Detailed specifications

2.2.10.9 Energy Analysis (Include in Basis of Design)
2.2.10.9.1 Building Envelope Analysis

(1) Recommendations for overall building envelope
(2) Review of thermal vapor flow and moisture
(3) Recommendation for vapor barriers
(4) Recommendation for vapor isolation
(5) ASHRAE 90.1 analysis

2.2.10.9.2 Energy Study

(1) ASHRAE 90.1 HVAC calculations
(2) ASHRAE 90.1 Electrical Calculations

2.2.10.10 Cost – Provide Cost analysis in the report Basis of Design

2.2.10.10.1 Submit a written detailed estimate of construction developed from the completed plans and specifications.

2.2.10.10.2 Break down the construction estimate into the major architectural, civil, structural, mechanical, and electrical building components by labor and material for major divisions of work.

2.2.10.10.3 The estimates will include separate estimated costs for any construction alternates included in the bid documents but not part of the base bid.

2.2.10.10.4 Show estimated contractor overhead and profit, unit costs applied and materials and labor quantities.

2.2.10.10.5 No Design Contingency should be included

2.2.10.11 Schedule – Provide schedule in the Basis of Design

2.2.10.11.1 The consultant/contractor shall provide a final logic bar chart schedule for project construction and identify the critical path. The schedule will include purchase and delivery activities and durations for all major equipment and building components.

Appendix A: STANDARD FLOOR AND ROOM NUMBERING FOR MU

A.2.2.1 General

1. At MU, the Office of Space Planning and Management will review and approve all newly assigned room numbers. Provide MU with an electronic copy of the plan drawings.
    a. The Standard Floor and Room Numbering conventions apply to all MU campus buildings *EXCEPT* MU Healthcare. Coordinate with the Project Manager for floor and room numbering for MU Healthcare projects which will be developed in conjunction with Healthcare representatives.
2. At MU, the consultant in accordance with the following procedure will assign room numbers. At the initial design phase and throughout the design and construction phases, room numbers will comply with these guidelines.
    a. At MU Consultants are required to provide proposed room numbering for review approval prior to the completion of the Design Development phase.
    b. At MU Coordinate with the Project Manager to determine if select project stakeholders are to be involved in the development of the floor and room numbering.
    c. At MU Consultants are to provide code required room identification signage and messaging plans. Coordinate with Project Manager to determine if this scope will be owner or contractor provided.
3. The definitions used here facilitate general understanding of floor and room and do not always conform to NFPA or ICC code definition.
4. Include numbers in the project drawings. Room numbers must be shown correctly on drawings before advertisement for bids.

A.2.2.2 Floor Designators

1. First floor - lowest floor having a grade level entrance or exit.
2. If there is no floor at grade level, the first floor above grade is the first floor.
3. The floor immediately below the first floor is the basement floor.
4. Floors below the basement are to be called the first sub-basement, second sub-basement, etc. as needed.
5. Floors above the first floor are to be called second floor, third floor, etc., as needed.

A.2.2.3 Numerical Designation of Rooms by Floor

1. General
    a. For projects with “shell spaces” coordinate with the Project Manager to determine if provision should be made for future renovations
    b. Typically, numbering will be consecutive which may not consider future addition of numbers for renovations or reconfigurations; if consideration of non-consecutive numbering appears warranted coordinate with the Project Manager.
2. Sub-basement rooms - label by alpha indicators only.
3. Basement rooms - label with numbers 0-99.
4. First floor rooms - label with numbers 100-199.
5. Second floor rooms - label with numbers 200-299.
6. Third floor rooms - label with numbers 300-399, etc., as needed.

A.2.2.4 Alpha Prefixes and Suffixes for Numeric Room Designators

1. For large buildings with over 100 rooms per floor, reference to magnetic north and, where appropriate, to building north, must be shown on drawings. Assign appropriate alpha character

N, E, W, S, as prefix to numeric indicator. This allows for 400 unique assignable alphanumeric prefix.

2. For remodeling or for very large buildings with over 400 rooms per floor, the 26 letters of the alphabet may be used as suffix to numeric indicators. Conventions for application are as follows:
   (1) Wall or doorway will distinguish between new room and existing parent room.
   (2) No alpha suffix derived room area will be created that is not in contact physically with existing parent or alpha suffix derived parent room.
   (3) Rooms with internally derived alpha suffix rooms inside will be marked with word "complex" after parent room number.
   (4) Rooms will be marked with tactile letter signs at 5 foot height located on wall adjacent to door on opposite side from hinge, as stated in ANSI part
   (5) A117.1 (1971), in order to coincide with section 504 of the Rehabilitation Act of 1973 specifications.
   (6) Certain types of rooms will be marked as to function as well as room number such as Rest Rooms and Mechanical Rooms. Assigned alpha numeric system will provide for 10,800 unique alpha numeric indicators per floor and will require designators of not more than six elements (1 alpha, 4 numeric, 1 alpha) even in buildings over 10 floors.

A.2.2.5 Room Area Definition

1. All areas in every building must follow this convention and be marked accordingly Any area separated from an adjacent area by a full floor to ceiling partition and/or has a highly differentiated function from that adjacent area will be labeled as a discrete entity. This will be characterized by a building unique numeric or alphanumeric code to indicate its uniqueness.
2. In the case of low walls, see-through partitions, wire cages, or no walls at all, the above convention implies the possible application of unique designators within larger open areas. (Example: stack and reading areas within Ellis Library.)

A.2.2.6 Numbering Rooms

1. If floor has 100 or less rooms per floor:
   (1) Starting from an entrance, apply numeric designators in clockwise direction to each individual room area.
   (2) Where hallways are present, in some cases, use of even/odd designators may be used to further differentiate sides of hallways and eliminate confusion
   (3) Where intermediate hallways or isolated rooms are encountered, numbers are to be assigned in the clockwise (counter clockwise-MUS&T) sequence at the first entrance to the hallway or isolated area.
2. If floor has more than 100 rooms per floor:
   (1) Follow the above convention after having used alpha prefix designators in accordance with magnetic orientation to building.
   (2) Use alpha suffix designators if more than 400 rooms per floor or if remodeling of present rooms creates new room areas to be designated use of the clockwise and odd/even conventions described above.
   (3) Rooms not accessible from a corridor or common area will be numbered by the use of an alpha suffix. The prefix and the number will be the same as the room through which common access is available. For example, rooms accessible through room E101 will be numbered E101A, E101B, etc.

(4) Rooms not accessible from a corridor or common area and are at a different level than the room which provides access will be called mezzanines. Mezzanines will be numbered described above.
(5) If a room is subdivided into more than one room and the new rooms created are accessible from the corridor or common areas, and if room numbers in the appropriate sequence are not available for use, the original room number will be retained and numerical suffixes (-1, -2, -3, etc.) will be used for each new room created.
(6) For remodeling projects requiring new room numbers, the starting point for numbering will be in vertical alignment with the starting point of numbering on adjacent floor(s).
(7) Rooms spanning more than one floor will be numbered according to the main level entrance to the room if one entrance is on the main level. If no entrance is on the main level, the room will be numbered according to the entrance closest to the main level.
(8) The main corridor will be numbered 100, 200, 300, etc. on the first, second, third, etc. floors. Other corridors, stairwells, vestibules, and elevators will be numbered using the number of the main corridor with the addition of an alpha suffix, applied in a clockwise fashion.
(9) The consultant shall obtain written approval of the room numbering at Design Development and notify the Project Manager of any desired changes as they occur prior to issuance of Construction Documents.