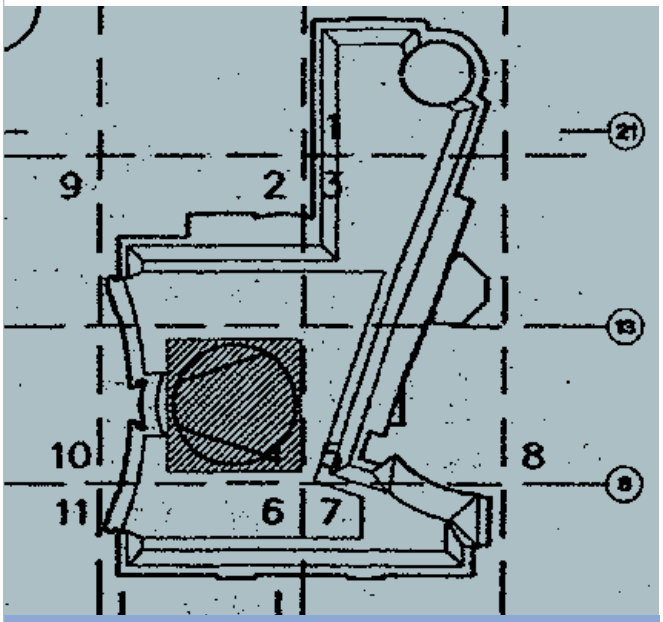
Appendix

Submission Requirements

A.0 TABLE OF CONTENTS

A.1 General Requirements



Ronald Reagan Building, Washington, D.C.

These design submission requirements have been developed to ensure a rational, well-documented design process and to facilitate reviews by GSA staff and tenant agencies as the design develops. The submission requirements listed here apply to all projects, whether design services are performed by architects and engineers under contract to GSA or by in-house staff.

These requirements are the minimum standards and the specific A/E Scope of Work will take precedence on each project.

All submissions in each phase of work are required to be given to the GSA in drawing or written form and on computer disk as determined by the GSA Project Manager.

Drawings

Drawing Size. All drawings of a single project must be a uniform standard size, as designated by the American National Standards Institute (ANSI). The following are related sheet sizes:

(A)	8.5" x 11"	220 mm x 280 mm
(B)	11" x 17"	280 mm x 430 mm
(C)	17" x 22"	430 mm x 560 mm
(D)	22" x 34"	560 mm x 860 mm
(E)	34" x 44"	860 mm x 1120 mm

Drawing Lettering. Lettering on drawings must be legible when drawings are reduced to half size and when they are microfilmed. This applies to concept and design development drawings as well as construction documents.

Drawing Scale. All drawings will be produced with metric drawing scales which are always expressed in non-dimensional ratios. Scales should also be illustrated graphically on the drawings. Scale of drawings should be appropriate for high resolution and legibility to include half-size reduced copies.

There are nine preferred base scales: 1:1 (full size), 1:5, 1:10, 1:20, 1:50, 1:100, 1:200, 1:500, 1:1000. Three others have limited usage: 1:2 (half size), 1:25, 1:250. Floor plans should be drawn at 1:100 (close to 1/8-inch scale).

CAD Standards. The National CAD/CIFM Standards should be obtained via the internet at www.gsa.gov/pbs/cifm/cifm_resources/standards.htm or by contacting the PBS CAD Center at (202) 501-9094, Fax: (202) 208-7147. These guidelines should be followed for all CAD drawing formatting. Regional CAD standards are available through the Regional CAD Coordinator and are considered supplements to the national standards. (Refer to the base scale examples in the previous paragraph.)

Dimensioning. The millimeter is the only unit of measurement to appear on construction documents for building plans and details for all disciplines except civil engineering, which shall be stated in meters. However, building elevation references are stated in meters. Use of millimeters is consistent with how dimensions are specified in major codes, such as BOCA. No dimension requires the "mm" label. On the drawings the unit symbol is eliminated and only an explanatory note such as: "All dimensions are shown in millimeters" or "All dimensions are shown in meters," is provided. Whole numbers always indicate millimeters; decimal numbers taken to three places always indicate meters. Centimeters will not be used for dimensioning.

If dual dimensioning is utilized on drawings, SI units shall be primary, with English units secondary and in parenthesis.

Seals. Each sheet of the construction documents must bear the seal and signature of the responsible design professional. (Specification and calculations cover page only.)

Cover Sheet. Provide code certification statement for compliance with specified codes and standards by each discipline with the professional seal and signature. The intent is to formally recognize the responsibility for compliance.

Security Requirements. All building plans, drawings and specifications prepared for construction or renovation, either in electronic or paper formats, must have imprinted on each page of the construction drawings or plans, "**PROPERTY OF UNITED STATES GOVERNMENT - FOR OFFICIAL USE ONLY**" in a minimum of 14 point bold type.

The following paragraph will be noted on the cover page of the construction drawings set and on the cove page of the specifications:

> "**PROPERTY OF THE UNITED STATES GOVERNMENT. COPYING, DISSEMINATION, OR DISTRIBUTION OF THESE DRAWINGS, PLANS OR SPECIFICATIONS TO UNAUTHORIZED PERSONS IS PROHIBITED.**" in a minimum of 14 point bold type.

The construction drawings, plans, and specifications are to be disseminated only to those requiring the information necessary for design, construction bidding, construction coordination, or other GSA procurement competition processes.

Specifications

Format. Specifications should be produced according to the CSI division format. Each page should be numbered. Specifications should be bound and include a Table of Contents. The specifications shall include instructions to bidders and Division 1, edited to GSA requirements.

Project Specifications. The *General Guide for Editing Specifications* published by GSA can be obtained and used as a resource.

Editing of Specifications. It is the designer's responsibility to edit all specifications to reflect the project design intent, GSA policy requirements and Federal law. Specifications must be carefully coordinated with drawings to ensure that everything shown on the drawings is specified. Specification language that is not applicable to the project shall be deleted.

Dimensioning in Specifications. Domestically produced hard metric products shall be specified when they meet GSA guidelines regarding cost and availability; see Chapter 1, *General Requirements, Metric Standards* in this document. In the event a product is not available domestically in hard metric sizes, a non-metric sized product may be specified, and its data will be soft converted to a metric equivalent.

Only in special cases can dual dimensions be used on GSA projects, subject to the approval of the GSA Contracting Officer.

Design Narratives and Calculations

Format. Typed, bound narratives should be produced for each design discipline.

Content. Narratives serve to explain the design intent and to document decisions made during the design process. Like drawings and specifications, narratives are an important permanent record of the building design. Drawings and specifications are a record of WHAT systems, materials and components the building contains; narratives should record WHY they were chosen. The narrative of each submittal may be based on the previous submittal, but it must be revised and expanded at each stage to reflect the current state of the design.

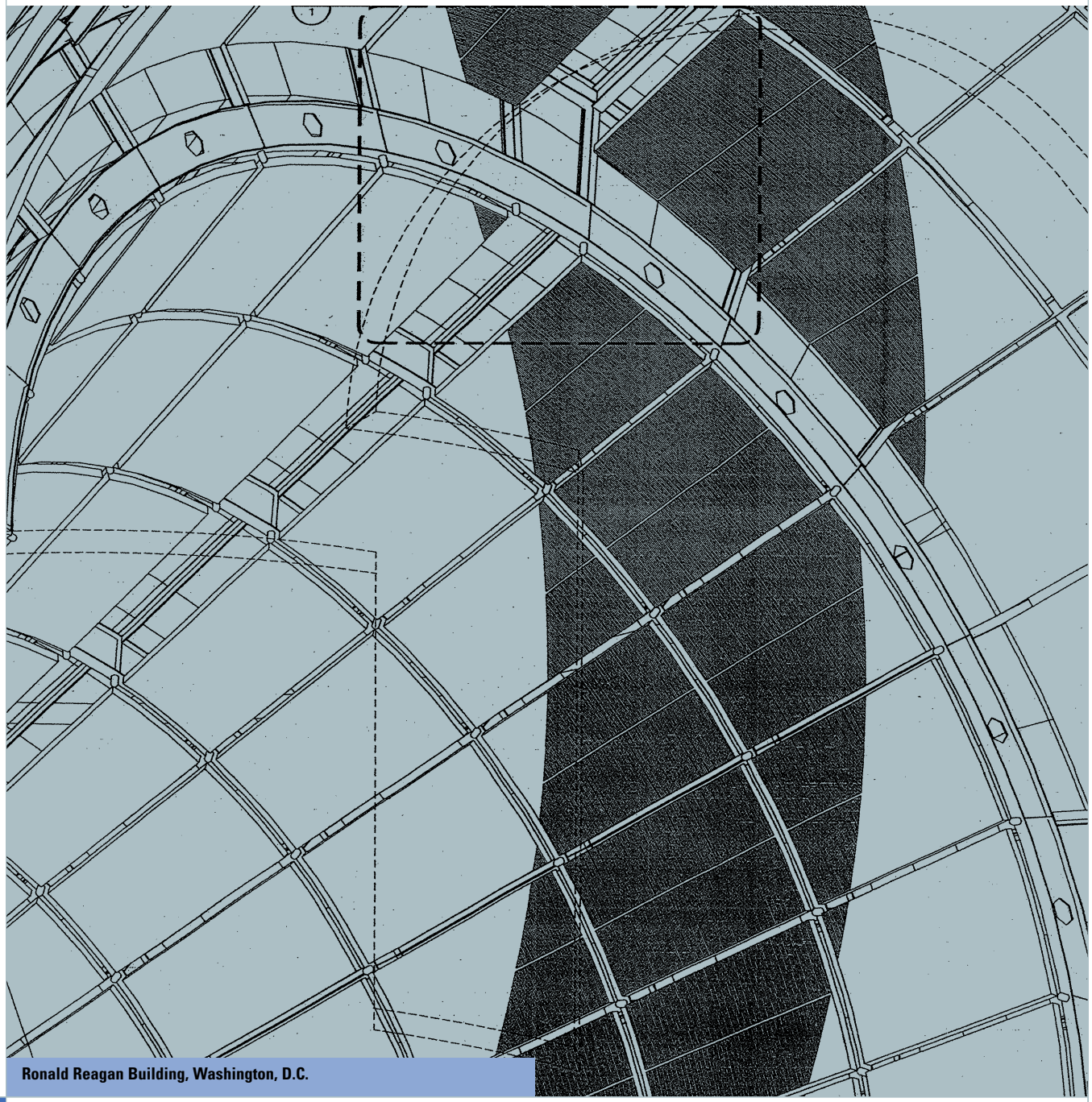
Calculations. Manual and/or computer based calculations should accompany narratives where required to support technical analysis. Each set of calculations should start with a summary sheet, which shows all assumptions, references applicable codes and standards, and lists the conclusions. Calculations should include engineering sketches as an aid to understanding by reviewers. The calculations for each submittal should be cumulative, so that the final submittal contains all calculations for the project. Calculations submitted at early stages of the project must be revised later to reflect the final design. Calculations must refer to code, paragraph of code used, standards, text books used for specific portion of calculation. Refer to drawing number where the results of the calculations have been used. Example: number and sizes of re-bars used in reinforced concrete members.

Performance Criteria. As part of the development of concepts through construction documents there shall be a check of building performance criteria as noted in A.2.

Cost Estimates

Cost estimates must be provided at various stages of the design process and must comply with the GSA document *Project Estimating Requirements*.

In addition to the designer's estimate, GSA will have independent estimates performed at approximately 30, 60, and 90 percent design completion to compare with the A/E estimate.



Ronald Reagan Building, Washington, D.C.

A.2 Performance Expectations Matrices

At the beginning of each project, the GSA Project Manager, tenants and design A/E need to define the functional objectives of a project. A functional objectives matrix, similar to the one shown in Figure A-1, while not required, may be an effective tool to define these objectives. (Such a matrix may also exist within the project's design programming documents.) By providing a numeric impact weight (e.g. 1-3, where 3 is high) at each intercept, a graphic check list becomes apparent as to which systems/features are most important in delivering a project's performance expectations. The high impact matrix intercepts call for design solutions that will optimize functional interests, consistent with the need to integrate solutions that will support all functional objectives.

High impact intercepts require formal design team technical discussions to help optimize design solutions. These technical discussions shall take the form of either a pre-concept design charrette and/or through a series of design team technical meetings during the concept phase. The technical discussion agenda can be organized by discipline (systems) and/or by functional objective heading, but should address:

- Functional performance goals
- Integrated solution options
- Heading-off what can go wrong
- Inspections/certification requirements
- Coordinating construction and turnover-phase issues/deliverables

For both the design concept and design development submissions, the design A/E shall identify the attainment of building functional objectives as represented by the matrix. This shall take the form of a narrative report that by system indicates how the proposed design supports expected building performance.

The Functional Objectives Matrix can be further refined by establishing a matrix for each expectation, e.g. that provided for Sustainability, in figure A-2. While not required, these matrices may help ensure a comprehensive response to functional objectives by breaking down each major function into its component principles/objectives. Sample matrices for Productivity, Security, and other functional objectives are available upon request through the Office of the Chief Architect.

Figure A-1 Functional Objectives Matrix

SYSTEMS		FUNCTIONAL OBJECTIVES: Productivity	Sustainability	Security	Seismic	Fire Safety	Accessibility	Historic Preservation	Maintainable
Foundations		1	1	1	3	1	1	1	1
On/Below Grade		1	1	2	3	1	2	1	1
Superstructure		1	1	3	3	2	2	2	1
Enclosure	Walls	2	3	3	3	2	1	3	2
	Windows/Doors	3	3	3	2	1	3	3	3
Roofing	Coverings	1	3	2	1	3	1	3	3
	Openings	2	3	2	1	1	1	3	3
Interior Construction	Partitions/Doors	2	2	3	2	3	3	3	2
	Access Floors	3	1	1	2	2	1	1	1
Interior Finishes	Walls	3	2	1	1	2	1	1	2
	Floors	3	3	1	1	2	1	1	3
	Ceiling	3	3	1	2	2	1	1	3
Conveying		2	1	1	2	2	3	1	3
Plumbing		1	3	1	2	2	3	1	3
HVAC	Central Plant	3	3	1	2	1	1	1	3
	Distribution	3	3	1	2	3	1	1	3
Fire Protection		1	1	2	3	3	1	1	1
Electrical	Service/Distribution	2	1	2	3	2	1	1	1
	Lighting	3	3	3	2	2	1	1	3
Equipment		1	1	3	1	2	1	1	2
Furnishings		3	3	1	1	2	3	1	2
Special Construction		1	2	1	2	2	1	1	2
Demolition	Building Elements	3	3	1	1	1	1	3	1
	Hazard Mat.	3	3	1	1	1	1	1	1
Building Sitework	Site Preparation	1	3	1	1	1	2	1	1
	Landscaping	2	3	2	1	1	1	1	3
	Utilities	1	1	1	3	2	1	1	2
Trans. Sitework		2	3	1	2	1	3	1	2

Figure A-2 Sustainability Matrix

SYSTEMS		PRINCIPLES / OBJECTIVES: Energy	Water	Materials	In. Env. Qual.	Site & Trans.	O & M
Foundations		1	1	2	1	1	1
On/Below Grade		1	1	2	1	1	2
Superstructure		1	1	2	1	1	2
Enclosure	Walls	3	1	2	2	1	3
	Windows/Doors	3	1	1	2	1	3
Roofing	Coverings	3	1	2	3	1	3
	Openings	3	1	1	2	1	3
Interior Construction	Partitions/Doors	1	1	3	3	1	3
	Access Floors	1	1	2	1	1	3
Interior Finishes	Walls	2	1	3	2	1	3
Floors		2	1	3	2	1	3
	Ceiling	2	1	3	2	1	3
Conveying		2	1	1	1	1	3
Plumbing		3	3	1	1	1	2
HVAC	Central Plant	3	3	2	1	1	3
	Distribution	3	2	1	3	1	3
Fire Protection		1	1	1	1	1	1
Electrical	Service/Distribution	1	1	1	1	1	1
	Lighting	3	1	1	2	2	2
Equipment		2	2	1	1	1	1
Furnishings		1	1	2	2	1	2
Special Construction		1	1	1	1	2	1
Demolition	Building Elements	1	1	2	2	2	1
	Hazard Mat.	1	1	3	3	2	1
Building Sitework	Site Preparation	2	1	1	1	3	2
	Landscaping	3	3	2	1	2	2
	Utilities	1	1	1	1	1	1
Trans. Sitework		2	1	1	1	3	1

A.3 New Construction and Modernizations

The design process and related submission requirements for new construction and modernizations are somewhat different than those for alteration projects. A modernization is defined as the comprehensive replacement or restoration of virtually all major systems, tenant-related interior work (such as ceilings, partitions, doors, floor finishes, etc.) and building elements and features. The following flow diagram and related definitions describe this process.

Peer review, arranged through the Office of the Chief Architect, is required for all new construction projects as well as any modernization project with significant alterations to either the building aesthetic or systems. All new construction projects, as well as modernization projects which significantly alter an existing structure shall be presented to the Commissioner and Chief Architect for approval in Washington D.C.

Design Process Definitions

General. These definitions are for new construction. Some requirements will be eliminated for a modernization project, such as zoning area, form, massing, etc.

Program Review

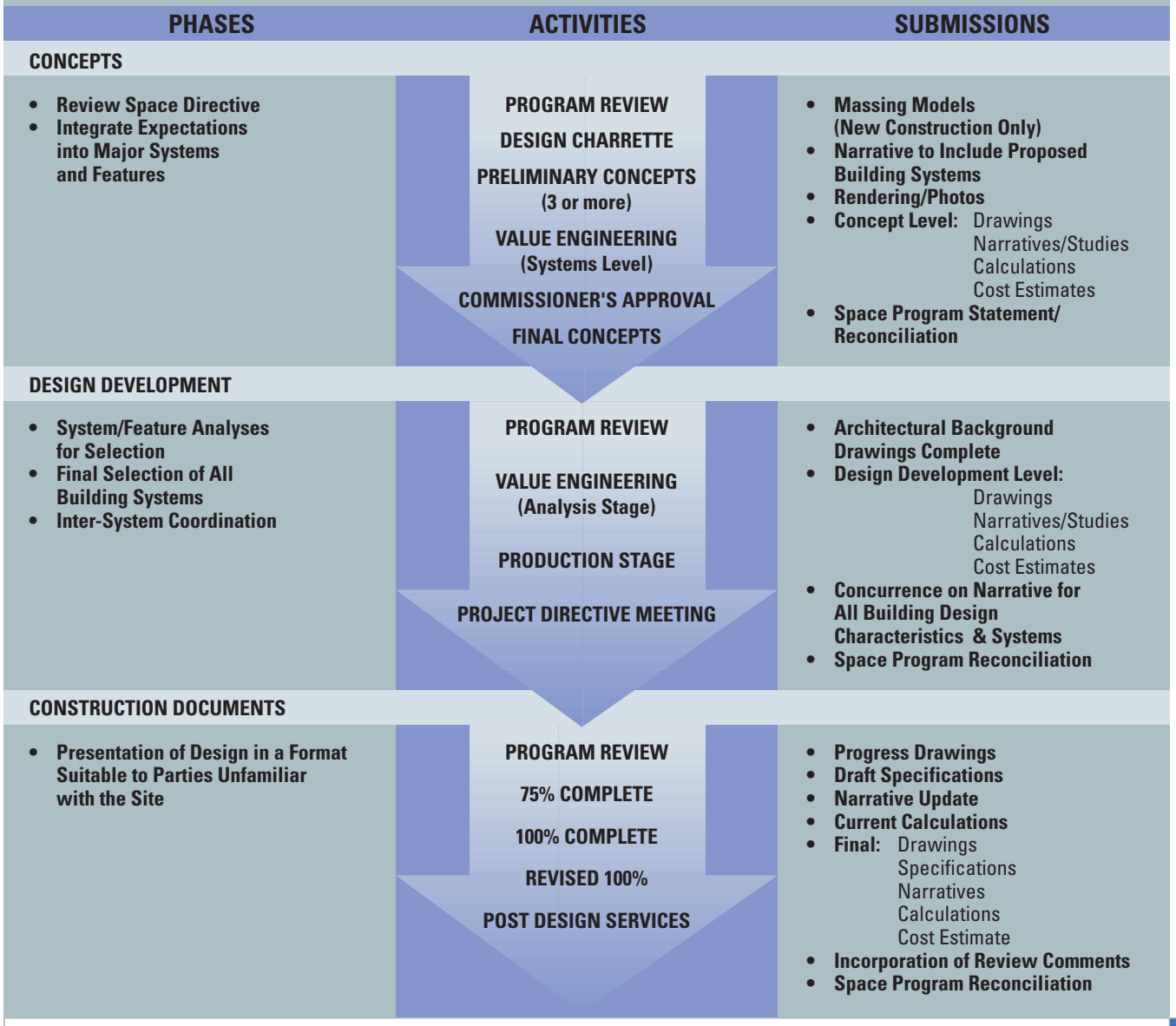
Prior to initiating each phase of design, the design team should meet to review design program expectations and to exchange ideas, lessons-learned, and concerns. Such technical "partnering" sessions allow a clearer definition of expectations while remaining within the project's scope and budget.

Concepts

A submission that will demonstrate compliance with the Building Program (space tabulation of building program) including all adjacency and functional requirements. This submission will also show that the proposed project is within the zoning area, and that the building and massing are compatible with the surroundings. The aesthetics should support the design philosophy of GSA shown in the general approach to architecture in the preceding chapters of this document. Building systems and building envelope appropriate for the conceptual designs should be defined in order that they can be evaluated early for effectiveness and efficiency related to operation, maintenance and energy consumption.

Since there are many options to accomplish these ends with any particular program and site, GSA will participate in the normal design process of comparing options by working with the A/E through preliminary concepts. During preliminary concepts, three concepts must be presented; these preliminary concepts are intended to be working level and not presentation documents. They should be developed only to the level that allows selection of a concept that will still be within program operation

Figure A-3 Design Process and Related Submission Requirements for New Construction and Modernization



and budget goals. This selected concept will be further refined and presented as the final concept.

For major projects, presentation is made to the Commissioner of the Public Buildings Service for final approval.

Design Development

A set of submissions and meetings that will finalize the selection of all systems with respect to type, size and other material characteristics. Systems are not only structural, mechanical, fire protection and electrical, but include all other building components such as the building envelope (wall, window and roof), interior construction (flooring, ceiling and partitions), service spaces, elevators, etc.

The design submission will consist of a combination of drawings, narrative and calculations. Although final design development plans, sections and elevations must be to scale, drawings made in the analysis stage to illustrate various options may be freehand.

This submission is not a preliminary construction document stage. The approval at the project directive meeting may require that building layout or size changes be incorporated into the construction documents. No design discipline should start work on construction documents until the project directive has been approved.

Life Cycle Cost Analysis. As specified herein and within programming requirements, life cycle cost assessments shall be made, leading to system/feature selections.

Production Stage. Development of the most favored of each system with supporting calculations and narrative. Plans, sections, elevations and details showing systems should be included.

Value Engineering (Analysis Stage). VE is a process that is somewhat continuous throughout the project but its greatest emphasis should be in the early stages of the project (concepts and design development). Initially it should focus on building systems and materials in a general sense during concepts. As the project is developed the focus will shift to detailed aspects of the earlier decisions during design development.

- Diagrams, narratives, and sketches with calculations to demonstrate the life-cycle cost effectiveness of the system should be prepared and received during this phase.
- This approach requires a diligent effort and commitment by all project team members early in the project to systems and materials that make sense economically and allow quality and durability.

Project Directive. The report summarizes analysis and design to date at completion of the design development phase. A meeting among GSA and A/E staff, particularly those who will be working on the construction documents, is held to review the project directive for concurrence.

Construction Documents

A set of detailed and coordinated submissions that become the basis of a construction contract. The notes on these should result in a single interpretation of a specific set of data or facts and, therefore, become the basis of a competitive price proposal. Construction documents should avoid using terms that the design specialist may know, but which have nothing to do with the purchase and installation of a product. Individual GSA regions may request a single or multiple submissions (i.e. 75 percent, 100 percent) as appropriate. Reviews may be both formal and informal ("onboard"). Language between specifications and notes on the drawings must be consistent and complementary.

Design Awards

Every two years GSA recognizes outstanding projects through its biennial Design Awards program. Designers are required to submit each new construction project for consideration.

Site Analysis and Preliminary Concepts

Requirements. The preliminary concepts submittal consists of three or more distinctly different architectural design schemes presented in sketch format (single line, drawn freehand to scale), along with massing models, site slides and photographs, and sufficient narrative to allow comparison and selection of a design direction for preparation of a final design concept.

- **Site Survey.** If a survey is part of the scope of work for the project, see Appendix A.5 for requirements.
- **Sketches.** It may be recognized that the information requested in subparagraphs 1 and 2 may be in progress and not yet complete.

1. Site location plan [at least 2 kilometers (1.25 miles) around site], showing:
   - Site relative to location of city center, major landmarks, major parking facilities, major roads and airport.
   - Location of subway stations and other mass transit links.

2. Existing site plan (at least one block around site), describing:
   - Site boundaries, approximate topography, existing buildings, setbacks and easements.
   - Climatic conditions including path of sun.
   - Location of on-site and off-site utilities.
   - Natural landscape.
   - Pedestrian and vehicular circulation. (Include direction of traffic on adjoining streets.)

3. Site plans for each design scheme, showing:
   - Building location and massing.
   - Building expansion potential.
   - Parking and service areas.

4. Floor plans, showing as a minimum:
   – Entrances, lobbies, corridors, stairways, elevators, work areas, special spaces and service spaces (with the principal spaces labeled). Dimensions for critical clearances, such as vehicle access, should be indicated.

5. Building sections (as necessary), showing:
   – Floor-to-floor heights and other critical dimensions.
   – Labeling of most important spaces.
   – Labeling of floor and roof elevations.

Slides.

1. Minimum of six 35 mm slides showing the site and elevations of existing buildings (or landscape, as applicable) surrounding the site.

Models.

1. Massing models of each architectural design scheme on a common base. (No fenestration should be provided at this stage of design development.)

Narrative (in "Executive Summary" format).

1. Site statement, describing:
   – Existing site features.
   – Climatic conditions.
   – Topography and drainage patterns.
   – Any existing erosion conditions.
   – Wetlands and locations of flood plains.
   – Surrounding buildings (style, scale).
   – Circulation patterns around site.
   – Site access.
   – Noise/visual considerations.
   – Local zoning restrictions.
   – Federal Aviation Agency requirements.
   – Hazardous waste.
   – Pollution.
   – Potential archeological artifacts.
   – Historic preservation considerations, if applicable.

2. Site photographs, showing contiguous areas.

3. Existing major site utilities.

4. Description of each architectural design scheme, explaining:
   – Organizational concept.
   – Expansion potential.
   – Building efficiency.
   – Energy considerations.
   – Advantages and disadvantages.
   – Historic preservation considerations, if applicable.
   – Sustainable design considerations.

5. Code statement.
   – Building classification, occupancy group(s), fire-resistance requirements and general egress requirements that relate to the site and occupancy use. Specific code requirements of each concept will not be required.

6. Construction cost of alternative schemes.
   – Verify that each design scheme presented can be constructed within the project budget.

7. Space Program Statement/Reconciliation

8. Preliminary Energy Analysis for compliance with Energy Goals.

9. Art in Architecture Statement.
   – Provide statement defining the integration of Art in Architecture. At a minimum identify the location for the proposed art concept.

Final Concept

Site Planning and Landscape Design

The following information must be complete for the final concept submittal of all buildings. (If materials produced for the preliminary concepts submittal do not require modification, such materials are acceptable for this submission.)

Drawings.

1. Site plan (at least one block around site), describing:
   - Site boundaries, approximate topography, existing buildings, setbacks and easements.
   - Building orientation with respect to path of sun.
   - Building massing and relationship to massing of surrounding buildings.
   - Future building expansion potential.
   - Location of on-site and off-site utilities.
   - Grading and drainage.
   - General landscape design, showing location of major features.
   - Pedestrian and vehicular circulation. (Include direction of traffic on adjoining streets.)
   - Parking and service areas.
   - Fire protection, water supplies, fire hydrants, and fire apparatus access roads.

Narrative.

1. Description of site and landscape design final concept.
   - Circulation.
   - Parking.
   - Paving.
   - Landscape design.
   - Irrigation, if any.
   - Utility distribution and collection systems.
   - Method for storm water detention or retention.
   - Landscape maintenance concept.
   - Fire protection, water supplies, fire hydrants, and fire apparatus access roads.
   - Accessibility path for the physically disabled.

Architectural

Drawings.

1. Floor plans, showing as a minimum:
   - Work areas, lobbies, corridors, entrances, stairways, elevators, special spaces and service spaces (with the principal spaces labeled). Dimensions for critical clearances, such as vehicle access, should be indicated.
   - Office areas must show proposed layouts down to the office level of detail verifying the integration between the approved program and the building concept is achievable.
   - Indicate how major mechanical and electrical equipment can be removed/replaced.

2. Elevations of major building façades, showing:
   - Fenestration.
   - Exterior materials.
   - Cast shadows.

3. Building sections (as necessary), showing:
   - Adequate space for structural, mechanical and electrical, telecommunications and fire protection systems.
   - Mechanical penthouses.
   - Floor-to-floor and other critical dimensions.
   - Labeling of most important spaces.
   - Labeling of floor and roof elevations.

4. Color rendering. [Minimum size must be 600 mm by 900 mm (24 inches by 36 inches).]

Photographs.

1. Four 200 mm by 250 mm (8-inch by 10-inch) color photographs, mounted, identified and framed, and two color slides, of the rendering or model image (showing at least 2 vantage points). In addition, provide for all building elevations (at least 1 vantage point per each elevation).
   - Two of the photographs and the two slides are to be sent to the GSA project manager.
   - Provide two additional 600 mm by 900 mm (24-inch by 36-inch) photographs of the rendering for the GSA project manager. (For courthouse projects only.)

Model.

1. Provide a model of the final concept with sufficient detail to convey the architectural intent of the design.

Narrative.

1. Architectural program requirements.
   - Show in tabular form how the final concept meets the program requirements for each critical function.

2. Description of final concept, explaining:
   - Expansion potential.
   - Building floor efficiency.
   - Conveying systems design (elevators, escalators).
   - Energy usage goals.
   - Treatment of historic zones, if applicable.
   - Operations and maintenance goals (exterior and interior window washing, relamping, etc.).

3. Vertical transportation analysis (elevators and escalators).

4. Code statement.
   Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.
   - Building classification, occupancy group(s), fire-resistance requirements, construction type, occupant load calculations and egress requirements for the Final Concept.
   - A code/criteria analysis should be prepared that documents an investigation of various codes and agency criteria that will govern the design of a specific project. This analysis should alert the Government to any conflicts in the project's design criteria so that they can be resolved early. The analysis should also provide a common perspective for the design and review of the project. This analysis is probably most critical in building modernization and repair/alteration projects.

5. Construction cost.
   - Verify that the final concept can be constructed within the project budget.

6. Identify architectural systems alternatives which will be analyzed during design development for life cycle cost analysis.

Structural

Drawings.

1. Plans, showing:
   - Framing plans of the proposed structural system showing column locations; bay sizes; and location of expansion or seismic joints.

Narrative.

1. Identification of unusual local code requirements.

2. Code compliance statement.
   - Name of model building code followed.
   - Building classification.
   - Identification of seismic zone, wind speed, etc.
   - Identification of special requirements, such as highrise.

3. For new buildings located in moderate and high risk seismic areas only:
   - Statement certifying that the structural engineer has reviewed the building configuration for seismic adequacy, and that criteria outlined in Chapter 4, *Structural Engineering, Building Configuration in Earthquake Zones*, of this document, have been met. This statement must be signed by the structural engineer and the architect.

Mechanical

Drawings.

1. Plans showing equipment spaces for mechanical equipment.

Narrative.

1. Description of at least two potential HVAC systems and a baseline system.
   - Unless otherwise described within design programming requirements, the baseline system to be used is that within Chapter 5 of this standard.

2. Proposed special features of plumbing system.

3. Code compliance statement.

Fire Protection

Fire submission requirements may be met in one of two ways, either as a separate Fire Protection section (as outlined in this document) or integrated into the construction documents as Architectural, Plumbing, Mechanical, Electrical etc. However, if integrated into the documents the A/E must provide a summary sheet identifying where the following is discussed.

Drawings.

1. Plans showing:
   - Equipment spaces for fire protection systems (e.g., fire pump, fire alarm, etc.).
   - Fire protection water supplies, fire hydrant locations, fire apparatus access roads, and fire lanes.

Narrative.

1. Description of the building's proposed fire protection systems including the egress system.

2. Code compliance statement.
   - Identification of special requirements, such as high rise, atrium, grand stairways, etc.

Electrical

Drawings.

1. Plans showing equipment spaces for all electrical equipment to include: panels; switchboards; transformers; UPS; and generators.

Narrative.

1. Description of at least two potential electrical systems and a baseline system.
   - General characteristics of a baseline system are described in Chapter 1, *General Requirements* of this document.

2. Proposed special features of electrical system.

3. Code compliance statement.

Certification Requirements.

1. The architect/engineer (lead designer) must certify that the project has been conceptualized to comply with ASHRAE 90.1 (latest approved version) and will meet GSA's energy goal requirement.

2. Green building (sustainable) design concepts—LEEDS strategy.

3. Life cycle cost analysis.
   - VE decisions and commitments that were made during this phase by the Project Team.

4. In bullet form, identify how proposed design features will support performance expectations of the project. Expectations are identified in the project's design program and within the Functional Objectives Matrix in Appendix A.2.

Final Concept Cost Estimate

A cost estimate must be provided. It should comply with the requirements for the concept stage estimate stated in GSA document *Project Estimating Requirements*.

Cost estimates must separate costs for interior tenant buildout from core/shell cost items as described in the *GSA New Pricing Guide*. The interior buildout cost must be divided by each building tenant.

Design Development

Site Planning and Landscape Design

Calculations.

1. Site storm drainage combined with building storm drainage, and sanitary sewer calculations.

2. Storm water detention calculations, if applicable.

3. Parking calculations, if applicable.

4. Dewatering calculations
   - Calculations modeling dewatering rates during dry and wet season excavation. Calculations must take into account effect of dewatering on adjacent structures and improvements.
   - Calculations must assume a specific shoring system as part of a comprehensive excavation system.

Narrative.

1. Site circulation concept, explaining:
   - Reasons for site circulation design and number of site entrances.
   - Reasons and/or calculations for number of parking spaces provided.
   - Reasoning for design of service area(s), including description of number and sizes of trucks that can be accommodated.
   - Proposed scheme for waste removal.
   - Proposed scheme for fire apparatus access and fire lanes.

2. Site utilities distribution concept.
   - Brief description of fire protection water supplies.
   - Brief description of fire hydrant locations.

3. Drainage design concept.

4. Landscape design concept, explaining:
   - Reasoning for landscape design, paving, site furnishings, and any water features.
   - Reasoning for choice of plant materials.
   - Proposed landscape maintenance plan and water conservation plan.
   - Brief operating description of irrigation system.

5. Site construction description.
   - Brief description of materials proposed for pavements and utilities.

Code analysis.

1. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.
   - Identify local zoning and all building code requirements and provide a complete analysis as they pertain to the project.

Drawings.

1. Site layout plan, showing:
   - All buildings, roads, walks, parking and other paved areas (including type of pavement).
   - Accessible route from parking areas and from public street to main facility entrance.
   - Fire apparatus and fire lanes.

2. Grading and drainage plan, showing:
   - Site grading and storm drainage inlets, including storm water detention features.

3. Site utilities plan, showing:
   - Sizes and locations of domestic and fire protection water supply lines, sanitary sewer lines, steam/condensate lines, and chilled water supply and return lines, if applicable.

4. Landscape design plan, showing:
   - General areas of planting, paving, site furniture, water features, etc.

5. Irrigation plan, if applicable.

Architectural

Calculations.

1. Acoustical calculations.

2. Dew point location.

3. Toilet fixture count.

Narrative.

1. Building concept, explaining:
   - Reasons for building massing, entrance locations and service locations.
   - Building circulation and arrangement of major spaces.
   - Interior design.
   - Adherence to the Building Preservation Plan, if applicable.
   - Energy conservation design elements.
   - Water conservation considerations.
   - Explain how all these design considerations are combined to provide a well integrated cohesive design concept.

2. Analysis of refuse removal, recycled materials storage and removal, and maintenance requirements.

3. Building construction description, explaining:
   - Structural bay size.
   - Exterior materials, waterproofing, air barriers/vapor retarders, and insulation elements.
   - Roofing system(s).
   - Exterior glazing system.
   - Interior finishes, with detailed explanation for public spaces.
   - Potential locations for artwork commissioned under the "Art in Architecture " program, if applicable.
   - Use of recyclable materials.

4. Review of project for code compliance.
   - Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.

5. For major alterations, provide a determination whether an accessible floor is needed.

6. Building maintenance, explaining:
   - How unique and tall architectural spaces such as atriums or grand staircases will be cleaned, have their light fixtures maintained, have interior and exterior glass surfaces cleaned and typical maintenance performed.
   - How courtrooms, dining facilities and other assembly spaces with fixed seating, multi-level spaces or with sloped floors will have their ceilings, lights and other ceiling elements maintained and repaired.
   - Proposed scheme for window washing equipment.
   - Consideration and prevention of bird nesting on exterior surfaces.
   - How major mechanical and electrical equipment can be serviced and/or replaced in future years.

7. Review of building for compliance with project specific criteria as noted in Chapter 8, *Security Design*.

8. Description of process for servicing and replacement of equipment given the necessary dimension clearances.

9. Program Status and Reconciliation Report.
   – Report verifying the current design's compliance with the approved space program. Any deviations must be clearly reported.

10. Curtainwall Report.
   – In projects with complex curtainwall systems, describe size and locations of major movement joints to accommodate structural drift due to seismic and/or wind loading. Describe proposed curtainwall attachment methods to accommodate these lateral movements.
   – Describe water migration, and fire safety systems.
   – Describe typical interfaces between exterior wall system and interior finishes.
   – Describe interfaces between major enclosure assemblies such as glass curtain wall to precast or stone panels.
   – Identification of at least three suppliers that can provide proposed exterior wall system.
   – Address any requirement for blast resistance in the context of "Windgard" simulations and/or blast testing results, as provided by the Office of the Chief Architect.

11. Building Keying and Signage Report.
   – Report must fully define the keying hierarchy for the entire building incorporating various levels of access, security, and fire egress. A/E should coordinate with GSA Fire Safety Engineer for keying.
   – Signage system and room numbering system must be integrated with keying system.

12. Provide two Finish Boards for both Public and Tenant interior areas composed of actual material samples and color coded plans and sections of major spaces showing their use.

Drawings.

1. Building floor plans, showing:
   – Spaces individually delineated and labeled.
   – Enlarged layouts of special spaces.
   – Dimensions.
   – Planning module.

2. Building roof plan, showing:
   – Drainage design, including minimum roof slope.
   – Dimensions.
   – Membrane and insulation configuration of the roofing system.

3. Elevations, showing:
   – Entrances, window arrangements, doors.
   – Exterior materials with major vertical and horizontal joints.
   – Roof levels.
   – Raised flooring and suspended ceiling space.
   – Dimensions.

4. One longitudinal and one transverse section, showing:
   – Floor-to-floor dimensions.
   – Stairs and elevators.
   – Typical ceiling heights.
   – General roof construction.

5. Exterior wall sections, showing:
   – Materials of exterior wall construction, including flashing, connections, method of anchoring, insulation, vapor retarders, and glazing treatments.
   – Vertical arrangement of interior space, including accommodation of mechanical and electrical services in the floor and ceiling zones.

6. Proposed room finish schedule, showing:
   – Floors, bases, walls and ceilings.
   – (Finish schedule may be bound into narrative.)

7. Perspective sketches, renderings and/or presentation model, if included in the project scope.

8. Proposed site furniture, showing:
   – Site furniture cut sheets or photos
   – Proposed locations.

9. Diagrams illustrating the ability to access, service and replace mechanical/electrical equipment showing the pathway with necessary clearance.

10. Location of accessible pathways and services for the physically disabled.

11. Placement of Art-in-Architecture elements.

Photographs.

1. Two sets each of 35 mm slides and 200 mm by 250 mm (8 inch by 10 inch) photographs for: rendering or model image (if changed from concept submission); and elevation views for all exposures (if changed from concept submission).

Structural

Calculations. For any computer-generated results, submit a program user's manual, a model of the input data and all pertinent program material required to understand the output. A narrative of the input and results for computer-generated calculations for the recommended structural concept should be contained in the calculations as well.

1. Gravity load and lateral load calculations, with tabulated results showing framing schedules.

2. Foundation calculations.

3. Calculations showing that the system is not vulnerable to progressive collapse.

4. Vibration calculations.

5. Blast calculations.

Narrative.

1. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.

2. Comparative cost analysis of at least three potential framing systems.
   - The analysis should compare first costs based on the design of a typical cross section of the building, one column bay in width. It should also include a comparison of lateral load-resisting elements. Nonstructural building systems that have a bearing on the overall cost of the systems must be included. For example, in a comparison between steel and concrete systems, the cost of fireproofing the steel structure must be considered, if fireproofing is required by code.
   - The analysis should include a brief narrative listing factors that may have a bearing on the final selection, such as the availability of local labor skilled in the erection systems, and other concerns.

3. Description of recommended structural concept, including:
   - Choice of framing system, including lateral load-resisting elements, and proposed foundation design.
   - Verification of adequacy of all assumed dead and live loads.

4. Identify all code requirements and provide a complete analysis as it pertains to this project including but not limited to:
   - Required fire-resistance rating of structural elements.
   - Summary of special requirements resulting from applicable local codes.

5. Proposed methods of corrosion protection, if applicable.

6. Geotechnical Engineering Report, including final boring logs (if part of scope of work).
   - See Appendix A.5 for specific requirements.

7. Geologic Hazard Report, when required in seismic zones 2A, 2B, 3 and 4.
   - See Appendix A.5 for specific requirements.

8. Blast consultant's report and analysis (if part of scope of work).

Drawings.

1. Framing plans and key details.

Mechanical

Calculations.

HVAC.

1. Block loads for heating and refrigeration.

2. Heat and air balance calculations.

3. HVAC calculations for walls, roofs, rooms and spaces to size AHU's piping and duct systems.

4. Energy analysis.
   – Projections for the annual energy consumption of the building, taking into account architectural wall and roof design, and preliminary lighting design.

5. Life Cycle Cost Analysis
   – Comparative analyses of alternatives defined in concept submissions.
   – Additional analyses as required to optimize equipment selections, heat recovery/storage, and control/zoning options.

Plumbing.

1. Water supply calculations.
   – Include pressure for domestic hot and cold water.

2. Roof drainage calculations.

3. Plumbing fixture count analysis.

4. Sanitary waste pipe sizing calculations.

Narrative.

HVAC.

1. Life Cycle Cost Analysis of at least three potential HVAC systems.
   – The analysis should compare first cost and operating costs. One of the systems must be the base line system described in Chapter 5.

2. Description of the HVAC systems studied.
   – The general features, configuration, and functional advantages and disadvantages of each system should be compared qualitatively. In addition, a description of how the other building systems and their components integrate with the HVAC, such as windows, lighting, and building orientation.

3. Description of recommended HVAC system.
   – Include cost and other considerations.

4. Energy source study (for new buildings only, except border stations).
   – An evaluation of the most economical primary energy source over the life of the building. This is a separate study from the Life Cycle Cost Analysis for the HVAC systems.

5. Recommendations for HVAC systems for special spaces.
   – Automated data processing rooms, auditoria, conference rooms, kitchens and other special spaces identified in the building program.

6. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.

Plumbing.

1. Proposed plumbing system.
   – Include lists of typical fixtures.

2. Evaluation of alternate sources for preheating of domestic water (solar or heat recovery).

Drawings.

1. Site plan.
   – Proposed inverts of sewers, storm water pipes and gas lines at the building service entrance.

HVAC.

1. Floor plans.
   – Proposed building zoning and major duct runs. Sketch layouts of mechanical rooms, showing locations of major equipment, including size variations by different manufacturers.

2. Systems schematics and flow diagrams.

Plumbing.

1. Floor plans.
   – Proposed building zoning and major piping runs.
   – Locations of proposed plumbing fixtures and equipment.

2. Systems schematics and flow diagrams.

Fire Protection

Fire submission requirements may be met in one of two ways, either as a separate Fire Protection section (as outlined in this document) or integrated into the construction documents as Architectural, Plumbing, Mechanical, Electrical etc. However, if integrated into the documents the A/E must provide a summary sheet identifying where the following is discussed.

Calculations.

1. Occupant load and egress calculations.

2. Fire protection water supply calculations.
   – Includes water supply flow testing data.

3. Fire pump calculations where applicable.

4. Smoke control calculations where applicable (e.g., atrium, etc.).

5. Stairway pressurization calculations where applicable.

Narrative.

1. Building egress system.
   – Includes egress calculations and stairway exit capacities, remoteness, exit discharge, etc.

2. All building fire alarm and suppression systems.

3. Smoke control system(s), where applicable.

4. Special fire protection systems (e.g., kitchen extinguishing system), where applicable.

5. Fire resistance rating of building structural elements.
   – Coordinate with structural engineer.

6. Fire alarm system.

7. Interface of fire alarm system with Building Automation system and Security Systems.

8. Review of building for compliance with life safety requirements and building security requirements.

9. Interior finish requirements as they pertain to the life safety requirements.

Drawings.

1. Floor Plans showing:
   - Equipment spaces for fire protection systems (e.g., fire pump, fire alarm, etc.)
   - Fire protection water supply lines, fire hydrant locations, fire apparatus access roads, and fire lanes.
   - Standpipes and sprinkler risers.
   - Riser diagrams for sprinkler system.
   - Riser diagram for fire alarm system.
   - Remoteness of exit stairways.
   - Location of firewalls and smoke partitions.
   - Identification of occupancy type of every space and room in building.
   - Calculated occupant loads for every space and room in the building.
   - Location of special fire protection requirements (e.g., kitchens, computer rooms, storage, etc.)

Electrical

Calculations.

1. Lighting calculations for a typical 186 m2 (2,000 sf) open office plan with system furniture.

2. Lighting calculations for a typical one person private office.

3. Power calculations from building entry to branch circuit panel.

4. Load calculations.

5. Life cycle cost analysis of luminaire/lamp system and associated controls.

Narrative.

1. Description of alternative power distribution schemes.
   - Compare the advantages and disadvantages of each approach. Include the source of power, potential for on-site generation, most economical voltage and primary versus secondary metering.

2. Proposed power distribution scheme.
   - Provide a detailed description and justification for the selected scheme. Address special power and reliability requirements, including emergency power and UPS systems.

3. Proposed lighting systems.
   - Discuss typical lighting system features, including fixture type, layout, and type of controls.
   - Discuss special spaces such as lobbies, auditoria, dining rooms and conference rooms.
   - Discuss exterior lighting scheme.

4. Interface with Building Automation System.
   – Methods proposed for energy conservation and integration with Building Automation System.

5. Engineering analysis for demand limit controls.

6. Description of each proposed signal system.

7. Description of proposed security systems' features and intended mode of operation.
   – Proposed zone schedule.
   – Proposed card access controls, CCTV assessment and intrusion protection system, if applicable.

8. Proposed Telecommunications Infrastructure.
   – Systems proposed for infrastructure and cabling to accommodate the communications systems. These must be designed and provided in compliance with EIA/TIA Building Telecommunications Wiring Standards.

9. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.

Drawings.

1. Site plan.
   – Proposed site distribution for power and communications, proposed service entrance and location of transformers, generators, and vaults, etc.

2. Floor plans.
   – Proposed major electrical distribution scheme and locations of electrical closets.

3. Floor plans.
   – Proposed major routing of communications system, communications equipment rooms and closets.

4. Floor plans.
   – Plan layouts of electrical rooms, showing locations of major equipment, including size variations by different manufacturers.

5. Single line diagram of the building power distribution system.

6. Plan of typical office lighting layout.

7. Single line diagram of other signal system including: telephones; security; public address; and others.

8. Security system site plan.
   – Proposed locations for CCTV, duress alarm sensors, and access controls for parking lots. If the system is not extensive, these locations may be shown on the electrical site plan.

9. Security system floor plans.
   – Proposed locations for access controls, intrusion detection devices, CCTV and local panels.

Design Development Cost Estimate

A cost estimate must be provided. It should comply with the requirements for the design development estimate stated in GSA document *Project Estimating Requirements*.

Cost estimate must separate costs for interior tenant buildout from core/shell cost items as described in the *GSA New Pricing Guide*. The interior buildout costs must be divided by each building tenant.

Address what value engineering items were incorporated from the Concept Value Engineering Workshops. (Document all VE Workshop sessions during design development and show what is to be incorporated into the final design.)

Specifications.
Assemble all project related construction guide specifications and mark out all content that does not apply to the project.

Certification Requirements.

1. The architect/engineer (lead designer) must provide certification that the project has been designed and is in compliance with ASHRAE 90.1 (latest approved version) and will meet GSA energy goal requirements.

2. Assemble material for LEED rating submission, indicating features and points that assure desired LEED rating.

3. VE decisions and commitments that were made during the Design Development phase by the Project Team.

4. In bullet form, identify how selected design features will support the project's performance expectations. All building systems involved with the project shall be discussed, each addressing all performance expectations as covered in the design program and Appendix A.2.

Construction Documents

The construction documents must be complete, coordinated between disciplines, biddable, readable and buildable, with no room for unreasonable additional interpretation. The drawings listed below represent requirements for GSA's review, and do not constitute any limitation on the documentation required to properly contract for the construction of the project, or limit the professional design liability for errors and omissions.

One of the guidelines to insure inter-discipline and intra-discipline coordination is included under each category of work and is referred to as the Review Checklist. The A/E consultant should make sure that all of these items, and others that pertain to good project coordination, are reviewed and addressed before submission of the documents to GSA.

Update of Code Analysis. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished meet code requirements.

Site Planning and Landscape Design

Code Criteria. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.

Drawings. General: The plans listed below, except the demolition plans, may be combined on small projects.

1. Demolition plans, if required.

2. Site layout plan.
   - Location of all buildings, roads, walks, accessible routes from parking and public street to building entrance, parking and other paved areas, and planted areas.
   - Limits of construction.
   - Locations and sizes of fire protection water supply lines, fire hydrants, fire apparatus access roads, and fire lanes.
   - Location of floodplains and wetlands.

3. Grading and drainage plan, showing:
   - Existing and new contours [use 500 mm (2 foot) interval minimum in area around buildings].
   - Spot elevations at all entrances and elsewhere as necessary.
   - Elevations for walls, ramps, terraces, plazas and parking lots.
   - All surface drainage structures.
   - Water retainage and conservation.

4. Site utilities plan, showing:
   - All utilities, including inlets, manholes, clean-outs and invert elevations.

5. Planting plan, showing:
   - Building outline, circulation, parking and major utility runs.
   - Size and location of existing vegetation to be preserved (include protection measures during construction).
   - Location of all new plant material (identify function, such as windbreak or visual screen where appropriate).
   - Erosion control.

6. Planting schedule, showing:
   - Quantity of plants, botanical names, planted size and final size.

7. Irrigation plan, if applicable.
   - Include schematic of irrigation control system.

8. Planting and construction details, profiles, sections, and notes as necessary to fully describe design intent.

9. Construction phasing, if part of project.

10. Survey of surrounding buildings, structures and improvements in both wet and dry season to document pre-construction elevations.

11. Potential archeological artifacts.

Calculations.

1. Final drainage calculations, including stormwater detention.

2. Final parking calculations, if applicable.

3. Pipe sizing calculations for water and sewer pipes.

4. Pavement design calculations.

Site Design Review Checklist.
This checklist is intended to provide an inter-disciplinary coordination review.

- □ Piping and other utility locations and inverts at building penetrations coordinated with mechanical drawings.
- □ Electrical service coordinated with electrical drawings.
- □ Interference of utilities with underground electrical runs checked.
- □ Interference between planting and utilities checked.
- □ Elevations of entrances coordinated with architectural drawings.
- □ Required reinforcement shown for all free standing and retaining walls.
- □ Connections to foundation drainage coordinated.
- □ Sub-surface drainage shown.
- □ Location of underground storage tanks shown.
- □ Construction of underground storage tanks detailed.

Architectural

Drawings.

1. Project title sheet, drawing index.

2. Demolition plans.
   – Show for modernizations, if required.

3. Floor plans.
   – Show planning grids and raised access floor grid, if applicable.

4. Reflected ceiling plans.
   – Show ceiling grid and location of all elements to be placed in the ceiling.

5. Building sections.
   – Vertical zoning for electrical and mechanical utilities must be indicated on sections.

6. Roof plans.
   – Roof plans must show slopes, low points, drains and scuppers, equipment, equipment supports, roof accessories and specialty items, if applicable.

7. Exterior elevations.

8. Wall sections.

9. Interior elevations.

10. Details.

Schedules.

Diagrams illustrating proper clearance for servicing and replacement of equipment.

Specifications.

1. Room finish, color and door schedules can be incorporated into either the specifications or drawings.

2. Call for thermographic scans of building envelope to identify sources of heat transfer.

3. Call for assembly of mock-ups for spaces such as courtrooms and sample office space fitouts.

Architectural Review Checklist.

This checklist enumerates some of interfaces between architectural and engineering disciplines that require close coordination.

- □ Interference with structural framing members coordinated.
- □ Locations and details of below-grade and other waterproofing shown, and coordinated with structural drawings.
- □ Anchorage of exterior wall elements shown.
- □ Expansion and/or seismic joints shown and detailed.
- □ Adequate clearances to install, service, repair and replace mechanical and electrical equipment. (Verify all space requirements are incorporated into the floor plans.)
- □ Rooftop mechanical equipment shown.
- □ Adequate clearances under rooftop mechanical and electrical equipment to facilitate maintenance, repair and replacement of the roofing system.
- □ Location of roof drains and floor drains coordinated with mechanical drawings.

- ☐ Air diffusers and registers coordinated with mechanical drawings.
- ☐ Louver sizes and locations coordinated with mechanical drawings.
- ☐ Light fixture types and locations coordinated with mechanical and electrical drawings.
- ☐ Wall and roof sections coordinated with heat loss calculations.
- ☐ Adequate envelope design details to ensure thermal/air/moisture control.
- ☐ For pressurized plenum raised flooring, assure effective barrier to prevent air passage to exterior walls.
- ☐ Acoustical wall treatments shown in mechanical rooms (if applicable).
- ☐ Location of access panels in plaster ceilings and soffits coordinated with mechanical drawings.
- ☐ Plumbing fixture mounting heights coordinated with mechanical drawings.
- ☐ Coordination of architectural elements with exposed structural members.
- ☐ Location of air supply and ducted exhaust systems.
- ☐ Security light fixtures required and locations coordinated with electrical drawings.

Structural

Drawings.

1. Demolition plans.

2. Full set of structural construction drawings.
   - Drawings must be fully dimensioned, noted and detailed for accurate bidding and construction.
   - Load criteria for all floor live loads, roof live load, roof snow load must be shown on drawings. Live load reduction, if used, must be indicated.
   - Basic wind speed, importance factor, exposure, effective velocity pressure and wind load must be indicated.
   - Seismic design criteria, such as earthquake zone, and response factors must be indicated. Additional information may be required by the local building official.
   - Soil bearing pressure and lateral earth pressure must be indicated.
   - Properties of basic materials must be indicated.
   - Blast-resistant requirements if applicable.
   - Indicate the codes and standards used to develop the project.

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

4. Structural details. (All typical details must be shown on the drawings.)
   - Include details for steel connections.
   - Include details for anchorage of building system equipment and nonstructural building elements.

Calculations. For any computer generated results, submit a model of the input data and all pertinent program material required to understand the output. A narrative of the input and results should be contained in the calculations as well.

1. Final structural calculations, including:
   - Gravity loads.
   - Lateral loads.
   - Foundations.
   - Thermal loads where significant.
   - Vibration propagation.
   - Progressive collapse.
   - Supports for nonstructural elements, including mechanical and electrical equipment.
   - Steel connections
   - Blast analysis.

Structural Review Checklist.

□ Floor elevations shown on drawings.

□ Camber requirements shown on drawings.

□ Beam and girder connections detailed.

□ Clearances for bolts and fasteners shown (steel and wood construction).

□ Fire resistance of structural members indicated.

□ Beam reactions shown for moment connections.

□ Equipment, piping and ductwork supports detailed (may be shown on structural, mechanical or electrical drawings, as applicable).

□ Hoists shown in major mechanical rooms (if required).

□ Interference with piping and ductwork coordinated.

□ Interference with electrical ducts and conduit coordinated.

□ Anchorage of architectural, mechanical or electrical systems and components.

□ Roof drains coordinated with architectural and mechanical drawings.

□ Subdrainage and foundations coordinated with mechanical drawings/piping.

□ Waterproofing of foundation walls, retaining walls and other structural elements coordinated with architectural drawings.

Mechanical

Drawings. Systems must be fully drawn and sized to permit accurate bidding and construction.

HVAC.

1. Demolition plans.
   – Show for modernizations, if required.

2. HVAC piping layouts.
   – All valves must be shown. Indicate locations where temperature, pressure, flow, contaminant/ combustion gases, or vibration gauges are required, and if remote sensing is required.

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

4. Automatic control diagram(s).
   – Diagram to show control signal interface, complete with sequence of operation.

5. Layout of equipment rooms showing all mechanical equipment. (The layout shall indicate the space allocated for maintenance and removal.)

6. Mechanical details.

7. Complete equipment schedules.

8. HVAC duct riser diagram.

9. Schematic flow diagrams.

Plumbing.

1. Demolition plans.
   – Show for modernizations, if required.

2. Piping riser diagrams.
   – Plumbing.

3. Floor plans.
   – Plumbing layout and fixtures; large scale plans should be used where required for clarity.

4. Riser diagrams for waste and vent lines.

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

6. Plumbing fixture schedule.

Calculations.

1. HVAC calculations for the entire building, arranged by individual air handling and pumping system.
   – Block loads for heating and refrigeration.
   – Room load and supply air calculations.
   – System load and supply air calculations (for VAV systems).
   – System pressure static analysis at peak and minimum block loads (for VAV systems).
   – Heat loss calculations for walls and roofs.
   – Acoustical calculations (for VAV systems, use peak air flow).
   – Flow and head calculations for pumping systems.

2. Plumbing calculations.
   – Include entire building, including roof drainage calculations and hot water heating calculations.
   – Water supply calculations, including pressure.
   – Roof drainage calculations.
   – Sanitary waste sizing calculations.

3. Generator calculations.
   – Sizing of fuel storage and distribution and vibration isolation.

Mechanical Review Checklist.

- ☐ Interference with structural framing members coordinated.
- ☐ Equipment pad locations coordinated with structural drawings.
- ☐ Adequate clearances to service and replace mechanical equipment.
- ☐ Hoist (or other means of equipment replacement) coordinated with structural drawings.
- ☐ Motors and special power needs coordinated with electrical drawings.
- ☐ Location of roof drains and floor drains coordinated with architectural and structural drawings.
- ☐ Air diffusers and registers coordinated with architectural drawings and electrical lighting plans.
- ☐ Location of supply and exhaust systems coordinated with security barriers, detection devices and other related concerns.
- ☐ Louver sizes and locations coordinated with architectural drawings.
- ☐ Inverts of piping coordinated with civil drawings.
- ☐ Supports and bracing for major piping, ductwork and equipment coordinated with structural drawings.
- ☐ Penetrations through rated wall/floor/roof assemblies detailed and specified.
- ☐ BAS system specified, including software and point schedules. (Use an open communication protocol system like BACnet.)
- ☐ Start up and testing requirements specified.

Special Checklist for VAV Systems.

- ☐ Minimum amount of outside air to be admitted during occupied hours shown on drawings; also minimum ventilation supplied at lowest setting of VAV box.
- ☐ Fan schedule for both supply and return fans, showing minimum and maximum airflow rates and total pressure at minimum flow, maximum sound power level and blade frequency increment at peak air flow.
- ☐ VAV terminal units to be specified indicating maximum and minimum air flow rates minimum static pressure required, maximum static pressure permitted and noise ratings at maximum air flow.
- ☐ Supply air outlets specified by face and neck sizes, ADPI performance for maximum and minimum airflow.
- ☐ Controller pressure setting and sensor location shown, including reference pressure location. For multiple sensors all locations must be shown. Also show pressure setting for high limit of supply fan.
- ☐ Maximum and minimum air flow rates shown for air flow measuring stations. Air flow measuring stations located.
- ☐ All required control instruments shown and located.

Fire Protection

Fire submission requirements may be met in one of two ways, either as a separate Fire Protection section (as outlined in this document) or integrated into the construction documents as Architectural, Plumbing, Mechanical, Electrical etc. However, if integrated into the documents the A/E must provide a summary sheet identifying where the following is discussed.

Drawings.

1. Demolition plans.
   - Show for modernizations, if required.

2. Full set of fire protection construction drawings.
   - Drawings must be carefully dimensioned, noted and detailed for accurate bidding and construction.

3. Fire Protection details. (All typical details must be shown on the drawings.)

   Building Construction
   - Building's construction type (e.g., 443, 222, etc.).
   - Firewalls and smoke partitions.
   - Panel and curtain walls.
   - Fire stopping configurations. Include details of all openings between the exterior walls (including panel, curtain, and spandrel walls) and floor slabs, openings in floors, and shaft enclosures.

   Life Safety
   - Each stair.
   - Horizontal exits.
   - Each required fire door.
   - Stairway pressurization fans.
   - Security door hardware, including operation procedures.

   Water Supply
   - Fire pump configuration.
   - Anchorage of underground fire protection water supply lines.
   - Standpipe riser.

   Water Based Fire Extinguishing Systems
   - Installation of waterflow switches and tamper switches.
   - Sprinkler floor control valves, sectional valves, and inspector text assembly.

   Non-Water Based Fire Extinguisher Systems
   - Special fire extinguishing systems (e.g., wet chemical, etc.).

   Fire Alarm System
   - Fire alarm riser.
   - Typical firefighter telephone station.
   - Typical firefighter telephone jack.
   - Electrical closets for fire alarm system panels.
   - Fire alarm telephone panel (includes voice paging microphone and firefighter telephone system).
   - Visual indicating device control and power detail, typical for floors (state location).
   - Amplifier rack (state location).
   - Typical location of duct smoke detectors.
   - Outdoor fire alarm speaker.
   - Wall mounted cone fire alarm speaker.
   - Typical terminal cabinet.
   - Lay in ceiling mounted fire alarm speaker.
   - Lay in ceiling mounted fire alarm combination speaker/strobe.
   - Wall mounted strobe device.
   - Typical manual fire alarm box installation.
   - Fire alarm system input/output matrix.
   - Graphic annunciator panel.
   - Installation of the graphic annunciator.
   - Fire command center showing the locations of each panel to be installed.

Specifications.

1. Final Specifications.
   – Specifications shall be based on GSA M/E Supplements to Masterspec.

Calculations. For any fire modeling generated results, submit a copy of the input data and all pertinent program material and assumptions required to understand the output and the analysis. A narrative of the input and results shall be part of the calculations.

1. Final occupant load and egress calculations.

2. Final fire protection water supply calculations.
   – Includes water supply flow testing data.

3. Final fire pump calculations where applicable.

4. Final smoke control calculations where applicable (e.g., atrium, etc.).

5. Final stairway pressurization calculations.

6. Fire modeling.

Fire Protection Review Checklist.

Building Construction

□ Verify details for fire walls and smoke partitions.

□ Verify Underwriters Laboratories or U.S. Gypsum Association design numbers with fire walls, smoke partitions, and partitions.

□ Verify firestopping for penetrations in fire rated walls and floors meet Code requirements.

□ Verify structural components are fire rated (if applicable).

□ Verify fireproofing meets Code requirements (if applicable).

□ Verify proper building separation for exposure protection.

□ Verify interior finish meets Code requirements.

Life Safety

□ Verify the number of exits based on occupant load.

□ Verify exits discharge outside.

□ Verify travel distance to exits.

□ Verify remoteness of exits.

□ Verify common path of travel limits meet Code requirements.

□ Verify door swings meet Code requirements.

□ Verify stair details.

□ Verify horizontal exit details.

□ Verify exit signs meet Code requirements.

□ Verify emergency lighting meet Code requirements.

□ Verify each occupancy classification meets specific exiting requirements.

□ Verify the type, size, and location of each portable fire extinguisher.

Water Supply

- ☐ Verify water supply is adequate to meet design density.
- ☐ Verify detail of anchorage of underground fire protection water supply line.
- ☐ Verify location of valve box and cover plate on buried gate valve.
- ☐ Verify fire pump calculations justify the size of the fire pump and jockey pump.
- ☐ Verify riser diagram for fire pump meets Code requirements.
- ☐ Verify detail of fire pump configuration.
- ☐ Verify sensing lines for both the fire pump and jockey pump are indicated on the details.
- ☐ Verify all piping for fire pump is identified on the drawings.
- ☐ Verify the location of the test header.
- ☐ Verify the location of both controllers.
- ☐ Verify the power feeds to the fire pump and jockey pump are identified on the drawings.

Water Based Fire Extinguishing Systems

- ☐ Verify specifications contain information stating the static and residual pressures are available at a measured flow rate.
- ☐ Verify the sprinkler riser is sized properly on the riser diagrams.
- ☐ Verify that sprinkler piping is not shown on the construction contract drawings. Only the interior fire main piping shall be shown, in addition to the location of obstructions, structural components, construction of walls, floors, and ceilings.
- ☐ Verify the location and size of underground or standpipe water supplies.
- ☐ Verify the location and arrangement of all waterflow and tamper switches.
- ☐ Verify the location of the riser and all points where it penetrates a floor.
- ☐ Verify the location of the fire department connection.
- ☐ Verify the location of all control valves and alarm valves.
- ☐ Verify all areas of the building have sprinkler protection.
- ☐ Verify accuracy of symbol list.
- ☐ Verify all floor control valves and sectional valves have drains.
- ☐ Verify inspector's test valve arrangements.
- ☐ Verify wall and ceiling construction is indicated, as well as ceiling height.

Non-Water Based Fire Extinguisher Systems

- ☐ Verify kitchen equipment is protected by a wet chemical system, monitored by fire alarm system.
- ☐ Verify power and gas shut down for kitchen equipment meet Code requirements.

Fire Alarm System

- ☐ Verify location of all audible notification appliances on the drawings and riser diagram meet Code requirements.
- ☐ Verify audible notification appliances are identified in stairways and elevator cabs.
- ☐ Verify location of all visible notification appliances on the drawings and riser diagram meet Code requirements.
- ☐ Verify accuracy of fire alarm riser diagram.
- ☐ Verify that at least two vertical fire alarm risers are installed remote as possible from each other. Verify that the second riser is separated from the first riser by at least a one-hour fire rated enclosure, not common to both risers.
- ☐ Verify location and construction requirements of fire command center.
- ☐ Verify location of graphic annunciator panel.
- ☐ Verify fire alarm system wiring is solid copper.
- ☐ Verify location of all manual fire alarm stations meet Code requirements.
- ☐ Verify smoke detectors are installed in each elevator lobby and elevator machine room to initiate elevator recall.
- ☐ Verify locations of all area smoke detectors on the drawings and riser diagram meet Code requirements.
- ☐ Verify locations of all fire fighter telephone stations and telephone jacks on the drawings and riser diagram meet Code requirements.
- ☐ Verify locations of all duct smoke detectors on the drawings and riser diagram meet Code requirements.
- ☐ Verify accuracy of fire alarm system input/output matrix.
- ☐ Verify accuracy of symbol list.
- ☐ Verify accuracy of final smoke control calculations where applicable (e.g., atrium, etc.).
- ☐ Verify accuracy of final stairway pressurization calculations where applicable.
- ☐ Verify accuracy of interface of fire alarm system and Building Automation System.
- ☐ Verify accuracy of interface of fire alarm system and the building security systems.

Miscellaneous

- ☐ Verify that the locations of the fire dampers meet Code requirements.
- ☐ Verify that the location of smoke dampers meet Code requirements.
- ☐ Verify that the elevator systems meet Code requirements.
- ☐ Verify that sprinklered elevator machine rooms are provided with a means to automatically disconnect power.

Electrical

Drawings. General: Systems must be fully drawn and sized to permit accurate bidding and construction.

1. Demolition plans.
   – Show for modernizations, if required.

2. Floor plans.
   – Show lighting, power distribution and communications raceway distribution and locations of fire alarm and annunciator panels.

3. Single-line diagram of primary and secondary power distribution.
   – Include normal power, emergency power and UPS.

4. Single-line diagram of fire alarm system.

5. Single-line diagram of telecommunications system.

6. Circuit layout of lighting control system.

7. Details of underfloor distribution system.

8. Site plan.
   – Indicate service locations, manholes, ductbanks and site lighting.

9. Layout of electrical equipment spaces.
   – Show all electrical equipment. Include elevations of substation transformers and disconnect switches.

10. Schedules for switchgear, switchboards, motor control centers, panelboards and unit substations.

11. Grounding diagram.

12. Complete phasing plan (if required) for additions and alterations.

13. Security systems site plan.
    – Final locations of all security devices and conduit runs.

14. Security system floor plans.
    – Layout of all security systems.

15. Storage areas for electrical equipment/spare parts.

Specifications.

1. Final specification.
   – Zone schedules may be bound into the specifications or shown on drawings.

Calculations.

1. Illumination level calculations.

2. Short circuit calculations.

3. Voltage drop calculations.

4. Overcurrent coordination study.

5. Generator calculations.
   – Include starter loads.

Electrical Review Checklist.

- ☐ Interference between major conduit and structural framing members coordinated.
- ☐ Adequate clearances to install and service electrical equipment.
- ☐ Light fixture locations and types coordinated with architectural drawings and interior design.
- ☐ Screens for exterior generators and transformers coordinated with architectural drawings.
- ☐ Penetrations through rated wall/floor/roof assemblies detailed and specified.
- ☐ Normal or emergency power supplied for all mechanical and fire safety equipment.
- ☐ Supports and bracing for major conduits and equipment coordinated with structural drawings.

Certification Requirements for Energy Conservation. The architect/engineer (lead designer) must provide certification that the project has been designed and is in compliance with ASHRAE 90.1 (latest approved version), and will meet GSA energy goal requirements.

Certification will also indicate that the architectural/engineering design elements have been integrated with the overall project design, and that the building can meet the programmed LEED rating.

The architect/engineer certification must be signed and sealed by a principal of the architectural/engineering firm in charge of the project.

Construction Documents Cost Estimate

A cost estimate must be provided. It should comply with the requirements for final working drawing stage estimate stated in the GSA document, *Project Estimating Requirements*.

Cost estimate must separate costs for interior tenant buildout from core/shell cost items as described in the *GSA New Pricing Guide*. The interior buildout costs must be divided by each building tenant.

Data and Operations Manual

An operations manual shall be prepared and training provided for the building Operations and Maintenance personnel describing the design objectives and how to operate the building. The manual shall include: as-built drawings, equipment data, model numbers for the equipment, parts lists, equipment options, operating manuals for each piece of equipment, testing and balancing reports and certifications, maintenance schedules, and warranty schedules. This manual must also diagram the following: 1) cabling 2) fire safety sprinkler system 3) exterior grounds sprinkler system. The manual must be reviewed and certified complete before submission to the Facilities Manager.

GSA Design Awards Submission.

All prospectus level projects shall be submitted of the GSA Design Awards Program for consideration.

The submission must clearly communicate, in visual and narrative form, the scope and outstanding features of the project and be organized to facilitate easy review by the jury.

Materials must be in transparent sleeves inside a standard 10 by 11-1/2 inch three-ring binder that is no more than 1-1/2 inches thick. The project name and category must appear on the front and the spine of the binder. No deviations from these requirements are permitted.

A.4 Alteration Projects

The design process and related submission requirements for alterations are somewhat different than those for new construction and modernizations. An alteration is defined as a limited construction project for an existing building that comprises the modification or replacement of one or a number of existing building systems or components. Alterations are less than total building modernizations. The following flow diagram and related definitions describe this process.

Design Process Definitions

Program Review. Prior to initiating each phase of design, the design team should meet to review design program expectations and to exchange ideas, lessons-learned, and concerns. Such technical "partnering" sessions allow a clearer definition of expectations while remaining within the project's scope and budget.

Concept. A submission that will demonstrate that the space program has been accomplished, including any adjacency and functional requirements. This submission will also show that the proposed project is compatible with the project authorization and that the aesthetics support the design philosophy of GSA shown in Chapter 3, Architecture and Interior Design of this document. A preliminary analysis of proposed building systems should be accomplished to determine the most cost-effective alternatives.

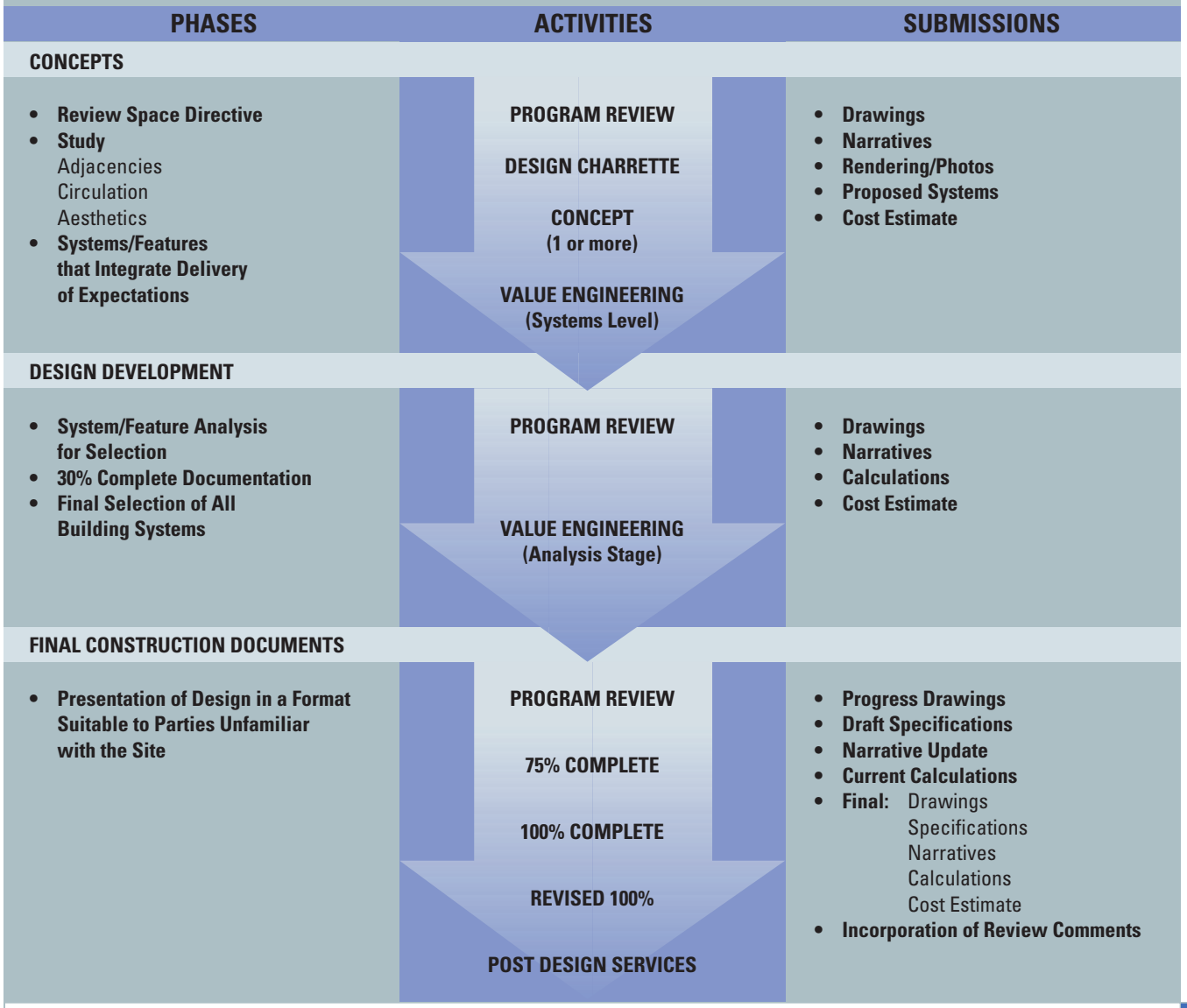
Design Development. A set of submissions and meetings that will finalize the selection of type, size and other material characteristics of all systems. Systems are not only structural, mechanical, fire protection and electrical, but all other building components such as envelope (wall, window and roof), interior (flooring, ceiling and partitions), toilet and service rooms, elevators, etc. The submission will consist of a combination of drawings, narrative and calculations.

Construction Documents. A set of detailed and coordinated submissions that become the basis of a construction contract. They should be produced in a general fashion that any construction contractor nationwide can understand. Designs shall be illustrated to distinguish between existing construction and new work, and be clear enough to result in a single interpretation of a specific set of data or facts. Language used in the specifications should be consistent and complementary to notes on the drawings. The documents should avoid using terms that the design specialist may know, but which have nothing to do with the purchase and installation of a product.

Specifications. Specifications to be organized according to CSI format, fully edited, typed and bound.

Code Analysis. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in each phase meet the code requirements.

Figure A-4 Design Process and Related Submission Requirements for Renovation



Concept

Site Planning and Landscape Design

A sitework narrative only needs to be submitted if sitework is a substantial part of the scope of work for the alteration.

Narrative.

1. Site statement, describing:
   - Existing site features.
   - Topography and drainage patterns.
   - Any existing erosion conditions.
   - Wetlands and location of flood plains.
   - Circulation patterns around site.
   - Site access.
   - Noise/visual considerations.
   - Local zoning restrictions.
   - Potential archeological artifacts.
   - Historic preservation considerations, if applicable.
   - Fire protection considerations, if applicable.

2. Site analysis of utilities, if utilities are to be changed.

3. Description of site and landscape design concept.
   - Proposed changes to circulation design.
   - Proposed changes to parking.
   - Proposed method for stormwater detention or retention.
   - Proposed changes to paving.

Architectural

An architectural concept only needs to be submitted if architectural work is a substantial part of the scope of work for the alteration.

Drawings.

1. Demolition plans.

2. Floor plans, showing as a minimum:
   - Existing and new spaces, circulation, entrances, stairways, elevators, special spaces and service spaces including mechanical, fire protection, electrical and communication spaces. Dimensions for critical clearances, such as vehicle access and fire apparatus access should be indicated.

Narrative.

1. Architectural program requirements.
   - Describe how the design meets the project authorization.

2. Design concept, explaining:
   - General layout.
   - Treatment of historic zones, if applicable.

3. Calculations.
   - Where building renovation involves window or insulated wall systems, perform an LCC assessment to optimize selection.

Structural

A structural narrative only needs to be submitted if a structural upgrade is part of the scope of work.

Narrative.

1. Description of existing structural systems, state of repair, variances from present codes and available spare load capacity. Data may be obtained from review of original construction drawings and codes or from an analysis of the actual structure.
   – This report may have been completed as part of the Prospectus Development Study.

2. Identification of governing codes.

3. Description of recommended changes to the structural system, addressing:
   – Structural materials, required selective demolition or alteration of existing structural elements, roof and floor framing system, means of resisting lateral loads and connections between existing and new structural systems.

4. If a seismic safety study exists for the building, describe any variations taken in design, compared to the study's recommendations.

Mechanical

A mechanical narrative only needs to be submitted if the alteration scope of work involves changes to the major mechanical systems. Replacement in kind of all or part of an existing mechanical system does not need to be shown at this stage of design.

Narrative.

1. Description of requested changes to existing systems.
   – Describe HVAC and plumbing systems, including available capacity versus criteria in Chapter 5 of this document and operational characteristics.
   – Identify how new systems will be tied into existing systems. (Any replacement should be well-integrated with other building systems that remain or are replaced.)
   – Outline energy conservation opportunities that were researched. Highlight those that were incorporated. This report may have been completed as part of the Prospectus Development Study.

Fire Protection

Fire Submission requirements may be met in one of two ways, either as a separate Fire Protection section (as outlined in this document) or integrated into the construction documents as Architectural, Plumbing, Mechanical, Electrical etc. However, if integrated into the documents, the A/E must provide a summary sheet identifying where each of the following requirements is met.

Drawings.

1. Demolition plans.
   - Identify existing fire protection systems (e.g., sprinklers, fire alarm notification appliances, etc.).

2. Floor plans, showing a minimum:
   - New fire protection systems (e.g., sprinklers, fire alarm notification appliances, etc.).

Narrative.

A fire protection narrative only needs to be submitted if the fire protection work is a substantial part of the scope of work for the alteration or involves changes to a fire protection system.

1. Fire Protection program requirements.

2. Description of the buildings proposed fire protection systems including modifications to the existing egress systems.

3. Code statement identifying changes in building occupancy classification, occupancy group(s), fire resistance requirements, egress requirements, etc.

Electrical

An electrical narrative only needs to be submitted if the alteration scope of work involves changes to the type or location of major electrical systems.

Narrative.

1. Description of requested changes to existing systems.
   - Describe lighting, power and signal systems, including available capacity versus criteria in Chapter 6. and operational characteristics.
   - Describe code deficiencies. Identify how new systems will be tied into existing systems.
   - This report may have been completed as part of the Prospectus Development Study.

2. Describe both existing and new distribution systems within the building.
   - Special power and reliability requirements should be addressed, including emergency power and UPS systems.

Concept Cost Estimate

A cost estimate must be provided. It should comply with the requirements stated for the Concept Stage Estimate in GSA document *Project Estimating Requirements*.

A life cycle cost analysis of three options that have been modeled should be included with this submittal.

Design Development

Site Planning and Landscape Design

Calculations.

1. Storm drainage and sanitary sewer calculations.

2. Storm water detention facility calculations, if applicable.

3. Parking calculations, if applicable.

Narrative.

1. Site circulation concept, explaining:
   - Reasons for site circulation design and number of site entrances.
   - Reasons and/or calculation for number of parking spaces provided.
   - Reasoning for design of service area(s), including description of number and sizes of trucks that can be accommodated.
   - Proposed scheme for waste removal.
   - Proposed scheme for fire apparatus access (including aerial apparatus), roads and fire lanes.

2. Site utilities distribution concept.

3. Drainage design concept.

4. Landscape design concept, explaining:
   - Reasoning for landscape design, paving, site furnishings, and any water features.
   - Reasoning for choice of plant materials.
   - Proposed landscape maintenance plan.
   - Brief operating description of irrigation system.
   - Summarize water conservation opportunities that have been studied.
   - Brief description of fire protection water supplies.
   - Brief description of fire hydrant locations.

5. Site construction description.
   - Brief description of materials proposed for pavements and utilities.

6. Code Analysis.
   - Analysis of applicable local zoning and building code requirements.

Drawings.

1. Demolition plans.

2. Preliminary site layout plan, showing:
   - Roads, walks, parking and other paved areas (including type of pavement). Show access route for the physically disabled from parking and from public street to main entrance.
   - Fire apparatus access (including aerial apparatus) and fire lanes.

3. Preliminary grading and drainage plan, showing:
   - Preliminary site grading, storm drainage inlets, including detention facilities.

4. Preliminary site utilities plan, showing:
   - Sizes, inverts, and locations of domestic and fire protection water supply lines, sanitary sewer lines, gas lines, steam/condensate lines and chilled water supply and return lines, if applicable.

5. Preliminary landscape design plan, showing:
   - Preliminary hardscape design, including site furniture, water features, etc.
   - Preliminary planting scheme.
   - Preliminary irrigation design.

Architectural

Narrative.

1. Building concept, explaining:
   - Entrance locations and service locations.
   - Building circulation and arrangement of major spaces.
   - Interior design.
   - Adherence to the Historic Building Preservation Plan, if applicable.

2. Building construction description, explaining, if applicable:
   - Exterior materials, waterproofing, air barriers/vapor retarders and insulation elements.
   - Roofing system(s).
   - Exterior glazing system.
   - Interior finishes, with detailed explanation for public spaces.
   - Potential locations for artwork commissioned under the "Art in Architecture" program, if applicable.

Drawings.

1. Demolition plans.

2. Building floor plans, showing:
   - Spaces individually delineated and labeled.
   - Enlarged layouts of special spaces.
   - Dimensions.
   - Accessible routes for the physically disabled as well as other compliance requirements regarding signage, toilets, etc.

3. Building roof plan, if applicable, showing:
   - Drainage design, including minimum roof slope.
   - Dimensions.
   - Membrane and insulation configuration of the roofing system.

4. Elevations of major building façades (if changes to the exterior are proposed), showing:
   - Existing and new fenestration.
   - Existing and new exterior materials.
   - Cast shadows.

5. Two building sections (of renovated areas only), showing:
   - Accommodation of structural systems.
   - Mechanical penthouses, if any.
   - Floor to floor and other critical dimensions.
   - Labeling of most important spaces.

6. Exterior wall sections, showing:
   - Materials of exterior wall construction, including flashing, connections and method of anchoring.
   - Vertical arrangement of interior space, including accommodation of mechanical, fire protection and electrical services in the floor and ceiling zones.

7. Proposed room finish schedule, showing:
   - Floors, base, walls and ceilings.
   - Finish schedule may be bound into narrative.

Structural

Calculations. For any computer generated results, submit a model of the input data and all pertinent program material required to understand the output. A narrative of the input and results should be contained in the calculations as well.

1. Gravity load calculations.

2. Lateral load calculation.

3. Foundation calculations.

4. Calculations showing that system is not vulnerable to progressive collapse.

5. Vibration calculations.

6. Results of any other studies necessary for the project design.

Narrative.

1. Description of structural concept, including:
   - Choice of framing system, including lateral load resisting elements.
   - Proposed foundation design.
   - Verification of adequacy of all assumed dead and live loads.

2. Code analysis.
   - Building classification, required fire resistance of structural elements, identification of seismic zone, wind speed, etc.
   - Identification of special requirements, such as highrise.
   - Summary of special requirements resulting from applicable local codes.

3. Proposed methods of corrosion protection, if applicable.

4. Geotechnical Engineering Report, including final boring logs (if part of scope of work).
   - See separate section in this book for specific requirements.

5. Geologic Hazard Report, when required in zones 2A, 2B, 3 and 4.

Drawings.

1. Demolition plans.

2. Preliminary framing plans and key details.
   - Include column locations, bay sizes and location of expansion or seismic joints.

3. Preliminary schedules, including:
   - Column, beam, slab, metal deck, and wood framing schedules, as applicable.
   - Preliminary seismic details.

Mechanical

Calculations.

HVAC.

1. Block loads for heating and refrigeration.

2. Heat and air balance calculations.

3. HVAC calculations for air handling units.

4. Heat loss calculations for walls and roofs.

5. Energy analysis.
   – Projections for the annual energy consumption of the building, taking into account architectural wall and roof design and lighting.

Plumbing.

1. Water supply calculations.
   – Include pressure for domestic hot and cold water.

2. Roof drainage calculations, should new roof drainage be part of the project.

Narrative.

1. Life Cycle Cost Analysis of at least three potential HVAC systems.
   – The analysis should compare first cost and operating costs. One of the systems must be the base line system described in the Chapter 1 of this document..

2. Description of the HVAC systems studied.
   – The general features, configuration, and functional advantages and disadvantages of each system should be compared qualitatively.

3. Description of recommended HVAC system.
   – Include cost and other considerations.

4. Recommendations for HVAC systems for special spaces.
   – Automated data processing rooms, auditoria, conference rooms, kitchens and other special spaces identified in the building program.

5. Proposed plumbing system.
   – Include lists of typical fixtures.

6. Evaluation of alternate sources for preheating of domestic water (solar or heat recovery).

7. Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.

Drawings.

1. Demolition plans.

2. Site plan.
   – Proposed inverts of sewers, stormwater pipes and gas lines at the building service entrance, showing match to existing utilities.

3. Floor plans.
   – Proposed HVAC scheme, showing building zoning and major duct and piping runs.

4. Floor plans.
   – Sketch layouts of mechanical rooms, showing locations of major equipment. including size variations by different manufacturers.

5. Floor plans.
   – Locations of proposed plumbing fixtures and equipment.

6. Systems schematics and flow diagrams.

7. Typical schematics for plumbing systems.

Fire Protection

Fire Submission requirements may be met in one of two ways, either as a separate Fire Protection section (as outlined in this document) or integrated into the construction documents as Architectural, Plumbing, Mechanical, Electrical etc. However, if integrated into the documents, the A/E must provide a summary sheet identifying where each of the following requirements is met.

Calculations.

1. Occupant load and egress calculations.

2. Fire protection water supply calculations.
   – Includes water supply flow testing data.

3. Fire pump calculations where applicable.

4. Smoke control calculations where applicable (e.g., atrium, etc.).

5. Stairway pressurization calculations where applicable.

Narrative.

1. Building egress system.
   – Includes egress calculations and stairway exit capacities, remoteness, exit discharge, etc.

2. All building fire alarm and suppression systems.

3. Smoke control system(s), where applicable.

4. Special fire protection systems (e.g., kitchen extinguishing system), where applicable.

5. Fire resistance rating of building structural elements.
   – Coordinate with structural engineer.

6. Fire alarm system.

7. Interface of fire alarm system with Building Automation system and Security Systems.

8. Review of building for compliance with life safety requirements and building security requirements.

9. Interior finish requirements as they pertain to the life safety requirements.

Drawings.

1. Floor Plans showing:
   - Equipment spaces for fire protection systems (e.g., fire pump, fire alarm, etc.).
   - Fire protection water supply lines, fire hydrant locations, fire apparatus access roads, and fire lanes.
   - Standpipes and sprinkler risers.
   - Riser diagrams for sprinkler system.
   - Riser diagram for fire alarm system.
   - Remoteness of exit stairways.
   - Location of firewalls and smoke partitions.
   - Identification of occupancy type of every space and room in building.
   - Calculated occupant loads for every space and room in the building.
   - Location of special fire protection requirements (e.g., kitchens, computer rooms, storage, etc.).

Electrical

Calculations.

1. Lighting calculations for a typical 186 m^2 (2,000 sf) open plan office with system furniture.

2. Lighting calculations for a typical one person private office.

3. Power calculations from building entry to branch circuit panel.

4. Load calculations.

5. Life cycle cost analysis of luminaire/lamp system.

6. Life cycle cost study on the options to integrate related building systems.

Narrative.

1. Proposed power distribution scheme.
   - Provide a detailed description and justification for the selected scheme.

2. Interface with Building Automation System.
   - Methods proposed for energy conservation and integration with Building Automation System.

3. Engineering analysis for demand limit controls.

4. Description of each proposed signal system.

5. Description of proposed security systems features and intended mode of operation.
   - Proposed zone schedule.
   - Proposed card access controls, CCTV assessment and intrusion protection system, if applicable.

Drawings.

1. Demolition plans.

2. Site plan.
   – Proposed site distribution for power and communications, proposed service entrance and location of transformers, generators, and vaults, etc.

3. Floor plans.
   – Proposed major electrical distribution scheme and locations of electrical closets.

4. Floor plans.
   – Major routing of communications system, communications equipment rooms and closets.

5. Underfloor distribution system.
   – Show typical detail for power and communications services.

6. One-line diagram.

7. Typical lighting layout.
   – Include lighting for special areas.

8. Exterior lighting scheme.

9. Layout of electrical rooms.
   – Show locations of major equipment.

10. One-line diagrams of other signal systems.

11. Security system site plan.
    – Location for CCTV, duress alarm sensors and access control locations for parking lots shown. If the system is not extensive, these locations may be shown on the electrical site plan.

12. Security system floor plans.
    – Access controls, intrusion detection devices and CCTV locations shown. Preliminary local panel locations shown.

Design Development Cost Estimate

A cost estimate must be provided. It should comply with the requirements stated in GSA document *Project Estimating Requirements*.

Construction Documents

The construction documents must be complete, coordinated between disciplines, biddable, readable and buildable, with no room for unreasonable additional interpretation.

The A/E firm shall provide a signed and dated professional seal on all final contract documents. The cover sheet should also include a statement by the design A/E, certifying the design meets the listed design criteria. Exceptions and waivers to the design criteria should also be listed on the cover sheet of the contract documents, including the name and date of the individual providing authorization.

Site Planning and Landscape Design

Cover Sheet. Provide code clarification statement for compliance with specified codes and standards by each discipline with professional seals and signatures. In addition, include a drawing index.

Drawings. General: The plans listed below, except the demolition plans, may be combined on small projects.

1. Demolition plans.

2. Site layout plan.
   - Location of all buildings, roads, walks, accessible routes, parking and other paved areas and planted areas.
   - Limits of construction.
   - Locations of fire protection water supply lines, fire hydrants, fire apparatus access roads, and fire lanes.

3. Grading and drainage plan, showing:
   - Existing and new contours [use 500 mm (2 foot) interval minimum in area around buildings].
   - Spot elevations at all entrances and elsewhere as necessary.
   - Elevations for walls, ramps, terraces and plazas.
   - All surface drainage structures.

4. Site utilities plan, showing:
   - All underground utilities, including inlets, manholes, clean-outs and invert elevations.

5. Planting plan, showing:
   - Building outline, circulation, parking and major utility runs.
   - Size and location of existing vegetation to be preserved (include protection measures during construction).
   - Location of all new plant material (identify function, such as windbreak or visual screen where appropriate).

6. Planting schedule, showing:
   - Quantity of plants, botanical names, planted size and final size.

7. Irrigation plan, if applicable.
   - Include schematic of irrigation control system.

8. Construction details, profiles and sections and notes as necessary to fully describe design intent.

9. Construction phasing, if part of project.

Calculations.

1. Final drainage calculations, including stormwater detention.

2. Final parking calculations, if applicable.

3. Pipe sizing calculations for water and sewer pipes.

4. Pavement design calculations.

Site Design Review Checklist.

□ Piping and other utility locations and inverts at building penetrations coordinated with mechanical and electrical drawings.

□ Interference of utilities with underground electrical runs checked.

□ Interference between planting and utilities checked.

□ Elevations of entrances coordinated with architectural drawings.

□ Required reinforcement shown for all free standing and retaining walls.

□ Connections to foundation drainage coordinated.

□ Sub-surface drainage shown.

□ Location of underground storage tanks shown.

□ Construction of underground storage tanks detailed.

Architectural

Drawings.

1. Demolition plans.

2. Floor plans.
   – Show planning grids and raised access floor grid, if applicable.

3. Reflected ceiling plans.
   – Show ceiling grid and location of all elements to be placed in the ceiling.

4. Building sections.
   – Vertical zoning for electrical and mechanical utilities must be indicated on sections.

5. Roof Plans.
   – Roof plans must show slopes, low points, drains and scuppers, if applicable.

6. Exterior elevations.

7. Wall sections.

8. Interior elevations.

9. Details.

10. Schedules

Specifications.

1. Instructions to bidders.

2. Division 1, edited to suit specific GSA requirements.

3. Room finish, color and door schedules can be incorporated into either the specifications or drawings.

Architectural Review Checklist.
This checklist enumerates some of interfaces between architectural and engineering disciplines which require close coordination.

- □ Interference with structural framing members coordinated.
- □ Location of below-grade waterproofing shown.
- □ Anchorage of exterior wall elements shown.
- □ Expansion and/or seismic joints shown and detailed.
- □ Adequate clearances to install, service and replace mechanical and electrical equipment.
- □ Rooftop mechanical equipment shown.
- □ Location of roof drains and floor drains coordinated with mechanical drawings.
- □ Air diffusers and registers coordinated with mechanical drawings.
- □ Louver sizes and locations coordinated with mechanical drawings.
- □ Light fixture types and locations coordinated with mechanical and electrical drawings.
- □ Wall and roof sections coordinated with heat loss calculations.
- □ Adequate envelope design details to ensure thermal/air/moisture control.
- □ Acoustical wall treatments shown in mechanical rooms (if applicable).

Structural

Drawings.

1. Demolition plans.

2. Full set of structural construction drawings.
   - Drawings must be fully dimensioned, noted and detailed for accurate bidding and construction.
   - Load criteria for all floor live loads, roof live load, roof snow load must be shown on drawings. Live load reduction, if used, must be indicated. (Indicate if live load reductions are used on columns – do not use live load reductions on horizontal framing members – and identify code used. State when live loads have not been used, and when and where they are used.)
   - Basic wind speed, importance factor, exposure, effective velocity pressure and wind load must be indicated.
   - Seismic design criteria, such as earthquake zone, and response factors must be indicated. Additional information may be required by the local building official.
   - Soil bearing pressure and lateral earth pressure must be indicated.

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

4. Structural details.
   - Include details for steel connections.
   - Include details for anchorage of nonstructural building elements.

Calculations. For any computer generated results, submit a model of the input data and all pertinent program material required to understand the output. A narrative of the input and results should be contained in the calculations as well.

1. Final structural calculations, including:
   - Gravity loads.
   - Lateral loads.
   - Foundations.
   - Thermal loads where significant.
   - Vibration propagation.
   - Progressive collapse.
   - Supports for nonstructural elements, including mechanical and electrical equipment.
   - Steel connections.

Structural Review Checklist.

- □ Floor elevations shown on drawings.
- □ Camber requirements shown on drawings.
- □ Beam and girder connections detailed.
- □ Clearances for bolts and fasteners shown (steel and wood construction).
- □ Fire resistance of structural members indicated.
- □ Beam reactions shown for moment connections.
- □ Equipment, piping and ductwork supports detailed (may be shown on structural, mechanical or electrical drawings, as applicable).
- □ Hoists shown in major mechanical rooms (if required).

- ☐ Interference with piping and ductwork coordinated.
- ☐ Interference with electrical ducts and conduit coordinated.
- ☐ Concrete inserts shown for anchorage of architectural, mechanical or electrical systems and components.
- ☐ Roof drains coordinated with architectural and mechanical drawings.
- ☐ Subdrainage and foundations coordinated with mechanical drawings/piping.
- ☐ Details for drift, anchoring of exterior walls and anchoring of nonstructural full-height partitions shown in drawings.

Mechanical

Drawings. Systems must be fully drawn and sized to permit accurate bidding and construction.

HVAC.

1. Demolition plans.

2. HVAC piping layouts.
   – All valves must be shown. Indicate locations where temperature, pressure and flow gauges are required.

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

4. Automatic control diagram.
   – Diagram to show control signal interface, complete with sequence of operation.

5. Layout of equipment rooms showing all mechanical equipment.
6. Mechanical details.

7. Complete equipment schedules.

8. HVAC duct riser diagram.

Plumbing.

1. Demolition plans.

2. Floor plans.
   – Plumbing layout and fixtures; large scale plans should be used where required for clarity.

3. Riser diagrams for waste and vent lines.

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

Calculations.

1. HVAC calculations for the entire building, arranged by individual air handling and pumping system.
   - Block loads for heating and refrigeration.
   - Room load and supply air calculations.
   - System load and supply air calculations (for VAV systems).
   - System pressure static analysis at peak and minimum block loads (for VAV systems).
   - Heat loss calculations for walls and roofs.
   - Acoustical calculations (for VAV systems use peak air flow).
   - Flow and head calculations for pumping systems.

2. Plumbing calculations.
   - Include entire building, including roof drainage calculations and hot water heating calculations.
   - Water supply calculations, including pressure.
   - Sanitary waste sizing calculations.

3. Sizing of fuel storage and distribution and vibration isolation.

Mechanical Review Checklist.

- ☐ Interference with structural framing members coordinated.
- ☐ Equipment pad locations coordinated with structural drawings.
- ☐ Adequate clearances to install and service mechanical equipment.
- ☐ Hoist (or other means of equipment replacement) coordinated with structural drawings.
- ☐ Motors and special power needs coordinated with electrical drawings.
- ☐ Location of roof drains and floor drains coordinated with architectural drawings.
- ☐ Air diffusers and registers coordinated with architectural drawings.
- ☐ Louver sizes and locations coordinated with architectural drawings.
- ☐ Inverts of piping coordinated with civil drawings.
- ☐ Supports and bracing for major piping and equipment coordinated with structural drawings.
- ☐ Penetrations through rated wall/floor/roof assemblies detailed and specified.
- ☐ BAS system specified, including software and point schedules.
- ☐ Start up and testing requirements specified.

Special Checklist for VAV Systems.

- ☐ Minimum amount of outside air to be admitted during occupied hours shown on drawings; also minimum ventilation supplied at lowest setting of VAV box.
- ☐ Fan schedule for both supply and return fans, showing minimum and maximum airflow rates and total pressure at minimum flow, maximum sound power level and blade frequency increment at peak air flow.

- ☐ VAV terminal units to be specified indicating maximum and minimum air flow rates minimum static pressure required, maximum static pressure permitted and noise ratings at maximum air flow.

- ☐ Supply air outlets specified by face and neck sizes, ADPI performance for maximum and minimum airflow.

- ☐ Controller pressure setting and sensor location shown, including reference pressure location. For multiple sensors all locations must be shown. Also show pressure setting for high limit of supply fan.

- ☐ Maximum and minimum air flow rates shown for air flow measuring stations. Air flow measuring stations located.

- ☐ All required control instruments shown and located.

- ☐ Location of supply and exhaust systems coordinated with security barriers, detection devices, and other related concerns.

Fire Protection

Fire Submission requirements may be met in one of two ways, either as a separate Fire Protection section (as outlined in this document) or integrated into the construction documents as Architectural, Plumbing, Mechanical, Electrical etc. However, if integrated into the documents, the A/E must provide a summary sheet identifying where each of the following requirements is met.

Drawings.

1. Demolition plans.

2. Full set of fire protection construction drawings.
   - Drawings must be carefully dimensioned, noted and detailed for accurate bidding and construction.

3. Fire Protection details. (All typical details must be shown on the drawings.)

   Building Construction
   - Building's construction type (e.g., 443, 222, etc.).
   - Firewalls and smoke partitions.
   - Panel and curtain walls.
   - Fire stopping configurations. Include details of all openings between the exterior walls (including panel, curtain, and spandrel walls) and floor slabs, openings in floors, and shaft enclosures.

   Life Safety
   - Each stair.
   - Horizontal exits.
   - Each required fire door.
   - Stairway pressurization fans.
   - Security door hardware, including operation procedures.

   Water Supply
   - Fire pump configuration.

– Anchorage of underground fire protection water supply line.
– Standpipe riser.

Water Based Fire Extinguishing Systems
– Installation of waterflow switches and tamper switches.
– Sprinkler floor control valves, sectional valves, and inspector text assembly.

Non-Water Based Fire Extinguisher Systems
– Special fire extinguishing systems (e.g., wet chemical, etc.).

Fire Alarm System
– Fire alarm riser.
– Typical firefighter telephone station.
– Typical firefighter telephone jack.
– Electrical closets for fire alarm system panels.
– Fire alarm telephone panel (includes voice paging microphone and firefighter telephone system).
– Visual indicating device control and power detail, typical for floors (state location).
– Amplifier rack (state location).
– Typical location of duct smoke detectors.
– Outdoor fire alarm speaker.
– Wall mounted cone fire alarm speaker.
– Typical terminal cabinet.
– Lay in ceiling mounted fire alarm speaker.
– Lay in ceiling mounted fire alarm combination speaker/strobe.
– Wall mounted strobe device.
– Typical manual fire alarm box installation.
– Fire alarm system input/output matrix.
– Graphic annunciator panel.
– Installation of the graphic annunciator.
– Fire command center showing the locations of each panel to be installed.

Calculations. For any fire modeling generated results, submit a copy of the input data and all pertinent program material and assumptions required to understand the output and the analysis. A narrative of the input and results shall be part of the calculations.

1. Final occupant load and egress calculations.

2. Final fire protection water supply calculations.
   – Includes water supply flow testing data.

3. Final fire pump calculations where applicable.

4. Final smoke control calculations where applicable (e.g., atrium, etc.).

5. Final stairway pressurization calculations.

6. Fire modeling.

Fire Protection Review Checklist.

Building Construction
□ Verify details for fire walls and smoke partitions.

□ Verify Underwriters Laboratories or U.S. Gypsum Association design numbers with fire walls, smoke partitions, and partitions.

□ Verify firestopping for penetrations in fire rated walls and floors meet Code requirements.

□ Verify structural components are fire rated if applicable.

□ Verify fireproofing meets Code requirements if applicable.

- ☐ Verify proper building separation for exposure protection.
- ☐ Verify interior finish meets Code requirements.

Life Safety

- ☐ Verify the number of exits based on occupant load.
- ☐ Verify exits discharge outside.
- ☐ Verify travel distance to exits.
- ☐ Verify remoteness of exits.
- ☐ Verify common path of travel limits meet Code requirements.
- ☐ Verify door swings meet Code requirements.
- ☐ Verify stair details.
- ☐ Verify horizontal exit details.
- ☐ Verify exit signs meet Code requirements.
- ☐ Verify emergency lighting meet Code requirements.
- ☐ Verify each occupancy classification meets specific exiting requirements.
- ☐ Verify the type, size, and location of each portable fire extinguisher.

Water Supply

- ☐ Verify water supply is adequate to meet design density.
- ☐ Verify detail of anchorage of underground fire protection water supply line.
- ☐ Verify location of valve box and cover plate on buried gate valve.
- ☐ Verify fire pump calculations justify the size of the fire pump and jockey pump.
- ☐ Verify riser diagram for fire pump meets Code requirements.
- ☐ Verify detail of fire pump configuration.
- ☐ Verify sensing lines for both the fire pump and jockey pump are indicated on the details.
- ☐ Verify all piping for fire pump is identified on the drawings.
- ☐ Verify the location of the test header.
- ☐ Verify the location of both controllers.
- ☐ Verify the power feeds to the fire pump and jockey pump are identified on the drawings.

Water Based Fire Extinguishing Systems

- ☐ Verify specifications contain information stating the static and residual pressures are available at a measured flow rate.
- ☐ Verify the sprinkler riser is sized properly on the riser diagrams.
- ☐ Verify that sprinkler piping is not shown on the construction contract drawings. Only the interior fire main piping shall be shown, in addition to the location of obstructions, structural components, construction of walls, floors, and ceilings.

- ☐ Verify the location and size of underground or standpipe water supplies.
- ☐ Verify the location and arrangement of all waterflow and tamper switches.
- ☐ Verify the location of the riser and all points where it penetrates a floor.
- ☐ Verify the location of the fire department connection.
- ☐ Verify the location of all control valves and alarm valves.
- ☐ Verify all areas of the building have sprinkler protection.
- ☐ Verify accuracy of symbol list.
- ☐ Verify all floor control valves and sectional valves have drains.
- ☐ Verify inspector's test valve arrangements.
- ☐ Verify wall and ceiling construction is indicated, as well as ceiling height.

Non-Water Based Fire Extinguisher Systems

- ☐ Verify kitchen equipment is protected by a wet chemical system, monitored by fire alarm system.
- ☐ Verify power and gas shut down for kitchen equipment meet Code requirements.

Fire Alarm System

- ☐ Verify location of all audible notification appliances on the drawings and riser diagram meet Code requirements.
- ☐ Verify audible notification appliances are identified in stairways and elevator cabs.
- ☐ Verify location of all visible notification appliances on the drawings and riser diagram meet Code requirements.
- ☐ Verify accuracy of fire alarm riser diagram.
- ☐ Verify that at least two vertical fire alarm risers are installed remote as possible from each other. Verify that the second riser is separated from the first riser by at least a one-hour fire rated enclosure, not common to both risers.
- ☐ Verify location and construction requirements of fire command center.
- ☐ Verify location of graphic annunciator panel.
- ☐ Verify fire alarm system wiring is solid copper.
- ☐ Verify location of all manual fire alarm stations meet Code requirements.
- ☐ Verify smoke detectors are installed in each elevator lobby and elevator machine room to initiate elevator recall.
- ☐ Verify locations of all area smoke detectors on the drawings and riser diagram meet Code requirements.
- ☐ Verify locations of all fire fighter telephone stations and telephone jacks on the drawings and riser diagram meet Code requirements.
- ☐ Verify locations of all duct smoke detectors on the drawings and riser diagram meet Code requirements.

- □ Verify accuracy of fire alarm system input/output matrix.
- □ Verify accuracy of symbol list.
- □ Verify accuracy of final smoke control calculations where applicable (e.g., atrium, etc.).
- □ Verify accuracy of final stairway pressurization calculations where applicable.
- □ Verify accuracy of interface of fire alarm system and Building Automation System.
- □ Verify accuracy of interface of fire alarm system and the building security systems.

Miscellaneous

- □ Verify that the locations of the fire dampers meet Code requirements.
- □ Verify that the location of smoke dampers meet Code requirements.
- □ Verify that the elevator systems meet Code requirements.
- □ Verify that sprinklered elevator machine rooms are provided with a means to automatically disconnect power.

Electrical

Drawings.

1. Demolition plans.
2. Floor plans.
   – Show lighting, power distribution and communications raceway distribution.
3. Single-line diagram of primary and secondary power distribution.
   – Include normal power, emergency power and UPS.
4. Single-line diagram of fire alarm system.
5. Single-line diagram of telecommunications system.
6. Circuit layout of lighting control system.
7. Details of underfloor distribution system.
8. Site plan.
   – Indicate service locations, manholes, ductbanks and site lighting.
9. Layout of electrical equipment spaces.
   – Show all electrical equipment. Include elevations of substation transformers and disconnect switches.
10. Schedules for switchgear, switchboards, motor control centers, panelboards and unit substations.
11. Grounding diagram.
12. Complete phasing plan (if required) for additions and alterations.

13. Security systems site plan.
    – Final locations of all security devices and conduit runs.

14. Security system floor plans.
    – Layout of all security systems.

15. Storage areas for electrical equipment/spare parts.

Calculations.

1. Illumination level calculations.

2. Short circuit calculations.

3. Voltage drop calculations.

4. Overcurrent coordination study.

5. Generator calculations.
    – Include starter loads.

6. UPS calculation (if UPS provided).

Electrical Review Checklist.

□ Interference between major conduit and structural framing members coordinated.

□ Adequate clearances to install and service electrical equipment.

□ Light fixture locations and types coordinated with architectural drawings and interior design.

□ Screens for exterior generators and transformers coordinated with architectural drawings.

□ Penetrations through rated wall/floor/roof assemblies detailed and specified.

□ Normal and emergency power requirements supplied for all mechanical and fire safety equipment.

Code criteria should be reviewed by each discipline to the degree of detail necessary to assure that tasks accomplished in this phase meet the code requirements.

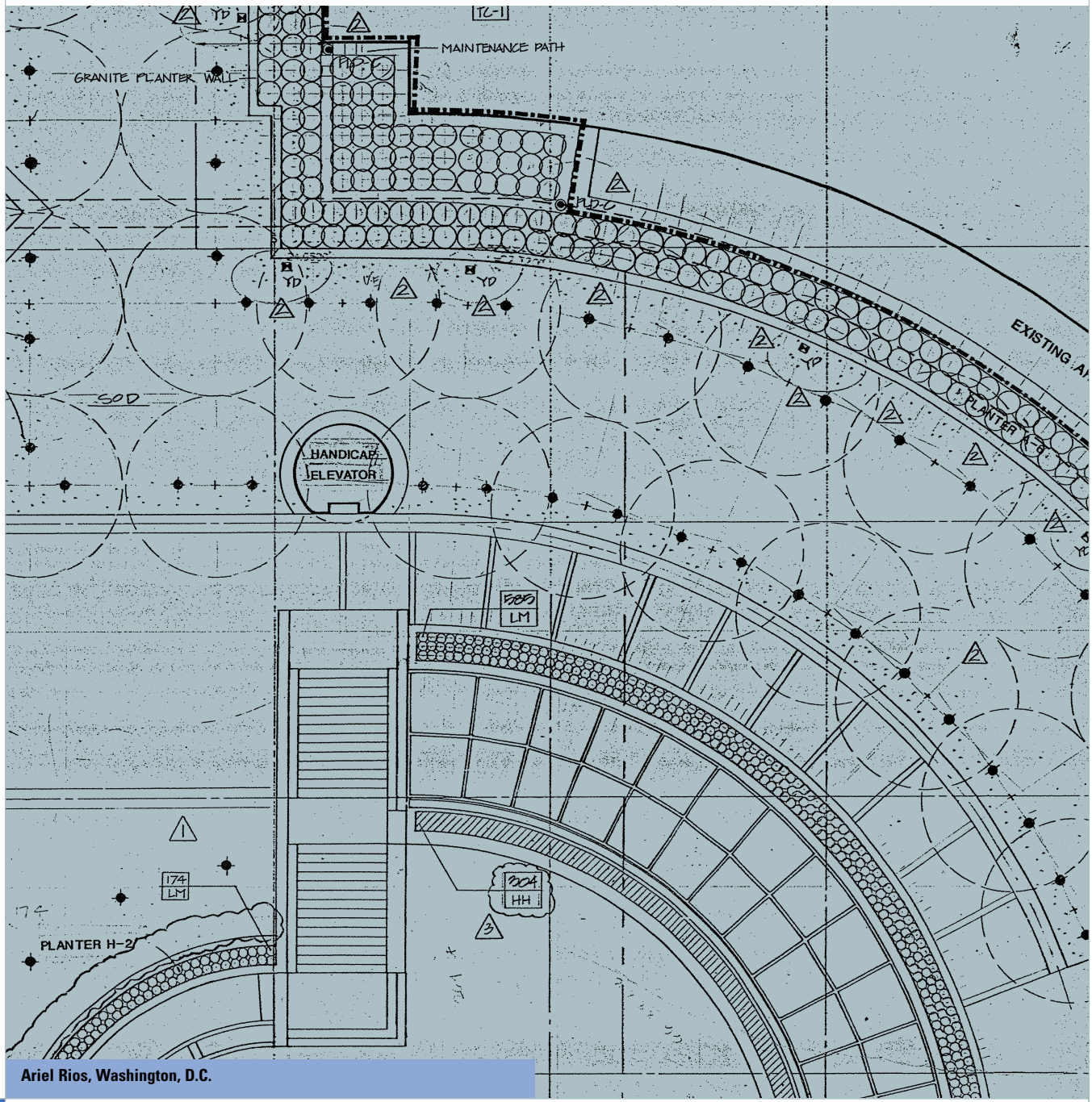
Construction Documents Specifications

1. Instructions to bidders.

2. Division 1, edited to suit specific GSA requirements.

3. Technical specifications sections, organized according to CSI format.
    – Specifications must be fully edited, typed and bound. Room finish, color and door schedules can be incorporated into either the specifications or drawings.

Construction Documents Cost Estimate. A cost estimate must be provided. It should comply with the requirements for final working drawing stage estimate stated in GSA document *Project Estimating Requirements*.



Ariel Rios, Washington, D.C.

A.5 Surveys and Geotechnical Reports

Site Survey

Site surveys are generally prepared for GSA projects involving sitework. The survey may be contracted separately by GSA or may be included in the scope of the A/E for the project. The guidelines given here apply in either case. In cases where GSA contracts for the survey directly, the A/E may be requested to review the scope of work for the survey and recommend modifications to the technical requirements to suit the specific project site.

The criteria listed here are not absolute; they should be modified by the civil engineer to suit the particular conditions of the project. All surveys should be prepared and sealed by a surveyor licensed in the state where the project is located.

General Requirements. Surveys should generally contain the following information:

- Locations of all permanent features within limits of work, such as buildings, structures, fences, walls, concrete slabs and foundations, above-ground tanks, cooling towers, transformers, sidewalks, steps, power and light poles, traffic control devices, manholes, fire hydrants, valves, culverts, headwalls, catch basins or inlets, property corner markers, benchmarks, etc.
- Location of all adjacent and abounding roads or streets and street curbs within limits of work, including driveways and entrances. Type of surfacing and limits should be shown. For public streets, right-of-way widths and centerlines should also be shown.
- Location of all trees, shrubs, and other plants within limits of work. For trees, caliper size should be shown; dead trees should be indicated.
- Location of all overhead telephone and power lines within the limits of work and their related easements.
- Based on existing records, location of underground utilities, such as gas, water, steam, chilled water, electric power, sanitary, storm, combined sewers, telephone, etc. should be shown. Sizes of pipes (I.D.), invert elevations, inlet or manhole rim elevations should be indicated. Where appropriate, information should be verified in the field.
- Based on existing records, location of underground storage tanks or other subsurface structures.
- Topography field criteria should include such items as 300 millimeter or 600 millimeter (1 to 2 foot) contour intervals plotted on a grid system appropriate to the scale of the survey; elevations at top and bottom of ditches and at any abrupt changes in grade; periodic top-of-curb and gutter elevations, as well as street centerline elevations; elevations at all permanent features within the limits of work; ground floor elevations for all existing buildings.
- Bearings and distances for all property lines within the limits of work.
- Official datum upon which elevations are based and the benchmark on or adjacent to the site to be used as a starting point.
- Official datum upon which horizontal control points are based.
- If there are not already two benchmarks on the site, establish two permanent benchmarks.
- Elevations of key datum points of all building structures and improvements directly adjacent and across the street from the project site during both wet and dry season.
- Delineate location of any wetlands or floodplains, underground streams or water sources.

Geotechnical Investigation and Engineering Report

On most GSA projects geotechnical investigations will take place at three separate stages: during site selection, during building design, and during construction. The requirements for geotechnical work during site selection and during construction are described in other GSA documents. The requirements for geotechnical work for the building design are defined here. They apply whether GSA contracts for geotechnical work separately or includes the geotechnical investigation in the scope of the A/E services.

Purpose. The purpose of the geotechnical investigation during building design is to determine the character and physical properties of soil deposits and evaluate their potential as foundations for the structure or as material for earthwork construction. The type of structure to be built and anticipated geologic and field conditions have a significant bearing on the type of investigation to be conducted.

The investigation must therefore be planned with a knowledge of the intended project size and anticipated column loads, land utilization and a broad knowledge of the geological history of the area.

The guidelines given here are not to be considered as rigid. Planning of the exploration, sampling and testing programs and close supervision must be vested in a competent geotechnical engineer and/or engineering geologist with experience in this type of work and licensed to practice engineering in the jurisdiction where the project is located.

Analysis of Existing Conditions. The report should address the following:

- Description of terrain.
- Brief geological history.
- Brief seismic history.
- Surface drainage conditions.
- Groundwater conditions and associated design or construction problems.
- Description of exploration and sampling methods and outline of testing methods.
- Narrative of soil identification and classification, by stratum.
- Narrative of difficulties and/or obstructions encountered during previous explorations of existing construction on or adjacent to the site.
- Description of laboratory test borings and results.
- Plot plan, drawn to scale, showing test borings or pits.
- Radon tests in areas of building location.
- Soils resistivity test, identifying resistivity of soil for corrosion protection of underground metals and electrical grounding design.
- Boring logs, which identify:
  Sample number and sampling method.
  Other pertinent data deemed necessary by the geotechnical engineer for design recommendations, such as:
  - Unconfined compressive strength.
  - Standard penetration test values.
  - Subgrade modulus.
  - Location of water table.
  - Water tests for condition of groundwater.
  - Location and classification of rock.
  - Location of obstructions.
  - Atterberg tests.
  - Compaction tests.
  - Consolidation tests.
  - Triaxial compression test.
  - Chemical test (pH) of the soil.
  - Contamination.

Engineering Recommendations. Engineering recommendations based on borings and laboratory testing should be provided for the following:

Recommendations for foundation design, with discussion of alternate solutions, if applicable, including:

- Allowable soil bearing values.
- Feasible deep foundation types and allowable capacities, where applicable, including allowable tension (pull-out) and lateral subgrade modulus.
- Feasibility of slab on grade versus structurally supported ground floor construction, including recommended bearing capacities and recommended subgrade modulus (k).
- Discussion of evidence of expansive surface materials and recommended solutions.
- Lateral earth design pressures on retaining walls or basement walls, including dynamic pressures.
- Design frost depth, if applicable.
- Removal or treatment of objectionable material.
- Discussion of potential for consolidation and/or differential settlements of substrata encountered, with recommendations for total settlement and maximum angular distortion.
- Use and treatment of in-situ materials for controlled fill.
- Recommendations for future sampling and testing.
- Recommendations for pavement designs, including base and sub-base thickness and subdrains.
- Recommendations for foundation and subdrainage, including appropriate details.
- Discussion of soil resistivity values.
- Discussion of radon values and recommendation for mitigating measures, if required.

Geologic Hazard Report

A geologic hazard report shall be prepared for all new building construction in zones 2A, 2B, 3 and 4, except for those facilities judged to be minor or relatively unimportant facilities for which earthquake damage would not pose a significant risk to either life or property. In zones 2A and 2B, reports need not be prepared for buildings having an importance factor, I, of 1.0 if the structure has less than 4500 m^2 (50,000 sf) of floor area. Geologic hazard reports are not required for zones 0 and 1.

Required Investigation. When required by the project scope, a geologic hazard investigation which addresses the hazards indicated below should be performed. Whenever possible, a preliminary investigation should be performed in the planning stage of siting a facility, to provide reasonable assurance that geologic hazards do not preclude construction at a site. During a later stage of geotechnical investigations for a facility at a selected site, supplemental investigations may be conducted as needed to define the geologic hazards in more detail and/or develop mitigating measures. The scope and complexity of a geologic hazard investigation depends on the economics of the project and the level of acceptable risk. In general, major new building complexes, high-rise buildings, and other high value or critical facilities shall have thorough geologic hazard investigations. Small, isolated buildings need not have elaborate investigations.

Surface Fault Rupture. For purposes of new building construction, a fault is considered to be an active fault and a potential location of surface rupture if the fault exhibits any of the following characteristics:

- Has had documented historical macroseismic events or is associated with a well-defined pattern of microseismicity.
- Is associated with well-defined geomorphic features suggestive of recent faulting.
- Has experienced surface rupture (including fault creep) during approximately the past 10,000 years (Holocene time).

Fault investigations shall be directed at locating any existing faults traversing the site and determining the recency of their activity. If an active fault is found to exist at a site and the construction cannot reasonably be located elsewhere, investigations shall be conducted to evaluate the appropriate set-back distance from the fault and/or design values for displacements associated with surface fault rupture.

Soil Liquefaction. Recently deposited (geologically) and relatively unconsolidated soils and artificial fills without significant cohesion and located below the water table, are susceptible to liquefaction. Sands and silty sands are particularly susceptible. Potential consequences of liquefaction include foundation bearing capacity failure, differential settlement, lateral spreading and flow sliding, flotation of lightweight embedded structures, and increased lateral pressures on retaining walls. The investigation shall consider these consequences in determining the size of the area and the depth below the surface to be studied. An investigation for liquefaction may take many forms. One acceptable method is to use blow count data from the standard penetration test conducted in soil borings. This method is described in publications by H. B. Seed and I. M. Idriss, (1982), *Ground Motions and Soil Liquefaction During Earthquakes*: Earthquake Engineering Research Institute, Oakland, CA, Monograph Series, 134 p. and H.B. Seed et al, (1985) "The Influence of SPT Procedures in Soil Liquefaction Resistance Evaluations": *Journal of Geotechnical Engineering*, ASCE 111(12): pp. 1425-1445.

Landsliding. New construction shall not be sited where it may be within a zone of seismically induced slope failure or located below a slope whose failure may send soil and debris into the structure. Factors which affect slope stability include slope angle, soil type, bedding, ground water conditions, and evidence of past instability. The geologic hazard investigation shall address the potential for seismically induced slope deformations large enough to adversely affect the structure.

Differential Compaction. Loosely compacted soils either above or below the water table can consolidate during earthquake shaking, producing surface settlement. The potential for total and differential settlements beneath a structure shall be assessed. If liquefaction is not expected to occur, then in most cases, differential compaction would not pose a significant problem to construction.

Flooding. Earthquake-inducing flooding can be caused by tsunamis, seiches, and dam and levee failures. The possibility of flooding shall be addressed for new construction located near bodies of water.

Amplitude of Strong Ground Shaking. The amplitude of strong ground shaking used to assess geologic hazards is characterized by peak ground acceleration. Site-specific peak ground accelerations shall conform to the following: except as otherwise specified herein, site peak ground accelerations shall be assumed equal to the zone factor assigned by the ICBO Uniform Building Code (e.g., 0.40 g for zone 4, 0.30 g for zone 3, etc.). When a probabilistic ground motion analysis is carried out, the site peak ground acceleration shall have not less than a 10-percent probability of being exceeded during the design life of the structure. The design life shall be assumed equal to 50 years unless specified otherwise by GSA. For any site located in a region where active faults have been identified, the site peak ground acceleration shall not be lower than the mean values of peak acceleration estimated (using appropriate attenuation relationships) for maximum earthquakes on the active faults.

Duration of Strong Ground Shaking. Estimates of the duration of strong ground shaking at a site are reflected by earthquake magnitude and shall be used to assess geologic hazards such as liquefaction and slope failure. Strong motion duration is strongly dependent on earthquake magnitude.

Estimates of the duration of strong ground shaking shall be based on the assumption of the occurrence of a maximum credible earthquake generally accepted by the engineering and geologic community as appropriate to the region and to the subsurface conditions at the site.

Mitigative Measures. A site found to have one or more significant geologic hazards may be used, provided the hazards are removed, abated, or otherwise mitigated in the design, or if the risk is judged to be acceptable. Examples of mitigative measures include: removal and recompaction of poorly compacted soils; use of special foundations; stabilizing slopes; and draining, compaction, or chemical treatment of liquefiable soils. The geological hazard report shall identify feasible mitigative measures.

Required Documentation. Investigations of geologic hazards shall be documented. As noted in the paragraph entitled "Required Investigation" above, a preliminary geologic hazard investigation shall be conducted and a report issued during the siting phase for a facility. However, unless the geologic hazard investigations have been documented in a stand-alone report, they shall be addressed in a section of the geotechnical engineering report prepared during the design phase of a project. The geologic hazard report, whether it is a separate report or a section of the geotechnical engineering report, shall as a minimum contain the following:

- List of hazards investigated, which must include the five described earlier in this section.
- Description of the methods used to evaluate the site for each hazard.
- Results of any investigations, borings, etc.
- Summary of findings.
- Recommendations for hazard mitigation, if required.

In some cases, estimates of site ground motions may be needed for assessment of geologic hazards such as liquefaction and slope failure.