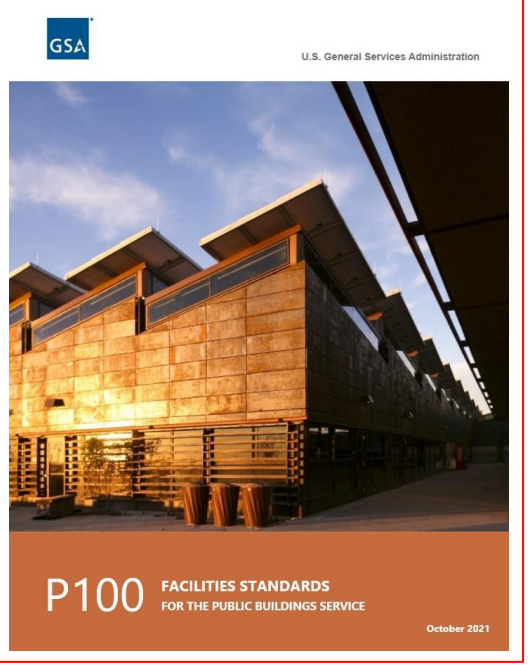
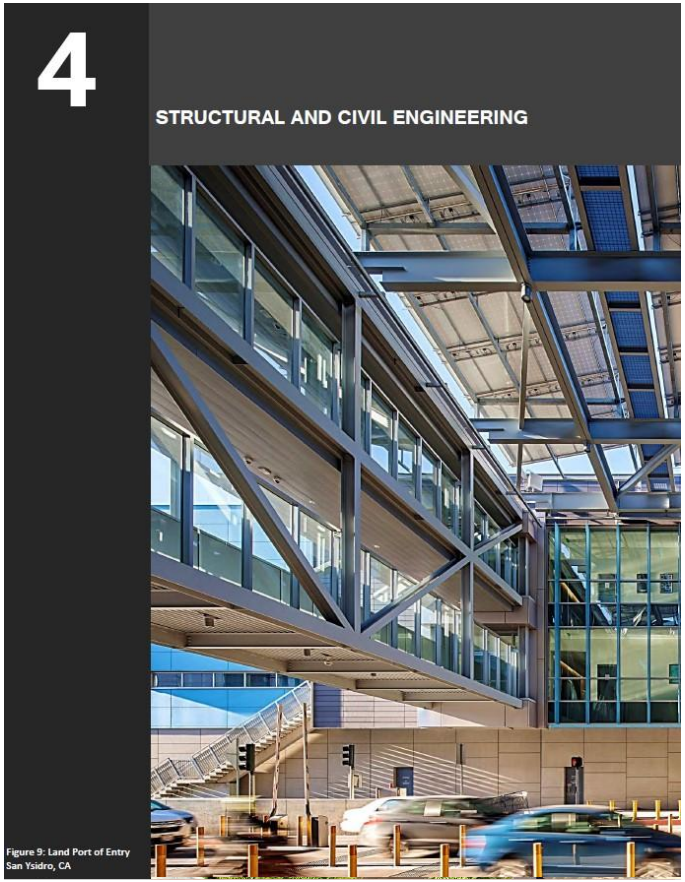
P100 - Training 2021

The Facilities Standards for the Public Buildings Service

This session is being recorded.



Structural & Civil Engineering



Bill Earl

Structural Engineer
Office of Design & Construction
Chief Architect
Center for Engineering

Ch 4 Technical Committee

R2 - Karin Reed
R3 - Greg Retzler
Lou Norella
R4 - Chris Hector
R9 - Ron Larson
Medi Givechian
R10 - Pete Blakely
NCR - Dawit Zena

Today's Agenda

01 **New Title**

Added Civil

02 **New Format**

Performance Tables

03 **Revised Content**

Rewording & Order
Other

04 **New Content**

Civil Best Practices

05 **Appendix A**

Questions

01
New Title

P100 now includes Civil Engineering recommendations

Why?

P100 History:

- 2010 Issuance
- DOT Reference
- Appendix A

The designer must use the principles of structural dynamics to evaluate the potential for structural vibrations as it relates to both human comfort and the tenant agency program of requirements.

The design must be based on recommendations of American Institute of Steel Construction *Steel Design Guide Series 11 Floor Vibrations Due to Human Activity* and the International Organization of Standards *ISO 2631-2:2003 Mechanical Vibration and Shock Evaluation of Human Exposure to Whole-Body Vibration - Part 2: Vibration in Buildings (1 Hz to 80 Hz).*

Architectural facade elements for shading or screening or architectural expression must be reviewed by the structural engineer of record for wind induced vibration. This review must be documented in the project structural calculations.

4.3.2 INNOVATIVE METHODS AND MATERIALS

When designing with new or untried materials or methods of construction the merits of the methods or materials shall be established. If the merits are established, new, unusual, or innovative materials, systems, or methods may be incorporated into designs when evidence shows that such use is in the best interest of the Government from the standpoint of economy, lower life-cycle costs, and quality of construction.

When new and innovative methods and materials are proposed for a project, a peer review panel, determined by GSA, must evaluate and approve the adequacy of the methods, systems, and materials proposed by the designer. Innovative design methods include but are not limited to non-linear finite element analysis, time-history loading development, computational fluid dynamics, and other methods deemed non-mainstream by the GSA Structural Engineer.

4.3.3 STRUCTURAL SYSTEMS AND ELEMENTS

Precast floor framing systems must not be used in new or additions to existing federal office buildings or courthouses. When the design can be demonstrated to adapt well to future changes in locations of heavy partitions or equipment, precast systems may be considered for low-rise structures such as parking garages, industrial buildings, and storage and maintenance facilities. Precast must not be used as part of the structural framing to prevent progressive collapse.

Pre-tensioned and post-tensioned floor and roof framing systems are not allowed.

Exception: Pre-tensioned or post-tensioned systems, bonded or unbonded, for parking structures that are separate from the occupied building are allowed. Post tensioning is allowed for repair or retrofit to reduce deflections or enhance capacity.

Footings and permanent support structures, such as tiebacks, must not project beyond property lines.

Building additions must be designed and constructed using materials and systems compatible with the existing structure.

02

New Format

Performance Tables

Performance Tables

4.1 STRUCTURAL PERFORMANCE TABLE

Live Load	
	Uniform Floor Loading
Baseline	100 psf including partitions, reducible
Tier 1	100 psf including partitions, non-reducible
Tier 2	N/A
Tier 3	N/A
M & V	Y
Plans & Specs	Y
Calculations & Analysis	Project team should provide calculations showing requirements are met. Calculations required at all performance levels.
References	ASCE 7
Basis of Design	Describe design narrative for how the floor structure design addresses the requirements.
Construction Verification	N/A
Seismic	
	Structure
Baseline	Life Safety
Tier 1	Damage Control
Tier 2	Immediate Occupancy
Tier 3	N/A
M & V	N/A
Plans & Specs	Y
Calculations & Analysis	Project team should provide calculations showing requirements are met. Calculations required at all performance levels.
References	For existing buildings reference ASCE 41. For new buildings, reference IBC. For new buildings above baseline, also reference ASCE 41 for tiering performance goals.
Basis of Design	Describe seismic resistance design assumptions.
Construction Verification	Verify that all IBC and other specific required special inspections have been performed and reports have been submitted.
	Non Structural
Baseline	Life Safety
Tier 1	Position Retention
Tier 2	Position Retention
Tier 3	N/A
M & V	N/A
Plans & Specs	Y
Calculations & Analysis	Project team should provide calculations showing requirements are met. Calculations required at all performance levels.
References	For existing buildings reference ASCE 41. For new buildings, reference IBC. For new buildings above baseline, also reference ASCE 41 for tiering performance goals.
Basis of Design	N/A
Construction Verification	N/A
Wind	
	Structure
Baseline	15% in 50 Yr Exceedance or local code whichever is greater
Tier 1	7% in 50 Yr Exceedance

03 Revised Content

Order of Information
Plain Language & Minor Corrections
Specific Vibration Criteria
Seismic Monitoring
Quality Assurance

CHAPTER 4 STRUCTURAL AND CIVIL ENGINEERING

4.2 STRUCTURAL PERFORMANCE ATTRIBUTES

4.2.1 LOADS AND NATURAL HAZARDS
4.2.1.1 LIVE LOAD
4.2.1.2 SEISMIC LOAD
4.2.1.2.1 STRUCTURAL LATERAL RESISTANCE SYSTEM
4.2.1.2.2 NON-STRUCTURAL COMPONENTS
4.2.1.3 WIND LOAD
4.3 PRESCRIPTIVE STRUCTURAL REQUIREMENTS
4.3.1 VIBRATIONS
4.3.2 INNOVATIVE METHODS AND MATERIALS
4.3.3 STRUCTURAL SYSTEMS AND ELEMENTS
4.3.4 ALTERATIONS TO HISTORIC STRUCTURES
4.3.5 GEOTECHNICAL REQUIREMENTS
4.3.6 SEISMIC INSTRUMENTATION
4.3.7 CROSS-DISCIPLINARY COORDINATION
4.3.8 GENERAL

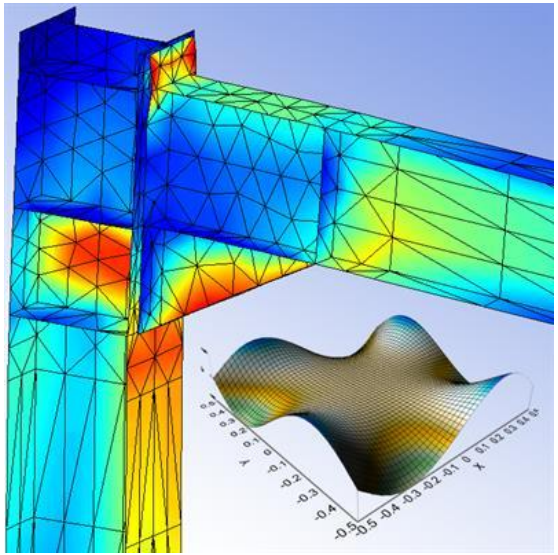
4.4 PHYSICAL SECURITY PERFORMANCE REQUIREMENTS

4.5 PHYSICAL SECURITY PERFORMANCE ATTRIBUTES
4.5.1 BLAST DESIGN REQUIREMENTS
4.5.2 PROGRESSIVE COLLAPSE DESIGN REQUIREMENTS

4.6 CIVIL PERFORMANCE REQUIREMENTS

4.7 CIVIL PERFORMANCE ATTRIBUTES
4.7.1 FLOOD MITIGATION
4.8 PRESCRIPTIVE CIVIL REQUIREMENTS
4.8.1 SITE GRADING AND DRAINAGE
4.8.2 SITE UTILITIES
4.8.3 SITE CIRCULATION
4.8.4 PAVEMENTS
4.9 GEOLOGIC HAZARD REPORT
4.9.1 REQUIRED INVESTIGATION
4.9.2 SURFACE FAULT RUPTURE
4.9.3 SOIL LIQUEFACTION
4.9.4 LAND SLIDING
4.9.5 DIFFERENTIAL SETTLEMENT
4.9.6 FLOODING
4.9.7 DURATION OF STRONG GROUND SHAKING
4.9.8 MITIGATIVE MEASURES
4.9.9 REQUIRED DOCUMENTATION

Special Circumstances



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Compatability

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04

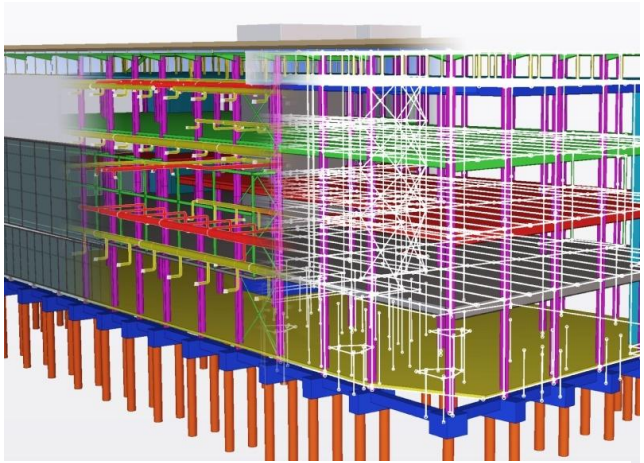
New Content

Control

4.3.8 GENERAL

The designer must coordinate with the GSA Structural Engineer early in the project to establish the required content and organization of structural engineering calculations. When computer programs are used to perform design calculations or estimate complex building behavior, supporting analysis files & models used to create the calculation package or used for structural design are to be provided, in their original native format, if requested by the GSA Structural Engineer.

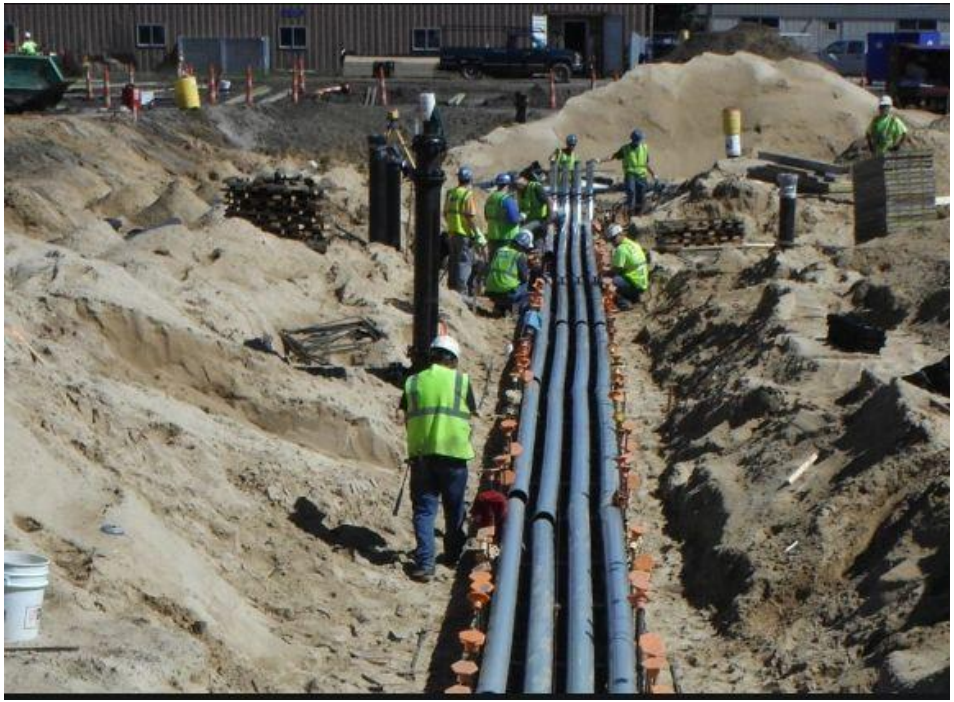
Coordination



4.3.7 CROSS-DISCIPLINARY COORDINATION

The designer is responsible for coordination with other engineering and architectural disciplines to ensure physical and dimensional compatibility of systems interfacing with or supported by the structure. Where major elements of other disciplines work interfaces with the structure, this information shall be shown on construction documents. The IBC specifies the minimum required information to be included on construction documents. However, the GSA Structural Engineer has the final authority to require what additional information shall be shown.

Civil Engineering



Civil Engineering

4.8.1 SITE GRADING

- Balance cut and fill soil quantities on site.
- Provide positive grading minimum 2% grade from building to curb line.
- Control erosion design (meet local and State requirements for sediment control or follow EPA requirements) shall consider ease of maintenance of the site.
- Follow ABBAS requirements.

4.8.2 SITE UTILITIES

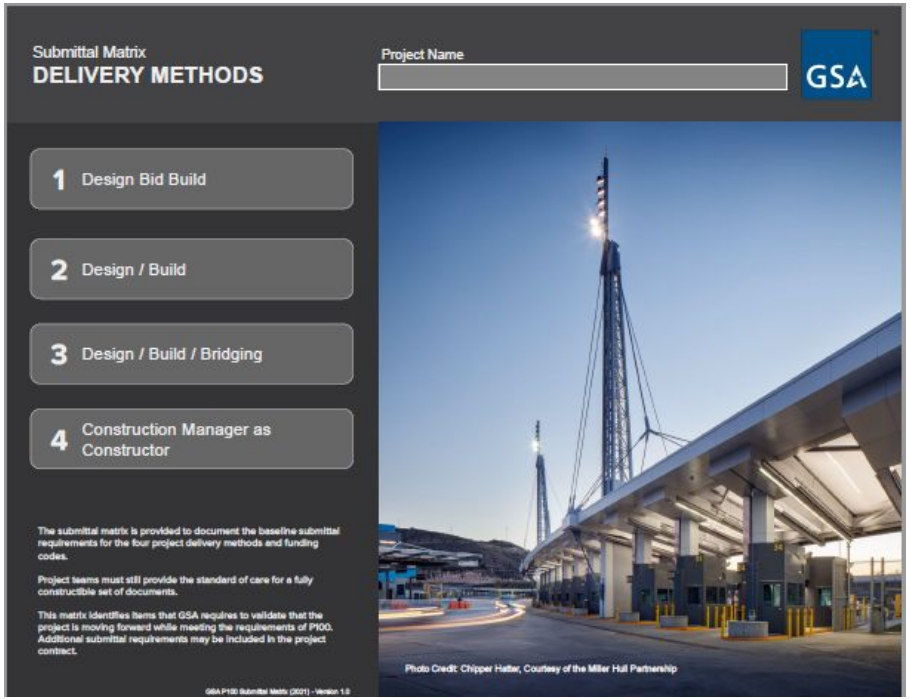
- Utility Location – avoid trees, consider future maintenance, integrate into landscape design to minimize visual impact.
- Water – follow regulations of local water authority, locate behind curb lines or under sidewalks or unpaved areas, do not place under foundations or within building footprint.
- Sanitary Sewer - follow regulations of local sanitary sewer authority, separate storm and sanitary systems on site, provide cleanouts 5' from building, provide manholes at service line entry points, provide drop manholes when service line does not enter at main sewer line invert, if septic systems are necessary, follow regulations of local code and provide 50% surplus capacity.
- Storm Drainage – follow local and State requirements, locate in unpaved areas, design for a 25-year storm, use gravity flow, rainwater not collected for reuse shall be discharged into the storm drain. Small buildings in rural areas may use gutters, downspouts, and splash blocks.
- Coordinate site utility design with the requirements of chapters 5 & 6.

4.8.3 SITE CIRCULATION

- Separate service traffic from parking entries.
- Truck maneuvering areas must provide adequate space (one way traffic preferred).
- Loading docks should be nearly flat (1:50 slope) in the apron area.
- At surface lots minimum parking stall size shall be 9'x18'-6. Maximum grade 5%.
- Consult with the local fire department for emergency access requirements.
- If possible, provide a public drop off area along the street near the main entrance.

4.8.4 PAVEMENTS

- Use local governing design standards – if not available follow State DOT.
- Materials shall be suitable for traffic loads and volume.
- Durability shall be compatible for site climate with consideration to maintenance.
- Slip resistant – in northern climates address snow removal and snowmelt.
- Do not use surface applied curbs.
- Use concrete pavements at truck maneuvering areas.

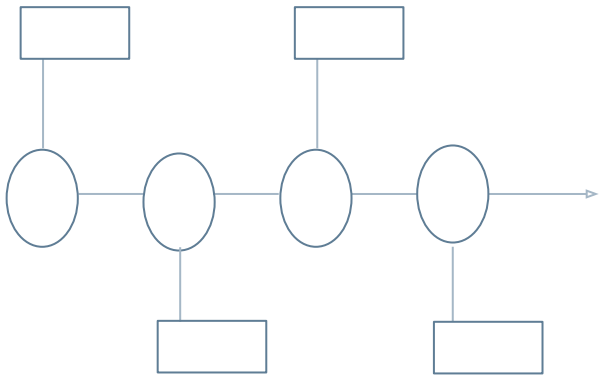


05

Appendix A

More Regional SME Engagement

Submittal Matrix



Construction Type
- 1 - DBB
- 2 - DB
- 3 - DB Bridging
- 4 - CMC

Project Phase
- Preliminary Concept
- Concept Development
- Final Concept
- DD - 100%
- CD - 65%
- CD - 95%
- CD - Final

Discipline
- General Information
- Sustainability
- Urban Development
- Building Enclosure Systems
- Architecture / Interiors
- Structural
- Mechanical
- Plumbing
- Electrical
- Fire Protection
- Cost Estimating
- Specialty Spaces
- Historic Preservation
- Art in Architecture

Concept Design: Preliminary Concept / First Design Review (BA 51, 55)

DESIGN LOADS Chapter 4	❑ Prepare narrative that summarizes design loads.
FOUNDATIONS & GEOTECHNICAL Chapter 4	❑ Provide geotechnical report. Provide minutes from report recommendations discussion with GSA structural engineer, landscape architect, and architect.
VIBRATIONS Chapter 4	❑ N/A
INNOVATIVE METHODS & MATERIALS Chapter 4	❑ Identify any special materials or potential construction methods that are planned or could potentially be required.
STRUCTURAL SYSTEMS Chapter 4	❑ Narrative describing a minimum of 3 alternatives schemes/materials (including superstructure and foundations) to be considered.
STRUCTURAL ANALYSIS & CALCULATIONS Chapter 4	❑ Narrative describing anticipated content of calculations including any special requirements that involve unusual features of the design or complex analysis methods.
QUALITY ASSURANCE & SPECIAL INSPECTIONS Chapter 4	❑ N/A
HISTORIC CONSIDERATIONS Chapter 4	❑ Narrative that identifies historic status and related potential constraints
PHYSICAL SECURITY Chapter 4	❑ Narrative summarizing anticipated physical security requirements and standards. Include FSL information from FSC.
CIVIL SITE Chapter 4	❑ Narrative identifying project site characteristics and civil design challenges
MISCELLANEOUS COMPONENTS Chapter 4	❑ Narrative summarizing primary structural and facade attachments to the exterior of the building

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Thanks!

Do you have any questions?

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