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Lateral Forces (Wind/Earthquake) Component of the Structural Engineering BREADTH Exam Specifications

Effective Beginning with the April 2018 Examination

- The 4-hour **Lateral Forces (Wind/Earthquake)** breadth examination is offered on Saturday morning and focuses on wind/earthquake loads. It contains 40 multiple-choice questions.
- The exam uses the US Customary System (USCS) of units.
- The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application.
- The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.
- Score results are combined with depth exam results for final score of this component.

	Approximate Number of Questions
I. Analysis of Structures	**15**
A. Generation of Loads	7
1. Horizontal seismic	
2. Vertical seismic	
3. Dynamic seismic lateral earth pressure	
4. Wind loads on buildings—MWFRS (directional procedure)	
5. Wind loads on buildings—MWFRS (envelope procedure)	
6. Wind loads on other structures and building appurtenances—MWFRS	
7. Wind loads—components and cladding (C&C)	
8. Wind loads on bridges	
9. Load combinations	
B. Load Distribution and Analysis Methods	8
1. Statics (e.g., determinate and indeterminate, location of forces and moments, free-body diagrams)	
2. Approximate frame analysis methods	
3. Computer-generated structural analysis techniques (e.g., modeling, interpreting, and verifying results)	
4. Seismic static force procedures	
5. Seismic dynamic force procedures	
6. Seismic irregularities (e.g., horizontal and vertical)	
7. Horizontal torsional moments	
8. Relative rigidity force distribution	
9. Flexible diaphragms	
10. Rigid diaphragms	
11. Wind load distribution	

II. Design and Details of Structures — 25

A. General Structural Considerations — 3
   1. Construction administration (procedures for correcting nonconforming work, testing methods, inspection methods, structural observation)
   2. Serviceability requirements (i.e., deflection, building drift)
   3. Anchorage of a structural system to resist uplift and sliding forces
   4. Components, attachments, and cladding
   5. Seismic coefficients (e.g., response modification factor, redundancy factor, overstrength factor, deflection amplification factor)
   6. Abutment/pier seat width

B. Structural Systems Integration — 2
   1. General structural systems selection based on design criteria (e.g., height limits, foundation considerations)
   2. Specifications, quality controls, and coordination with other disciplines
   3. Constructability
   4. Strengthening existing systems (e.g., details, system compatibility, reinforcing methods)

C. Structural Steel — 5
   1. Braced frames
   2. Moment resisting frames
   3. Dual systems
   4. Cantilever columns
   5. Bridge piers
   6. Bridge bracing elements

D. Cold-Formed Steel — 1
   1. Steel diaphragms
   2. Bearing wall systems (e.g., shear wall systems, flat strap bracing)

E. Concrete — 5
   1. Shear walls
   2. Moment resisting frames
   3. Diaphragms
   4. Bridge piers/abutments
   5. Bridge reinforcement details (e.g., ductile detailing, anchorage)

F. Wood — 3
   1. Diaphragms (e.g., drag struts, chords)
   2. Sub-diaphragms
   3. Shear walls

G. Masonry — 3
   1. Out-of-plane (i.e., slender walls)
   2. Shear walls
   3. Anchorage of walls (e.g., out-of-plane, uplift)
   4. Attachment of elements to masonry

H. Foundations and Retaining Structures — 3
   1. Retaining walls and abutments
   2. Spread footings
   3. Piles (e.g., concrete, steel, timber)
   4. Drilled shafts/drilled piers/caissons

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STRUCTURAL ENGINEERING Design Standards[1]

These standards apply to the Vertical and Lateral components of the Structural Engineering exam.

Effective Beginning with the April 2018 Examinations

ABBREVIATION	DESIGN STANDARD TITLE
AASHTO	*AASHTO LRFD Bridge Design Specifications,* 7th edition (without interims), American Association of State Highway & Transportation Officials, Washington, DC.
IBC	*International Building Code,* 2015 edition (without supplements), International Code Council, Falls Church, VA.
ASCE 7	*Minimum Design Loads for Buildings and Other Structures,* 3rd printing, 2010, American Society of Civil Engineers, Reston, VA.
ACI 318	*Building Code Requirements for Structural Concrete*, 2014, American Concrete Institute, Farmington Hills, MI.
AISC	*Steel Construction Manual,* 14th edition, American Institute of Steel Construction, Inc., Chicago, IL.
AISC	*Seismic Design Manual,* 2nd edition, American Institute of Steel Construction, Inc., Chicago, IL.
AISI S100	*North American Specification for the Design of Cold-Formed Steel Structural Members*, 2012 edition, American Iron and Steel Institute, Washington, DC.
AISI S213	*North American Standard for Cold-Formed Steel Framing–Lateral Design 2007 Edition with Supplement No. 1*, October 2009 (reaffirmed 2012), American Iron and Steel Institute, Washington, DC.
NDS	*National Design Specification for Wood Construction,* 2015 edition & *National Design Specification Supplement, Design Values for Wood Construction,* 2015 edition, American Wood Council, Leesburg, VA.
NDS	*Special Design Provisions for Wind and Seismic,* 2015 edition, American Wood Council, Leesburg, VA.
TMS 402/602	*Building Code Requirements and Specifications for Masonry Structures* (and related commentaries)*,* 2013; The Masonry Society, Boulder, CO; American Concrete Institute, Detroit, MI; and Structural Engineering Institute of the American Society of Civil Engineers, Reston, VA.

Notes

1. Solutions to exam questions that reference a standard of practice are scored based on this list. Solutions based on other editions or standards will not receive credit. All questions use the US Customary System (USCS) of units.