ARCH 631. Study Guide for Exam 3

This guide is not providing “answers” for the conceptual questions. It is a list of topical concepts and their application you should be familiar with. It is an aid to help prepare for the mid-term exam.

Covers material of Lectures 15, 16, 17, 19 & 20

General: Lateral Loads

- Lateral stability vs. gravity loading
- Resisting mechanisms
- “In-plane” forces
- Load transfer and shear planes
- Torsional deformations
- Horizontal vs. vertical shear planes
- Diaphragm action
- Diaphragms, shear walls, bracing, frame action, drag struts, chevron, knee, etc.
- Selective placement of horizontal and vertical rigid planes
- Member orientation for frame action
- Mechanism choices with building height
- Behavior of multistory frames under lateral load.
- Behavior of “tubes”
- Serviceability issues, dampers

Hazards Design

- Equivalent static wind pressure, direction, size with respect to building height, formula
- Wind speed & 50 year return period
- Vortex shedding
- Flutter
- Windward, leeward
- Flood zones & “100 year flood”
- Hydrostatic pressure calculation (linear with depth of water by density = $\gamma h$)
- Dynamic loads
- Fault zones, focus (hypocenter), epicenter
- Magnitude, duration, intensity of ground motion
- Liquefaction, landslides, subsidence, tsunami
- Inertial forces (mass, acceleration)
- Base shear and code formulas
- Overturning
- Resonance, frequency, period of vibration, damping
- Stiffness - lateral and torsional
- Center of mass, center of rigidity
- Drift and shear distribution by floor mass
- Pounding, re-entrant corners, soft stories
- Seismic joints, base isolation, tuned mass dampers
- Period length relationship to stiffness
- “Spring-mass” assembly model
- Redundancy and continuity
- Non-structural elements contribution to stiffness
- Spectrum or spectral response
- NEHRP (actual name and function)
### General: Connections and Tension Members

- Normal stress (compression & tension)
- Shear stress (non beams)
- Bearing stress
- Pinned joint vs. rigid joint
- Single shear vs. double shear
- Simple shear connector
- Connected area for longitudinal shear stress calculation
- Nail capacity and pitch for resisting longitudinal shear
- Effective area vs. net area vs. gross area of tension member
- Forces and stresses resisted by nails, adhesives, split ring connectors, bolts, etc.
- Rupture vs. yielding in steel
- Bolt designations
- Weld strengths
- Throat thickness
- Fillet, butt, plug, slot
- Coping
- Block shear rupture
- Web “crippling”

### Timber Design

- Lumber vs. engineered timber characteristics (ex: glulam)
- Light-frame vs. heavy timber construction
- Lumber grading
- Various strengths (directionality, wood type, etc.)
- Built-up member types
- Design methodologies and obtaining allowed stresses (adjustment factors - duration, multiple member use....)
- Creep
- Nominal dimensions
- Beam self weight with respect to material density (variable for wood types)
- Column stability factor, $F_{CE}$ & $I/d$
- Interaction equations ($P-\Delta$)
- Connection stresses
- Design vs. analysis
- Bolt designations
- Effective net area
- Connection types
- Single vs. double shear
- Bolt capacity charts and relation to wood strengths
- Allowable shear capacity charts for diaphragms
- Chord forces in diaphragms