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 = γh)
- ☐ 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} & l/d
- ☐ Interaction equations (P-Δ)
- ☐ 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