CEE454 Quiz 3, Autumn 2009
Open Book, NSD manuals and supplements

Please show all work for full credit
THREE problems total.

Part 1: Short answer (20 points)

a. (10 points) If you construct a residential building subject to lateral forces such as wind or seismic, you need a lateral force resisting system (LFRS). When you use a horizontal diaphragm and shearwall combination as a LFRS, briefly sketch how the applied lateral loads are transferred through the building down to the foundation. Hint: Recall the presentation by KPFF.

b. (10 points) Briefly discuss the origin of the “d” in “8d” nails.
Part 2. Calculations

OSB Floor Panel Design [30 points]
The floor sheathing in a corridor of a building is to be sized for load combination 1.2D + 1.6L. OSB is to be used over nominal 2-in framing members that are spaced 24 in apart; the sheathing is to be placed so that the 8 ft dimension is perpendicular to the framing members. Determine the sheathing thickness if the unfactored dead load is 20 psf and the unfactored live load from occupancy is 55 psf. Use $\lambda = 0.8$.

Show all work and organize your calculations in the table below:

<table>
<thead>
<tr>
<th>Demand (psf)</th>
<th>Capacity (psf): Give span rating</th>
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</thead>
<tbody>
<tr>
<td>L/360 (L)</td>
<td></td>
</tr>
<tr>
<td>L/240 (D+L)</td>
<td></td>
</tr>
<tr>
<td>Moment</td>
<td></td>
</tr>
<tr>
<td>Shear</td>
<td></td>
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</table>

**Thickness required is _______** [be sure to give table reference]
Connections. (50 points).
The single-story wood-frame building has a double 2 x 4 top wall plate of Doug-Fir-Larch. This
top plate serves as a chord and drag strut along line 1. The unfactored wind forces are \( w_T = 100 \)
lb/ft and \( w_L = 250 \) lb/ft. \( C_M = 1.0 \). Use LRFD procedures to find:

a. The maximum chord force along line 1.

State equations first:

Solve for values:

b. The maximum strut force along line 1.

State equations first:

Solve for values:
c. Determine the number of 20d common nails necessary to splice the top plate for the maximum force determined in a and b.

Nail values are

Capacity
Equation:
Value:

Number of nails:
EXTRA CREDIT.

Bearing.

Given the rafter connection in the figure, consider the 1.2D + 1.6 S load combination if $P_D = 140$ lbs and $P_S = 560$ lbs. Lumber is No. 1 Spruce-Pine-Fir (South) and $C_M = C_t = 1.0$.

Find:
- the factored bearing load $P_b$ in the rafter and in the top plate of the wall.
- the capacity value $P_{u,b}$ in the top plate
- the capacity value $P_{u,d}$ in the rafter

![Diagram of rafter and top plate connection]