

Wellington at Hershey's Mill



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 Spring 2006 Senior Thesis Presentation

Wellington at Hershey's Mill West Chester, Pennsylvania
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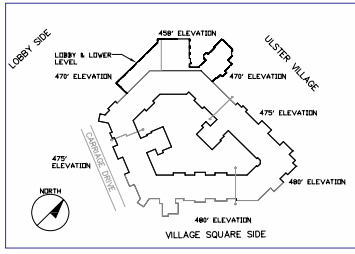
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Wellington at Hershey's Mill

- **Location and Site:** 1361 E Boot Road West Chester, Pennsylvania 19380
- **Occupancy Type:** Assisted Living Community
- **Construction:** December 1, 2003 – August 15, 2005
- **Size:** 370,000 Sq. Ft.
- **Total Number of Stories:** 5 Stories
- **Cost:** \$20.7 million
- **Layout:** Garage level below three residential floors

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Site Layout

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Design Live Loads (original & alternate systems) (ASCE 7 -02 Table 4-1):

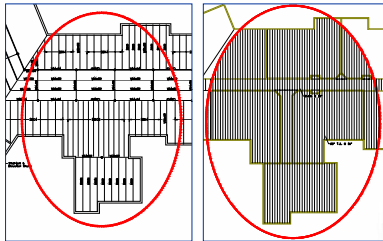
Roof:	20 psf
Private Rooms & the corridors that serve them:	40 psf

Superimposed Dead Loads:

Carpet:	1 psf
Ceiling:	1 psf
MEP:	10 psf

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First Floor Framing 2nd & 3rd Floor Framing

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Original Building Section

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Alternate System Design Intentions

- Increase fire resistance by redesigning system using concrete & masonry.
- Analyze system for acoustics & heat transfer to insure equal or greater standard of living for occupants.

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Alternate System: First Floor Framing

- Hollowcore Plank: 12"x4' SpanDeck with 2" topping
- Beams (LRFSD):

Beam #	Span (ft)	Trib Width (ft)	Designed Beam
1	22.67	23.96	W30x90
2	22.67	23.96	W30x90
3	22.67	23.96	W30x90
4	22.67	20.125	W27x84
11	22.67	17.625	W24x84
12	22.67	17.625	W24x84
13	22.67	20.625	W27x84
14	22.67	20.625	W27x84
123	18.17	20.12	W24x62
124	9.8	13.6	W14x22
125	15.42	33.875	W24x68
126	15.58	30.875	W21x68

- Columns (CRSI):
14" x 14" SQUARE TIED COLUMN WITH 4-#10's

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Alternate System: First Floor Framing

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Alternate System: Second & Third Floor Framing

- Hollowcore Plank: 12"x4' SpanDeck with 2" topping
- Masonry (Empirical):
 - Exterior Walls - 8" grouted CMU (2500 psi),
Type N Mortar (140 psi max wall stress)
 - Interior Walls - 6" grouted CMU (4500 psi),
Type N Mortar (200 psi max wall stress)

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Alternate System: Second & Third Floor Framing

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Alternate System: Foundation Wall

Assumptions:

- No cohesion or surcharge
- Design at full height retainage

Final Design: 12" concrete wall with #7s @ 12"

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Fire-Resistance Rating Comparison

Original System

First Floor Framing Walls
Exterior: 3 hours
Interior: 1 hour

Floor system: 2 hours
Second & Third Floor Framing Walls
Interior: 1 hour
Exterior: 1 hour

Apartment partition walls: not rated
Building separation walls: 2-3 hours
Floor system: 1 hour

Alternate System

First Floor Framing Walls
Exterior: 4+ hours
Interior: 3-4 hours

Floor system: 2 hours
Second & Third Floor Framing Walls
Interior: 4+ hours
Exterior: 2 hours

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Acoustical Analysis

Original
18 in steel joists 16" o.c. with 1 5/8" concrete on 5/8 in plywood under heavy carpet laid on pad, and 5/8 in gypsum board attached to joists on ceiling side (20 lb/ft²)
(actual system: 18 in steel joists 16" o.c. with 4" concrete slab, heavy carpet laid on pad and gypsum board attached to joists on ceiling side)

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Req'd TL (dB):	27.22	45.6	48.4	52.9	55.3	55
System TL (dB):	27	37	45	54	60	65

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Alternative
4 in reinforced concrete slab (54 lb/ft²)
(actual system: hollowcore plank system)

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Req'd TL (dB):	26.24	45.7	48.2	53.0	55.1	55.1
System TL (dB):	48	42	45	56	57	66

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Heat Transfer Calculations

Original System: $q_x = UA\Delta T = 202.4 \text{ BTU/hr}$

Alternate System: $q_x = UA\Delta T = 479.6 \text{ BTU/hr}$

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Summary of Findings

- Initial design of alternate system showed the need for bearing walls to bear directly on the columns in the garage.
- The alternate system is a superior acoustic barrier between the garage and first floor.
- Fire-resistance ratings are higher for the alternate system.
- The original system is a better thermal barrier.

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Questions?