

RESURGENCE

ENGINEERING AND PRESERVATION, INC.

132 BRENTWOOD STREET
PORTLAND, MAINE 04103
V/F (207) 773-4880
EMAIL: RESURGENCE@VERIZON.NET

DESIGN MEMORANDUM December 1, 2008

To: City of Portland Inspections Department, c/o Jeanie Bourke
Cc: Joe Reynolds, Pearl Properties LLC
From: Alfred H. Hodson III, P.E., Resurgence Engineering & Preservation, Inc.
RE: Structural Design Criteria for 61 India Street Rehabilitation, Portland, Maine
Four Story, Mixed-Use Building behind and above Existing Facade
Resurgence Engineering and Preservation Project Number 08-003

REQUEST FOR WAIVER OF 2003 IBC SEISMIC DESIGN COMPARISON OF SEISMIC LOADING ASCE 7-02 (2003 IBC) VERSUS ASCE 7-05 (2006 IBC)

Jeanne:

I have reviewed the design of the above-listed building in accordance with both ASCE 7-02 (referenced in 2003 IBC) and ASCE 7-05 (referenced in 2006 IBC). The seismic design requirements of ASCE 7-05 differ from those in ASCE 7-02 because more recent research has led to re-drawn earthquake hazard maps. The redrawn maps consider maximum considered earthquake ground motion for short and long-term earthquake durations.

As can be seen by the following tables, the modified mapping results in lower acceleration values for the Portland Maine area. When applying these values into the seismic design formula, the end result is that the building can be designed in accordance with the requirements for a "Seismic Design Category B" structure.

Designing the building as a Seismic Design Category B structure significantly simplifies structural analysis, because the seismic forces can be evaluated in separate directions in accordance with ASCE 7-05 Section 12.5.2, Direction of Loading for Seismic Design Category B. Additionally, the base shear forces are reduced by approximately 13 percent.

If you have any questions, please feel free to call me. Thank you for accepting this design position that is in accordance with more recent research that will ultimately be included in the upcoming Maine State Building Code.

Sincerely,



Alfred H. Hodson III, P.E.

SEISMIC COMPARISON -- ASCE 7-02 (2003 IBC) VERSUS ASCE 7-05 (2006 IBC)

Criteria	Variable Symbol	Variable Value		
ASCE 7-02 EQUATIONS AND REFERENCE PAGES		7-02	7-05	ASCE 7-05 REF.
Building Classification (Occupancy Category) (ASCE-7, Table 1-1, page 4)	Category	II	II	Table 1-1 page 3
Seismic Use Group (ASCE-7, Table 9.1.3, page 96) (based on Building Occupancy Category II)	Use Group	I		
Occupancy Importance Factor (ASCE-7, Table 9.1.4, page 97) (based on Seismic Use Group I)	I_e	1.0	1.0	Tab. 11.5-1 p. 116
Short-Period (0.2 second) Structural Acceleration (ASCE-7, Figure 9.4.1.1(a), page 111) (percentage of gravity, g)	S_s	0.37	0.32	Fig 22-1 p. 211
1.0-second Structural Acceleration (ASCE-7, Figure 9.4.1.1(b), page 113) (percentage of gravity, g)	S_1	0.10	0.08	Fig. 22-3 p. 213
Site Classification (ASCE-7, Table 9.4.1.2, page 108) (Soil Type D per Geotech Report)	Stiff Soil	D	D	
Site Coefficients and Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameters (used to calculate S_{MS}) (ASCE-7, Table 9.4.1.2.4a, page 129) $F_a = 1.50$ when interpolating between $S_s = 0.25$ and $S_s = 0.50$ for Site Class D	F_a	1.50	1.53	Tab. 11.4-1 p. 115
Site Coefficients and Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameters (used to calculate S_{M1}) (ASCE-7, Table 9.4.1.2.4b, page 130) $F_a = 2.40$ for $S_1 \leq 0.10$ for Site Class D	F_v	2.40	2.40	Tab. 11.4-2 p. 115
Short-Period (0.2 second) MCE, 5% Damped Spectral Response Acceleration Adjusted for Site Class Effects (ASCE-7, Equation 9.4.1.2.4-1, page 129; $S_{MS} = F_a S_s \rightarrow 1.50$ $\times 0.37$)	S_{MS}	0.56g	0.490g	eq 11.4-1 p. 115 (1.53*0.32)
1.0-second MCE, 5% Damped Spectral Response Acceleration Adjusted for Site Class Effects (ASCE-7, Equation 9.4.1.2.4-2, page 129; $S_{M1} = F_v S_1 \rightarrow 2.40$ $\times 0.10$)	S_{M1}	0.24g	.192g	Eq 11.4-2 p. 115
Short-Period (0.2 second) Design Spectral Response Acceleration (ASCE-7, Equation 9.4.1.2.5-1, page 129; $S_{DS} = \frac{2}{3} S_{MS} \rightarrow \frac{2}{3} \times .56$)	S_{DS}	0.37g	0.326g	eq 11.4-3 p. 115
1.0-second Design Spectral Response Acceleration (ASCE-7, Equation 9.4.1.2.5-2, page 129; $S_{D1} = \frac{2}{3} S_{M1} \rightarrow \frac{2}{3} \times .24$)	S_{D1}	0.16g	0.128g	Eq 11.4-4 p. 115
Seismic Design Category based on short period response accelerations (ASCE-7, Table 9.4.2.1a, page 131; $S_{DS} = 0.37g$, Seismic Use Group (SUG) = I)	SDC_s	C	B	Tab 11.6-1 p. 116
Seismic Design Category based on 1-second period response accelerations (ASCE-7, Table 9.4.2.1a, page 132; $S_{D1} = 0.16g$, Seismic Use Group (SUG) = I)	SDC_1	C	B	Tab 11.6-2 p. 116