GUIDANCE TO CODE OFFICIALS

Elevation of existing houses

February 11, 2013

In the aftermath of Superstorm Sandy, there have been a number of inquiries about elevating existing houses. The following is intended to offer guidance on some of the technical issues associated with the elevation of existing houses. This guidance is limited to existing houses with no increase in the habitable space. As always, new construction, even if it is to replace storm-damaged structures, must meet all of the applicable requirements of the adopted subcodes.

An elevation is an addition: The elevation of an existing house is categorized as an addition under the rehabilitation subcode because it brings about an increase in the mean height of the highest roof of the structure. The addition itself must comply with the requirements for new construction. In the case of the elevation of an existing house, this would be the new foundation system, including pilings.

Increase in height to greater than 35 feet: The rehab subcode prohibits an increase in height beyond that which would be permitted for new construction. Under the one- and two-family dwelling subcode, buildings of unprotected wood-framed (VB) construction are limited to two stories and 35 feet in height. Buildings with a mean roof height of greater than 35 feet or greater than two stories in height must be of VA construction or must have a fire sprinkler system. While these are reasonable requirements when applied to new construction, these requirements become punitive when applied to an existing house being elevated. Clearly, the primary concern here is fire safety, specifically, the ability of the occupants to evacuate safely in the event of a fire. For this reason, it is suggested that a variation be granted for increases in height that bring the mean height of the highest roof surface to greater than 35 feet and/or result in the building being greater than two stories in height provided that (1) there are hard-wired, interconnected smoke alarms installed in the locations required by the one- and two-family dwelling subcode; and (2) the dwelling unit is separated by a one hour, fire-rated assembly from any parking area or other area underneath the dwelling unit where motor vehicles or water craft or other gas-fired engines may be stored.

Wind load: An increase in height may also necessitate consideration of any increased wind load.

- International Residential Code (IRC) Houses - For houses constructed in compliance with any edition of the International Residential Code (or the International Building Code) with an elevation of the existing house that brings the mean height of the highest roof surface up to, but not above, 42 feet, no additional analysis of the existing building is required. The factors of safety incorporated into the structural requirements of the International Codes are sufficient.

- "Pre-IRC" Houses – Roof Connections - There is some concern with the ability of roof connections to withstand uplift forces for houses constructed prior to adoption of the International Codes. This is because earlier national model codes allowed toe nailing and did not include the requirements for strapping found in the International Residential Code. Toe nails have low capacity to resist uplift forces. Specifically, each toe nail will provide approximately 87 pounds of uplift resistance. This means that two toe nails (typical construction) will have only 174 pounds of uplift resistance. Houses should resist the uplift forces shown in the table below. Accordingly, houses constructed in compliance with an earlier (pre-International Codes) edition of the national model codes must be retrofitted with appropriate hardware such that the roof is able to resist the uplift loads shown in the table on the following page of this guidance.

- Houses elevated to greater than 42 feet - For all houses (whether built under the IRC or not) where the mean height of the highest roof surface resulting from elevation of the existing house will be greater than 42 feet, an engineering analysis should be required to demonstrate that all of the connections (not limited to the roof) will resist the predicted wind forces.

Required Strength of Truss or Rafter Connections to Resist Wind Uplift Forces

Unit connection forces (pounds per linear foot)

Building Width (ft)	Mean Roof Height (ft)	Exposure B						Exposure C						Exposure D	
		Ultimate Wind Speed 115 mph		Ultimate Wind Speed 120 mph		Ultimate Wind Speed 130 mph		Ultimate Wind Speed 115 mph		Ultimate Wind Speed 120 mph		Ultimate Wind Speed 130 mph		Ultimate Wind Speed 130 mph	
		Total uplift forces at corner	Other locations	Total uplift forces at corner	Other locations	Total uplift forces at corner	Other locations	Total uplift forces at corner	Other locations	Total uplift forces at corner	Other locations	Total uplift forces at corner	Other locations	Total uplift forces at corner	Other locations
12	30	56	42	68	51	92	69	71	53	88	66	122	91	164	123
	35	59	44	71	54	97	72	78	58	95	71	130	97	171	128
	42	62	46	75	56	101	76	86	64	104	78	140	105	181	136
24	30	87	65	106	80	146	110	82	62	109	82	165	124	236	177
	35	91	69	111	83	153	115	93	70	120	90	178	134	246	185
	42	96	72	117	88	161	121	106	80	135	101	196	147	264	198
36	30	118	89	144	108	200	150	93	70	130	97	208	156	307	230
	35	124	93	151	113	210	158	108	81	146	109	227	170	322	242
	42	130	98	159	119	220	165	127	95	167	125	251	188	346	260
48	30	149	112	183	137	255	191	104	78	152	114	253	189	380	285
	35	156	117	192	144	268	201	123	93	173	129	277	208	399	299
	42	164	123	202	151	281	211	580	435	199	150	308	231	431	323
60	30	180	135	221	166	310	233	115	86	173	129	297	223	453	340
	35	189	142	232	174	326	244	139	104	198	149	327	245	477	357
	42	198	149	244	183	342	256	169	126	231	173	365	274	515	386

Notes:

1. "Building Width" is the width of the building parallel to the roof rafters.
2. Tabulated uplift forces are specified in pounds per linear foot of wall. To determine connection requirements, multiply the tabulated unit uplift load by the multiplier from the table below corresponding to the spacing of the connectors.

Connection spacing (inches)	12	16	24
Multiplier	1.00	1.33	2.00

3. Interpolation between mean roof height is permitted.
4. Interpolation between the spans is permitted.
5. For wind speeds not listed, use the higher value listed.
6. Corners are defined as 6 feet for building widths of 30 feet or less. For buildings greater than 30 feet in width, the distance is W/5, where W is the building width.
7. Building height is defined as the height in feet from the grade plane to the mean height of the highest roof surface.

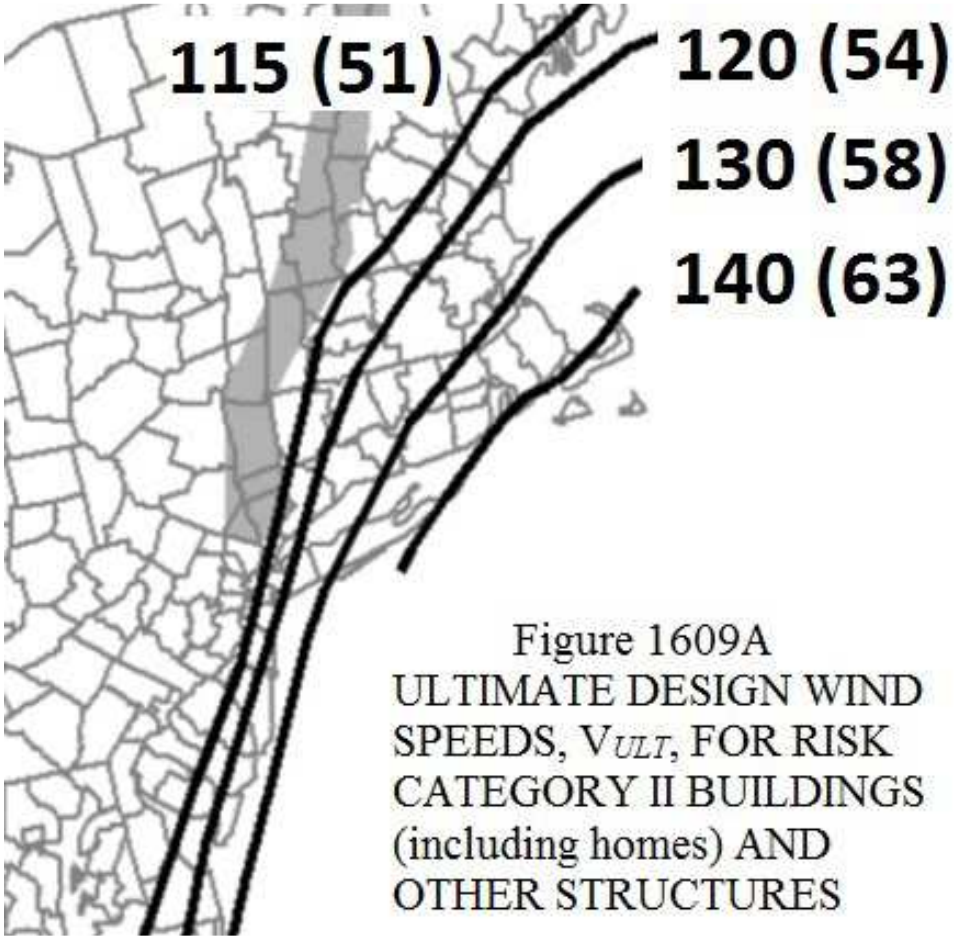

Figure 1609A
ULTIMATE DESIGN WIND SPEEDS, V_{ULT}, FOR RISK CATEGORY II BUILDINGS (including homes) AND OTHER STRUCTURES

(see Section 1609.4.3 of the IBC/2012)
Exposure D: From flat, unobstructed areas and water surfaces for a distance of 600 feet from the ocean or the bay.

Exposure C: From flat, unobstructed areas and water surfaces for a distance greater than 600 feet to 2600 feet from the ocean or the bay.

Exposure B: From flat, unobstructed areas and water surfaces for a distance greater than 2600 feet from the ocean or the bay.