WABO - SEAW WHITE PAPER
SNOW LOAD REGULATIONS AND ENGINEERING PRACTICES
WASHINGTON STATE
August 2000

BACKGROUND

In 1996, the Structural Engineers Association of Washington (SEAW) presented a seminar on snow load design at three locations in the State. The main purpose of the seminar was to introduce a new edition of the *SEAW Snow Load Analysis for Washington* to engineers and regulators. The first edition was published in 1975.

At the late 1996 seminar in SeaTac, an ad-hoc committee of members of the Seattle Chapter of SEAW conducted a panel discussion of issues related to the seminar, including snow load regulation. Much of the discussion focused on the lower elevation regions of the Puget Sound area. As a result of the panel discussion, it was recommended that SEAW and the Washington Association of Building Officials (WABO) attempt to bring more consistency to the design and review process relating to snow loads. A joint WABO-SEAW Ad Hoc Snow Load Committee (see Appendix III) was subsequently formed to consider snow load issues and to facilitate consistency of design and enforcement.

GOALS OF THE SNOW LOAD AD HOC COMMITEE

The Goals of the Ad Hoc Committee are to further regional understanding and consistency with respect to snow load design and enforcement practices on low-lying areas of the Puget Sound, and to document the results of the considerations in a White Paper which will be a resource tool available to members of the construction industry. Although the potential exists to use the information generated to consider code changes, the immediate Goals of the Committee do not extend to considering changes to the State Building Code.

CURRENT REGULATIONS

The Uniform Building Code (UBC) is the adopted model code in the State of Washington. In general, the provisions of the UBC (1994 Section 1605.4, 1997 Section 1614) require local jurisdictions to establish snow loads used in the design of structures constructed in the local community. The load that the UBC intends for local determination is a uniform load. In addition the UBC requires consideration of non-uniform accumulation due to potential drifting. This may appear non-specific, but the lack of data and numerous influencing variables, such as moisture, wind, elevation, temperature, geographic location, and proximity to large bodies of water, as well as variations in roof shapes and in the sizes and shapes of adjacent structures, together make state-wide adoption of specific loads and drift methodologies difficult. Lack of specificity of the Code helps cause an inherent lack of consistency from jurisdiction to jurisdiction as compared to more defined regulation. Furthermore, the design practices of private professional engineers vary considerably.

Appendix 1634 of the UBC (Append. Chapter 16 Div. I 1997 UBC) provides methods for calculating loads due to drifting snow. Generally, Appendix Chapters of the UBC are not adopted by the state; rather, they are left available for local jurisdictions to adopt if desired. Appendix Chapters contain regulations that have not been developed sufficiently to gain the standing necessary for incorporation into the main body of the code.

In some cases, individual jurisdictions have adopted ordinances that establish a specific local uniform snow load. In other cases, snow load requirements are developed by the local jurisdiction as written or unwritten policies.

OTHER RELATED ISSUES

For the construction of safe roof structures, other issues can be as important or more important than specificity in regulation. Examples include:

intent of the owner/developer - is the intent construction for a long-term capital investment, or is the focus minimum construction for immediate sale?

technical capabilities of the design engineer, the local plan reviewer and the inspector - is the engineer practicing in an area of expertise? does the jurisdiction have licensed engineers and certified inspectors on staff? does the jurisdiction as well as the design engineer have a continuous education plan?

lack of communication between the design engineer and those responsible for inspection regarding critical concerns - does the design engineer realize an inspector's time is limited? (10-15 inspections per day are common.) does the contract allow for field involvement by the design engineer?

staffing level of the local regulator- does the jurisdiction have budget to hire engineering staff and sufficient inspection staff?

contractor knowledge and understanding - does the contractor have a good line of communication with the engineer? does the contractor realize a seemingly small change in design or specification may not be equivalent but rather have long term impacts?

financial and economic pressures - are the terms of the construction contract so tight as to drive consideration of less than what was specified? is competition between manufactured products driving designs to be marginalized? are assumptions being made regarding a level of independent inspection that does not exist?

timely mechanisms for resolving conflicts between the regulator and the project designers - does time it takes obstruct getting the right answer and promote further gaps in communication?

perceived relative importance between different sizes and occupancies of structures - is the position of some jurisdictions justified that small car ports and storage buildings, etc. have lower priority for regulatory structural involvement than other larger and more highly occupied buildings?

THE *SEAW SNOW LOAD ANALYSIS FOR WASHINGTON*

There have been several publications developed over the last 30 years that address the statistical determination of snow loads for the design of buildings. These publications include the 1970 National Building Code of Canada, and manuals by Structural Engineers Associations in Oregon, Colorado, Idaho, and Washington. The latest version of the *SEAW Snow Load Analysis for Washington* incorporates many concepts from these previous publications.

Precipitation and snow depth data used in the *SEAW Snow Load Analysis for Washington* are based on measurements from the Soil Conservation Service and the National Weather Service. Density relationships have been developed in the various documents mentioned above. The Snow Load Analysis uses the Rocky Mountain Conversion Density relationship from a 1986 University of Idaho study. Basically, the relationship provides lower density at lesser snow depths and higher density at greater snow depths to account for accumulation effects. Snow depths are based on a Mean Recurrence Interval of 50 years with a Log Pearson Type III distribution.

SEAW's *Snow Load Analysis for Washington* provides a method to calculate basic ground snow load throughout the state from mapped information and elevations. Using the ground snow load and formulas found in UBC Appendix Chapter 16, one can then calculate the roof snow load, which for most buildings is less than the ground snow load. The Snow Load Analysis also contains a table in Appendix A of that document that provides a recommended **ground** snow load for various jurisdictions (see Appendix I this document). These recommended loads are appropriately higher than what one could calculate from known elevations and the isolines.

In the low-lying regions of Puget Sound, these recommended **ground** snow loads are commonly in the range of 15 to 25 psf. If one calculates roof snow loads by applying the UBC methodology (P_gxIxC_e) for common buildings, the associated roof snow loads would calculate to 10.5 to 17.5 psf.

The Analysis also provides examples which calculate drifted snow load based on methods outlined in the UBC Appendix. The methods use the ground snow load as a basis to determine the drift loads.

While it should be recognized that the Snow Load Analysis is the best resource available to help both the designer and the local building official determine local snow load requirements, it is, by itself, not a legally enforceable document. It was written solely to provide information about snow load design.

ISSUES WITH CURRENT REGULATIONS

Because of the lack of specificity in the State adopted code, design engineers can experience difficulties identifying specific local requirements. Because engineers tend to design structures in many different jurisdictions, they must seek this information on a job to job basis. They must maintain contacts, and hope that those contacts can provide information sufficient to prevent costly revisions during the permit application review and inspection of the building. During the preliminary stages of project development, the structural engineer provides information for estimates upon which financial and contractural decisions are based. Subsequent changes made during the permit process not only upset these decisions, but also consume time and money during resolution.

During a panel discussion at the SEAW's SeaTac seminar, the following issues were discussed, most of which relate to the low lying regions of Puget Sound:

- The confusion surrounding whether specified basic snow loads are ground snow or roof snow loads.

- The perception in some jurisdictions that the Snow Load Analysis is an enforceable document.

- A lack of clarity about which basic ground load source to use (the isoload maps or the various tables) and the limitations of each source as they relate to snow density.

- The variability of snow drift requirements between jurisdictions. At one end of the spectrum, drift considerations are not required by the local regulator, and are left to be determined by the design engineer. At the other end of the spectrum, drift considerations are required, including a multitude of calculations for different roof conditions and load cases.

- The variability of drift calculation assumptions (ground snow vs. roof snow, area of roof that accumulates snow, impact of adjacent structures, complex multiple roof shapes), which can result in widely varying loads and resulting roof structures.

- The discrepancies between the likelihood of significant drift conditions in low lying Puget Sound and the rationale providing the basis for drift recommendations found in the UBC and the Manual. The drift provisions of the UBC appear to be based on climates quite different than the low lying Puget Sound area. The primary difference is the amount of time the snow accumulates and drifts, which can be weeks to months in the central and eastern US and mountainous regions, but only several days in the Puget Sound area.

SURVEY OF CURRENT SNOW LOAD PROVISIONS

Prior to the SeaTac seminar, various building departments were surveyed informally over the phone, which helped generate some of the discussion at the seminar. While the decision to proceed with the WABO-SEAW Ad Hoc Committee occurred before the 1996 December/1997 January storm (the Holiday Storm), the storm caused the Committee to proceed with a more formal survey of all the building officials in the State. In the winter of 1997, this survey was sent to a total of 85 towns, 192 cities, and 39 counties, and response was received from 14 towns, 90 cities, and 27 counties. A copy of the survey results is found in the Appendix II of this paper.

The survey asked jurisdictions questions relating to the uniform load used, drift enforcement practices, local amendments, and use of the SEAW Analysis. It is of note that most jurisdictions reported using at least 20 psf. With the bulk using 25-psf. uniform roof snow load.

FEMA/SEAW STORM DAMAGE EVALUATION RESULTS

The Holiday storm caused much damaged around Puget Sound as well as in regions beyond Puget Sound, particularly on the east side of the Cascade Mountain Range, and in the south central regions of the state. The Holiday storm injected a need for consideration well beyond this White Paper, and indeed, the Seattle Chapter of SEAW joined with the Federal Emergency Management Agency (FEMA) to write a report on the resulting damage in Washington. The report includes a description of the weather event, the general extent of damage, a survey of building departments, as well as case studies of various types of structures, which experienced failure.

The report was published in June of 1998, titled An Analysis of Building Structural Failures Due to the Holiday SnowStorms. This document and this White Paper are obviously closely related, and reading SEAW/FEMA's Analysis is recommended reading.

REGIONS COVERED BY WHITE PAPER

The initial purpose of the Snow Load Ad Hoc Committee, was to consider problems relating to snow load regulation and design in King, Pierce, and Snohomish Counties, and to develop a White Paper acceptable to both organizations, that may include recommendations for enforcement and design practices relating to snow loads.

A great deal of Committee discussion occurred about the vertical and lateral boundaries of "low lying Puget Sound". Greater boundaries provide more information to a larger area and therefore to more future construction projects. On the other hand, effects of local weather conditions such as the Fraser River Valley to the north in B.C., areas immediately east of the Olympic Range, and the Columbia River area to the south are not as well known or understood, particularly with respect to wind and density of the falling snow, and thus argue for limited boundaries. While limiting the boundaries simplifies recommendations, the Committee decided to expand the boundaries to include a wider region of the state west of the Cascades Range.

SUMMARY OF FINDINGS

After considering the information provided by the WABO survey, the FEMA/SEAW joint effort, and the experience of committee members, the Committee established the following findings:

- The climates are similar enough in the low-lying areas of western Washington that it is reasonable to establish a consistent specification, and consistency benefits, designers, building officials, as well as the forest product industry...
- The historic approach of uniform snow loads has provided acceptable performance.
- The historic uniform load approach keeps the design and review process straightforward.
- The drift provisions found in the reference documents were developed for significantly different climates and are questionable for the Puget Sound.
- Based on the SEAW/FEMA a joint effort, recent storm damage was not related to drifting.
- Consideration should be given for conditions resulting from a rain storm following a snow storm (rain on snow effect), on flat or near flat roofs- the UBC Appendix chapter suggests 5 psf. For roofs less that ½:12 slope.

RECOMMENDATIONS

1. In low lying areas between the Cascades and the coastal mountains of western Washington, it is recommended that all roof structures be designed for a minimum uniform roof snow load of 25 psf. However, this should not preclude certain jurisdictions from adopting a more conservative loading if historical data supports such, due to localized weather phenomenon or particular geographical features.

2. For the purposes of the 25 psf recommendation and the effects of drift, low lying areas are defined areas in jurisdictions that have a recommended ground snow load of 25 psf or less in Appendix A of the 1996 *SEAW Snow Load Analysis for Washington*. (Note that this is typically conservative in comparison the method outlined in UBC Appendix and the SEAW Analysis where a 30% reduction is commonly applied to the ground snow load to determine roof snow load).

3. In low-lying areas of Puget Sound as described in item 2, there is not a significant enough concern about drift to warrant proactive regulatory enforcement by the local jurisdiction. In some unusual cases (such as buildings with a UBC Importance Factor greater than 1), it may be appropriate for the design engineer to consider the effects of drift and the possibility of snow sliding off steep, upper roofs onto lower ones. However, the method for considering drift (UBC Appendix or *SEAW Snow Load Analysis for Washington*) requires significant judgement which should generally fall within the realm of the design engineer, rather than become part of proactive jurisdiction enforcement.

4. To account for the potential of rain on snow effects in low-lying area, it is recommended that an additional uniform load of 5 psf for roofs with a slope of less than 5 degrees be further studied. (Note: this was a topic where the Ad Hoc Committee did not gain consensus and therefore the "further study" recommendation; this should not be enforced by local jurisdictions based on this Paper unless specifically adopted under ordinance, with consensus on a regional basis with broad industry involvement).

5. It is recommended that those jurisdictions in low-lying regions that do not have a specific written ordinance on snow loads adopt one.

APPENDIX I

SEAW SNOW LOAD ANALYSIS - APPENDIX A

GROUND SNOW LOADS

COUNTY / City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
1. ADAMS		
Lind	1390	20
Othello	1038	17
* Ritzville	1825	18
Washtucna	1024	15
2. ASOTIN		
Anatone	3570	120
* Asotin	770	22
Clarkston	820	20
3. BENTON		
Benton City	494	15
Kennewick	400	15
* Prosser	665	15
Plymouth	289	15
Richland	359	15
4. CHELAN		
Ardenvoir	1280	81
Blewett	2320 [3]	95
Chelan	1130	45
Entiat	800	40
Holden	3224	221
Lake Wenatchee	1868	160
Leavenworth	1180	120
Peshastin	1010	55
Plain	1870	122
Stehekin	1120	165
Stevens Pass Ski Area	4060 [3]	400
* Wenatchee	780	22
5. CLALLAM		
Fairholm	600 [3]	53
Forks	300	36
La Push	10	30
Neah Bay	20	15
* Port Angeles	32	20
Sekiu	80	40
Sequim	183	20
6. CLARK		
Amboy	400	25
Battle Ground	295	16
Camas	150	20
Orchards	230	20
* Vancouver	150	20
Washougal	65	20

GROUND SNOW LOADS

COUNTY / City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
7. COLUMBIA		
* Dayton	1613	25
Starbuck	645	15
8. COWLITZ		
Castle Rock	50	19
Kalama	210	24
* Kelso	80	18
Longview	21	18
Toutle	492 [3]	34
9. DOUGLAS		
Bridgeport	829	36
East Wenatchee	800	22
Mansfield	2262	57
Rock Island	650	25
* Waterville	2622	88
10. FERRY		
Curlew	1800	50
Inchelium	1560	112
Keller	1498	23
Laurier	1645 [3]	86
* Republic	2600	54
11. FRANKLIN		
Connell	840	15
Kahlotus	901	18
* Pasco	383	15
12. GARFIELD		
* Pomeroy	1855	28
13. GRANT		
Coulee City	1585	24
* Ephrata	1250	24
Grand Coulee	1640	18
Hartline	1905	29
Mattawa	778	15
Moses Lake	1060	15
Quincy	1295	34
Soap Lake	1074	20
Warden	1305	18

GROUND SNOW LOADS

COUNTY City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
14. GRAYS HARBOR		
Aberdeen	10	15
Elma	50	18
Hoquiam	20	15
Humptulips	131	28
McCleary	257	18
* Montesano	66	15
Oakville	90	15
Ocean Shores	10	15
Quinault	221	45
Taholah	17	30
Westport	12	15
15. ISLAND		
* Coupeville	80	17
Freeland	110	15
Oak Harbor	120	17
16. JEFFERSON		
Brinnon	77	30
Leland	200 [3]	30
* Port Townsend	120	20
Queets	30	30
Quilcene	20	25
17. KING		
Auburn	85	20
Bellevue	100	20
Bothell	90	20
Black Diamond	650	24
Carnation	75	25
Duvall	140	25
Enumclaw	720	25
Fall City	90	30
Humphrey	1200 [3]	84
Issaquah	100 [3]	20
Kent	50	20
Kirkland	180	20
Lester	1620	100
North Bend	442	33
Palmer	880 [3]	55
Renton	15	20
* Seattle	350	20
Skykomish	931	80
Stevens Pass Ski Area	4060 [3]	400
Vashon Island	375	17
18. KITSAP		
Bremerton	100	15
* Port Orchard	140	15
Poulsbo	15	18

GROUND SNOW LOADS

COUNTY City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
19. KITTITAS		
Cle Elum	1905	88
Easton	2160	150
* Ellensburg	1540	34
Kittitas	1647	37
Lake CleElum	2223	188
Lake Kachess	2260	227
Lake Keechelus	2517	320
Liberty	2680	92
Roslyn	2280	130
Snoqualmie Pass Ski Area	3000	433
Vantage	640 [3]	18
Wymer	1300 [3]	29
20. KLICKITAT		
Appleton	2308	104
Bickleton	3020	31
Centerville	1605	41
Glenwood	1895	108
* Goldendale	1633	20
Klickitat	447	45
Lyle	140	45
Satus Pass	3146	120
Trout Lake	1900	166
White Salmon	640	52
Wishram	180	36
21. LEWIS		
Centralia	189	20
* Chehalis	226	20
Mineral	1770	88
Morton	940	57
Mossyrock	698	34
Onalaska	505	25
Packwood	1051	100
Pe Ell	412	34
Randle	880	78
Toledo	110	19
Vader	175	19
22. LINCOLN		
* Davenport	2369	56
Harrington	2140	41
Odessa	1544	23
Reardan	2496	37
Sprague	1899	34
Wilbur	2163	32

GROUND SNOW LOADS

COUNTY City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
23. MASON		
Belfair	43	15
Lake Cushman	733	114
Hoodsport	40	30
Lilliwaup	10	30
Matlock	443 [3]	48
* Shelton	6	22
24. OKANOGAN		
Brewster	820	33
Conconully	2300	61
Coulee Dam	1145	18
Mazama	2111 [3]	105
Methow	1153	49
Nespelem	1820	29
* Okanogan	860	25
Omak	837	25
Oroville	930	29
Tonasket	940	25
Twisp	1614	64
Winthrop	1760	91
25. PACIFIC		
Ilwaco	11	15
Lebam	190	15
Long Beach	10	15
Naselle	12	15
Raymond	14	15
* South Bend	80	15
26. PEND OREILLE		
Cusick	2050	68
Ione	2090	63
Metaline Falls	2100	70
* Newport	2166	80
27. PIERCE		
Ashford	1770	150
Buckley	726	18
Carbonado	1180	60
Chinook Pass	5432 [3]	760
Crystal Mountain Ski Area	4380	438
DuPont	245	15
Eatonville	810	15
Elbe	1211	99
Greenwater	1720	118
Kapowsin	629	35
McMillin Reservoir	580 [3]	18
Longmire	2757	193
Orting	215	18
Paradise	5440 [3]	600
Puyallup	40	18

GROUND SNOW LOADS

COUNTY City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
27. PIERCE (continued)		
Roy	310	18
Sunrise	6385	760
* Tacoma	380	21
28. SAN JUAN		
Deer Harbor	60 [3]	20
* Friday Harbor	91	20
Lopez	40 [3]	20
Olga	60 [3]	20
Orcas	60	20
Roche Harbor	55	20
Rosario	90	20
29. SKAGIT		
Anacortes	100	15
Blanchard	5	17
Burlington	30	17
Concrete	435	57
La Conner	50	15
Lyman	86 [3]	21
Marblemount	310	60
McMurray	280	17
* Mount Vernon	180	15
Rockport	275	50
Sedro Woolley	55	15
30. SKAMANIA		
Carson	520	50
North Bonneville	57	50
Skamania	55	50
Spirit Lake	3198	384
Stabler	947	171
* Stevenson	103	50
Willard	1260	73
31. SNOHOMISH		
Arlington	120	17
Darrington	549	110
* Everett	110	15
Index	532	37
Granite Falls	391	18
Marysville	20	16
Monroe	55	19
Monte Cristo	2756 [3]	220
Mountain Terrace	440	20
Oso	200 [3]	20
Silverton	1520 [3]	114
Stanwood	5	15
Startup	140	18
Sultan	114	18
Verlot/Robe	1000 [3]	60

GROUND SNOW LOADS

COUNTY City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
32. SPOKANE		
Cheney	2400	36
Deer Park	2130	59
Medical Lake	2420	36
Mount Spokane		
Ski Area Bottom	4600 [3]	120
Top	5800 [3]	151
* Spokane	2000	39
Rockford	2361	32
33. STEVENS		
Boundary	1400 [3]	48
Chewelah	1671	50
* Colville	1610 [3]	46
Hunters	1560 [3]	64
Kettle Falls	1625	45
Northport	1328 [3]	47
Springdale	2070	56
Wellpinit	2400	80
34. THURSTON		
Littlerock	150	15
* Olympia	130	15
Rochester	60	15
Tenino	290	15
Tumwater	220	15
Vail	464 [3]	22
Yelm	340	18
35. WAHKIAKUM		
* Cathlamet	53	22
Grays River	27	15
Skamokawa	26	15
36. WALLA WALLA		
Attalia	380 [3]	15
Waitsburg	1260	30
* Walla Walla	1000	18

GROUND SNOW LOADS

COUNTY City	Elevation[1] (FT)	Recommended Ground Snow Load[2] (PSF)
37. WHATCOM		
Acme	310	22
* Bellingham	100	15
Blaine	45	16
Deming	210	24
Diablo	910	100
Ferndale	60	20
Glacier	900	74
Lawrence	145 [3]	24
Lynden	103	24
Maple Falls	643	77
Mt. Baker Ski Area	4200 [3]	588
Newhalem	510	129
Nooksack	84	24
Sumas	36	24
Wickersham	310	28
38. WHITMAN		
* Colfax	1962	26
Lacrosse	1481	15
Palouse	2426	36
Pullman	2400	30
Rosalia	2232	36
St. John	1980 [3]	41
Tekoa	2494	39
39. YAKIMA		
American River	2800	165
Goose Prairie	3266	172
Grandview	800 [3]	15
Naches	1470	38
Rimrock Lake	2950	110
Sunnyside	770	15
Toppenish	760	17
Wapato	855	17
White Swan	973	37
White Pass Ski Area	4720	244
* Yakima	1066	19

* Denotes County Seat

1 Source unless noted: U. S. Geological Survey, Geographic Names Information System, U.S.G.S. Earth Science Information Center, Spokane, WA.

2 In no case should the roof design live load be less than the minimum as required by the *1994 Uniform Building Code* Section 1605 nor less than required by the local Building Official.

3 Source of elevation: U.S.G.S. map per U.S.G.S. Earth Science Information Center, Spokane, WA.

APPENDIX II- WABO STORM DAMAGE SURVEY[1]

Of statewide responses reporting a single snow load requirement including the county double count, the following is an approximate distribution of loads, psf:

Snow load, psf	0	15	20	25	30	32	35	40	50	60	72
No. Of jurisdictions	1	1	17	57	23	2	4	4	3	1	1

Of statewide responses reporting including county double count, the following relate to the drift related enforcement:

no. perceiving drift as problem / total responding	yes	25 / 131
	no	103 /131
no. having drift operating policies / total responding	yes	15 / 131
	no	111 /131
no. requiring drift considerations / total responding	yes	57 / 131
	no	69 / 131

Of the statewide responses reporting including county double count, the following relates to formal amendment and policies relating to specific snow load requirements:

no. with local amend. specifying snow load / total resp.	yes	15 /131
	no	112/131
if no local amend., how many have handout / total resp.	yes	26 /131
	no	92 / 131
no. using Manual as a resource document / total resp.	yes	53 /131
	no	67/131
no. holding applicant accountable to Manual / total	yes	32 /131
	no	67 /131

Of the statewide responses including county double count, the following relate to local failures from the storm:

no. of failures

carports	498
boat storage	51
commercial	230
prefabricated	109
mobile home	136
other	525
other	350

[1] Note that this was a statewide survey, and although it provides good information, it should not be considered professional. The term “double count” relates to the fact that the relationship between some counties and the included jurisdictions with respect to snow load regulation is not known.

Of the statewide responses including county double count, the following relate to building official perceptions of needed attention for improved building product relative to snow loads:

no. perceive. drains as major contributor / total resp.	yes	27/131
	no	73/131
current status quo is OK, recent damage was due to unique storm	yes	66/131
	no	34/131

range of importance (0= not important - 4 = very important)	0	1	2	3	4
potential improvements / number of jurisdiction					
better engineering is needed	10	19	42	24	15
better construction is needed	10	8	31	36	25
increased building to approved plans is needed	11	7	25	19	45
improved technical knowledge	5	5	19	39	43
better enforcement					
plan review	18	11	26	33	22
inspection	17	12	24	35	21
more regional enforcement uniformity	10	13	28	16	42
increase the code standards	23	27	19	18	21

APPENDIX III

SEAW / WABO AD HOC COMMITTEE

CHAIR

Tom Kinsman	Seattle

ICBO

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WABO

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