STATE OF HAWAII

DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES

UNIFORM STATEWIDE BUILDING CODE TASK FORCE

REPORT AND RECOMMENDATIONS TO THE HAWAII LEGISLATURE

SUBMITTED TO

THE TWENTY-THIRD STATE LEGISLATURE

IN RESPONSE TO SENATE CONCURRENT RESOLUTION NUMBER 17,

REGULAR SESSION OF 2005

UNIFORM STATEWIDE BUILDING CODE TASK FORCE
REPORT AND RECOMMENDATIONS TO THE HAWAII LEGISLATURE

December 9, 2005

PURPOSE OF THIS REPORT

The 2005 Hawaii State Legislature requested the convening of a Uniform Statewide Building Code Task Force to explore the establishment of a Uniform Statewide Building Code and to make recommendations pertaining to its adoption. Senate Concurrent Resolution 17, included as Exhibit I to this report, called for the Department of Accounting and General Services to assemble this Task Force.

COMPOSITION OF THE TASK FORCE

In accordance with Senate Concurrent Resolution Number 17, the Task Force was comprised of 14 members representing the four county building departments, the building construction industry, design professional organizations (architects and structural engineers), the insurance industry, the realtor industry, State Fire Council, and a licensed architect with expertise in indigenous architecture. Exhibit II lists the individual members of the Task Force.

HISTORICAL BACKGROUND

Throughout the state's history, the counties have adopted model building codes on independent schedules. The counties have on many occasions skipped several consecutive updates of the codes. As a result, it has been common for two or three different versions of the building code to be in simultaneous use in Hawaii. There were only two years in the past 30 when a single model building code was briefly applicable within the four counties statewide by coincidence. (See Exhibits III and IV.) Other State regulations governing building construction were updated even less frequently, adding to the complexity. Because of the more timely adoption of building code and standards by federal agencies, yet another set of code provisions have typically been added to those applicable to the design and construction industry in Hawaii. As a result, the design, construction, realtor, and insurance industry in Hawaii have worked in a fragmented regulatory environment.

There are major differences in the life safety provisions of the older legacy codes and the modern model codes. Very significant variations in the design provisions exist, particularly with respect to resistance to fire safety, earthquake, hurricane, tsunami, and flood events. The older code provisions do not utilize the lessons learned from recent past natural disasters, and they do not include improvements made to address those public safety issues. Outdated codes do not reflect current national consensus standards nor the present state of knowledge of local conditions impacting the design and construction of buildings.

The implementation of up-to-date building codes and standards helps reduce losses from disasters and thus strengthens the frontline defense of pre-disaster hazard mitigation. Communities that have modern, well-enforced codes and standards have sustained less damage during major disasters and are able to recover more quickly. In addition, there have been many design provisions recently developed that affect the economy of construction materials. As of this report's date, federal agencies and 90% of the states have modernized their building codes, mostly through adopting statewide codes. Hawaii should also update its building codes.

RECOMMENDATIONS

The purpose of the recommendations of the Task Force formed under Senate Concurrent Resolution Number 17 is to promote the health, safety, and welfare of the occupants or users of buildings and structures and the general public through the adoption of a statewide model building code. The specific recommendations determined by a consensus of the Task Force are as follows:

1. There should be a coordinated set of comprehensive statewide model building codes based on nationally published codes or standards that are applicable to one and two family dwellings, all other residential uses, and commercial, industrial, institutional and State-owned buildings.

2. The statewide model building codes should encompass the following
   - Building code
   - Residential code
   - Fire code
   - Elevator code
   - Electrical code
   - Plumbing code
   - Mechanical code
   - Energy code
   - Private sewage disposal regulations

3. It should be noted that several of the building regulations that definitely need to be modernized, updated, and coordinated within a statewide model building code include those now independently established by several State agencies and not the Counties. The state building regulations are those governing fire, elevator, mechanical, and private sewage disposal. Therefore, the State has an interest and responsibility to participate and contribute to this effort in order for it to be successful.

4. The statewide model building codes would apply to all State departments and agencies. The statewide model building code shall be applicable to the construction of all buildings and structures owned by the State.

5. A State Building Code Commission should be established, comprised of nine (9) voting members and one (1) non voting member from:
   a. Four county building officials
   b. One member representing the State Fire Council
   c. One member representing the Department of Health
   d. One member representing the Department of Labor and Industrial Relations
   e. One member from each of the following professional organizations:
      1. American Institute of Architects Hawaii State Council
      2. Structural Engineers Association of Hawaii
   f. Non-Voting Member: The Director of the State executive department under which the Commission is attached.

Members shall not be compensated but shall receive reimbursement for travel and incidental expenses directly related to their service.

6. The Commission should be attached to a State executive department that has a responsibility or vested interest in building performance and/or the public safety of buildings.

7. The statewide model building codes should be reviewed and adopted by the State Building Code Commission within a year after the published date of the new model codes by the appropriate issuing organization.

8. A Technical Advisory Committee should be comprised of the four county building officials or their designees. This committee would be responsible for drafting amendments to the statewide model building code. Amendments to be recommended to the Commission for adoption would require the unanimous agreement of all four county building officials or their designees on this committee.

9. The Commission may have other investigative committees which would:
    - Perform analysis and make recommendations on building code adoptions/actions to the Commission.
    - May be formed to serve as a specialized technical committee for each type of building code cited in Recommendation No. 2.
    - Comprised of county building department staff, fire, trade and design professionals, and other stakeholders at the discretion of the Commission, and which may include members of the Commission.

10. The Commission should serve as a clearinghouse for information and common issues which cross jurisdictional lines.

11. Understanding that each county has some unique characteristics, each county must have the authority to amend the statewide building code as long as the amendments are consistent with the purpose and scope of the statewide model building code. The governing body of each county would be authorized to amend the statewide model building code as it applies within the jurisdiction of the county.

12. The counties would have two years after the adoption date of the statewide model building codes by the Commission to adopt county-specific amendments. If the counties do not amend the statewide model codes within the two-year timeframe, then the codes adopted by the Commission would become applicable as the county building code.

13. The State and counties would retain the administrative, permitting, and enforcement responsibilities they currently have.

14. The Commission would require the following staff, to be selected and appointed by the Commission:

- Executive director (with a background of experience in engineering or architecture)
- Administrative support position serving the Executive Director and the Commission (with a background in State statutes and administrative rules)

15. The Commission would require State funding for the following areas:
    - Personal services (i.e., salaries) for the Commission's staff
    - Expenses for
      a. Office supplies and operating expenses/technical references/equipment
      b. Inter-island Travel
      c. Professional services for research studies and technical expertise, etc.
      d. Technical training at the State and County levels relating to updated codes

16. County building departments would require additional State funding to implement and enforce the statewide building codes within the specified adoption deadlines.

17. The statewide model building code is not intended to prohibit indigenous Hawaiian buildings. Rather, the issue of exemption from the building code or amendments to the building code for indigenous buildings should be addressed by the individual counties (see Exhibit VII).

PROS AND CONS OF A STATEWIDE MODEL BUILDING CODE

The following lists identify the potential positive and negative implications of the establishment of a statewide model building code.

Potential Advantages – A Statewide Building Code:

1. Will produce quicker response in adopting better life safety provisions.
2. Will mitigate economic losses and casualties from future natural disasters, such as fires, tsunamis, earthquakes, floods, and hurricanes (see Exhibits VIII and IX).
3. Will create one uniform code that substantially unifies both state and county codes and standards, and this would promote efficiency in adoption and the overall simplification of statewide use.
4. Will result in more timely and predictable adoption of new codes that include performance standards and requirements for construction and construction materials, consistent with modern accepted standards of engineering, fire and life safety of statewide interest.
5. Will help to ensure all related codes are updated and adopted concurrently, avoiding contradictory or confusing layers of regulation. This would eliminate restrictive, obsolete, conflicting, duplicating and unnecessary regulations and requirements which could unnecessarily increase construction costs or retard the use of new materials and methods of installation or provide unwarranted preferential treatment to types or classes of materials or products or methods of construction. (See Exhibit V.)
6. Will permit the use of modern technical methods, devices and improvements that should lead to greater economy.

7. By adopting a consistent statewide building code that will replace the current fragmented codes, a more favorable property insurance and reinsurance market is created that reflects reduced expected losses in the future (Exhibit VI).
8. Will help ensure compliance with State and County Hazard Mitigation Plans and National Flood Insurance Program requirements mandated by the federal government.
9. Can result in a more efficient process with overall economy of total effort in code adoption.
10. Should provide an increased level of technical support to the Counties of Hawaii, Maui, and Kauai, which for reasons of population base, have historically not had sufficient funds to conduct code evaluation research to a level equivalent to the City & County of Honolulu, and have not been able to adopt codes on a consistent periodic basis.

Potential Disadvantages / Impediments to Success:

1. This would create another government layer in the building code adoption process.
2. Although the conditions affecting construction in Hawaii are nearly identical, the statewide model building code cannot address all special conditions or technical needs that are unique to a county.
3. The county building departments have expressed some concern over the speed in which a statewide model building code would be required to be locally adopted.
4. Unless addressed in accordance with the recommendations of this report, the counties would not have adequate funding for the added effort of more frequent updates and training to enforce a statewide code.
5. Without funding for the statewide building code Commission, there will be inadequate staffing and support to achieve the benefits of a statewide building code. This could also result in a shifting of responsibilities to the counties, further burdening the county building departments with additional workload but without sufficient funding, which could reduce their level of response to permitting applications.

COMPARISON WITH OTHER STATES

Over forty states have adopted a statewide building code, nearly all using codes from the International Code Council, which has major improvements in life safety provisions. The Task Force reviewed the laws, responsibilities, and composition of some other states which have adopted a statewide building code. There is a wide range of implementation mechanisms used, varying significantly in the scopes of authority given to the state and local governmental entities. (See Exhibit X for some examples.) The structure and responsibilities of the Commission proposed by this Task Force are similar in some respects to the Washington State Building Code Council (WA SBCC). The Task Force selected the WA SBCC as a reference because it emphasizes local county code adoption and administration, resulting in a small state staff supporting the process, while focusing on the protection of life safety and public health through updated building codes.

Key characteristics of the WA SBCC are as follows:

1. The WA SBCC is a rulemaking agency only and is comprised of 19 commission members supported by a permanent staff of three (Managing Director, Codes Staff, and Secretary).
2. The WA SBCC also utilizes technical or advisory committees in support of its activities.

3. All codes are administered, interpreted and enforced locally. The state agency has no enforcement authority to require a particular application or to provide interpretation of the building code.
4. Local programs can amend the codes to be more restrictive than the state adopted code.
5. Every local city and county in Washington must adopt and enforce the state codes.
6. Each local jurisdiction determines its own training requirements for employees.
7. Cities and counties gain approval by the WA SBCC to change the building code that applies to buildings with four dwelling units or fewer.

A significant difference between the WA SBCC and these Task Force recommendations is that the counties in Hawaii would benefit from "home rule" and would not need approval by the Commission to make necessary amendments to the statewide model building codes. The Task Force also believes that the building code Commission should be of a smaller, efficient size that is more appropriate for a state with four counties.

SUMMARY

After careful consideration of the potential positive and negative implications, the Uniform Statewide Building Code Task Force unanimously recommends that a Statewide Model Building Code be established, and requests that the consensus-based recommendations regarding the means of its implementation be reported to the 2006 Hawaii State Legislature by the Department of Accounting and General Services, and the Task Force furthermore requests that the Department offer its assistance towards that establishment.

EXHIBITS

Exhibit Description	Exhibit No.
Senate Concurrent Resolution 17, State Legislature of 2005	I
Task Force Member Listing	II
Table of Currently Used Building Codes in Hawaii	III
Impacts of statewide model building codes from:	
Structural Engineers Association of Hawaii	IV
General Contractors Association of Hawaii and the Building Industry Association	V
Insurance Industry	VI
Recommendation on Indigenous Hawaiian Architecture	VII
Hurricane Hazard and Building Codes in Hawaii	VIII
Building Code Adoption Timeliness as a Hazard Mitigation Tool	IX
Comparison of other states that have adopted Statewide Building Codes	X

This report in response to Senate Concurrent Resolution 17 of the 2005 Legislature of the State of Hawaii is issued with the unanimous approval of the Task Force on December 9, 2005

	Timothy Hiu
for	Brian Kajikawa
	Douglas Haigh
	Ralph Nagamine
	Lloyd Rogers
	Rodney Yamamoto
	Clark Morgan
	Mary Begier
	Sue Savio
	William Brizee
	Gary Chock
	Ernest Fukeda
	Jeff Ball
	Daniel Chun

THE SENATE

TWENTY-THIRD LEGISLATURE, 2005

STATE OF HAWAII

S.C.R. NO. 17 S.D. 2

SENATE CONCURRENT RESOLUTION

REQUESTING the convening of a task force to consider THE ESTABLISHMENT OF A UNIFORM STATEWIDE BUILDING CODE.

WHEREAS, the State of Hawaii has traditionally allowed the individual counties to establish their own building codes; and

WHEREAS, the counties have adopted various portions of the Uniform Building Code, but the code differs from county to county; and

WHEREAS, the status of fragmented building requirements in Hawaii is of serious concern to those involved in building ownership and design; and

WHEREAS, over forty states have adopted some form of a statewide building code; and

WHEREAS, the conditions affecting construction are nearly identical throughout the State; and

WHEREAS, the adoption of a uniform set of statewide building codes applicable to one and two family dwellings, all other residential uses, and commercial and industrial buildings would make it possible for building owners, designers, contractors, and code enforcers within the State to apply one set of standards; and

WHEREAS, international building codes are currently being considered for adoption by several counties; and

WHEREAS, the health and safety considerations related to these codes are of statewide interest; now, therefore,

BE IT RESOLVED by the Senate of the Twenty-third Legislature of the State of Hawaii, Regular Session of 2005, the House of Representatives concurring, that the Department of Accounting and General Services is requested to convene a Uniform Statewide Building Code Task Force (Task Force) to consider the establishment of a uniform statewide building code in Hawaii, to include elements of indigenous architecture; and

BE IT FURTHER RESOLVED that the Task Force is requested to explore the establishment of a statewide building code, including elements of indigenous architecture, applicable to one and two family dwellings, all other residential uses, and commercial and industrial buildings, and make recommendations pertaining to the adoption of a uniform building code for the State of Hawaii; and

BE IT FURTHER RESOLVED that the Task Force membership is requested to include:

(1) The building department directors of the counties of Kauai, Maui, and Hawaii, and the City and County of Honolulu, or their designees;

(2) One person appointed by the State Fire Council; and

(3) One person appointed by each of the following organizations:

(A) Building Industry Association of Hawaii;

(B) General Contractors Association of Hawaii;

(C) Hawaii Association of Realtors;

(D) Hawaii Independent Insurance Agents Association;

(E) American Institute of Architects Hawaii State Council; and

(F) Structural Engineers Association of Hawaii;

(4) One person appointed by the Insurance Commissioner representing an insurer that writes at least twenty per cent of the Hawaii homeowners insurance market;

(5) One person appointed by the Insurance Commissioner representing an insurer that writes less than twenty per cent of the Hawaii homeowners insurance market; and

(6) One person appointed by the Governor who is a licensed architect with expertise in indigenous architecture; and

BE IT FURTHER RESOLVED that the Task Force members are requested to serve on a voluntary basis and to assume responsibility for any costs associated with their participation on the Task Force; and

BE IT FURTHER RESOLVED that the Department of Accounting and General Services is requested to submit a report to the Legislature no later than twenty days prior to the convening of the Regular Session of 2006, outlining the positive and negative implications of the establishment of a statewide building code; and

BE IT FURTHER RESOLVED that certified copies of this Concurrent Resolution be transmitted to the Governor, the Comptroller, the directors of the building departments of the counties of Kauai, Maui, and Hawaii, and the City and County of Honolulu, the State Fire Council, the Building Industry Association of Hawaii, the General Contractors Association of Hawaii, the Hawaii Association of Realtors, the Hawaii Independent Insurance Agents Association, the American Institute of Architects Hawaii State Council, the Structural Engineers Association of Hawaii, and the Insurance Commissioner.

Report Title:

Uniform Statewide Building Code Task Force

Exhibit II

UNIFORM BUILDING CODE TASK FORCE
MEMBER LISTING

Name of Attendee	Organization
Timothy F. T. Hiu	City & County of Honolulu Department of Planning & Permitting Building Division
Brian Y. Kajikawa	County of Hawaii Department of Public Works Building Division
Douglas Haigh, P.E.	County of Kauai Department of Public Works Building Division
Ralph M. Nagamine	County of Maui Department of Public Works and Environmental Management Development Services Administration
Lloyd D. Rogers	State Fire Council (DLIR)
Rodney T. Yamamoto	Building Industry Association of Hawaii
Clark B. Morgan	General Contractors Association of Hawaii
Mary Begier	Hawaii Association of Realtors
Sue Savio	Hawaii Independent Insurance Agents Association
William A. Brizee, AIA	American Institute of Architects, Honolulu Chapter
Gary Chock	Structural Engineers Association of Hawaii
Ernest Fukeda	The Hawaiian Insurance & Guaranty Co., Ltd.
Jeff Ball	State Farm Insurance Companies
Daniel Chun	Kauahikaua & Chun/Architects

UNIFORM STATEWIDE BUILDING CODE TASK FORCE

EXISTING BUILDING CODES IN USE

	HONOLULU CITY & COUNTY	MAUI	KAUAI	HAWAII
BUILDING	UBC 1997 with Amendments	UBC 1997 with Amendments 1986 Housing Code	UBC 1997 with Amendments	Current UBC 1991
ELECTRIC	NEC 2002	NEC 1999 with Amendment	NEC 1999	Current NEC 1993
MECHANICAL	UPC 1997 with Amendments	UPC 1991 with Amendments	UPC 1997	Current UPC 1991
FIRE	UFC 1997 with Amendments	Chapter 16.04 Fire Code UFC 1988 with Amendments Chapter 132 HRS	UFC 1997 with Amendments	UFC 1988 Current

Exhibit IV

Information on the History of Building Code Adoptions by the Counties and Resulting Variances in Design and Construction Standards

Gary Chock
Structural Engineers Association of Hawaii

December 2005

Executive Summary
Current Code Status by County
Historical Code Adoption History
Historical Occurrences of Multiple Codes in Simultaneous Use
Historical Code Developments of Particular Relevance to Structural Engineers
(1991 to 2003 codes)
Federal Agencies
Current Code Adoptions by State

Executive Summary

This exhibit furnishes information on the history and status of the building codes adopted by the counties in the State of Hawaii. Throughout the state's history, the counties have adopted model building codes on independent schedules, and counties have on occasion skipped several consecutive 3-year updates of the codes. As a result, it has been common for two or three editions of the building code to be in simultaneous use in Hawaii. There were only two years in the past 30 when a single model building code was briefly applicable within the four counties state-wide by coincidence. Other State regulations governing building construction were updated even less frequently, adding to the complexity. Because of the more timely adoption of building code and standards by federal agencies, yet another set of code provisions have typically been added to those applicable to the design and construction industry in Hawaii.

An examination is made of the major differences in the structural provisions of the 1991, 1994, 1997 Uniform Building Codes (UBC) and the 2003 International Building Code (IBC) and International Residential Code (IRC). The 1991 UBC (Hawaii), 1997 UBC (Maui, Honolulu, and Kauai), and 2003 IBC (federal) are currently applicable in the State. Very significant variations in the design provisions exist, particularly with respect to resistance to earthquake and hurricane events. The older code provisions do not utilize lessons learned from recent past disasters, and they do not include improvements made to address those structural integrity issues. They do not reflect current national consensus standards. In addition, there have been many design provisions developed that affect the economy of certain structural materials.

It should be noted that seismic hazards have been identified with much greater spatial resolution then previously specified in the UBC. Also, modern wind design standards provide significantly better protection against hurricanes than in the past. For example, the prescriptive "high-wind" UBC appendix provisions adopted by the counties in the 1990's for detached single-family residential construction do not meet the level of resistance commensurate with hurricane wind speeds.

Most of the design provisions discussed have been substantially revised or rewritten over the past 12 years to reflect the evolution of technological research and industry practice, such that little similarity with the older provisions remains.

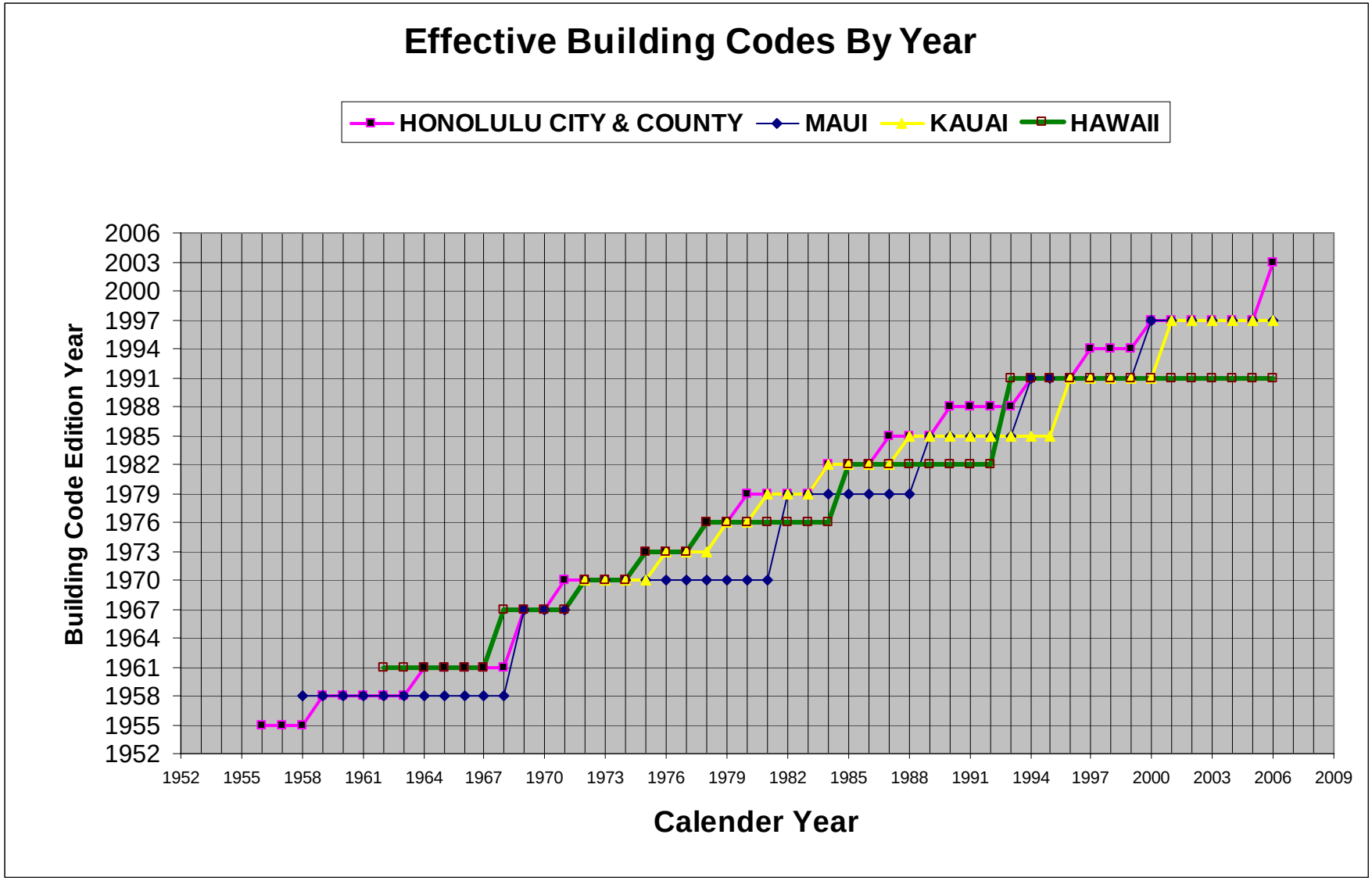
As of this report, 90% of the states as well as federal agencies utilize the International Building Code and related provisions. The City & County of Honolulu intends to adopt the International Building Code in the near future (2006).

Status of Some County Codes as of 2005

	HONOLULU CITY & COUNTY	MAUI	KAUAI	HAWAII
BUILDING	UBC 1997 with Amendments	UBC 1997 with Amendments	UBC 1997 with Amendments	UBC 1991 with amendments
		1986 Housing Code		
ELECTRIC	NEC 2002	NEC 1999 with Amendments	NEC 1999	NEC 1993
MECHANICAL	UPC 1997 with Amendments	UPC 1991 with Amendments	UPC 1997	UPC 1991
FIRE	UFC 1997 with Amendments	Chapter 16.04 Fire Code	UFC 1997 with Amendments	UFC 1988
		UFC 1988 with Amendments		
		Chapter 132 HRS		

Historical Code Adoption History

Exhibit IV


Effective Building Codes By Year
HONOLULU CITY & COUNTY
MAUI
KAUAI
HAWAII
Building Code Edition Year
2006
2003
2000
1997
1994
1991
1988
1985
1982
1979
1976
1973
1970
1967
1964
1961
1958
1955
1952
1952
1955
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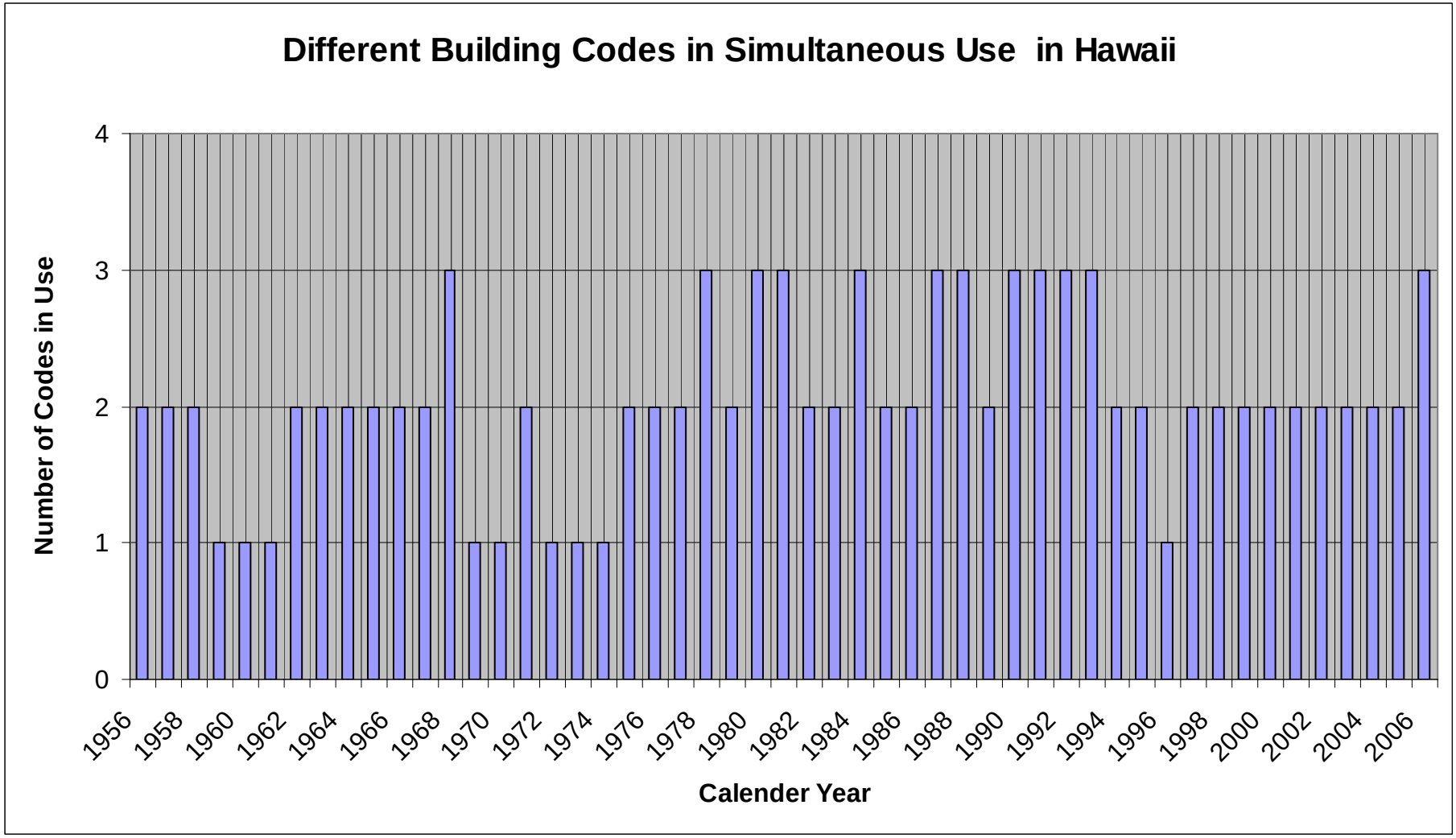
2009
Calender Year

Historical Occurrences of Multiple Codes in Simultaneous Use (not including federal agencies)



Historical Code Developments of Particular Relevance to Structural Engineers

1991 Uniform Building Code

UBC Structural Provisions	General Effect	Discussion
Seismic	Seismic Design Forces and Detailing Requirements are based on the 1990 Recommended Lateral Force Requirements by the Structural Engineers Association of California	Seismic Zone map is based on the first generation national seismic hazard map of the 48 continental states prepared by USGS in 1976, based on a 10% exceedence probability over 50 years. *Seismic hazard is underestimated for Oahu and Hawaii County.* Local amendment makes an adjustment only for Oahu. Four Soil Profile types are used to classify the site seismic response.
Seismic bracing of Mechanical and Electrical life safety systems	Design for seismic bracing is first introduced	Not typically within scope of work of the structural engineer or mechanical/electrical engineers; actual application uncertain.
Wind	The UBC wind provisions are a simplified code based on the 1982 standard for wind design, ANSI A58.1.	A Hawaii 50-year Basic Wind Speed is derived from 1968 data that did not include explicit analysis of hurricane risk. A level of resistance to Category 1 storms is provided. Design for wind-borne debris is not required. . The wind speed and level of resistance is later updated in ASCE 7-98 and 7-02 standards utilized in the International Building Code.
Wind	A simplified wind load procedure developed in California is introduced	An SEAOC (California) authored wind load procedure emphasized simplification, but did not always result in conservative results, according to the SEAW (Washington) commentary publication.
Wind	Exposure D classification is added for the coastal regions	Exposure D is introduced for the most severe exposure for all coastal terrain facing large bodies of water. *However, in the 2003 International Building Code, this exposure is acknowledged to be inapplicable to Hawaii during hurricane conditions*.

Load Combinations	Load combinations for strength design procedures are specific to each material.	The level of protection against failure varied with material, as there is no uniform load combination for all materials. 1991 UBC only addresses Allowable Stress Design.
Special Inspection	SEAOH publishes a Recommended Standard of Practice for Special Inspection for the 1991 UBC	Special inspection of masonry was discretionary based on the allowable stresses used by the engineer
Concrete	Seismic	*1991 UBC Shear wall design methods were uneconomical and later determined to actually be detrimental to ductility and safety.*
Structural Steel	Pre-Northridge earthquake standards of SEAOC	Design primarily based on AISC 1989 with provisions only applicable to Zones 3 and 4, which were totally revised later after the 1992 Northridge earthquake welded joint failures.
Light-gage Steel	No provisions	
Wood	Allowable Stresses based on traditional values prior to reduction in bending strength	*1991 UBC Allowable Stresses are later discovered to be too high and are significantly reduced after an extensive 12-year "in-grade" testing program by the industry*.
Wood	Appendix 25 High Wind Prescriptive Requirements	The premise for this appendix is that smaller structures have little or no structural design, and so some connectivity is better than it s absence. The prescriptive method provides a series of connections comprising a complete load path, but does not provide uplift resistance for hurricane conditions equivalent to the engineering criteria of the code.
Wood Preservatives	Older AWPA Wood Treatment Standards or the former AWPB Hawaii Local Area Standard	Treatments based on ACZA and CCA or borate. CCA is discontinued per EPA at a later date. No incising is required.

Historical Code Developments of Particular Relevance to Structural Engineers

1994 Uniform Building Code

UBC Structural Provisions	General Effect	Discussion
Organization	Format of Sections entirely changes	This revision established the organizational format to be used as the ICBO, SBC, and BOCA codes move towards being consolidated in the later IBC
Seismic	Limitations of calculated building period of vibration	Change toward more conservative (greater) seismic load
Seismic	Changed criteria for descriptive classification of Soil conditions	Definitions of Site Coefficients were adjusted to allow medium-dense conditions.
Wind	The UBC wind provisions are a simplified code based on the 1988 standard for wind design, ANSI A58.1.	Used a Hawaii 50-year Basic Wind Speed is derived from 1968 data that did not include explicit analysis of hurricane risk. Design for wind-borne debris was not required.
Wind	Introduces enclosed, partially enclosed and unenclosed structures	An attempt to account for internal pressurization effects by adjusting the net external design pressure.
Live Loads	Alternate live load reduction method	Provided different reduction based on influence area rather than tributary area
Load Combinations	Load combinations for strength design procedures are specific to each material.	The level of protection against failure varied with material, as there is no uniform load combination for all materials.
Inspection	Welding, Bolting, and Masonry	Clarified and provided more detail on inspection scope
Concrete	Slab thicknesses, Bolt anchorage, Seismic requirements	Changes to minimum slab thickness, new bolt capacity methods, and entirely revamped seismic provisions that in many cases were different from ACI standards
Masonry	Strength Design introduced	Working Stress or Strength Design were permitted to be used

Structural Steel	Eccentric Braced frame design introduced	1994 UBC did not include any findings of the post-Northridge earthquake research into welded joint fractures in steel frames
Light-gage Steel	1989 Cold-Formed Steel provisions adopted	
Wood	Wood allowable stresses revised	*Allowable Stresses were found to be too high and were significantly reduced in the 1994 UBC after an extensive 12-year "in-grade" testing program by the industry*
Wood	Conventional Construction	Provisions revised to provide more detailed requirements, including additional bracing in seismic zone 4.
Wood	Appendix 25 High Wind Prescriptive Requirements	The premise for this appendix is that smaller structures have little or no structural design, and so some connectivity is better than it s absence. The prescriptive method provides a series of connections comprising a complete load path, but does not provide uplift resistance for hurricane conditions equivalent to the engineering criteria of the code.

Historical Code Developments of Particular Relevance to Structural Engineers

1997 Uniform Building Code

UBC Structural Provisions	General Effect	Discussion
Seismic	Seismic Design Forces and Detailing Requirements are very significantly revised. Loads and system factors reflect a strength design level, and greater detailing requirements are added to provide ductile system performance. Special force requirements for elements supporting discontinuous systems are no longer limited to zones 3 and 4. Attempt made to provide very conservative simplified method for low-rise structures.	Seismic Zone map is based on the national seismic hazard map prepared by USGS in 1994. The island of Hawaii is assigned to Seismic Zone 4. Subsurface conditions become more significant to seismic design with soil type factors. *Near-source factors are used only in the 1997 UBC and never again.* However these are not defined for Hawaii. The method for determining soil profile types is made more quantified and less descriptively judged. Many restrictive and penalizing factors against certain systems
Wind	An earlier national consensus standard for wind design, ASCE 7-88, is left as the basis. The more updated ASCE 7-95 standard is not used.	Basic Wind Speed remains at the fastest mile speed rather than peak gust. The Hawaii 50-year Basic Wind Speed is derived from 1968 data that did not include explicit analysis of hurricane risk. Design for wind-borne debris is not required.
Load Combinations	Load combinations are adopted to be common amongst all materials. Vertical earthquake component is introduced.	Alternate allowable stress methods are permitted but undertake no further technical improvements. Special seismic load combinations are added that use a new (omega) factor.

Inspection	Quality assurance inspections added for high seismic zones	Special concrete frames and nondestructive testing of welded moment frames
Concrete	Seismic	Strength reduction of shear walls and design method, new provisions for precast systems, and coupling beams, changes in anchorage to concrete per strength design
Concrete	Reinforcing Splices and Laps	Lap splices changed significantly and become more complex
Masonry	Seismic	New requirements for columns and out-of-plane wall anchorage to flexible diaphragms in Zone 4.
Structural Steel	Initial Post-Northridge seismic research incorporated	New AISC Seismic Provisions begin to partially mitigate against welded joint fractures experienced in the Northridge earthquake
Light-gage Steel	Cold-Formed Shear Wall Design Methods introduced	Steel stud wall system design also includes special requirements in Seismic Zones 3 and 4
Wood	*Wood design provisions revised in its entirety*	Updated and expanded requirements
Wood	Appendix 25 High Wind Prescriptive Requirements	The premise for this appendix is that smaller structures have little or no structural design, and so some connectivity is better than it s absence. The prescriptive method provides a series of connections comprising a complete load path, but does not provide uplift resistance for hurricane conditions equivalent to the engineering criteria of the code.

Short Summary of Code Developments of Relevance to Structural Engineers

International Building Code 2003

IBC Structural Provisions	General Effect	Discussion
Seismic	Seismic Design Forces and Detailing Requirements are Redefined in the IBC based on the latest ASCE and NEHRP provisions. *The Hawaii Seismic maps were jointly produced by USGS and Hawaii Civil Defense*	The International Building Code uses the 2001 USGS seismic hazard contour maps that better represent the gradation of hazard throughout the State. The UBC zone maps are no longer valid. The design ground motion is based on uniform protection against collapse. Subsurface conditions become more significant to seismic design.
Seismic bracing of nonstructural components	Quality assurance inspections added	
Wind	The latest national consensus standard for wind design, ASCE 7-02, is incorporated.	*Basic Wind Speed is re-calibrated to a new standard. Design for wind-borne debris in a hurricane is required.* Local code amendments for Oahu, Kauai will provide detailed procedures for hurricane design considering island topographic and downslope wind effects.
Wind	Simplified Method Improved in the IBC	The Simplified Provisions for Wind Design of Low-Rise Buildings is made more straight-forward. It applies to low-rise structures with roof height of less than 60 feet.
Wind	Improved exposure definitions	ASCE-07 allows wind exposure to be smoothly transitioned between classified areas.
Live Loads	Parking Live Load Reduced to 40 psf	Slab designs become more economical.
Load Combinations	ASCE 7-02 load combinations are adopted to be common amongst all materials.	The dead and live load combination reduces design loads for concrete structures by about 10%
Inspection of Masonry Construction	Quality assurance inspections added	

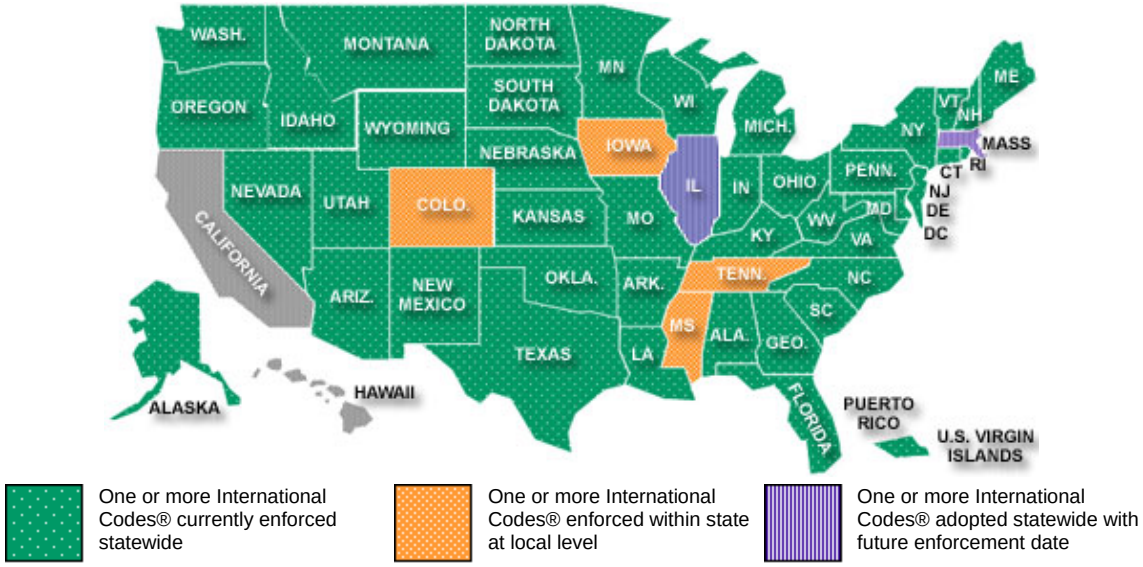
Structural Steel	Post-Northridge seismic research incorporated	*Addresses the prevention of welded joint fractures experienced in the Northridge earthquake.*
Light-gage Steel	Alternative Cold-Formed Shear Wall Design Methods (segmented and perforated) allowed	Provides an alternative perforated shear wall design method that does not require intermediate overturning restraints next to openings within the body of the wall.
Wood	The IBC and IRC allows the use of the ANSI/American Forest & Paper Association Wood Frame Construction Manual for One- and Two-Family Dwellings	Provides simplified engineering design requirements, based on code-conforming calculations for hurricane. Application in Hawaii would result in structural capacity for category 2 hurricanes. Allows more economical designs for wood shear walls. This includes 40% increased capacities for wind loads.
Wood Preservatives	AWPA Wood Treatment Standards revised	Requirements also include increased protection of fasteners for the current generation of treatments

Federal Agencies

The Army, Navy, Air Force, and other federal agencies have already adopted the International Building Code (since 2002) per the Unified Facility Criteria of 2002. AIA (national) recommended the International Building Code and International Residential Code. In 2000, Hawaii State Civil Defense recommended to all counties that they adopt the International Building Code.

Current Code Adoptions by State

45 states plus Washington, D.C. and the Department of Defense use the *International Building Code.* California is in the process of transitioning numerous state agency design standards to the International Building Code. 45 states plus Washington, D.C. use the *International Residential Code*



One or more International Codes® currently enforced statewide

One or more International Codes® enforced within state at local level

One or more International Codes® adopted statewide with future enforcement date

International Codes-Adoption by State

ICC makes every effort to provide current, accurate code adoption information. Not all jurisdictions notify ICC of code adoptions.
To obtain more detailed information on amendments and changes to adopted codes, please contact the jurisdiction.
To submit code adoption information: http://www.iccsafe.org/government/adoption-form.html

X = Effective Statewide A = Adopted, but may not yet be effective L = Adopted by Local Governments
S = Supplement 03 = 2003 Edition 00 = 2000 Edition

State	IBC	IRC	IFC	IMC	IPC	IPSDC	IFGC	IECC	IPMC	IEBC	ICCPC	IUWIC	IZC	ICCEC	Chart Comments
Alabama	X03,L	L	X03,L	X03,L	X03,L	L	X03,L	L	L	L	L		L	L	IBC, IFC, IMC, IPC, IFGC - AL Building Commission: state owned, schools, hotels, movie theaters
Alaska	X03	L03	X03	X03	L		L								
Arizona	X	L	L	L	L		L	X	L					L	IBC: State Department Health has adopted for Hospitals
Arkansas	X	X	X	X	X03			X03							
California															
Colorado	L	L	L	L	L	L	L	L	L	L	L	L	L	L	IBC, IFC: Colorado Division of Fire Safety
Connecticut		X03		X96	X97			X03							
Delaware	L	L		L	X		L	L	L						
District of Columbia	X00	X00	X00	X00	X00		X00	X00	X00						
Florida	X03	X03		X03	X03		X03			X03					
Georgia	X	X	X03	X	X		X	X							
Hawaii															
Idaho	X03	X03	X03	X03			X03	X03							
Illinois	L	L	L	L	L	L	L	A00,L	L	L			L	L	IECC: commercial only
Indiana	X	X,A03	X	X			X								2003 IRC, 5th Printing
Iowa	L	L	L	L	L	L	L	L	L	L			L	L	
Kansas	X	L	L	L	L	L	L	X	L					L	IBC: Acceptable building code except for schools
Kentucky	X	X		X				X03	L						IECC: bldgs other than 1&2 family regulated by the KBC
Louisiana	X	L		X			L		L						
Maine	X03,L	X03	L	L	L	L	L	L	L	L			L	L	
Maryland	X	X		L	L		L	L		L				L	
Massachusetts	A	A		A											
Michigan	X	X03	L	X	X		X		X	X					
Minnesota	X	X	X												
Mississippi	L	L	L	L	L	L	L	L	L	L	L			L	
Missouri	L	L	L	X	X	L	L	L	L	L			L	L	IMC, IPC: State buildings only
Montana	X	X		X			X	X03		X					
Nebraska	L	L	L	L	L	L	L	X03	L	L		L	L	L	
Nevada	X03	X03	X03	L	L	L	L	X03	L	X03				L	Nevada Public Works Board
New Hampshire	X	L	L	X	X		L	X	L						
New Jersey	X	X		X			X		L						
New Mexico	X03	X03	L	L	L		L	X03	L	X03					
New York	X00	X00	X00	X00	X00		X00	X00	X00						
North Carolina	X	X	X	X	X		X	X							
North Dakota	X	X	L	X			X		L						
Ohio	X03	L	L	X03	X03		X03	X03	L	L					
Oklahoma	X	X	X	X	X	L	X	L	X	X		L	L	L	IRC: Mechanical provisions only
Oregon	X03	X03	X03	X03			X03								
Pennsylvania	X	X	X	X	X		X	X	L	X	X	X		X	
Rhode Island	X03	X03		X03	X03		X03	X03							
South Carolina	X03	X03	X03	X03	X03	L03	X03	X03	L03	L03		L		L	IPMC, IEBC: Approved for local adoption
South Dakota	X	L	X	L			L	L	L	L				L	IBC, IFC: Approved for local adoption
Tennessee	L	L	L	L	L		L	L	L	L				L	
Texas	L	X	L	X	X	L	L	X	L	L			L	L	IMC, IPC approved for local adoption; IBC, IRC: TX Dept. of Insurance
Utah	X03	X03	X03	X03	X03		X03	X03							
Vermont				X											
Virginia	X00	X00	X00	X00	X00		X00	X00	X00					X00	
Washington	X03	X03	X03	X03			L			L		L			
West Virginia	X	X		X	X		X	X	X	X					
Wisconsin	X		L	X			X	X							
Wyoming	X	L	X	X	L		X		L					L	
U.S.Territories															
Puerto Rico					X										
U.S. Virgin Islands	X03	X03		X03				X03							

STATEWIDE BUILDING CODE TASKFORCE

The Construction Viewpoint

Offered by: Skip Morgan – General Contractors Association Representative
Rodney Yamamoto – Building Industry Association Representative

1. The General Contractors Association of Hawaii supports statewide uniform building code adoption.

2. A statewide uniform building code should encompass the:
   a) Building Code,
   b) Housing Code,
   c) Electrical Code,
   d) Plumbing Code,
   e) Mechanical Code and
   f) Fire Code

3. Projected Benefits:
   a) Improved efficiency in use of code statewide
   b) Better communication for users and enforcers
   c) Quicker response in adoption of life safety issues addressed by the code
   d) Ecomonies in the code adoption process
   e) Overall simplification of code processes

4. Current Example:

   Extract from General Notes included in a set of building plans:

   "All work to be performed in strict accordance to the latest Building, Plumbing, and Electrical Codes of the City & County of Honolulu"

   This section related to an established retail chain with locations throughout the State of Hawaii. The problem emerged as this particular project was to be built on the Big Island. Although this seems to be a minor error, it illustrates a relative common occurrence. Presently, contractors must be aware of and apply the appropriate codes to each County, something which Architects and Engineers for national accounts are not always aware.

Statewide Building Code Task Force
Submitted September 20, 2005

Benefits of a Uniform Statewide Building Code Relating to Insurance

During the task force meeting on August 24, 2005 the question was raised on how uniform building codes would benefit insurance consumers in Hawaii.

The primary benefit of uniform building codes to both the insurance industry and the public will be better built structures which will better withstand fires and natural disasters. The benefit of uniform building codes is priceless to a family whose home survives a hurricane such as Iniki.

It is impossible to predict how much insurance rates would be directly affected. Insurance rates are based on many factors and building codes and loss experience are only part of the equation.

With respect to loss experience, the general theory is that if insurable losses are reduced as a result of uniform building codes, the improved loss experience would be reflected in future rates. Will it actually result in lower rates? Not necessarily. As mentioned before, rates depend on many factors and the improved loss experience may not directly reduce rates, but it may help to reduce the need for future rate increases.

It should be noted that even loss experience is based on many factors. How well the codes are enforced would have an impact. Additionally, the cost and length of time to repair damaged property after, for example, a hurricane would have an impact, especially since Hawaii's contractor laws do not allow for expedited licensing in the event of a catastrophe. We mention this to illustrate that insurance rates are based on many factors.

Uniform building codes should also aid in keeping homeowners insurance coverage, particularly hurricane, available, which was a significant problem after Iniki.

A number of consumers also have, or may purchase, Building Ordinance or Law (code upgrade) insurance coverage. Under an up-to-date uniform building code, this coverage would ensure that their homes are repaired or rebuilt to the current code after a loss, better and safer than they were prior.

This Taskforce is an opportunity for the State of Hawaii to be proactive on this issue. We have seen the effect of hurricanes on other communities as well as our own. It is generally agreed that those areas which have adopted stronger, more up to date building codes have weathered the storms much better than those areas with weaker, older codes. In many cases, this was not considered proactively. As such, the newer building codes were put in place after the fact and in the wake of widespread damage and destruction.

KAUAHIKAUA & CHUN / ARCHITECTS

DWIGHT PAUAHI KAUAHIKAUA, AIA
DANIEL GARY CHUN, FAIA

November 9, 2005

MEMO: SCR 17 TASK FORCE

FROM: Daniel Chun FAIA

Following is the first draft of recommendations covering Indigenous Hawaiian Architecture as mandated by SCR 17.

INDIGENOUS HAWAIIAN ARCHITECTURE

Senate Concurrent Resolution 17 requires the Task Force to address provisions for indigenous Hawaiian architecture in a state building code.

It should be noted that the word "architecture" does not appear anywhere in what are considered building codes. Building codes govern the technical design and construction of buildings, while architecture concerns itself with expressing space and emotion through building. The following quotation from Professor Mike R. Austin of the University of Auckland (New Zealand) defines a difference between "indigenous building" and "indigenous architecture."

> "Since European discovery Polynesia has been represented in the Western imagination as an Edenic Utopia which by definition does not have, and does not need, any architecture. The buildings as grass huts are hardly buildings and definitely not architecture. Grass hut is used disparagingly because it is temporary and ephemeral. The grass hut perception blinds us to the recognising of open spaces and it also blind us to the use of [stone] masonry. What is often ignored however is the subsequent development of architectural open space forms and the necessity of shade from the overhanging roof and vegetation. There is architecture other than the grass hut in Polynesia but what is more important is that these are open space public forms."

The great sacred and civic architecture of ancient Hawaii is stone-based architecture, some of which still exists today. SCR 17 seems to be more concerned with allowing "indigenous building" rather than "indigenous architecture" as Barnes defines it. Stone enclosures built using indigenous techniques seem to be permitted in all counties. It is the grass house that is the object of Maui County's IHA (Indigenous Hawaiian Architecture) Code and SCR 17.

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Ever since Western building technology reached Hawaii indigenous grass house building has declined in popularity. Questionable resistance to hurricane winds, infestation by insects, constant maintenance, high level of required craftsmanship, lack of measurable technical standards, lack of windows, lack of acoustical privacy, lack of security, and susceptibility to fire has caused Hawaii's people to abandon this indigenous construction. It can be argued from a public safety and consumer protection perspective that modern and progressive building codes should not permit such buildings.

However the late 20th century has seen a rebirth of interest in indigenous Hawaiian arts and crafts. And there is renewed activity for indigenous Hawaiian self-determination. Indigenous building has not experienced the same level of rebirth as have other crafts for reasons including prohibition by local building codes. Local county codes address thatched roofing in hotel-zoned districts, but do not permit the county-wide construction of buildings based on accurate indigenous Hawaiian models. Most of Hawaii's thatched buildings appear more Southeast Asian in design inspiration.

Promoted by elected officials such as former Maui County Councilman, and now State Senator, J. Kalani English; Maui County initiated and adopted its IHA Code (*date?*). Maui architects such as Hans Reicke FAIA put a lot of effort into researching and crafting the IHA Code.

Similar IHA codes have not been adopted by other counties. The Honolulu City Council passed an ordinance [*research the ROH number*] requiring adoption of rules to permit such structures, but this has not yet been implemented. There are large technical and other issues that inhibit the adoption of IHA codes. Because grass roofed buildings using indigenous construction can be a dramatic expression of self-determination, there is concern on the part of county zoning and building departments that the adoption of IHA codes will subtly encourage illegal structures to be built.

INDIGENOUS BUILDINGS AND STATE BUILDING CODES

So far as is known the only state building code that recognizes indigenous buildings is that of New Mexico. New Mexico's building code contains prescriptive requirements for adobe (sun-dried brick) construction. However, the New Mexico situation is not similar to Hawaii's situation. Adobe construction, both historic and new, is in daily use in rural pueblo communities. The sun-dried bricks can be bought at the local Home Depot. It can be said that the typical adobe house is more fire resistant than the typical wood house built under Hawaii building codes! So while the New Mexico model of using prescriptive requirements for indigenous building can be copied, the technical considerations of safety and consumer protection are not the same.

RECOMMENDATIONS INDIGENOUS HAWAIIAN BUILDING CODE (IHB)

1. An exemption from obtaining a county building permit should be considered for indigenous buildings on federal or state lands. Many historic culturally important sites, where grass-roofed indigenous buildings might be wanted, belong to federal or state government, so this ought to satisfy the need on these types of sites. Important questions such as zoning, site planning, building size, fire protection, structural standards can be resolved in the EA/EIS process required for use of federal or state lands. If a private entity is building or operating the facility, then they should be allowed to share in the state or federal sovereign immunity to permit indigenous building on the historic or culturally significant site.

2. The Commission should consider incorporating Maui County's prescriptive IHA Code into a state wide building code. It would be better to call it IHB [Indigenous Hawaiian Building] Using the WA state building code model, each county would be allowed to enact more restrictive code provisions - banning these structures or imposing special permit application processes as is being considered in Honolulu. If the IHB code is not in the state building code, then a situation can arise whereby these buildings will not be permitted in Maui County because this would be interpreted as a less restrictive code.

3. The construction of an indigenous building on privately controlled property might be better permitted under a "license" system to ensure the regular maintenance that is needed to maintain structural integrity of parts like the lashings or logs embedded directly in earth. A license system requires more county administration and enforcement, but it would be better for public protection.

4. A study should be funded to test certain prescriptive requirements in Maui County's IHA Code. A bill was introduced to the Legislature to fund testing of certain Hawaii grown woods for strength. In the writer's professional opinion, the wood structure is less of a structural challenge than the lashing of wood joints. The University of Hawaii would be a good place to fund this research. The Manoa campus has schools of engineering and architecture. Maui Community College has a program for certifying master builders in indigenous construction.

5. Current provisions for thatched roofing, such as those in City & County of Honolulu building code amendments, should be included in any state building code. While thatched roofing alone does not equal indigenous architecture, the ability to include thatched roofing in building design should continue. This should be a separate chapter from any IHB code provisions. Some consideration could be given to adding more zoning districts in which thatched roofing is permitted. Or this can be left to the individual counties and their fire departments to restrict.

Hurricane Hazard and Building Codes in Hawaii

Hazard

Windspeed hazard curves for Hawaii have recently been derived by two independent investigations (Peterka, 2002, sponsored by NASA and Vickery, 2002, sponsored by the HHRF).

Hurricane Category	Sustained Wind	3 –sec. Peak Gust	Anywhere in Hawaii	Kauai County only	Oahu only	Maui County only	Hawaii County only
1	74 to 94 mph	82 to 108	1 in 25	1 in 120	1 in 80	1 in 60	1 in 60
2	94 to 110 mph	108 to 130	1 in 50	1 in 335	1 in 320	1 in 185	1 in 135
3 or 4	110 to 155 mph	130 to 191	1 in 75	1 in 500	1 in 400	1 in 300	1 in 200
Any Hurricane	Greater than 74 mph	Greater than 82	1 in 15	1 in 75	1 in 55	1 in 40	1 in 35

Hurricane Annual Odds of Occurrence by Saffir Simpson Category, incorporating NASA and HHRF sponsored research

Saffir Simpson Category	1	2	3	4
Central Pressure (mb)	>979	965-979	945-964	920-944
1 minute sustained speed	74 - 95	96 - 110	111 - 130	131 - 154
Peak Gust	82 - 108	108 - 130	130 - 156	156 - 191

Hurricane Categories and Various Reference Windspeeds

Peak Gust (mph) 10 m Open Country Exposure	**Kauai**	**Oahu**	**Maui**	**Hawaii**
500-year (Peterka)	128	134		
500-year (Vickery)	120	129	127	120
Wind Speed Capacity based on the IBC 105 mph design wind speed	133	133	133	133

Hurricane Windspeed versus Recurrence Interval and Modern-Day IBC Design

Topographic Amplification of Wind Speed in Hawaii

Terrain or topographic amplification of wind speed has been a significant contributing factor in the past hurricane loss experiences of Hawaii, as evidenced during Hurricanes Iwa (1982) and Iniki (1992). Historically, the magnitude of wind speed-up caused by topography in Hawaii was not well understood in the past, and it was not considered in any of the Uniform Building Codes used in Hawaii. These complex topographic effects include alteration of wind speed caused by mountain ranges, gorges, and valleys, as well as downslope accelerations. The International Building Code (IBC) requires explicit design for the topographic effects on wind speed, but its topographic factor is based on two-dimensional formulations that are not applicable to the complex three-dimensional topography that exists in Hawaii. Therefore, future implementation of the IBC statewide requires island-specific evaluations of the wind topographic and wind directionality factors. A 2002 NASA-sponsored project developed the needed new predictive methodologies utilizing special wind-tunnel modeling of island topographic effects. Accordingly, significant improvements in wind hazard mitigation can now be accomplished through the application of this particular methodology for wind speed-up mapping in the local County building codes.

The Honolulu Building Code adoption of the 2003 IBC is expected to include the needed wind data mapping products so that the state-of-the-art research data results can be used in design applications, in a way that completely addresses the requirements of the International Building Code. Similar projects to determine the wind mapping of Kauai and Hawaii Counties are expected to be conducted in 2006. A wind mapping project still needs to be sponsored to develop wind mapping for the Maui County building code.

In all cases, the wind design parameters will be determined through probabilistic analysis to take into account all the relevant factors of hurricane probabilities, terrain, and topographic features using wind-tunnel testing to develop a comprehensive mapping of wind effects. Because hurricanes are typically multi-county disasters, it is essential that all counties approach the risk through mapping and building regulations that are implemented with a common technical basis and procedure. A uniform level of protection for hurricane hazard would then be achieved in structural design throughout the State.

The Disaster Emergency Preparedness Act of 2005 (SB 960 CD1) states that

"The department of defense shall develop Hawaii public shelter and residential safe room design criteria by January 1, 2006, and shall facilitate impact resistance testing and certification of safe room design; provided that safe room prototype models are developed with public or private sector grants or investments. These criteria shall include Hawaii performance-based standards for enhanced hurricane protection areas and essential government facilities capable of withstanding a five hundred-year hurricane event and providing continuity of government or sheltering operations thereafter."

Determination of the wind hazard in topographically affected critical facility sites is essential for pre-disaster planning and emergency operations planning. Criteria for critical facility use and any necessary mitigation can then be objectively established and evaluated for priority, thereby optimizing the effectiveness of any retrofits.

Building Stock Vulnerability:

Engineered Buildings:

Hawaii design wind pressures have changed over the years in the Uniform Building Code (UBC) as indicated below:

UBC Code Years	Design Wind Pressure at 10M height
1991 to 1997	30 psf
1982 to 1988	26.5 psf
1958 to 1979	15 to 20 psf

The critical benchmark year identifying structures previously designed to a lower wind pressure would be the years of each county's adoption of the 1982 or later UBC editions, indicated below.

Kauai	Honolulu	Maui	Hawaii
1984	1984	1989	1985

Wind Vulnerability Benchmark Years for Engineered Structures

The 1982 to 1997 UBC values were predicated on an 80 mph basic fastest-mile windspeed, approximately equivalent to a 95 mph 3-second peak gust, and provided rated capacity for Category 1 hurricanes.

The 3-second peak gust is the wind parameter now used in the *International Building Code 2003* (IBC). The IBC 3-second gust windspeed standard now established for Hawaii is 105 mph statewide, which is 10 mph greater than the former standard. After adoption of the IBC, wind resistance for Category 2 hurricanes will be provided in new construction.

In many engineered concrete and masonry structures in the Counties of Maui and Hawaii, seismic design requirements will increase the basic structural system's capacity for low to mid-rise buildings (but not their openings, cladding and components) to a level of strength greater than Category 2 hurricanes.

Conventionally Constructed One and Two Family Dwellings:

Single-family residential construction has typically been permitted to be built using "conventional construction" provisions based on historical trade practices until problems were demonstrated by unacceptable wind damage in Hurricanes Iwa (1982) and Iniki (1992). There were no requirements for high wind connectors until the late 1980's ands early 1990's.

Nominal roof to wall uplift ties only were required for new single family residential construction in Hawaii subsequent to Hurricane Iwa per the following:

1989 Kauai County Building Code adoption of the 1985 UBC
1987 Honolulu Building Code adoption of the 1985 UBC
1989 Maui County Building code adoption of the 1985 UBC
Hawaii County did not have requirements for hurricane ties prior to **1993**

Additional ties to create a complete load path were required for new single-family residential construction subsequent to Hurricane Iniki. The Uniform Building Code Appendix for Conventional Light-Frame Construction in High-Wind, which provides significant resistance but not fully rated for the uplift created by hurricane wind speeds. This appendix, meant to provide at least some level of wind uplift resistance, was gradually adopted per the following dates, beginning with Kauai during the Iniki reconstruction:

1994 Honolulu Building Code adoption of 1991 UBC
1992 Kauai Building Code adoption of the 1991 UBC
1993 Hawaii Building Code adoption of 1991 UBC
1994 Maui Building Code adoption of the 1991 UBC

Since code adoption dates have varied dramatically among the counties, the categorization of vulnerable single-family housing stock depends on the year built according to the particular benchmark code adoption years for each county. The roof to wall tie benchmark years of wind resistance is indicated for that purpose.

Kauai	Honolulu	Maui	Hawaii
1989	1987	1989	1993

Wind Vulnerability Benchmark Years for Existing One and Two-Family Residences

A major improvement would occur under the International Residential Code, because it establishes engineering-based requirements for high wind uplift connectors that will provide fully-rated capacity for Category 2 hurricanes.

Exhibit submitted by Gary Chock

Building Code Adoption Timeliness as a Hazard Mitigation Tool
Completed 2004 by Martin & Chock Inc.
for the State of Hawaii
Department of Business, Economic Development & Tourism

Objectives of Study:

Study the effectiveness of building code adoption on existing Hawaii County building inventory and recommend methods to mitigate earthquake losses.

Modifying Hawaii County Building Inventory:

The existing Hawaii County building inventory was modified to consider if the new versions of the building codes were to be adopted in a timely manner and omitting the single wall exemption from the current building code. A theoretical code adoption date was set at two years after each new building code publication date.

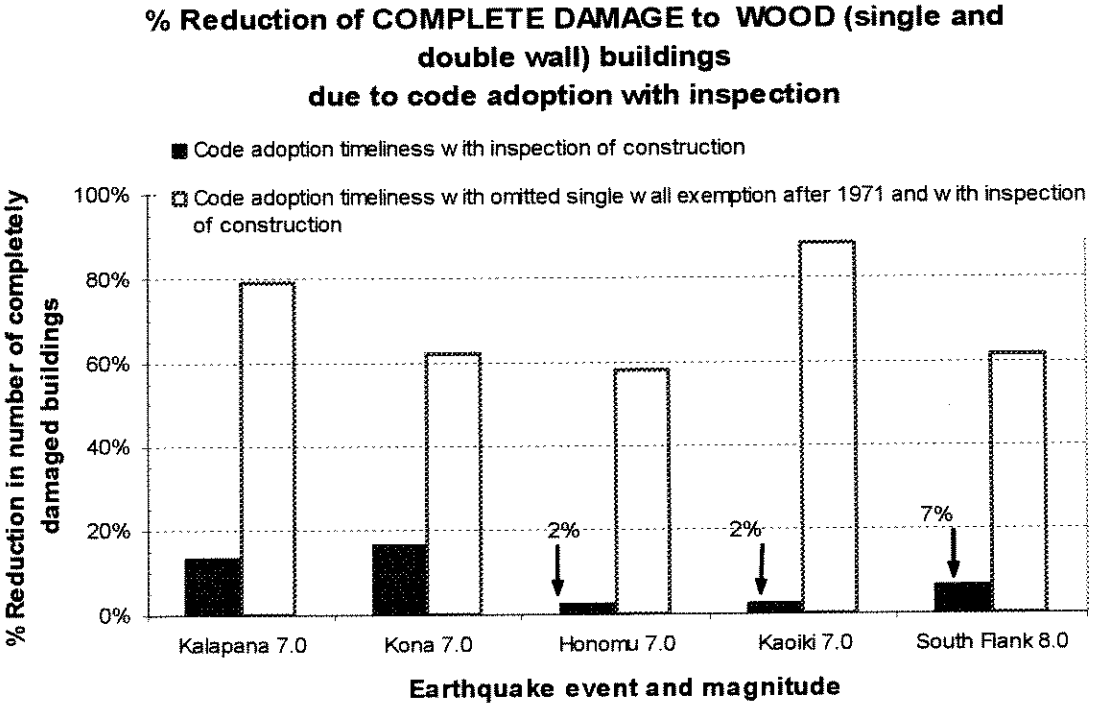
Results of Study:

Summary of Economic Results:

The Average Annualized Loss (AAL) for Hawaii County was reduced by 9.4%

Summary of Damage Results:

As shown in the figure below, the percent reduction for completely damaged wood buildings was as high as 90%.



Conclusions:

Losses can be reduced with the adoption of building code within two years provided that the designs are checked to meet code.

Omitting the single wall exemption from the building code and not allowing new single wall homes to be built can greatly reduce the amount of losses to wood residential homes

Recommendations:

Adopt each new version of the International Building Code in a timely manner; this could be up to two years.

Limit single wall construction as per International Building Code and limit only to repairs and additions to existing single wall homes.

Hawaii Statewide Building Code Feasibility Taskforce

This report compiles information from several western states, and the State of New York, each adopt codes statewide. The information presented notes the codes each state adopts, and identifies the statutes that give the state the authority to adopt codes statewide. A summary follows that identifies the scope of the authority of the adopting governmental entity, and describes elements of the relationship between state and local programs.

Oregon:

Codes adopted statewide, & authority to adopt codes:

Various statues name the codes and identify the agency responsible for adopting codes via administrative rulemaking.

The Building Codes Division (BCD) provides code development, administration, inspection, plan review, licensing, and permit services to the construction industry. The division was added to the newly formed Department of Consumer & Business Services in 1993. BCD adopts codes through an administrative process for the code named below.

Building Code, 2003 IBC, Oregon Revised Statutes (ORS 455)
Residential Code, 2003 IRC
Mechanical 2003, IMC & 2003 IFGC
Plumbing Code, 2003 UPC (ORS 693)
Electrical Code, 2005 NEC (ORS 479)
Elevator (ORS 460)
Manufactured dwellings (ORS 446)

Office St. Fire Marshal Adopts the Fire Code
Fire Code, 2003 IFC (ORS 476)

Links to state statues:

http://www.leg.state.or.us/ors/455.html
http://www.leg.state.or.us/ors/693.html
http://www.leg.state.or.us/ors/446.html
http://www.leg.state.or.us/ors/479.html

Office St. Fire Marshal, Fire Code,
http://www.leg.state.or.us/ors/476.html

Summary of Oregon state & local programs:

The Statewide building code, and other statewide adopted codes as listed above are all administered and adopted by the State's BCD. The state is responsible for administering all the codes and delegates the state program to the local jurisdiction only if the local jurisdiction meets the state's requirements. All code application interpretations are state rulings. They have approximately 300 employees in the agency. The State of Oregon reviews and audits local programs for fees, budgeting and their department operating plans. Oregon has mandatory statewide annual training requirements, and collects 1% of all permit fees to fund the statewide training for plans examiners and inspectors. Oregon requires mandatory certification to work as an inspector.

The fire code is adopted by the state Fire Marshal's Office and is used by local governments and local fire districts.

Washington:

Codes adopted statewide, & authority to adopt codes:

Washington State established the WA State Building Code Council (SBCC) in 1973 through the Revised Code of Washington (RCW 19.27). This one statute names all the codes that are the "State Building Code."

RCW 19.27 is called the "State Building Code Act" and it identifies and names the: IBC, IRC, IMC, NFPA 58, IFC, and the UPC as the codes that are the "State Building Code." The SBCC uses administrative rulemaking to adopt codes by reference, names the edition of the code year, and creates state wide amendments.

The Department of Labor & Industries by authority in RCW 19.28 adopts the NEC by administrative rulemaking for the state electrical code.

Links to state statues:

http://www.leg.wa.gov/RCW/index.cfm?fuseaction=chapterdigest&chapter=19.27
http://www.leg.wa.gov/RCW/index.cfm?fuseaction=chapterdigest&chapter=19.28

Summary of the state & local programs:

The WA SBCC is a rulemaking agency only. All codes are administered, interpreted and enforced locally. The state Agency has no enforcement authority to require a particular application or interpretation. Local programs can amend the codes to be more restrictive than the state adopted code.

Every local city and county in Washington must adopt & enforce the state codes or contract with another jurisdiction to provide these services for the community. Locals must seek approval by the SBCC to change the code that applies to buildings with four

dwelling units or fewer. Each local jurisdiction determines its own training requirements for employees. Washington does not have mandatory certification to work as an inspector.

Idaho:

Codes adopted statewide, & authority to adopt codes:

The Idaho Department of Building Safety Administers the state adopted codes. The state codes are adopted under the authority of several state statutes known as Idaho Code (IC). The codes apply to all public state buildings, schools, and other buildings if the local jurisdiction adopts the codes.

Authority to adopt codes:

IC Title 39 Chapter 41, Building Code
IC Title 54 Chapter 26 Plumbing & Plumbing Code.
IC Title 54 Chapter 53-51 LPG
IC Title 54 Chapter 50 HVAC (mechanical code)
IC Title 54 Chapter 10 Electrical

The Idaho State Fire Marshal adopts the fire code by administrative rulemaking.
IC Title 41 Chapter 268, http://www2.state.id.us/adm/adminrules/rules/idapa18/0150.pdf

Links to state statues:

http://www3.state.id.us/idstat/TOC/39041KTOC.html
http://www3.state.id.us/idstat/TOC/54026KTOC.html
http://www3.state.id.us/idstat/TOC/54053KTOC.html
http://www3.state.id.us/idstat/TOC/54050KTOC.html
http://www3.state.id.us/idstat/TOC/54010KTOC.html
http://www3.state.id.us/cgi-bin/newidst?sctid=410020068.K
http://www2.state.id.us/adm/adminrules/rules/idapa18/0150.pdf

Summary of the state & local programs:

The local jurisdictions in Idaho that have a codes administration program must use the state adopted codes. The local jurisdiction, city or county, can also choose to not have a program, and therefore no codes would be required, except as required for state buildings. The state fire code applies statewide. Idaho requires certification to work as a plumbing inspector and to work as a mechanical inspector.

New York:

Codes adopted statewide:

New York State has a statutory created board called the Uniform Fire Prevention and Building Code Council which adopts a collection of codes named the Uniform Fire Prevention and Building Code. The Uniform Fire Prevention and Building Code adopts the IBC, IFC, IPC, IMC, IPMC, IFGC, IECC, and IRC.

Authority to adopt codes:

New York Executive Law, Article 18.

Links to state statues/laws:

http://assembly.state.ny.us/leg/?cl=39&a=36
http://www.dos.state.ny.us/code/edu.htm

Summary of the state & local programs:

Jurisdictions use the New York State adopted code. New York City has its own process for adopting codes. The State is responsible for all training to all code enforcement officials and NYS certification and annual continuing education is mandatory.

Alaska:

Codes adopted statewide:

The Alaska Department of Public Safety by statutory authority adopts codes administratively. The statute authorizes DPS to adopt a building code, a fire code and a mechanical code.

Title 13 of the Alaska Administrative Code, Chapters 50 through 55, was adopted and amended to the 2003 International Building, Fire, and Mechanical Codes on August 27, 2004.

Department of Labor & Work Force Development, Division of Labor Standards and Safety adopts the plumbing, electrical and boiler codes. The Mechanical Inspection Section oversees installations of a variety of mechanical work to ensure public safety. The programs administered include electrical and plumbing installations in new construction; boiler and pressure vessels, in both new construction and existing installations; elevators, new and existing; and amusement rides, ski lifts and tramways, new and existing. In addition, the Mechanical Inspection Section enforces the Contractor Licensing and the Mechanical and Electrical Administrator programs.

Authority to adopt codes:

Alaska Statutes AS 18.70.080 Building Code
Alaska Statutes (AS 18.60.705) Plumbing code
Alaska Statutes AS 18.60.580 Electrical code

Links to state statues:

http://www.dps.state.us/fire/pdf/13AAC50.pdf
http://www.legis.state.ak.us/cgi-bin/folioisa.dll/stattx04/query=sec+18!2E60!2E705/doc/{@1}/hits_only?

Summary of the state & local programs:

Codes are adopted statewide and local jurisdictions can adopt and enforce codes locally. Alaska does not adopt a statewide residential code for single family dwellings.