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STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE BUILDING CODE COUNCIL
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

April 20, 2021

SUBJECT: State Building Code Adoption
Adopting the 2018 International Building Code with Amendments

The attached document is the Hawaii State Building Code as adopted on April 20, 2021 by the State Building Code Council in accordance with HRS 107-24.

No later than April 20, 2022, the design of all State building construction must comply with the attached code in accordance with HRS 107-27.

No later than April 20, 2023, each county in the State of Hawaii must amend and adopt the attached code in accordance with HRS 107-28(a).

If by April 20, 2023, a county does not amend the attached code, it shall become applicable as an interim county building code in accordance with HRS 107-28(b).

State Building Code Council

Attached: Hawaii State Building Code

STATE OF HAWAII

State Building Code Council

HAWAII STATE BUILDING CODE

Effective Date: April 20, 2021
Errata and Addenda: August 17,2021

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Scope.
The State Building Code is hereafter referred to as "this code". This code sets forth minimum requirements for the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to buildings or structures.

Definitions.
Unless the context otherwise requires, in this code:

"IBC" means the "State Building Code" adopted by the State Building Code Council adopting and amending the "*International Building Code*, 2018 Edition", published by the International Code Council.

"ICC" means the International Code Council.

"IEBC" means the "State Existing Building Code", adopted by the State Building Code Council adopting and amending the "*International Existing Building Code*, 2018 Edition", published by the International Code Council.

"IECC" means the "State Energy Conservation Code", Hawaii Administrative Rules, Chapter 3-181.1 adopting and amending the "International Energy Conservation Code, 2018 Edition" published by the International Code Council.

"IRC" means the "State Residential Code" adopted by the State Building Code Council adopting and amending the "International Residential Code for One- and Two-family Dwellings, 2018 Edition", published by the International Code Council.

"Section" means a section of a chapter of the International Building Code, 2018 Edition or a section of this code.

Adoption of the International Building Code.
The "International Building Code, 2018 Edition", as copyrighted and published in 2017 by International Code Council, Incorporated, 500 New Jersey Avenue, 6th Floor, Washington, DC 20001, is adopted by reference and made a part of this code. This incorporation by reference includes all parts of the International Building Code subject to the amendments hereinafter set forth. The ICC International Building Code 2018 Edition, is made a part of this chapter, subject to the amendments provided in this code. The appendices of the ICC IBC are not adopted except as provided in this code.

Permit authorization.
Each county of the State of Hawaii may, by ordinance, require that a permit be obtained from the building official for any area regulated by this code.

Amendments to the 2018 ICC International Building Code (IBC)

1. Title and purpose.

Section 101.1 is amended to read as follows:

"[A] 101.1 Title. These regulations shall be known as the Building Code of the State of Hawaii, hereinafter referred to as "this code"."

2. Scope.

Section 101.2 is amended to read as follows:

"[A] 101.2 Scope. The provisions of this code shall apply to the construction, alteration, relocation, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

Exception: Detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height, shall be permitted to comply with the State Residential Code if provided with debris impact protection in accordance with Section 1609.2 Protection of Openings. Exception 3 in Section 1609.2 shall not apply."

3. Appendices.

Section 101.2.1 is amended to read as follows:

"[A] 101.2.1 Appendices. Provisions in the appendices shall not apply unless specifically adopted.

Exceptions:

1. Appendix U, Hawaii Hurricane Sheltering Provisions for New Construction, shall be adopted.
2. Appendix W, Hawaii Wind Design Provisions for New Construction, shall be adopted.
3. Appendix X, Hawaii Provisions for Indigenous Hawaiian Architecture Structures, shall be adopted".

4. Referenced codes.

Section 101.4 is amended to read as follows:

"[A] Section 101.4 Referenced codes. The other codes listed in Sections 101.4.2 through 101.4.6 shall be considered to be part of the requirements of this code to the prescribed extent of each such reference.

[A] 101.4.1 Conflicts with other codes.
If a referenced code conflicts with another applicable law of the jurisdiction, then said applicable law shall prevail over the referenced code.

[A} 101.4.2 Gas. Whenever the term International Fuel Gas Code is used in this code, it shall mean the adopted State Plumbing Code.

[A] 101.4.3 Plumbing. Whenever the term International Plumbing Code is used in this code it shall mean the adopted State Plumbing Code.

[A] 101.4.4 Fire prevention. Whenever the term International Fire Code is used in this code, it shall mean the adopted State Fire Code.

[A] 101.4.5 Energy. Whenever the term *International Energy Conservation Code* is used in this code, it shall mean the adopted State Energy Conservation Code.

[A] 101.4.6 Existing Buildings. Whenever the term *International Existing Building Code* is used in this code, it shall mean the adopted State Existing Building Code.

[A] 101.4.7 Electrical Code
The provisions of the State Electrical Code shall apply.

[A] 101.4.8 Other Codes. Other referenced codes not listed in Section 101.4 are considered referenced guidelines and not mandatory.

5. Existing structures.
Section 102.6 is amended to read as follows:
"[A] 102.6 Existing structures. The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as otherwise specifically provided in this code, the State Existing Building Code, or the State Fire Code.

6. Part 2 – Administration and Enforcement
Administration and Enforcement, Sections 103 through 116, are deleted in their entirety, except Section 106.1 which is amended to read as follows:
"[A] 106.1 Live loads posted. In commercial or industrial buildings, for each floor or portion thereof designed for live loads 100 psf (4.80 kN/m^2), such design live loads shall be conspicuously posted by the owner or owner's authorized agent in that part of each story in which they apply, using durable signs. It shall be unlawful to remove or deface such notices".

7. Definitions
The definitions in Section 202 are amended to read as follows and as noted in Appendix W:
"STRUCTURAL OBSERVATION. The visual observation of the structural system by a registered design professional for general conformance to the approved construction documents.
Structural observation is equivalent to "observation of construction" of the structural system, as defined in Hawaii Administrative Rules chapter 16-115, implementing Hawaii Revised Statutes chapter 464. Structural observation does not include or waive the responsibility for the inspection required by Section 1705 or other sections of this code".

8. Occupant evacuation elevators.
Section 403.6.2 Occupant evacuation elevators is deleted in its entirety.

9. Community Storm Shelters.
Section 423 is deleted and replaced in Section U101 of Appendix U.

10. Hawaii Residential Safe Room
Section 429 is added in Section U102 of Appendix U.

11. State and County Enhanced Hurricane Protection Areas
Section 430 is added in Section U103 of Appendix U.

12. Group R.
Section 903.2.8 is amended to read:
"**[F]Section 903.2.8 Group R.** An automatic sprinkler system installed in accordance with section 903.3 shall be provided throughout all the buildings with a Group R fire area.
Exception: In accordance with HRS 46-19.8 Fire Sprinklers; residences, until June 30, 2027 no county shall require the installation or retrofitting of automatic fire sprinklers or an automatic fire sprinkler system in:

1. Any new or existing detached one-or two-family dwelling unit in a structure used only for residential purposes; and
2. Nonresidential agricultural and aquacultural buildings and structures located outside an urban area; provided that this section shall not apply to new homes that require a variance from access roads or firefighting water supply requirements."

13. Portable fire extinguishers.
Section 906 is deleted in its entirety and replaced to read as follows:
"SECTION 906
PORTABLE FIRE EXTINGUISHERS
906.1 General. Portable fire extinguishers shall be provided as required by the State Fire Code."

14. Fire command center.
Section 911 is deleted in its entirety and replaced to read as follows:
"SECTION 911
FIRE COMMAND CENTER
911.1 General. Where required by other sections of this code, a fire command center for fire department operations shall be provided and shall comply with the State Fire Code."

15. Fire pumps.
Section 913 is deleted in its entirety and replaced to read as follows:
"SECTION 913
FIRE PUMPS
913.1 Fire pumps. Where provided, fire pumps shall be installed in accordance with the State Fire Code."

16. Emergency power for illumination.

Section 1008.3.1 is amended to read as follows:
"Section 1008.3.1 General. In the event of power supply failure in rooms and spaces that require two or more means of egress, an emergency electrical system shall automatically illuminate all the following areas:

1. Aisles
2. Corridors
3. Exit access stairways and ramps.
4. Enclosed stairways of buildings more than two stories in height."

17. Doors, Gates and Turnstiles

Section 1010.2 is amended to read as follows:
"Section 1010.2 Gates. Gates serving the means of egress system shall comply with the requirements of this section. Gates used as a component in a means of egress shall conform to the applicable requirements for doors.
Exceptions:

1. Horizontal sliding or swinging gates exceeding the 4-foot (1219 mm) maximum leaf width limitation are permitted in fences and walls surrounding a stadium.
2. Security gates maybe permitted across corridors or passageways in school buildings if there is a readily visible durable sign on or adjacent to the gate, stating "THIS GATE IS TO REMAIN SECURED IN THE OPEN POSITION WHENEVER THIS BUILDING IS IN USE." The sign shall be in letters not less than one inch high on a contrasting background. The use of this exception may be revoked by the building official for due caused."

18. Exterior Exit Stairways and Ramps

Section 1027.2 is deleted in its entirety.

19. Emergency Escape and Rescue

Section 1030.2 is amended to by adding a new paragraph 1030.2.2 and reads as follows:
"1030.2.2 Glass jalousie windows. Glass jalousie windows complying with section 2403.5 may be used for emergency escape or rescue windows."

20. Chapter 11 Accessibility

Accessibility. Chapter 11 is deleted in its entirety and replaced to read as follows:
"1101 Scope. Buildings or portions of buildings shall be accessible to persons with disabilities in accordance with the following regulations:

1. For construction of buildings or facilities of the state and county governments, compliance with Section 103-50 HRS, administered by the Disability and Communication Access Board, State of Hawaii.
2. Department of Justice's Americans with Disabilities Act Standards for Accessible Design.

3. Housing and urban development recognized "safe harbors" for compliance with the Fair Housing Acts design and construction requirements.
4. Other pertinent laws relating with disabilities shall be administered and enforced by agencies responsible for their enforcement.

Prior to the issuance of a building permit, the owner (or the owner's representative, professional architect, or engineer) shall submit a statement that all requirements, relating to accessibility for persons with disabilities, shall be complied with."

21. Roof slope

Section 1502 is amended by adding a new section 1502.5 Slope to read as follows:
"1502.5 Slope. Roof shall be sloped a minimum of 1 unit vertical in 48 units horizontal (2 per cent slope) for drainage unless designed for water accumulation in accordance with Section 1611. Leaders, conductors, and storm drains shall be sized on the basis of Figure 1611.1 and the Plumbing Code."

22. Roof drains.

Section 1502 is amended by adding a new section 1502.6 Roof drains to read as follows:
"1502.6 Roof drains. Unless roofs are sloped to drain over the roof edges, roof drains shall be installed at each low point of the roof."

23. Revised Notations for Section 1602

Section 1602 is amended in Section W103 of Appendix W.

24. Construction documents.

Section 1603.1 is amended to read as follows:
"**1603.1 General.** C*onstruction documents* shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.
Exception: *Construction documents* for buildings constructed in accordance with the *conventional light-frame construction* provisions of Section 2308 shall indicate the following structural design information:
1. Floor and roof dead and live loads.
2. Ground snow load, Pg.
3. Basic design wind speed, V, miles per hour (mph) (km/hr) and effective allowable stress design wind speed, Veff-asd, as determined in accordance with Section 1609.3.1 and wind exposure.
4. Design spectral response acceleration parameters, SDS and SD1
5. Seismic design category and site class.
6. Flood design data, if located in flood hazard areas established in Section 1612.3.
7. Design load-bearing values of soils.

8. Rain load data".

25. Wind design data.
Section 1603.1.4 is amended in Section W104 of Appendix W.

26. Wind loads
Section 1609 is amended in Sections W105 and W106 of Appendix W.

27. Seismic design – short period
Table 1613.2.5(1) is amended to read as follows:
"TABLE 1613.2.5(1) SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD (0.2 second) RESPONSE ACCELERATION

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS} < 0.60g$	C	D	D
$0.60g \le S_{DS}$	D	D	D

28. Seismic design – long period
Table 1613.2.5(2) is amended to read as follows:
"TABLE 1613.2.5(2) SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1} < 0.27g$	C	D	D
$0.27g \le S_{D1}$	D	D	D

29. Special inspections and tests.
Section 1704.2 is amended to read as follows:
"1704.2 Special inspections and tests. Where application is made to the building official for construction, the owner or the registered design professional in responsible charge acting as the owner's authorized agent, shall employ one or more special inspectors independent of the contractors performing the work to provide special inspections and tests during construction on the types of work specified in Section 1705 and identify the special inspectors to the building official. These special inspections and tests are in addition to the inspections by the building.
Exceptions:
1. Special inspections and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as approved by the building official.
2. Unless otherwise required by the building official, special inspections and tests are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.

3. Special inspections and tests are not required for portions of structures designed and constructed in accordance with the cold-formed steel light-frame construction provisions of Section 2211.1.2 or the conventional light-frame construction provisions of Section 2308. For these structures, Section 1705.11 shall nevertheless apply.
4. The contractor is permitted to employ the special inspectors where the contractor is also the owner.
5. The employment of a special inspector shall not be required for construction work for any government agency that provides for its own special inspections and tests.
6. Special inspections and tests are not required for building components unless the design involves the practice of professional engineering or architecture as defined by Hawaii Revised Statutes chapter 464.

30. Special inspector qualifications.

Section 1704.2.1 is amended to read as follows:

"1704.2.1 Special inspector qualifications. Prior to the start of the construction, each special inspector shall provide written documentation to the building official demonstrating the competence and relevant experience or training of the special inspectors who will perform the special inspections and tests during construction. Experience or training shall be considered to be relevant where the documented experience or training is related in complexity to the same type of special inspection or testing activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code.

The registered design professional in responsible charge and engineers of record involved in the design of the project are permitted to act as the special inspector and their personnel are permitted to act as special inspectors for the work designed by them, provided they qualify as special inspectors".

31. Statement of special inspections

Section 1704.2.3 is amended to read as follows:

"1704.2.3 Statement of special inspections. The applicant shall submit a statement of special inspections in accordance with Section 107.1 as a condition for permit issuance. This statement shall be deemed to be satisfied by Section 1704.3.

32. Report requirement.

Section 1704.2.4 is amended to read as follows:

"1704.2.4 Report requirement. Special Inspectors shall keep records of special inspections and tests. The special inspector shall submit reports of special inspections and tests to the owner and licensed engineer or architect of record. Reports shall indicate whether the work inspected and tested was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction, then, if uncorrected, to the licensed engineer or architect of record and to

the building official. The special inspector shall submit a final signed report to the owner and licensed engineer or architect of record, stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans and specifications and the applicable workmanship provisions of this code.

Prior to the final inspection by the building official, the licensed engineer or architect of record shall submit a written statement verifying receipt of the final special inspection reports and documenting that there are no known unresolved code requirements that create significant public safety deficiencies."

33. Statement of special inspections

Section 1704.3 is deleted in its entirety and replaced to read as follows:

"1704.3 Statement of special inspections. Where special inspection or testing is required by Section 1705, the construction drawings shall include a complete list of special inspections required by this section".

34. Submittals to the building official

Section 1704.5 is deleted in its entirety.

35. Special Inspections for concrete construction

Section 1704.3 is amended to read as follows:

"1705.3 Concrete construction. Special inspections and tests of concrete construction shall be performed in accordance with this section and Table 1705.3.

Exception: Unless required by section 1705.11 Special inspections for wind resistance or section 1705.12 Special inspections for seismic resistance special inspections and tests shall not be required for concrete used in:

1. Isolated spread concrete footings of buildings three stories or less above grade plane that are fully supported on earth or rock where:
   1.1. The footings support columns of light-frame construction.
   1.2. The structural design of the footing is based on a specified compressive strength, f'_c, not more than 2,500 pounds per square inch (psi) (17.2 MPa), regardless of the compressive strength specified in the approved construction documents or used in the footing construction.

2. Continuous concrete footings supporting walls of buildings three stories or less above grade plane that are fully supported on earth or rock where:
   2.1. The footings support walls of light-frame construction.
   2.2. The footings are designed in accordance with Table 1809.7.
   2.3. The structural design of the footing is based on a specified compressive strength, f 'c, not more than 2,500 pounds per square inch (psi) (17.2 MPa), regardless of the

compressive strength specified in the approved construction documents or used in the footing construction.

3. Nonstructural concrete slabs supported directly on the ground, including prestressed slabs on grade, where the effective prestress in the concrete is less than 150 psi (1.03 MPa).
4. Concrete foundation walls constructed in accordance with Table 1807.1.6.2.
5. Concrete patios, driveways and sidewalks, on grade".

36. Special Inspections for wind resistance

Section 1704.11 is amended to read as follows:

"1705.11 Special inspections for wind resistance. Special inspections for wind resistance specified in Section 1705.11.1, unless exempted by the exceptions to Section 1704.2, are required for buildings and structures constructed where the basic design wind speed, V, is 120 mph (53 m/sec) or greater".

37. Complete load path and uplift ties.

Section 1705.11.1 is amended to read as follows:

"1705.11.1 Complete Load Path and Uplift Ties. Special inspection is required for metal connectors, anchors, or fasteners for wood and cold-formed steel construction at the following locations: roof ridges, roof rafters to beam or wall supports, beams to posts, posts or walls to floor framing or foundation below, ground anchors, and all other connections that are part of the load path to resist uplift forces.

Continuous special inspection is required during field gluing operations of elements of the main windforce-resisting system.

The special inspector need not be present during the installation of all of the connectors, provided that the special inspector verifies that all of the connectors are installed in conformance with the requirements of this code.

38. Complete load path and uplift ties.

Sections 1705.11.2 and 1705.11.3 are deleted in their entirety.

39. Pile splices.

Section 1810.3.6 is amended to read as follows:

"1810.3.6 Splices. Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the deep foundation element during installation and subsequent thereto and shall be designed to resist the axial and shear forces and moments occurring at the location of the splice during driving and under service loading.

Splices occurring in the upper 10 feet (3048 mm) of the embedded portion of an element shall be designed to resist at allowable stresses the moment and shear that would result from an assumed eccentricity of the axial load of 3 inches (76 mm), or the element

shall be braced in accordance with Section 1810.2.2 to other deep foundation elements that do not have splices in the upper 10 feet (3048 mm) of embedment.

40. Concrete strap type anchors.

Section 1904.3 is added to read as follows:

"1904.3 Concrete Strap Type Anchors. Concrete strap-type anchors made out of cold-formed steel shall not be used along the perimeter edges of a slab on grade where the steel does not have at least 1-1/2 inches side cover or other adequate protection".

41. Modification to ACI 318 - water cement ratio

Section 1905.1.9 is added to read as follows:

"1905.1.9 ACI 318, Section 19.3.2.1. Modify ACI 318 Table 19.3.2.1 as follows: Change the Maximum w/cm ratio for Exposure Class Cl to 0.50."

42. Modification to ACI 318 - embedments

Section 1905.1.10 is added to read as follows:

"**1905.1.10 ACI 318, Section 20.7 Embedments**. Add ACI 318, Section 20.7.6 Anchor Bolts at the Perimeter Edge of a Slab on Grade. Anchor bolts shall be hot dipped galvanized in accordance with ASTM F2329 and have a minimum concrete side cover of 1-1/2 inches unless provisions have been made to protect the anchor bolts from corrosion".

43. Modification to ACI 318 - Incorporation of ACI 562

Add Section 1905.2 to the 2018 IBC to read as follows:

"**1905.2 ACI 318, Section 1.4.2**

Revised ACI 318, Section 1.4.2 to read as follows:

"1.4.2 Applicable provisions of ACI 318 shall be permitted to be used for structures not governed by the general building code. Where repairs and rehabilitation are not required to satisfy the provisions of ACI 318, the provisions of ACI 562-16 shall be permitted to be used for the assessment, repair, and rehabilitation of existing structures."

44. Masonry cleanouts.

Section 2104.1.3 is added to read as follows:

"2104.1.3 Cleanouts. Cleanouts shall be provided for all grout pours over 5 feet 4 inches in height. Special provisions shall be made to keep the bottom and sides of the grout spaces, as well as the minimum total clear area required by TMS 602 clean and clear prior to grouting.

Exception: Cleanouts are not required for grout pours 8 feet or less in height providing all of the following conditions are met:

1. The hollow masonry unit is 8-inch nominal width or greater.
2. The specified compressive strength of masonry, f'm, is less than or equal to 2,000psi as determined per TMS 602 Table 2;
3. Fine grout is used complying with ASTM C-476 with a minimum compressive strength of 3,000 psi; and
4. Special Inspection is provided".

45. Protection of sill track.

Section 2203.2 is added to read as follows:
"2203.2 Protection of Sill Track.
Cold formed steel framing sills that directly bear on concrete or masonry that is in direct contact with earth shall be shielded along the exterior flange and bottom of the sill track with a self-adhered rubberized asphalt flashing material with a minimum thickness of 25 mil (0.64 mm) or other moisture barrier conforming to ASTM D412, D570, and E96/E96M."

46. Cold-formed steel prescriptive framing.

Section 2211.1.2 is amended to read as follows:
"2211.1.2 Prescriptive framing. Detached one- and two-family dwellings and townhouses, less than or equal to three stories above grade plane, shall be permitted to be constructed in accordance with AISI S230 subject to the limitations therein. Prescriptive framing shall not be applicable for structures designed using exception 3 in Section 1609.2 Protection of Openings in the Hawaii Amendments to this code."

47. Wood design requirements.

Section 2302.1 is amended to read as follows:
"2302.1 General. The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:

1. *Allowable stress design* in accordance with Sections 2304, 2305 and 2306
2. Load and resistance factor design in accordance with Sections 2304, 2305 and 2307
3. *Conventional light-frame* construction in accordance with Section 2304 and 2308.
4. AWC WFCM in accordance with Section 2309.
5. The design and construction of log structures in accordance with the provisions of ICC 400.

Exception:
Prescriptive requirements in applicable to the exterior roof and wall enclosure in 2304, 2308 and 2309 shall not be applicable for structures designed using exception 3 in Section 1609.2 Protection of Openings.

Method 3 and method 4 shall not be applicable for structures designed using exception 3 in Section 1609.2 Protection of Openings".

48. Preservative-treated wood

Section 2303.1.9 is deleted in its entirety and replaced to read as follows:
"**2303.1.9 Preservative-treated wood.** Structural lumber, including plywood, posts, beams, rafters, joists, trusses, studs, plates, sills, sleepers, roof and floor sheathing, flooring and headers of new wood-frame buildings and additions shall be:

1. Treated in accordance with AWPA Standard U1 (UC1 thru UC4B) for AWPA Standardized Preservatives, all marked or branded and monitored by an approving agency. Incising is not required, providing that the retention and penetration requirements of these standards are met.
2. For SBX disodium octaborate tetrahydrate (DOT), retention shall be not less than 0.28 pcf B2O3 (0.42 = pcf DOT) for exposure to Formosan termites. All such lumber shall be protected from direct weather exposure as directed in AWPA UC1 and UC2.
3. For structural glued-laminated members made up of dimensional lumber, engineered wood products, or structural composite lumber, pressure treated in accordance with AWPA U1 (UC1 thru UC4B) or by Light Oil Solvent Preservative (LOSP) treatment standard as approved by the building official. Water based treatment processes as listed in paragraphs 1 and 2 are not allowed to be used on these products unless specified by a structural engineer for use with reduced load values and permitted by the product manufacturer.
4. For structural composite wood products, treated by non-pressure processes in accordance with AWPA Standard U1 (UC1, UC2 and UC3A) or approved by the building official.

2303.1.9.1 Treatment. Wood treatment shall include the following:
1. A quality control and inspection program which meets or exceeds the current requirements of AWPA Standards M2-01 and M3-03;
2. Inspection and testing for the treatment standards as adopted by this code shall be by an independent agency approved by the building official, accredited by the American Lumber Standards Committee (ALSC) and contracted by the treating company;
3. Field protection of all cut surfaces with a preservative, which shall be applied in accordance with AWPA Standard M4-02 or in accordance with the approved preservative manufacturer's ICC-Evaluation Services report requirements.

2303.1.9.2 Labeling. Labeling shall be applied to all structural lumber 2 inches or greater nominal thickness, with the following information provided on each piece as a permanent ink stamp on one face or on a durable tag permanently fastened to ends with the following information:
1. Name of treating facility;
2. Type of preservative;
3. AWPA use category;
4. Quality mark of third party inspection agency;
5. Retention minimum requirements; and
6. Year of treatment.

All lumber less than 2 inches in nominal thickness, shall be identified per bundle by means of a label consisting of the above requirements. Labels measuring no less than 6 inches by 8 inches shall be placed on the lower left corner of the strapped bundle.

2303.1.9.3 Moisture content. Where *preservative-treated wood* treated with a water-borne preservative is used in enclosed locations where

drying in service cannot readily occur, such wood shall be at a moisture content of 19 percent or less before being covered with insulation, interior wall finish, floor covering or other material".

49. Wood structural panel sheathing.
Section 2304.6.1 is amended in Sections W107 and W108 of Appendix W.

50. Wood structural panel sheathing.
Section 2304.7.5 is amended in Section W109 of Appendix W.

51. Protection against decay and termites.
Section 2304.12 is deleted in its entirety and replaced to read as follows:
"2304.12 Protection against decay and termites.
2304.12.1 General. Where required by this section, protection from decay and termites shall be provided by the use of naturally durable or preservative-treated wood.

2304.12.2 Wood used above ground. Structural lumber installed above ground shall be preservative-treated wood in accordance with Section 2303.1.8.

2304.12.2.1 Soil treatment and termite barriers. Where structural lumber of wood frame buildings or structures are supported directly on the ground by a concrete slab, or concrete and/or masonry foundation, Formosan subterranean termite protection shall be provided by either chemically treating the soil beneath and adjacent to the building or structure by a Hawaii licensed pest control operator, or stainless steel termite barrier, or other termite protection measures approved by the building official.
All soil treatment, stainless steel termite barrier, and termite protection measures shall be installed according to manufacturer's recommendations for control of Formosan subterranean termites, with chemical barriers applied at the maximum label rates.

2304.12.3 Wood in ground contact. Wood supporting permanent buildings and structures, which is in direct soil contact or is embedded in concrete or masonry in direct contact with earth shall be treated to the appropriate commodity specification of AWPA Standard U1.
Wood in direct soil contact but not supporting any permanent buildings or structures shall be treated to the appropriate commodity specification of AWPA Standard U1 for ground contact.

2304.12.4 Retaining walls. Wood in retaining or crib wall shall be treated to AWPA Standard U1.

2304.12.5 Wood and earth separation. Where wood is used with less than 6-inch vertical separation from earth (finish grade), the wood shall be treated for ground-contact use.
Where planter boxes are installed adjacent to wood frame walls, a 2-inch-wide (51 mm) air space shall be provided between the planter and the wall. Flashings shall be installed when the air space is less

than 6 inches (152 mm) in width. Where flashing is used, provisions shall be made to permit circulation of air in the air space. The wood-frame wall shall be provided with an exterior wall covering conforming to the provisions of section 2304.6.

2304.12.6 Under-floor clearance for access and inspection. Minimum clearance between the bottom of floor joists or bottom of floors without joists and the ground beneath shall be 24 inches; the minimum clearance between the bottom of girders and the ground beneath shall be 18 inches.
Exception: Open slat wood decks shall have ground clearance of at least 6 inches for any wood member.

Accessible under-floor areas shall be provided with a minimum 18 inch-by 24 inch access opening, effectively screened or covered. Pipes, ducts and other construction shall not interfere with the accessibility to or within under-floor areas.

2304.12.7 Wood used in retaining walls and cribs. Wood installed in retaining or crib walls shall be preservative treated in accordance with AWPA U1 (Commodity Specifications A or F) for soil and fresh water use.

2304.12.8 Weather exposure. All portions of timbers (over 5-inch nominal width) and glued-laminated timbers that form structural supports of a building or other structure shall be protected by a roof, eave, overhangs, flashings, or similar coverings.
All wood or wood composite panels, in weather-exposed applications, shall be of exterior type.

2304.12.9 Water splash. Where wood-frame walls and partitions are covered on the interior with plaster, tile or similar materials and are subject to water splash, the framing shall be protected with approved waterproof paper conforming to Section 1404.2.

2304.12.10 Pipe and other penetrations. Insulations around plumbing pipes shall not pass through ground floor slabs. Openings around pipes or similar penetrations in a concrete or masonry slab, which is in direct contact with earth, shall be filled with non-shrink grout, BTB, or other approved physical barrier.

52. Conventional light-frame construction.
Section 2308.1 is amended to read as follows:
"2308.1 General. The requirements of this section are intended for conventional light-frame construction. Other construction methods are permitted to be used, provided that a satisfactory design is submitted showing compliance with other provisions of this code. Interior non load-bearing partitions, ceilings and curtain walls of conventional light-frame construction are not subject to the limitations of Section 2308.2. Detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress and their accessory structures shall be permitted to comply

with the State Residential Code subject to the limitations of Sections 2308.2 and 101.2.

2308.1.1 Portions exceeding limitations of conventional light-frame construction.
Where portions of a building of otherwise conventional light-frame construction exceed the limits of Section 2308.2 and the other provisions of this code, those portions and the supporting load path shall be designed in accordance with accepted engineering practice and the provisions of this code. For the purposes of this section, the term "portions" shall mean parts of buildings containing volume and area such as a room or a series of rooms. The extent of such design need only demonstrate compliance of the nonconventional light-framed elements with other applicable provisions of this code and shall be compatible with the performance of the conventional light-framed system".

53. Wood Frame Construction Manual

Section 2309.1 is amended to read as follows:
"2309.1 Wood Frame Construction Manual. Structural design in accordance with the AWC WFCM shall be permitted for buildings assigned to Risk Category I or II subject to the limitations of Section 1.1.3 of the AWC WFCM, Section 1609.1.1.1 and the load assumptions contained therein. Structural elements beyond these limitations shall be designed in accordance with accepted engineering practice".

54. Elevators and Conveying Systems

Section 3001.1 is amended as follows:
3001.1 Scope. This chapter governs the design and construction of the building elements for elevator and conveying systems. The design, construction, installation, alteration, repair and maintenance of elevators and conveying systems and their components are regulated by the State of Hawaii, Department of Labor and Industrial Relations, Hawaii Occupational Safety and Health Division, Boiler and Elevator Inspection Branch.

55. Elevators and Conveying Systems.

Section 3008 Occupant Evacuation Elevators is deleted in its entirety.

56. Appendix U – Hawaii hurricane sheltering provisions for new construction. Appendix U is added to read as follows:

"APPENDIX U
Hawaii Hurricane Sheltering Provisions for New Construction

Section U101 Community Storm Shelters.
Section 423 is deleted and replaced to read as follows:

"SECTION 423 COMMUNITY STORM SHELTERS

423.1 General. In addition to other applicable requirements in this code, designated earthquake, hurricane or other community storm shelters shall be constructed in accordance with ICC-500.

423.1.1 Scope. This section applies to the construction of storm shelters constructed as separate detached buildings or constructed as safe rooms within buildings for the purpose of providing safe refuge from storms that produce high winds, such as hurricanes. Such structures shall be designated to be hurricane shelters.

423.2 Definitions. The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

COMMUNITY STORM SHELTER. A building, structure, or portion thereof, constructed in accordance with ICC/NSSA 500 Standard on the Design and Construction of Storm Shelters and designated for use during a severe wind storm event such as a hurricane."

Section U102 Hawaii Residential Safe Room.
Chapter 4 is amended by adding Section 429 to read as follows:

"SECTION 429 HAWAII RESIDENTIAL SAFE ROOM

429.1 Performance-based design criteria. The residential safe room shall meet the minimum performance specifications of Sections 429.1.1 through 429.10.

429.1.1 Intent and scope. The intent of the residential safe room is to temporarily provide an enhanced protection area, fully enclosed within a dwelling or within an accessory structure to a residence, which is designed and constructed to withstand the wind pressures, windborne debris impacts, and other requirements of this section.

429.1.2 Alternative standards.

1. **Manufactured safe room designs subject to approval.** A manufactured safe room or safe room kit may be substituted if documentation is submitted and approved by the building official. The safe room shall be engineered, tested, and manufactured to meet or exceed the criteria of this section.

2. **FEMA in-residence shelter designs permitted.** It shall be permissible to build FEMA In-Residence Shelters of up to 64 square feet of floor area with walls up to 8 feet long that are built in accordance with construction details of FEMA 320.

429.2 Site criteria. Residential safe rooms shall not be constructed within areas subject to stream flooding, coastal flooding or dam failure inundation within any of the following areas:

1. FEMA Special Flood Hazard Areas (SFHA) subject to rainfall runoff flooding or stream or flash flooding;
2. Coastal zones "V" or "A" identified in the Flood Insurance Rate Map (FIRM) issued by FEMA for floodplain management purposes, in which the flood hazard are tides, storm surge, waves, tsunamis, or a combination of these hazards;
3. Areas subject to dam failure inundation as determined by the Department of Land and Natural Resources.

429.3 Size of safe room. The safe room shall be designed to provide a minimum of 15 square feet per person in a room which does not need to exceed 120 square feet (11 m^2) of floor area.

429.4 Provisions for exiting. The safe room shall be equipped with an inward-swinging interior door and an impact-protected operable window or exterior door suitable for a means of alternative exiting in an emergency.

429.5 Design for dead, live, wind, rain, and impact loads.

429.5.1 Structural integrity criteria.

1. The residential safe room shall be built with a complete structural system and a complete load path for vertical and lateral loads caused by gravity and wind.
2. The building that the residential safe room is in shall be assumed to be destroyed by the storm and shall not be taken as offering any protective shielding to the safe room enclosure.
3. The ceiling structure and wall shall be capable of supporting a superimposed debris load of the full weight of any building floors and roof above, but not less than 125 psf.
4. The residential safe room enclosure shall be capable of simultaneously resisting lateral and uplift wind pressures corresponding to a 145 mph 3-second peak gust ultimate design wind speed, determined in accordance with ASCE 7, Minimum Design Loads for Buildings and Other Structures. The site exposure factor shall be based on exposure C or the exposure shown in Figure 1609.4, whichever is the greater. The values for the gust factor and the directionality factor shall be taken as 0.85. Topographic wind amplification caused by mountainous terrain shall be considered in accordance with the building code. Internal pressure shall be determined in accordance with ASCE 7.
5. The residential safe room shall be anchored to a foundation system capable of resisting the above loading conditions.

429.5.2 Windborne debris impact protection of building enclosure elements. The entire enclosure of the safe room, including all walls, ceilings, and openings, fixed or operable windows, and all entry doors into the safe room, shall meet or exceed Level D requirements of ASTM E 1996 (Table 422.5-1), or be an approved assembly listed in Section 429.5.4. Any wall or ceiling penetration greater than 4 square inches shall be considered an opening.

Exception: Electrical outlet boxes and interior lighting switches not penetrating more than 2.5-inches into the interior wall surface and a plumbing piping or conduit not greater than 1.5-inch in diameter shall be exempted from this requirement.

429.5.3 Cyclic pressure loading of glazing and protective systems. Impact protective systems shall meet the ASTM E 1996 cyclic pressure requirement for the loading given in Table 429.5-1.

Table 429.5-1
Windborne Debris Protection and Cyclic Pressure Criteria for Residential Safe Rooms

ASTM E 1996 Missile Level Rating	Debris Missile Size	Debris Impact Speed	Enclosure Wall Ceiling, and Floor Cyclic Air Pressure Testing - maximum inward and maximum outward pressures
D	2 x 4 weighing 9.0 lb. +/- 0.25 lb., and with min. length 8 ft. +/- 4-inch	50 ft./sec. or at least 34 mph	35 psf inward 45 psf outward

429.5.4 Approved Debris Impact Resistant Wall Assemblies. The following methods of wall assembly construction shall be deemed to comply with Section 429.5.2:

1. 3/4-inch plywood on wood studs spaced at 16 inches on-center with #8 X 3 inch wood screws at 6 inches on-center.
2. 3/4-inch plywood attached to double studs spaced at 16 inches on-center with #8 X 3 inch wood screws at 6 inches on-center.
3. 8-1/4 inch cementitious lap siding over 22 gage sheet metal attached to 350S-162-33 studs spaced at 24 inches on-center.
4. 8-1/4 inch cementitious lap siding attached to 350S-162-33 studs spaced at 24 inches on-center studs with interior ¾-inch interior plywood sheathing.
5. 8-1/4 inch cementitious lap siding attached to 350S-162-33 studs spaced at 24 inches on-center with ½-inch interior 22 gage sheet metal composite gypsum wallboard.
6. 8-1/4 inch cementitious lap siding attached to 2 inch X 4 inch wood studs spaced at 16 inches on-center with ½-inch interior 22 gage sheet metal composite gypsum wallboard.

7. 8-1/4 inch cementitious lap siding attached to 2 inch X 4 inch wood studs spaced at 16 inches on-center with 22 gage sheet metal and 1/2-inch interior gypsum wallboard.
8. Cementitious lap siding attached to 5/8-inch structural plywood on 2 inch X 4 inch wood studs spaced at 16 inches on-center.
9. Cementitious-panel siding attached to 5/8-inch structural plywood on 2 inch X 4 inch or 362S-137-43 steel studs spaced at 16 inches on-center.
10. EFS with 1/2-inch dens-glass gold exterior sheathing on 362S-137-43 steel studs spaced at 16 inches on-center and 1/2-inch interior gypsum wallboard.
11. 24 gage steel sheet (50 ksi) on girts.
12. Concrete with a thickness of 4 inches with reinforcing.
13. Concrete masonry units with a thickness of 6 inches with partial grouting and reinforcing spaced at 24 inches on-center.
14. Concrete masonry units with a thickness of 8 inches with partial grouting and reinforcing spaced at 24 inches on-center.
15. Interior or exterior wall with laterally braced 2 inch x 4 inch wood studs with sheathing on either side of 22 gage sheet metal.

Sheathing shall be attached to studs with fasteners at 6 inches (152 mm) on center for edge and field fastening.

429.6 Ventilation. The residential safe room shall be naturally ventilated to allow the enclosure to have approximately one air change every two hours. This requirement may be satisfied by 12 square inches of venting per occupant. There shall be at least two operable vents. The vents shall be protected by a cowling or other device that shall be impact tested to comply with ASTM E 1996-14 Level D. Alternatively, the room shall be evaluated to determine if the openings are of sufficient area to constitute an open or partially enclosed condition as defined in ASCE 7.

429.7 Communications. The residential safe room shall be equipped with a phone line and telephone that does not rely on a separate electrical power outlet. Alternatively, a wireless telephone shall be permitted to rely on an Uninterruptible Power Supply (UPS) battery device.

429.8 Construction documents. Construction documents for the residential safe room shall be directly prepared by a Hawaii licensed professional structural engineer.

429.9 Special inspection. The construction or installation of the residential safe room shall be verified for conformance to the drawings in accordance with the appropriate requirements of Chapter 17.

429.10 Notification. The owner of the safe room shall notify the state department of defense and county civil defense agency of the property's tax map key or global positioning system coordinates."

Section U103 State- and County-owned public high occupancy buildings - design criteria for enhanced hurricane protection areas.
Chapter 4 is amended by adding Section 430 to read as follows:

"SECTION 430 STATE- AND COUNTY-OWNED PUBLIC HIGH OCCUPANCY BUILDINGS - DESIGN CRITERIA FOR ENHANCED HURRICANE PROTECTION AREAS

430.1 Intent. The purpose of this section is to establish minimum life safety design criteria for enhanced hurricane protection areas in high occupancy state- and county-owned buildings occupied during hurricanes of up to Saffir Simpson Category 3.

430.2 Scope. This section shall apply to state- and county-owned buildings which are of Risk Category III and IV defined by Table 1604.5 and of the following specific occupancies:

1. Enclosed and partially enclosed structures whose primary occupancy is public assembly with an occupant load greater than 300.
2. Health care facilities with an occupant load of 50 or more resident patients, but not having surgery or emergency treatment facilities.
3. Any other state- and county-owned enclosed or partially enclosed building with an occupant load greater than 5,000.
4. Hospitals and other health care facilities having surgery or emergency treatment facilities.

Exception: Facilities located within flood zone V and flood zone A that are designated by the owner to be evacuated during hurricane warnings declared by the National Weather Service, shall not be subject to these requirements.

430.3 Site criteria.
430.3.1 Flood zones. Comply with ASCE 24-14, Flood Resistant Design and Construction, based on provisions for Risk Category III.

1. Floor slab on grade shall be 1.5 foot above the base flood elevation of the county's flood hazard map, or a higher elevation as determined by a modeling methodology that predicts the maximum envelope and depth of inundation including the combined effects of storm surge and wave actions with respect to a Category 3 hurricane, nor less than the flood elevation associated with a 500-year mean recurrence interval.
2. Locate outside of V and Coastal A flood zones unless justified by site-specific analysis or designed for vertical evacuation in accordance with a method approved by the building official. When a building within a V or Coastal A flood zone is approved, the bottom of the lowest structural framing member of any elevated first floor space shall be 2 feet above the base flood elevation of the county's flood hazard map, or at higher elevation as determined by a modeling methodology that predicts the maximum envelope and depth of inundation including the combined effects of storm surge and wave actions with respect to a Category 3

hurricane, nor less than the flood elevation associated with a 500-year mean recurrence interval.

430.3.2 Emergency vehicle access. Provide at least one route for emergency vehicle access. The portion of the emergency route within the site shall be above the 100-year flood elevation.

430.3.3 Landscaping and utility laydown impact hazards. Landscaping around the building shall be designed to provide standoff separation sufficient to maintain emergency vehicle access in the event of mature tree blowdown. Trees shall not interfere with the functioning of overhead or underground utility lines, nor cause laydown or falling impact hazard to the building envelope or utility lines.

430.3.4 Adjacent buildings. The building shall not be located within 1,000 feet of any hazardous material facilities defined by Table 1604.5. Unanchored light-framed portable structures shall be not permitted within 300 feet of the building, unless the windborne debris hazard of the portable structure uplift is mitigated.

430.4 Enhanced hurricane protection area program requirements.

430.4.1 Applicable net area. At least 50 per cent of the net square feet of a facility shall be constructed to qualify as an enhanced hurricane protection area. The net floor area shall be determined by subtracting from the gross square feet the floor area of excluded spaces, exterior walls, columns, fixed or movable objects, equipment or other features that under probable conditions cannot be removed or stored during use as a storm shelter.

430.4.2 Excluded spaces. Spaces such as mechanical rooms, electrical rooms, storage rooms, attic and crawl spaces, shall not be considered as net floor area permitted to be occupied during a hurricane.

430.4.3 Occupancy capacity. The occupancy capacity shall be determined by dividing the net area of the enhanced hurricane protection area by 15 square feet net floor area per person.

430.4.4 Toilets and hand washing facilities. Toilet and hand washing facilities shall be located and accessible from within the perimeter of the enhanced hurricane protection area.

430.4.5 Accessibility. Where the refuge occupancy accommodates more than 50 persons, provide an ADA-accessible route to a shelter area at each facility with a minimum of 1 wheelchair space for every 200 enhanced hurricane protection area occupants determined in accordance with Section 430.4.3.

430.5 Design wind, rain, and impact loads.
430.5.1 Structural design criteria. The building main wind force resisting system and structural components shall be designed per ASCE 7 for a 145 mph minimum peak 3-second gust ultimate design wind speed.

Topographic and directionality factors shall be the site-specific values determined per Appendix W. Design for interior pressure shall be based on the largest opening in any exterior facade or roof surface.

430.5.2 Windborne debris missile impact for building enclosure elements. Exterior glazing and glazed openings, louvers, roof openings and doors shall be provided with windborne debris impact resistance or protection systems conforming to ASTM E1996-14 Level D, i.e., 9 lb. 2 X 4 @ 50 fps (34 mph).

430.5.3 Cyclic pressure loading of impact resistive glazing or windborne impact protective systems. Resistance to the calculated maximum inward and outward pressure shall be designed to conform to ASTM E1996-14.

430.5.4 Windows. All unprotected window assemblies and their anchoring systems shall be designed and installed to meet the wind load and missile impact criteria of this section.

430.5.5 Window protective systems. Windows may be provided with permanent or deployable protective systems, provided the protective system is designed and installed to meet the wind load and missile impact criteria and completely covers the window assembly and anchoring system.

430.5.6 Doors. All exterior and interior doors subject to possible wind exposure or missile impact shall have doors, frames, anchoring devices, and vision panels designed and installed to resist the wind load and missile impact criteria or such doors, frames, anchoring devices, and vision panels shall be provided with impact protective systems designed and installed to resist the wind load and missile impact criteria of this section.

430.5.7 Exterior envelope. The building enclosure, including walls, roofs, glazed openings, louvers and doors, shall not be perforated or penetrated by windborne debris, as determined by compliance with ASTM E1996-14 Level D.

430.5.8 Parapets. Parapets shall satisfy the wind load and missile impact criteria of the exterior envelope.

430.5.9 Roofs

430.5.9.1 Roof openings. Roof openings (e.g., HVAC fans, ducts, skylights) shall be provided with protection for the wind load and missile impact criteria of Sections 430.5.2 and 430.5.3.

430.5.9.2 High wind roof coverings. Roof coverings shall be specified and designed according to the latest ASTM Standards for high wind uplift forces and Section 1507, whichever is the greater.

430.5.9.3 Roof drainage. Roofs shall have adequate slope, drains and overflow drains or scuppers sized to accommodate 100-year hourly rainfall rates in accordance with Section 1611.1, but not less than 2-inches per hour for 6 continuous hours.

430.6 Ventilation

430.6.1 Mechanical ventilation. Mechanical ventilation as required in accordance with the International Mechanical Code. Air intakes and exhausts shall be designed and installed to meet the wind load and missile impact criteria of Sections 430.5.2 and 430.5.3.

430.6.2 HVAC equipment anchorage. HVAC equipment mounted on roofs and anchoring systems shall be designed and installed to meet the wind load criteria. Roof openings for roof-mounted HVAC equipment shall have a 12-inch-high curb designed to prevent the entry of rain water.

430.7 Standby electrical system capability. Provide a standby emergency electrical power system per Chapter 27 and NFPA 70 **Article 700** Emergency Systems and **Article 701** Legally Required Standby Systems, which shall have the capability of being connected to an emergency generator or other temporary power source. The emergency system capabilities shall include:

1. An emergency lighting system;
2. Illuminated exit signs;
3. Fire protection systems, fire alarm systems and fire sprinkler systems; and
4. Minimum mechanical ventilation for health/safety purposes.

430.7.1 Emergency generator. When emergency generators are pre-installed, the facility housing the generator, permanent or portable, shall be an enclosed area designed to protect the generators from wind and missile impact.
Generators hardened by the manufacturer to withstand the area's design wind and missile impact criteria shall be exempt from the enclosed area criteria requirement.

430.8 Quality assurance

430.8.1 Information on construction documents. Construction documents shall include design criteria, the occupancy capacity of the enhanced hurricane protective area, and Project Specifications shall include opening protection devices. Floor plans shall indicate all enhanced hurricane protection area portions of the facility and exiting routes there from. The latitude and longitude coordinates of the building shall be recorded on the construction documents.

430.8.2 Special inspection. In addition to the requirements of Chapter 17, special inspections shall include at least the following systems and components:

1. Roof cladding and roof framing connections;
2. Wall connections to roof and floor diaphragms and framing;
3. Roof and floor diaphragm systems, including collectors, drag struts and boundary elements;

4. Vertical windforce-resisting systems, including braced frames, moment frames and shear walls;
5. Windforce-resisting system connections to the foundation; and
6. Fabrication and installation of systems or components required to meet the impact-resistance requirements of Section 1609.1.2.

Exception: Fabrication of manufactured systems or components that have a label indicating compliance with the wind-load and impact-resistance requirements of this code.

430.8.3 Quality assurance plan. A construction quality assurance program shall be included in the construction documents and shall include:

1. The materials, systems, components, and work required to have special inspection or testing by the building official or by the registered design professional responsible for each portion of the work;
2. The type and extent of each special inspection;
3. The type and extent of each test;
4. Additional requirements for special inspection or testing for seismic or wind resistance; and
5. For each type of special inspection, identification as to whether it will be continuous special inspection or periodic special inspection.

430.8.4 Peer review. Construction documents shall be independently reviewed by a Hawaii-licensed structural engineer. A written opinion report of compliance shall be submitted to Hawaii Emergency Management Agency, the building official, and the owner.

430.9 Maintenance. The building shall be periodically inspected every three years and maintained by the owner to ensure structural integrity and compliance with this section. A report of inspection shall be furnished to the State Civil Defense.

430.10 Compliance re-certification when altered, deteriorated, or damaged. Alterations shall be reviewed by a Hawaii-licensed structural engineer to determine whether any alterations would cause a violation of this section. Deterioration or damage to any component of the building shall require an evaluation by a Hawaii-licensed structural engineer to determine repairs necessary to maintain compliance with this section."

57. Appendix W – Hawaii wind design provisions for new construction.
Appendix W is added to read as follows:

"APPENDIX W
Hawaii Wind Design Provisions for New Construction

W101 Revisions to Chapter 2, Chapter 16 and Chapter 23.
Wind design shall be in accordance with this code as amended by Sections W101 through W109.

W102 Windborne Debris Region definition
The definition of "Windborne Debris Region" in Section 202 is amended to read as follows:
"WIND-BORNE DEBRIS REGION. Areas in Hawaii where the basic design wind speed is 130 mph (63 m/s) or greater. For Risk Category II buildings and structures, the wind-borne debris region shall be based on Figure 26.5-2B of ASCE 7. For Risk Category III buildings and structures, the wind-borne debris region shall be based on Figure 26.5-2C of ASCE 7. For Risk Category IV buildings, the windborne debris region shall be based on Figure 26.5-2D of ASCE 7."

W103 Revised Notations for Section 1602
The following Notations are added to Section 1602:
"$V_{eff\text{-}asd}$ = Effective allowable stress design wind speed, miles per hour (mph) (km/hr) where applicable, calculated per Section 1609.3.1, that includes the effect of the special Hawaii factors for topographic effects and directionality.
V = Basic design wind speeds, miles per hour (mph) (km/hr) determined from Figures 26.5-2A through 26.5-2D of ASCE 7 for the Risk Category, applied to the strength design of the structure.
V_{unt} = Ultimate design wind speed miles per hour, (mph) (km/hr), of the region prior to any pressure calculation adjustments of topographic effects per Section 1609.3.2 or directionality effects per Section 1609.3.3."

W104 Wind design data.
Section 1603.1.4 is amended to read as follows:
"1603.1.4 Wind design data. The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral force-resisting system of the structure:

1. Basic design wind speed, V, miles per hour (km/hr) and effective allowable stress design wind speed, $V_{eff\text{-}asd}$, as determined in accordance with Section 1609.3.1.
2. Risk category.
3. Wind exposure. Applicable wind direction if more than one wind exposure is utilized.
4. Applicable internal pressure coefficient.
5. Design wind pressures to be used for exterior component and cladding materials not specifically designed by the registered design professional responsible for the design of the structure, psf (kN/m2)."

W105 Amendments to Section 1609.1 through 1609.4
Sections 1609.1 through 1609.4 are amended to read as follows:
"1609.1 Applications.
Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

1609.1.1 Determination of wind loads.
Wind loads on every building or structure shall be determined in accordance with Chapters 26 to 30 of ASCE 7. Minimum values for Directionality Factor, K_d, Velocity Pressure Exposure Coefficient, K_z, and Topographic Factor, K_{zt}, shall be determined in accordance with Section 1609. The type of opening protection required, the basic design wind speed, V, and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:
1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting structures and antennas, provided the effect of topography is included in accordance with Section 1609.3.3 Topographic effects.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.5 of ASCE 7.

The wind speeds in Figures 26.5-2A through 26.5-2D of ASCE 7 are basic design wind speeds, V, and shall be converted in accordance with Section 1609.3.1 to allowable stress design wind speeds, $V_{eff\text{-}asd}$, when the provisions of the standards referenced in Exceptions 4 and 5 are used.

1609.1.1.1 Applicability
The provisions of ICC 600 are applicable only to buildings located within Exposure B or C as defined in Section 1609.4.

The prescriptive provisions of ICC 600, AWC WFCM, or AISI S230 shall not be permitted for either of the following cases:
1. Structures which are more than three stories above grade plane in height.
2. Structures designed using exception 3 in Section 1609.2 Protection of Openings.

1609.2 Protection of openings.

In *windborne debris regions*, glazing in buildings shall be impact resistant or protected with an impact-resistant covering meeting the requirements of an *approved* impact-resistant standard or ASTM E1996 and ASTM E1886 referenced herein as follows:

1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the large missile test of ASTM E1996.
2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the small missile test of ASTM E1996.
3. Glazing in Risk Category II, III or IV buildings located over 60 feet (18 288 mm) above the ground and over 30 feet (9144 mm) above aggregate surface roofs located within 1,500 feet (458 m) of the building shall be permitted to be unprotected.
4. Glazing in Risk Category IV buildings and structures, and those Risk Category III buildings of the following occupancies shall be provided with windborne debris protection:
   a. Covered structures whose primary occupancy is public or educational assembly with an occupant load greater than 300.
   b. Health care facilities with an occupant load of 50 or more resident patients, but not having surgery or emergency treatment facilities.
   c. Any other public building with an occupant load greater than 5,000.
5. Glazing in Risk Category I, II, and other Risk Category III buildings and structures are subject to the following exceptions:

   Exceptions:

   1. Wood structural panels with a minimum thickness of 7/16 inch (11.1 mm) and maximum panel span of 8 feet (2438 mm) shall be permitted for opening protection in buildings with a mean roof height of 33 feet (10 058 mm) or less that are classified as a Group R-3 or R-4 occupancy. Panels shall be precut so that they shall be attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage method and shall be secured with the attachment hardware provided. Attachments shall be designed to resist the components and cladding loads determined in accordance with the provisions of ASCE 7, with corrosion-resistant attachment hardware provided and anchors permanently installed on the building. Attachment in accordance with Table 1609.2 with corrosion-resistant attachment hardware provided and anchors permanently installed on the building is permitted for buildings with a mean roof height of 45 feet (13 716 mm) or less where Veff-asd determined in accordance with Section 1609.3.1 does not exceed 140 mph (63 m/s).
   2. Glazing in Risk Category I buildings, including greenhouses that are occupied for growing plants on a production or

research basis, without public access shall be permitted to be unprotected.

3. Risk Category II buildings shall be permitted to be designed with unprotected openings subject to the following requirements:
   a) For each direction of wind, determination of enclosure classification shall be based on the assumption that all unprotected glazing on windward walls are openings while glazing on the remaining walls and roof are intact and are not assumed to be openings.
   b) Partially enclosed and open occupancy R-3 buildings without wind-borne debris protection shall also include a residential safe room in accordance with Section 425, Hawaii residential safe room, or alternatively provide an equivalently sized room structurally protected by construction complying with Section 429.5.

1609.2.1 Louvers.
Louvers protecting intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540.

1609.2.2 Application of ASTM E1996.
The text of Section 6.2.2 of ASTM E1996 shall be substituted as follows:

6.2.2 Unless otherwise specified, select the wind zone based on the basic design wind speed, *V*, as follows:
6.2.2.1 *Wind Zone 1*-130 mph ≤ basic design wind speed, *V* < 140 mph.

6.2.2.2 *Wind Zone 2*-140 mph ≤ basic design wind speed, *V* < 150 mph at greater than one mile (1.6 km) from the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.3 *Wind Zone 3*-150 mph (58 m/s) ≤ basic design wind speed, *V* **<** 160 mph (63 m/s), or 140 mph (54 m/s) ≤ basic design wind speed, *V* ≤ 160 mph (63 m/s) and within one mile (1.6 km) of the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.4 *Wind Zone 4* - basic design wind speed, *V* > 160 mph (63 m/s).

Table 1609.2.2
Wind-Borne Debris Protection Fastening Schedule
For Wood Structural Panels [a,b,c,d]

Fastener Type	Fastener Spacing		
	Panel span ≤ 4 feet	Panel span > 4 feet and ≤ 6 feet	Panel span > 6 feet and ≤ 8 feet
No. 8 Wood screw based anchor with 2 inch embedment length	16”	10”	8”
No. 10 Wood screw based anchor with 2-inch embedment length	16”	12”	9”
¼-inch lag screw based anchor with 2-inch embedment length	16”	16”	16”

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 0.454 kg, 1 mile per hour = 1.609 km/h.

a. This table is based on a 175 mph ultimate design wind speed and a mean roof height of 45 feet.

b. Fasteners shall be installed at opposing ends of the wood structural panel. Fasteners shall be located a minimum of 1 inch from the edge of the panel.

c. Anchors shall penetrate through the exterior wall covering with an embedment length of 2 inches minimum into the building frame. Fasteners shall be located a minimum of 2-1/2 inches from the edge of concrete block or concrete.

d. Where panels are attached to masonry or masonry/stucco, they shall be attached utilizing vibration-resistant anchors having a minimum withdrawal capacity of 1,500 pounds.

1609.2.3 Garage doors.
Garage door glazed opening protection for windborne debris shall meet the requirements of an approved impact-resisting standard of ANSI/DASMA 115.

1609.3 Basic design wind speed.
The basic design wind speed, V, in mph, for the determination of the wind loads shall be determined by Figures 26.5-2A through 26.5-2D of ASCE 7. The basic design wind speed, V, for use in the design of Risk Category II buildings and structures shall be obtained from Figure 26.5-2B of ASCE 7. The basic design wind speed, V, for use in the design of Risk Category III buildings and structures shall be obtained from Figure 26.5-2C of ASCE 7). The basic design wind speed, V, for use in the design of Risk Category IV buildings and structures shall be obtained from Figure 26.5-2D of ASCE 7. The basic design wind speed, V, for use in the design of Risk Category I buildings and structures shall be obtained from Figure 26.5-2A of ASCE 7. The basic design wind speed, V, shown for Hawaii in Figures 26.5-2A through 26.5-2D of ASCE 7 include topographic effects near mountainous terrain and near gorges, and shall be used with a topographic factor K_{zt} of 1.0 and the directionality factors given in Table 26.6-1 of ASCE 7.

Alternatively, when determining wind loads using both the explicit topographic factors given in section 1609.3.2 and the explicit directionality factors of section 1609.3.3, the ultimate design wind speed, V_{unt}, in mph, without topographic effects shall be as follows:

Risk Category I buildings and structures: 115 mph
Risk Category II buildings and structures: 130 mph
Risk Category III buildings and structures: 145 mph
Risk Category IV buildings and structures: 153 mph

1609.3.1 Wind speed conversion

Where required, the basic design wind speeds of Figures 26.5-2A through 26.5-2D of ASCE 7, shall be converted to effective allowable stress design wind speeds, $V_{eff-asd}$, using Table 1609.3.1 or Equation 16-33.

$$V_{eff-asd} = V\sqrt{0.6} \qquad \text{(Equation 16-33)}$$

where:

$V_{eff-asd}$ = *Effective* Allowable stress design wind speed applicable to methods specified in Exceptions 4 and 5 of Section 1609.1.1 and for Section 2308.10.1.

V = Basic design wind speeds determined from Figures 26.5-2A through 26.5-2D of ASCE 7.

TABLE 1609.3.1
WIND SPEED CONVERSIONS [a, b, c]

V	100	110	120	130	140	150	160	170	180	190	200
$V_{eff-asd}$	78	85	93	101	108	116	124	132	139	147	155

For SI: 1 mile per hour = 0.44 m/s.

a. Linear interpolation is permitted.

b. $V_{eff-asd}$ = Allowable stress design wind speed applicable to methods specified in Exceptions 4 through 5 of Section 1609.1.1.

c. V = basic design wind speeds determined from Figures 26.5-2A through 26.5-2D of ASCE 7.

1609.3.2 Topographic effects.

Wind speed-up effects caused by topography shall be included in the calculation of wind loads by using the factor K_{zt}, where K_{zt} is given in Figures 1609.3.2(a) through 1609.3.2(f).

Exception:

Site-specific probabilistic analysis of directional K_{zt} based on wind-tunnel testing of topographic speed-up shall be permitted to be submitted for approval by the building official.

Basic design wind speed, V, is determined per **Figures 26.5-2A through 26.5-2D of ASCE 7** that already include topographic effects near mountainous terrain and near gorges, which shall be used with a topographic factor K_{zt} of 1.0 and the directionality factors given in Table 26.6-1 of ASCE 7.

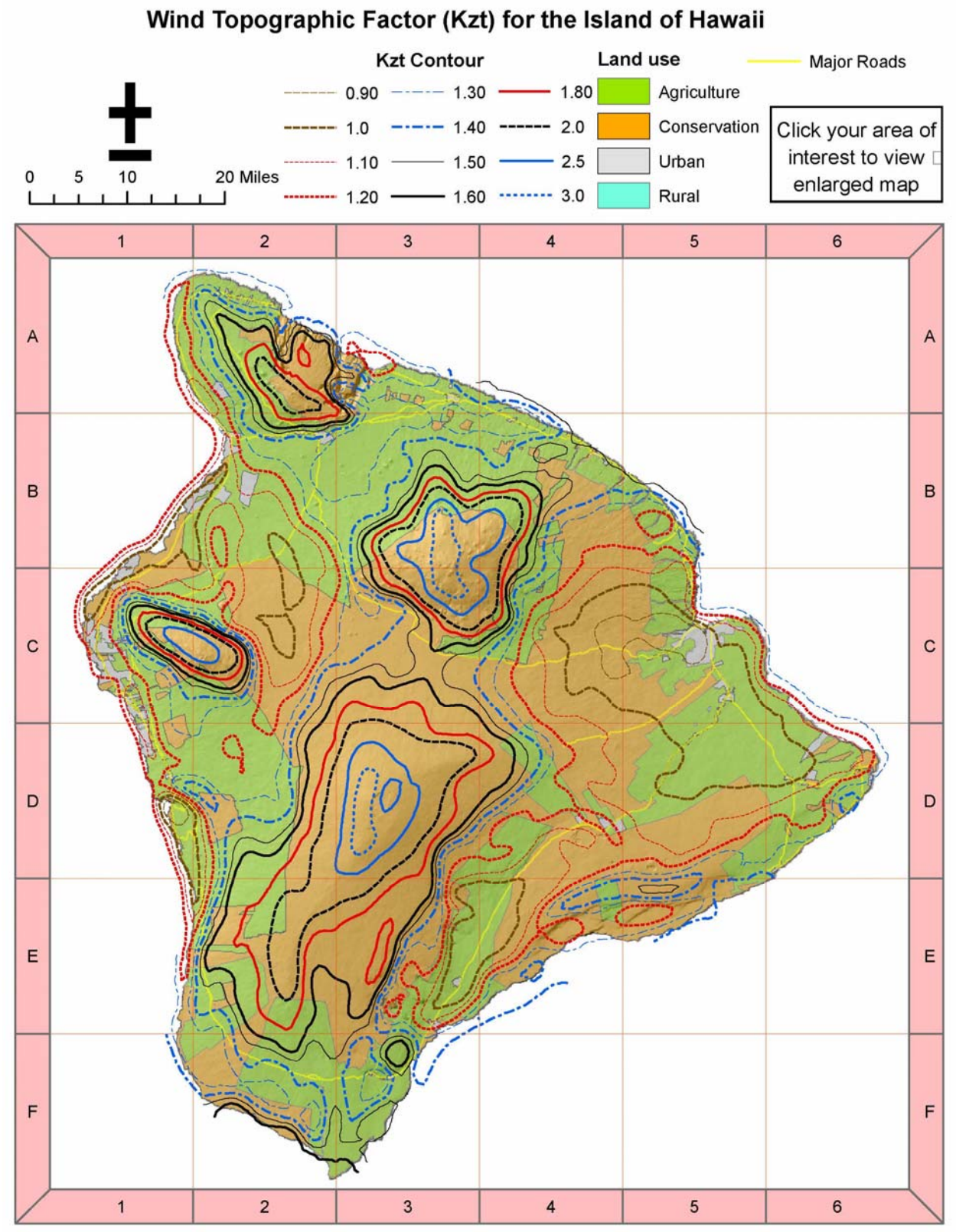


Figure 1609.3.2(a)
County of Hawaii Peak Gust Topographic Factor K_{zt}

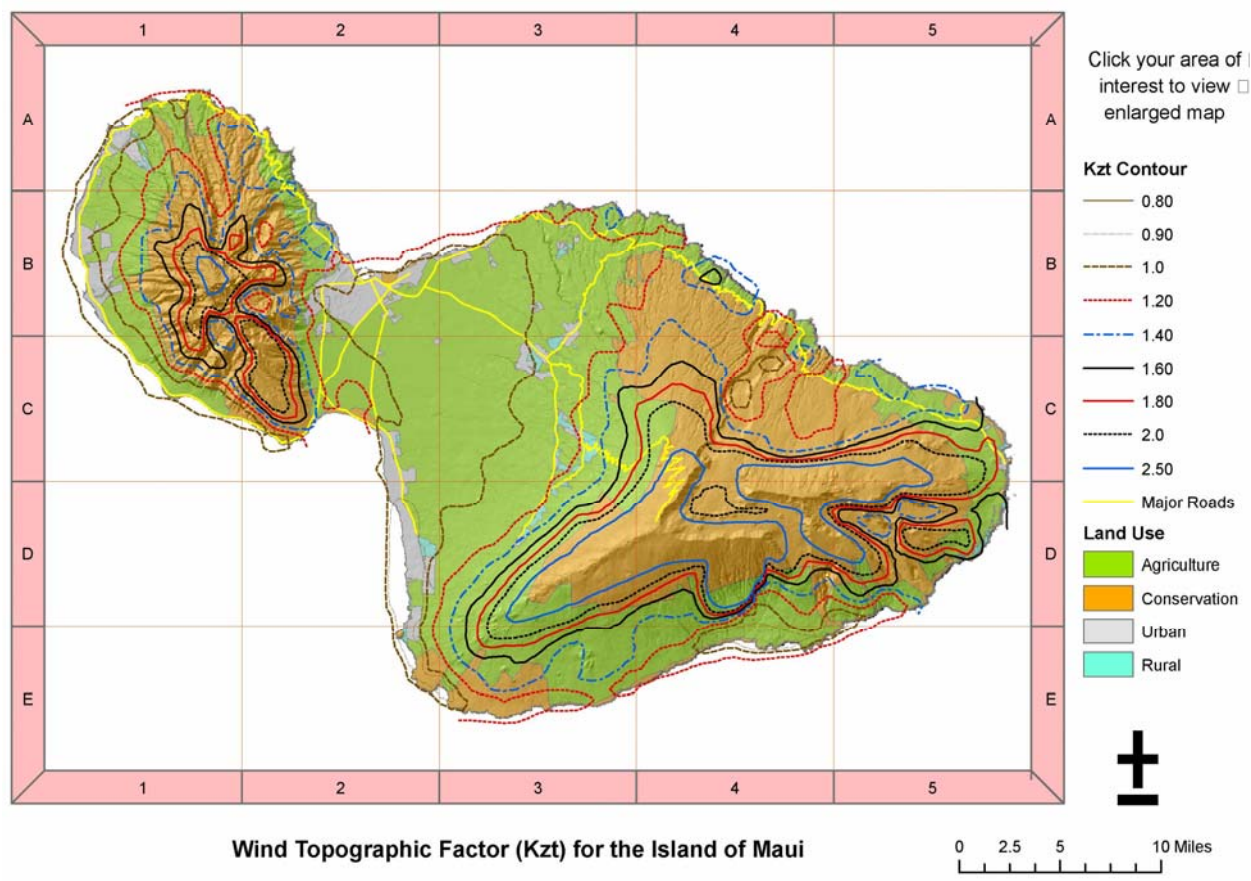


Figure 1609.3.2(b)
County of Maui, Island of Maui Peak Gust Topographic Factor K_{zt}

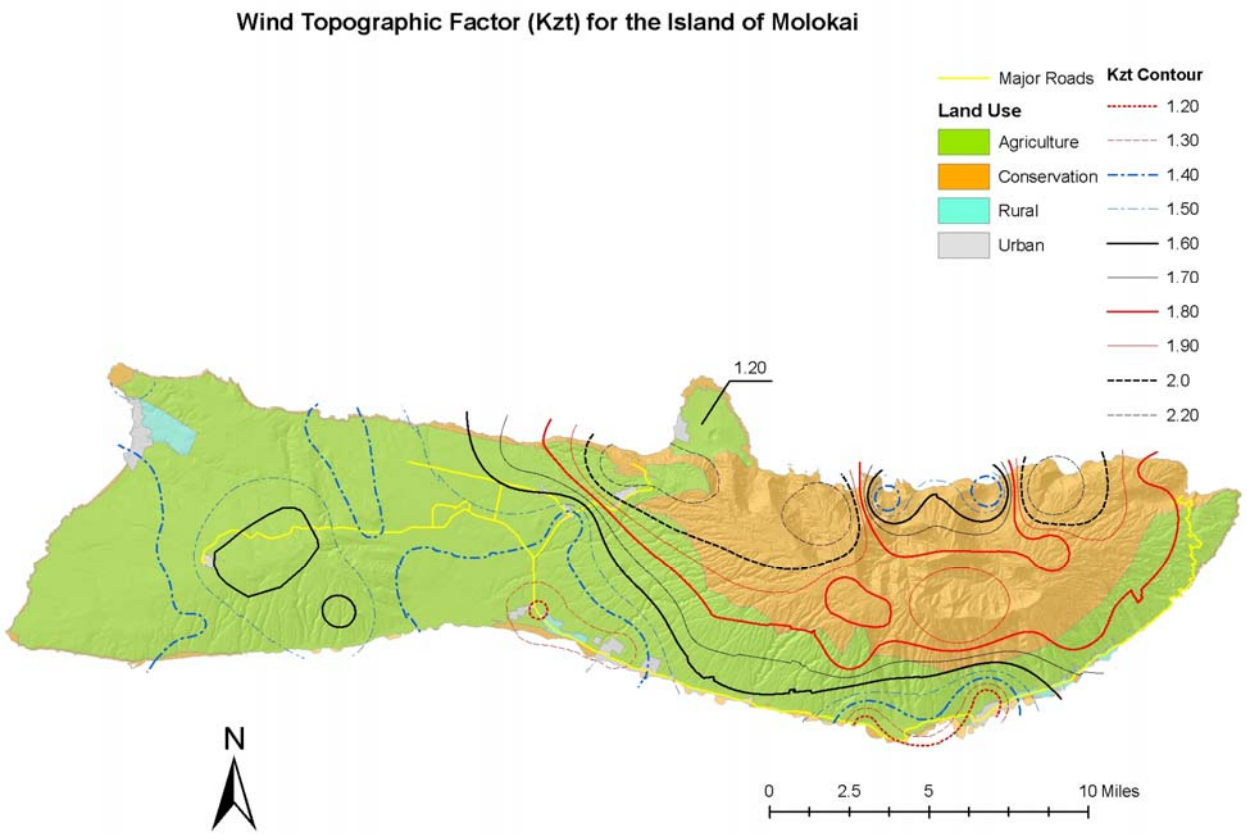


Figure 1609.3.2(c)
County of Maui, Island of Molokai Peak Gust Topographic Factor K_{zt}

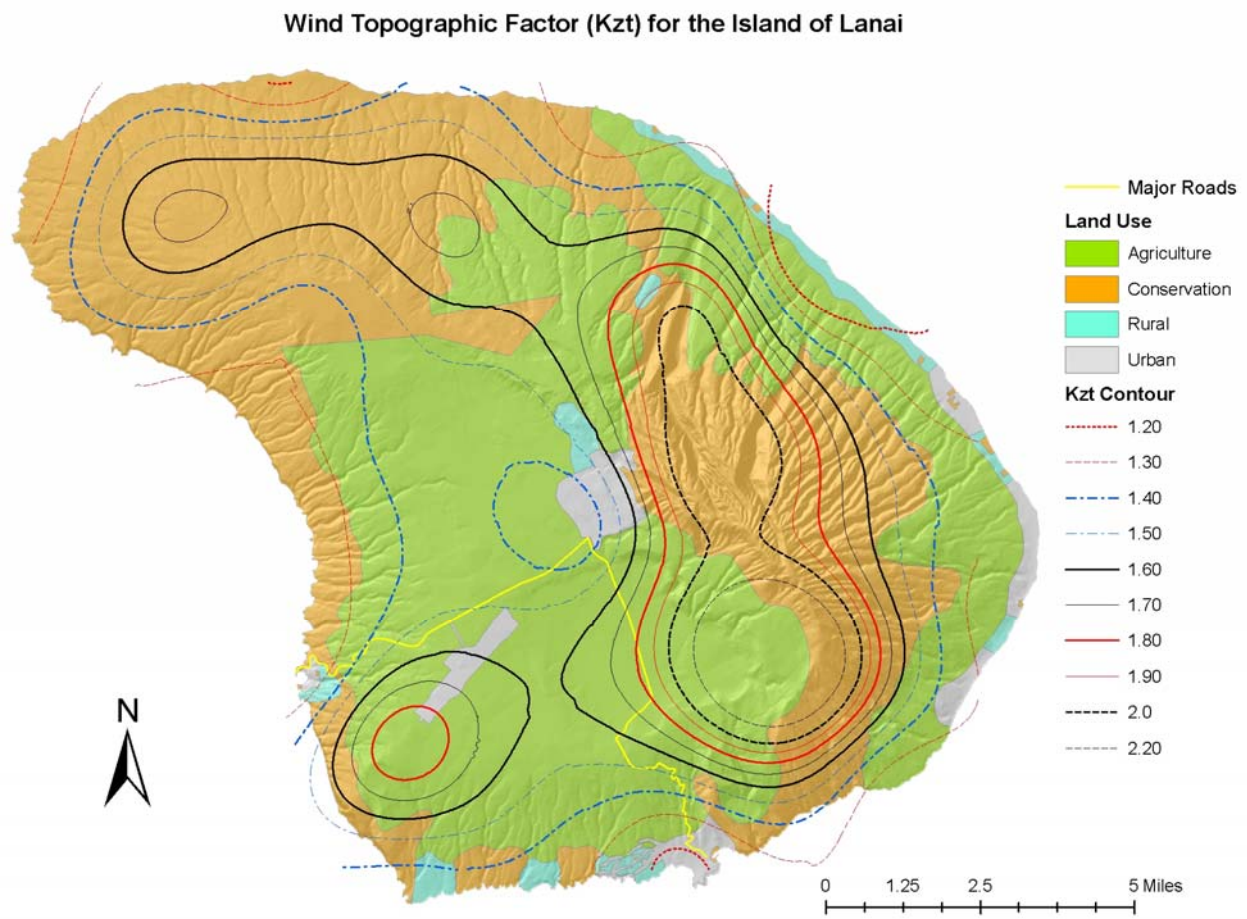


Figure 1609.3.2(d)
County of Maui, Island of Lanai Peak Gust Topographic Factor K_{zt}

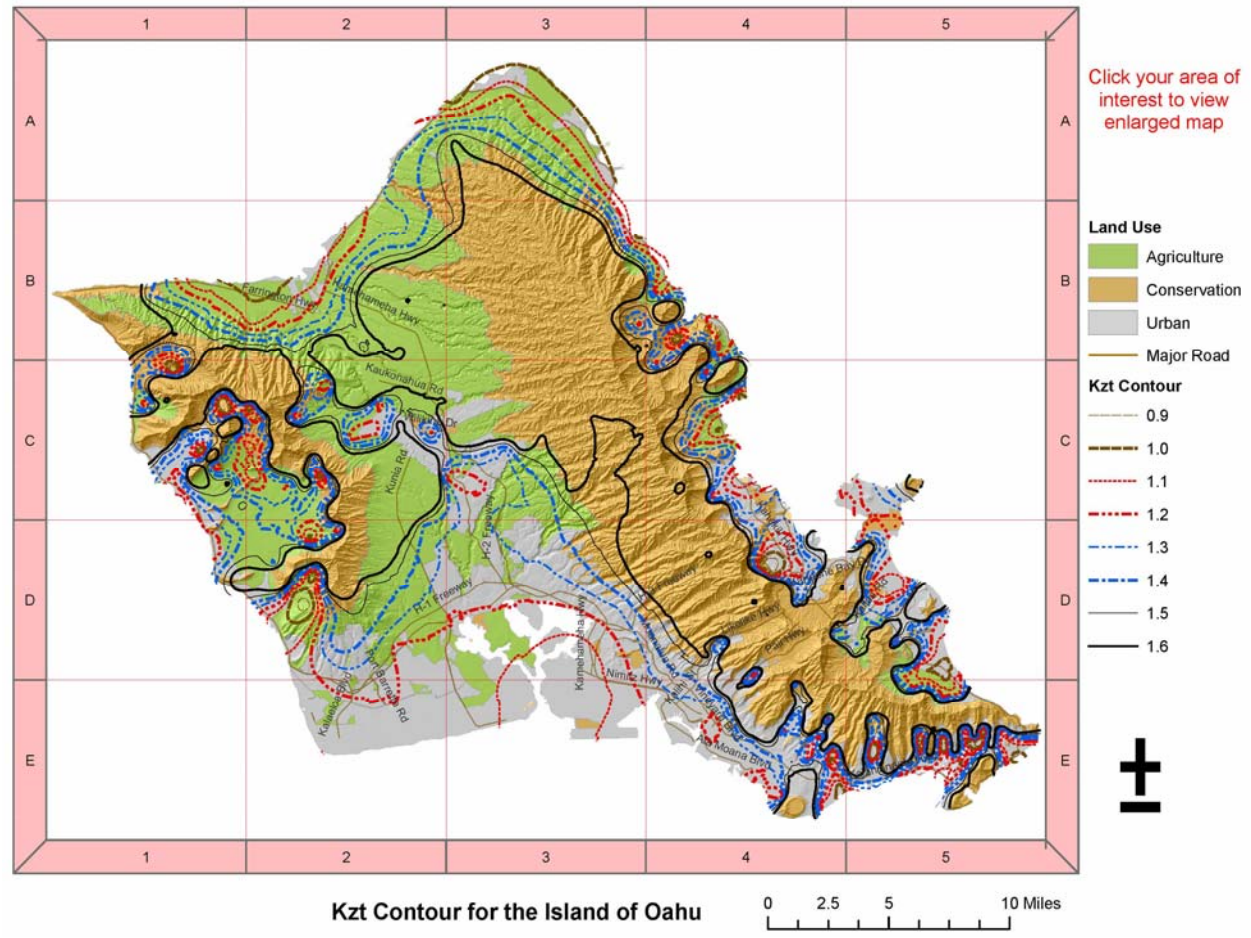


Figure 1609.3.2(e)
City and County of Honolulu Peak Topographic Factor K_{zt} for Building Heights up to 100 feet[a,b]

a. Site-specific probabilistic analysis of directional K_{zt} based on wind-tunnel testing of topographic speed-up shall be permitted to be submitted for approval by the building official. For buildings taller than 160 feet, this submittal shall include peak gust velocity profiles for all wind direction sectors.

b. At Exposure B sites with ground elevations less than 500 feet, K_{zt} values $\geq$ 1.2 shall be permitted to be reduced for building heights greater than 100 feet by multiplying K_{zt} mapped in Figure 1609.3.2(e) by the height adjustments given in the Table 1609.3.2(e). Interpolation is permitted.

Table 1609.3.2(e)
Height Adjustment of Mapped K_{zt} Values at Sites with Ground Elevation Less than 500 feet

Building roof height above ground (ft)	≤100	120	140	160	180	200	220	≥240
Adjustment factor to K_{zt} ≥1.2	100%	98%	96%	94%	92%	90%	92%	94%

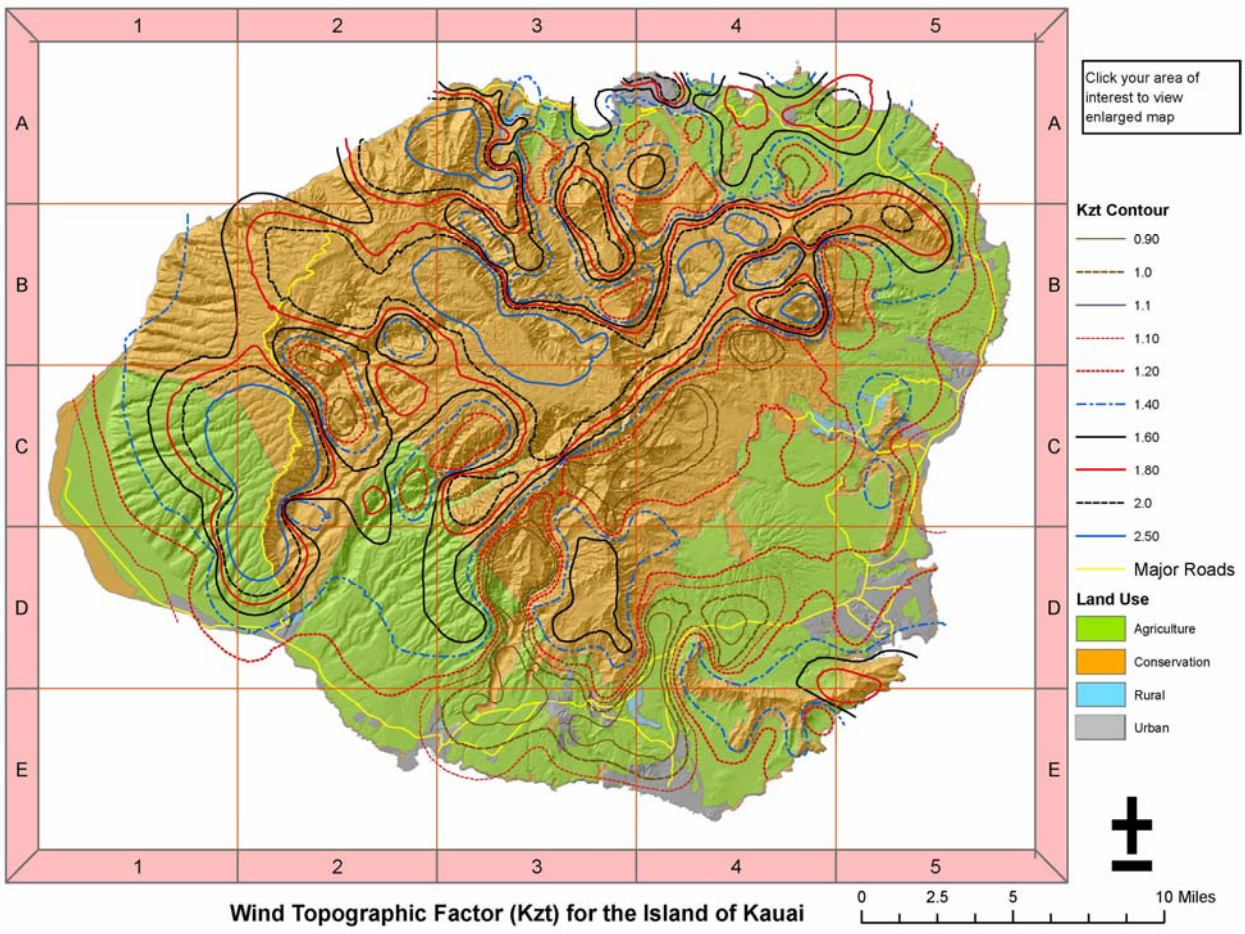


Figure 1609.3.2(f)
County of Kauai Peak Gust Topographic Factor K_{zt}

1609.3.3 Directionality factor.

The wind directionality factor, K_d, shall be determined from Tables 1609.3.3(a)(1) through 1609.3.3(a)(3) and 1609.3.3(b)(1) through 1609.3.3(b)(3), and Figures 1609.3.3(a)(4) and 1609.3.3(b)(4).

Exception: Basic design wind speed, V, is determined per Figures 1609.3(5) through 1609.3(8) that already include topographic effects near mountainous terrain and near gorges, which shall be used with a topographic factor Kzt of 1.0 and the directionality factors given in Table 26.6-1 of ASCE 7.

Table 1609.3.3(a)(1)
K_d Values for Main Wind Force Resisting Systems Sited in Hawaii County [a,b]

Topographic Location on the Island of Hawaii	Main Wind Force Resisting Systems		Main Wind Force Resisting Systems with totally independent systems in each orthogonal direction		Biaxially Symmetric and Axisymmetric Structures of any Height and Arched Roof Structures
	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	
Sites in North Kohala, South Kohala, South Kona, South Hilo, and Puna Districts at an elevation not greater than 3000 ft.	0.65	0.70	0.70	0.75	0.85
All other sites	0.70	0.80	0.75	0.80	0.95

a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but K_d shall have a value not less than 0.65.

Table 1609.3.3(a)(2)
K_d Values for Main Wind Force Resisting Systems Sited in Maui County [a,b]

Topographic Location in the County of Maui	Main Wind Force Resisting Systems		Main Wind Force Resisting Systems with totally independent systems in each orthogonal direction		Biaxially Symmetric and Axisymmetric Structures of any Height and Arched Roof Structures
	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	
Sites on the Island of Maui at an elevation not greater than 1000 ft.	0.60	0.65	0.70	0.75	0.85
Sites on the Island of Maui at an elevation greater than 1000 ft.	0.65	.70	0.75	0.80	0.90
All other sites on the Islands of Molokai and Lanai	0.80	0.85	0.80	0.85	0.95

a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but K_d shall have a value not less than 0.60.

Table 1609.3.3(a)(3)
K_d Values for Main Wind Force Resisting Systems Sited on Oahu, Hawaii[a,b]

Topographic Location on Oahu, Hawaii	Main Wind Force Resisting Systems		Main Wind Force Resisting Systems with totally independent systems in each orthogonal direction		Biaxially Symmetric and Axisymmetric Structures of any Height and Arched Roof Structures
	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	
Sites within valleys at an elevation of at least 50 ft. but not greater than 500 ft.	0.65	0.70	0.70	0.75	0.85
Central Oahu above an elevation of 500 ft, the Ewa and Kapolei plains, and coastal areas with K_{zt} (10m) not greater than 1.2	0.75	0.80	0.75	0.80	0.95
All other areas, including Hills, Hillsides, Ridges, Bluffs, and Escarpments at any elevation or height; coastal and inland areas with K_{zt} (10m) greater than 1.2	0.70	0.75	0.75	0.80	0.90

a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but K_d shall have a value not less than 0.65.

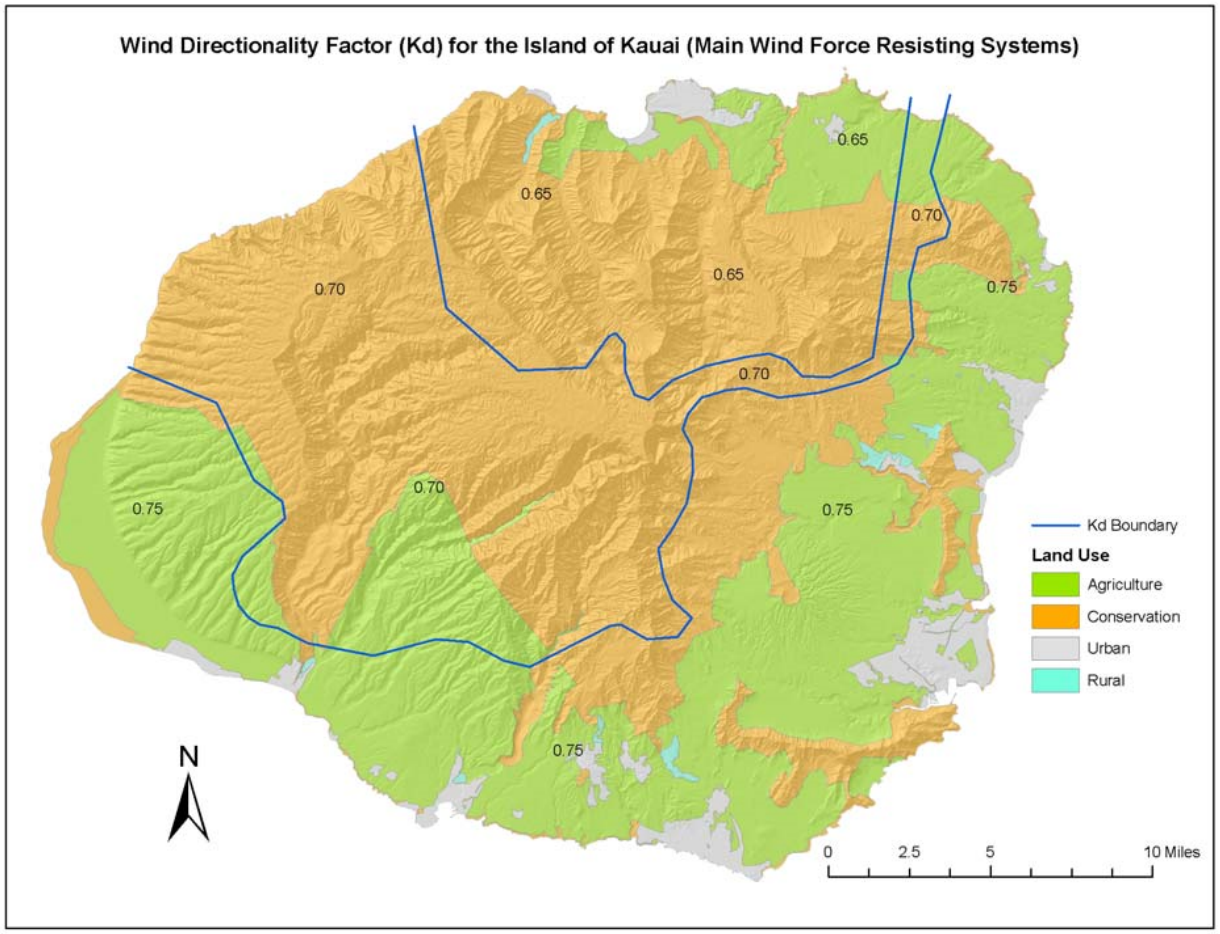


Figure 1609.3.3(a)(4)
K_d Values for Main Wind Force Resisting Systems Sited on Kauai County, Hawaii [a,b]

a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but K_d shall have a value not less than 0.65.

Table 1609.3.3(b)(1)
K_d Values for Components and Cladding of Buildings Sited in Hawaii County [a,b]

Topographic Location on the Island of Hawaii	Components and Cladding		
	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	Risk Category IV Buildings and Structures
Sites in North Kohala, South Kohala, South Kona, South Hilo, and Puna Districts at an elevation not greater than 3000 ft.	0.65	0.70	0.75
All other sites	0.75	0.80	0.85

a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but in any case, subject to a minimum value of 0.65.

Table 1609.3.3(b)(2)
K_d Values for Components and Cladding of Buildings Sited in Maui County
[a,b]

Topographic Location on the County of Maui	Components and Cladding		
	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	Risk Category IV Buildings and Structures
Sites on the Island of Maui at an elevation not greater than 1000 ft	0.65	0.70	0.75
Sites on the Island of Maui at an elevation greater than 1000 ft.	0.70	0.75	0.85
All other sites on the Islands of Molokai and Lanai	0.80	0.85	0.85

a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but in any case, subject to a minimum value of 0.65.

Table 1609.3.3(b)(3)
K_d Values for Components and Cladding of Buildings Sited on Oahu, Hawaii [a,b]

Topographic Location on Oahu	Components and Cladding		
	Mean Roof Height less than or equal to 100 ft.	Mean Roof Height greater than 100 ft.	Risk Category IV Buildings and Structures
Sites within valleys at an elevation of at least 50 ft. but not greater than 500 ft.	0.65	0.70	0.75
Central Oahu above an elevation of 500 ft, the Ewa and Kapolei plains, and coastal areas with K_{zt} (10m) not greater than 1.2	0.75	0.80	0.85
All other areas, including Hills, Hillsides, Ridges, Bluffs, and Escarpments at any elevation or height; coastal and inland areas with K_{zt} (10m) greater than 1.2	0.70	0.75	0.80

a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but in any case, subject to a minimum value of 0.65.

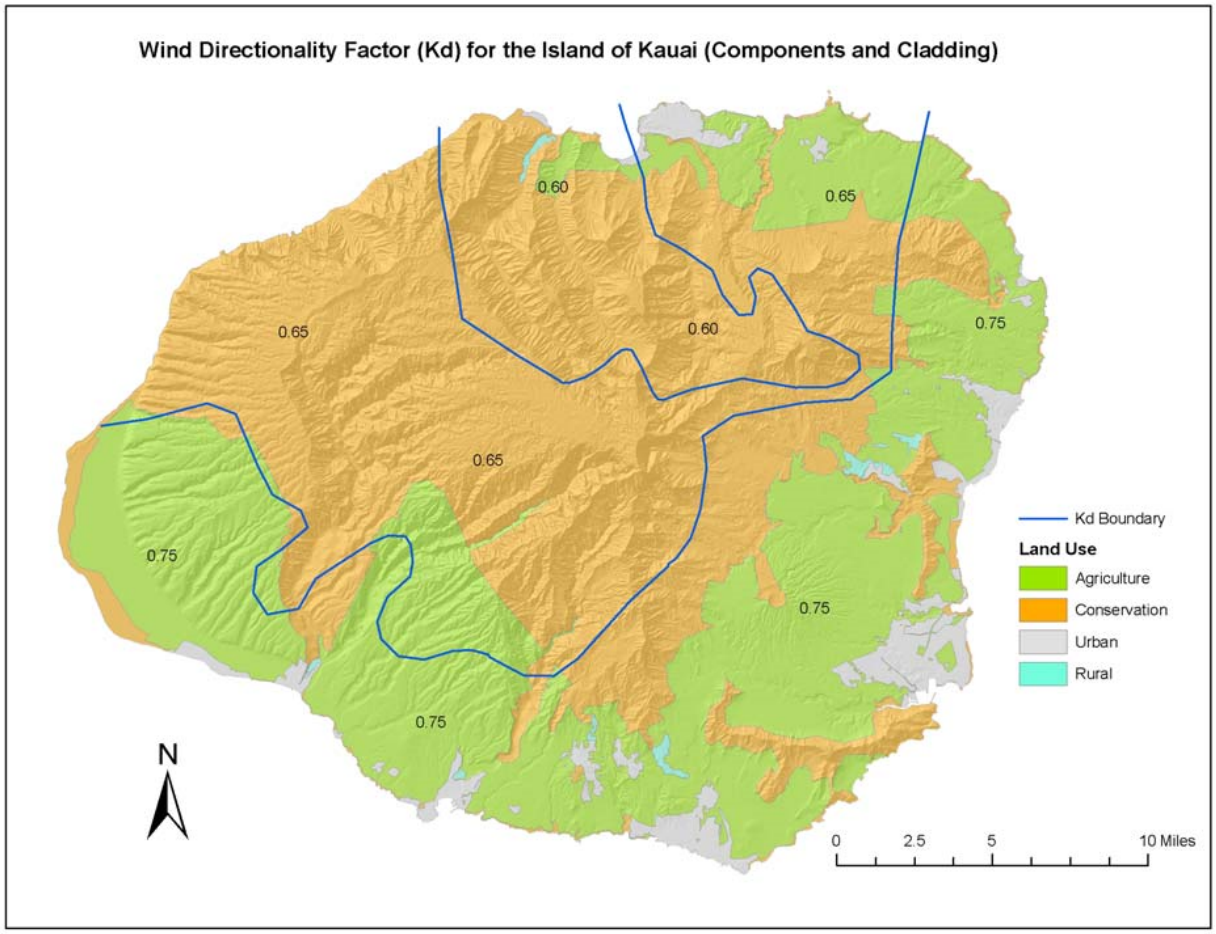


Figure 1609.3.3(b)(4)
K_d Values for Components and Cladding of Buildings Sited on Kauai County, Hawaii [a,b]

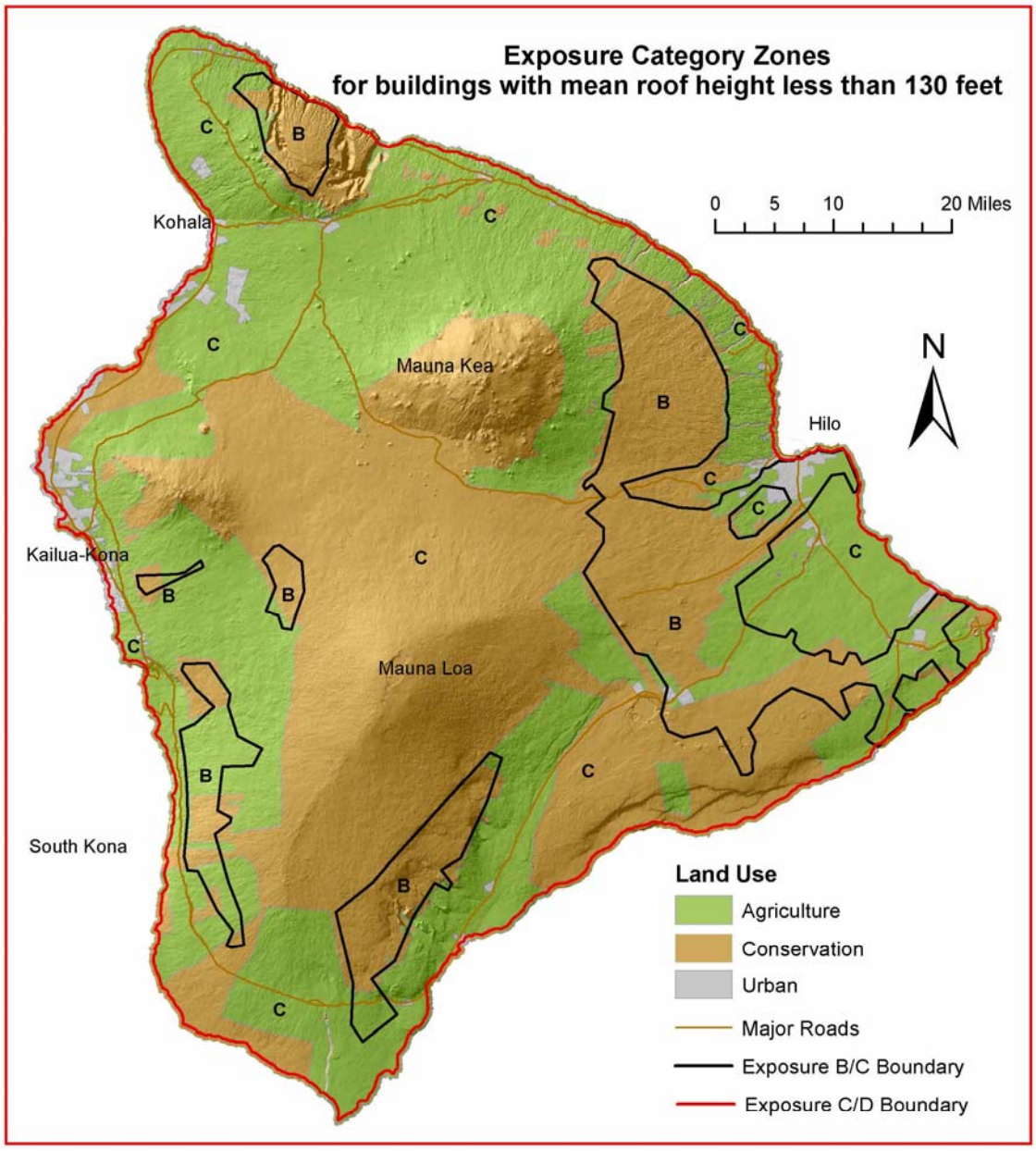
a. The values of K_d for other non-building structures indicated in ASCE-7 Table 26.6-1 shall be permitted.

b. Site-specific probabilistic analysis of K_d based on wind-tunnel testing of topography and peak gust velocity profile shall be permitted to be submitted for approval by the Building Official, but K_d shall have a value not less than 0.65.

1609.4 Exposure Category.
For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

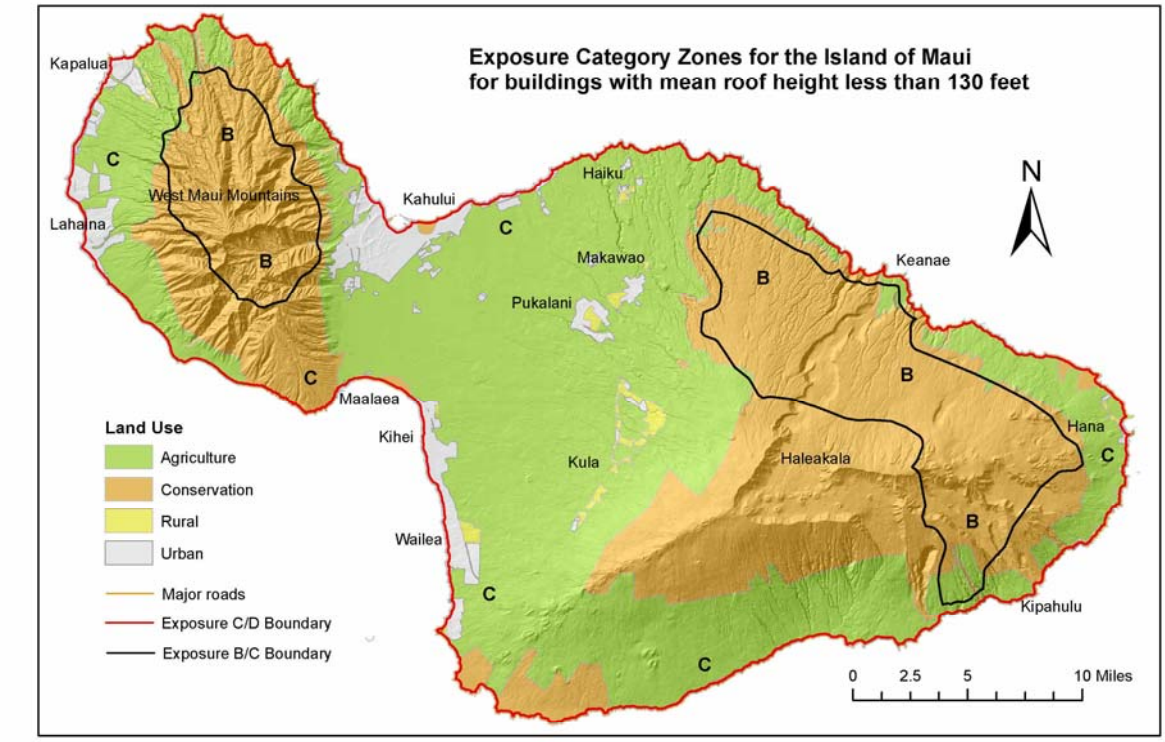
1609.4.1 Wind directions and sectors.
For each selected wind direction considered, at which the wind loads are to be evaluated, the exposure of the building or structure shall be determined for the two upwind sectors extending 45 degrees (0.79 rad) either side of the selected wind direction. The exposures in these two sectors shall be determined in accordance with Sections 1609.4.2 and 1609.4.3 and the exposure resulting in the highest wind loads shall be used to represent winds from that direction.

Exception: Exposure categories shall be permitted to be determined using Figures 1609.4(a) through 1609.4(e).



Notes:
1. Intermediate exposures, between categories B and C and between C and D, are permitted when substantiated per ASCE 7 recognized methodology.
2. Sites located within the C (coastal) zone shall be permitted to be evaluated for exposure category B for the wind directions where an adjacent B zone exists in the applicable upwind sector.
3. Sites located within 600 feet from the coastline shall be exposure category D for onshore wind directions.
4. For buildings whose height is equal to or greater than 130 ft, exposure category shall be determined per Section 1609.4.
5. For buildings whose mean roof height is less than or equal to 30 ft, exposure category shall be permitted to be evaluated per Section 1609.4.

Figure 1609.4 (a)
Exposure Category Zones for Hawaii County



Notes:
1. Intermediate exposures, between categories B and C and between C and D, are permitted when substantiated per ASCE 7 recognized methodology.
2. Sites located within the C (coastal) zone shall be permitted to be evaluated for exposure category B for the wind directions where an adjacent B zone exists in the applicable upwind sector.
3. Sites located within 600 feet from the coastline shall be exposure category D for onshore wind directions.
4. For buildings whose height is equal to or greater than 130 ft, exposure category shall be determined per Section 1609.4.
5. For buildings whose mean roof height is less than or equal to 30 ft, exposure category shall be permitted to be evaluated per Section 1609.4.

Figure 1609.4. (b)
Exposure Category Zones for Island of Maui, Maui County

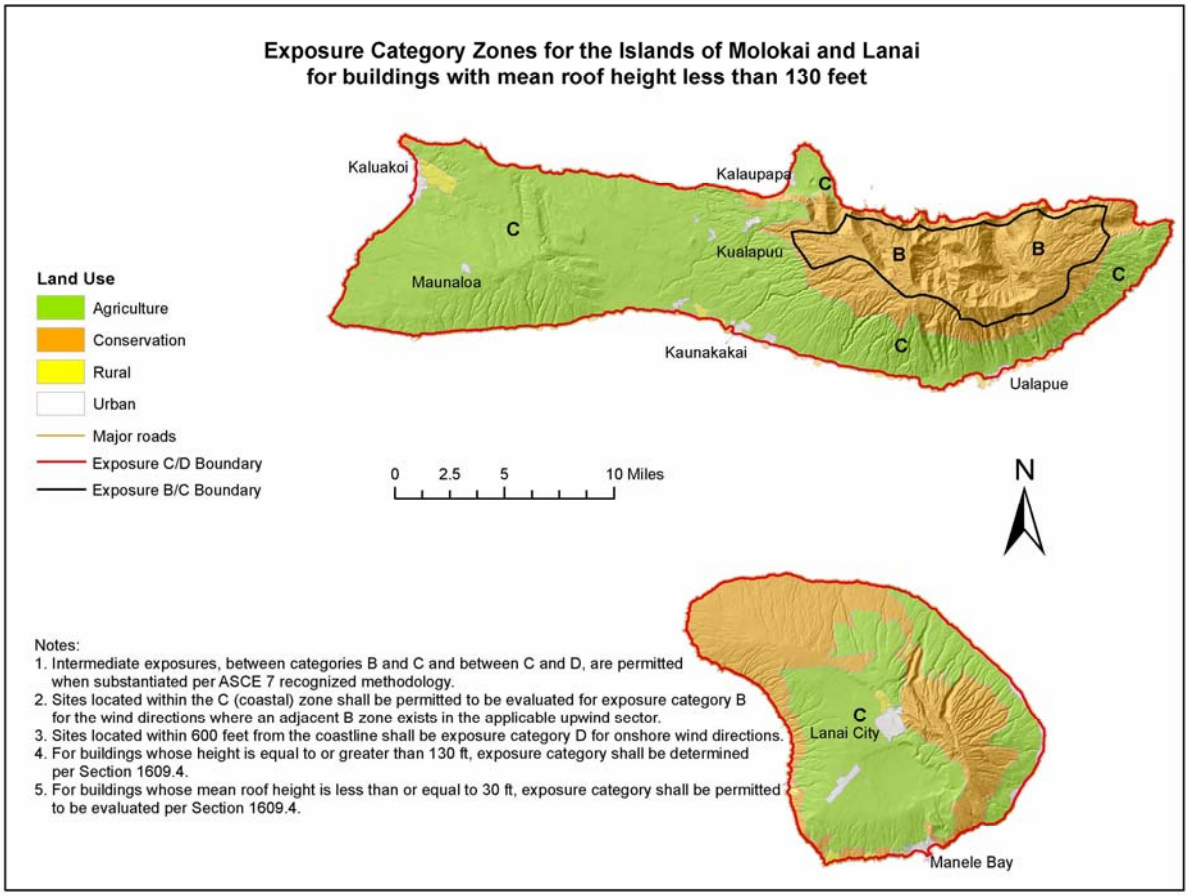
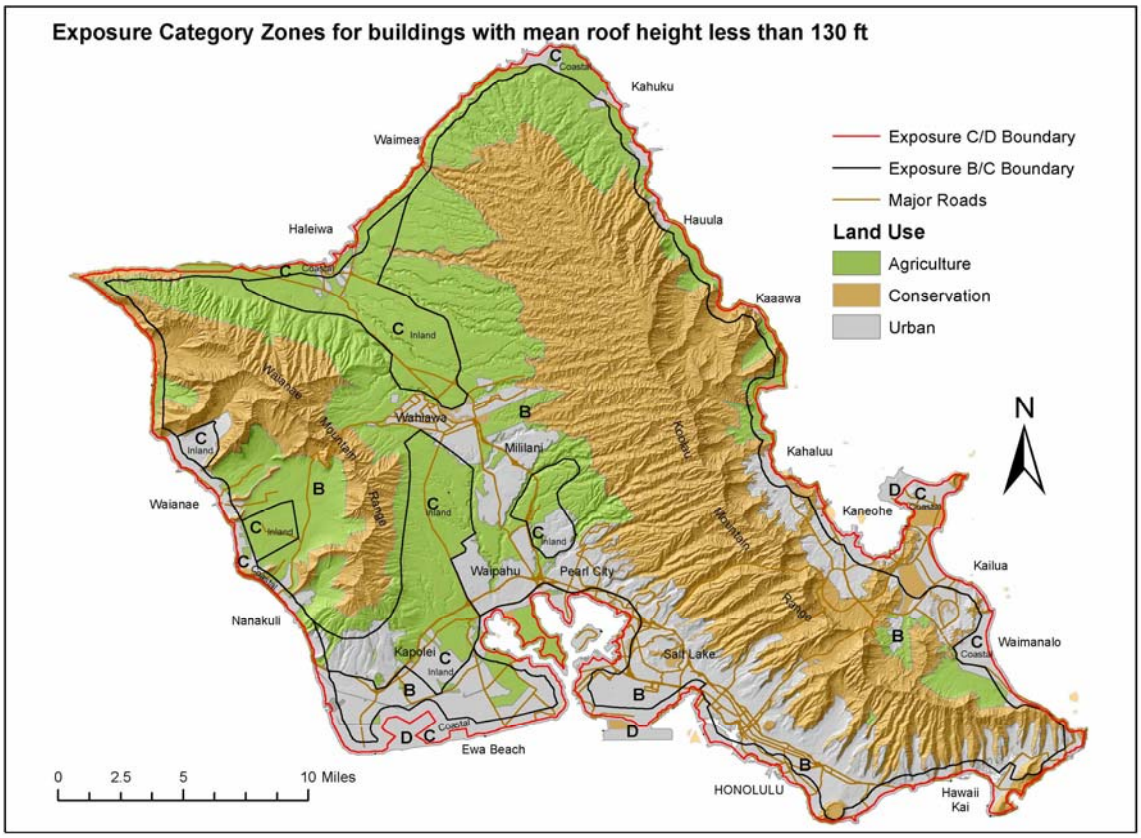
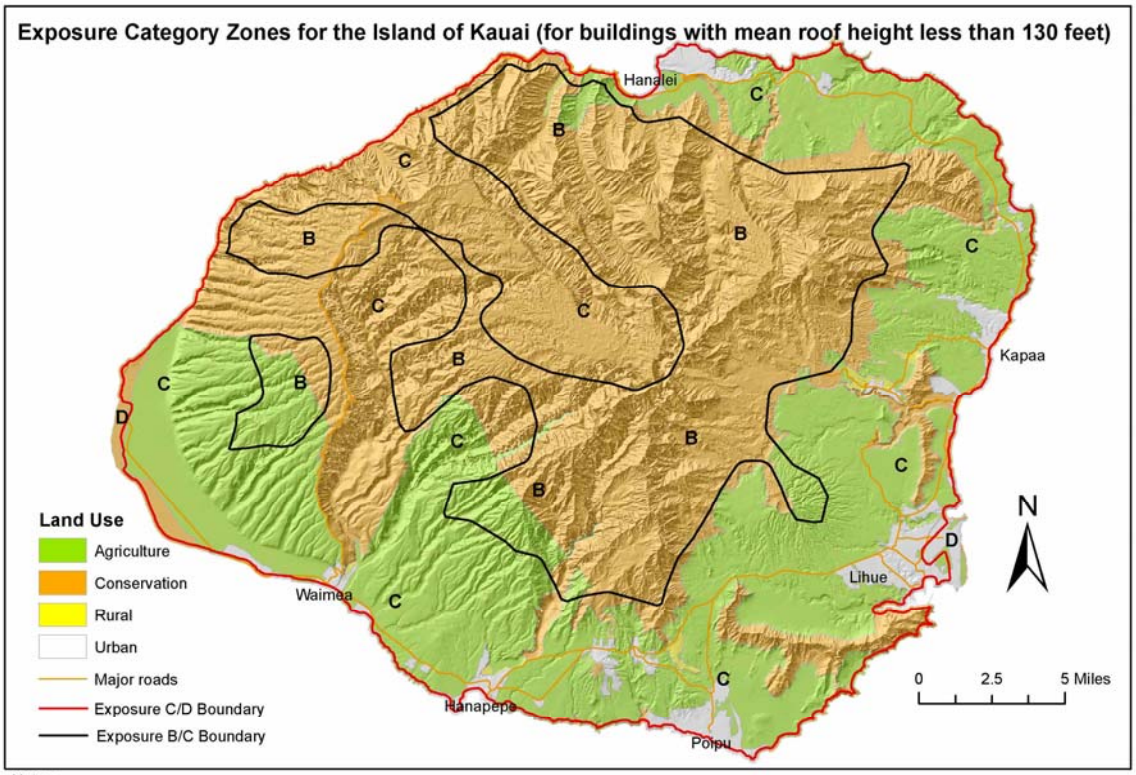


Figure 1609.4 (c)
Exposure Category Zones for Islands of Molokai and Lanai, Maui County



Notes:
1. Intermediate exposures, between categories B and C and between C and D, are permitted when substantiated per ASCE 7 recognized methodology.
2. Sites located within the C (coastal) zone shall be permitted to be evaluated for exposure category B for the wind directions where an adjacent B zone exists in the applicable upwind sector.
3. Sites located within 600 feet from the coastline shall be exposure category D for onshore wind directions.
4. For buildings whose height is equal to or greater than 130 ft, exposure category shall be determined per Section 1609.4.
5. For buildings whose mean roof height is less than or equal to 30 ft, exposure category shall be permitted to be evaluated er Section 1609.4.

Figure 1609.4 (d)
Exposure Category Zones for the City and County of Honolulu



Notes:
1. Intermediate exposures, between categories B and C and between C and D, are permitted when substantiated per ASCE 7 recognized methodology.
2. Sites located within the C (coastal) zone shall be permitted to be evaluated for exposure category B for the wind directions where an adjacent B zone exists in the applicable upwind sector.
3. Sites located within 600 feet from the coastline shall be exposure category D for onshore wind directions.
4. For buildings whose height is equal to or greater than 130 ft, exposure category shall be determined per Section 1609.4.
5. For buildings whose mean roof height is less than or equal to 30 ft, exposure category shall be permitted to be evaluated per Section 1609.4.

Figure 1609.4 (e)
Exposure Category Zones for Kauai County”

W106 Roof-top Solar panels

Section 1609.5.4 is added to read as follows:

"1609.5.4 Roof-top solar panels for conditions not included in ASCE 7 Chapter 29.

The normal force on other configurations of roof-top panels not regulated by ASCE 7 Chapter 29 shall be not less than that determined by Equation 1609-5:

$F = q_h (GC_p) C_N A$ (lb) (N) (Equation 1609-5)

Where:

C_N = pressure coefficients for monoslope free roofs from ASCE 7-16 Table 30.8-1 considering each elevated panel as a free roof surface in clear wind flow. The angle θ used for the determination of C_N shall be measured as the angle of the panel with respect to the plane of the roof (ω in Figure 1609.5-1). Values of C_N for forces on the panel may be taken as the Zone 1 coefficients.

Exception: Zone 2 coefficients for C_N shall be used where the panel angle, ω, is greater than 7.5 degrees; panels are located a distance less than or equal to twice the roof height measured from a roof corner; and the parapet is greater than 24 inches (610 mm) in height above the roof.

GC_p = the component and cladding external pressure coefficient for roofs for the roof zone corresponding to the location of the solar panel, and the effective wind area shall be that of the solar panel. The minimum magnitude of negative pressure values of GC_p in Zone 1 shall be taken as -1.0.

A = the total area of the solar panel element.

When located in roof zone 2 or 3 as defined in ASCE 7, the force F shall be applied with an eccentricity equal to a third of the solar panel width.

1609.5.4.1 Additive panel wind loads. The load on the panel shall be applied as point load anchorage reactions additive to the resultant of the pressure determined acting on the portion of the roof underlying the panel.

1609.5.4.2 Ballasted panels. Panels that are ballasted for uplift resistance and tilted at an angle α of 10 degrees or more from a horizontal plane shall be designed to resist the force determined by Equation 1609-7:

$$F_{ballast} \geq F\left(\frac{\mu\cos\beta + \sin\beta}{\mu\cos\alpha - \sin\alpha}\right)$$ (lb) (N) (Equation 1609-7)

Where:

F = the normal force on each panel determined in accordance with Section 1609.5.4

α = the angle of the roof plane with respect to horizontal.

β = the angle of tilt of the panel with respect to the roof plane.

μ = the static friction coefficient between the panel base and its bearing surface.

Alternatively, to resist uplift and sliding, ballasted panels that are tilted at an angle of less than 10 degrees from a horizontal plane shall each be ballasted to resist a force equal to 2 times the normal force on each panel. Ballasted panels that are tilted at an angle between 10 degrees to 25 degrees from a horizontal plane shall each be ballasted to resist a force equal to 8 times the normal force on each panel.

1609.5.4.3 Permeability. A reduction of load on the panels for permeability of the panel system shall not be permitted unless demonstrated by approved wind-tunnel testing or recognized documentation for the type of panel system being considered. Testing or documentation shall replicate the panel separation spacing and height above the roof.

1609.5.4.4 Shielding. A reduction of load on the panels for shielding provided by the roof or other obstruction shall not be permitted unless demonstrated by approved wind-tunnel testing or recognized documentation for the type of panel system being considered. Testing or documentation shall replicate the panel separation spacing and height above the roof."

W107 Revisions to Section 2304.6.1.
Section 2304.6.1 is amended to read as follows:
"2304.6.1 Wood structural panel sheathing. Where wood structural panel sheathing is used as the exposed finish on the exterior of outside walls, it shall have an exterior exposure durability classification. Where wood structural panel sheathing is used elsewhere, but not as the exposed finish, it shall be of a type manufactured with exterior glue (Exposure 1 or Exterior). Wood structural panel wall sheathing or siding used as structural sheathing shall be capable of resisting wind pressures in accordance with Section 1609. Maximum effective wind speeds for wood structural panel sheathing used to resist wind pressures shall be in accordance with Table 2304.6.1 for enclosed buildings with a mean roof height not greater than 30 feet (9144 mm)."

W108 Revisions to Table 2304.6.1.

Table 2304.6.1 is amended to read as follows:

"TABLE 2304.6.1
MAXIMUM EFFECTIVE ALLOWABLE STRESS DESIGN WIND SPEED, $V_{eff\text{-}asd}$ PERMITTED FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES[a,b,c]

MINIMUM NAIL		MINIMUM WOOD STRUCTURAL PANEL SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inches)	MAXIMUM WALL STUD SPACING (inches)	PANEL NAIL SPACING		MAXIMUM EFFECTIVE ALLOWABLE STRESS DESIGN WIND SPEED, $V_{eff\text{-}asd}$[d] (MPH)		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind exposure category		
							B	C	D
6d common (2.0" × 0.113")	1.5	24/0	3/8	16	6	12	110	90	85
		24/16	7/16	16	6	12	110	100	90
						6	150	125	110
8d common (2.5" × 0.131")	1.75	24/16	7/16	16	6	12	130	110	105
						6	150	125	110
				24	6	12	110	90	85
						6	110	90	85

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

a. Panel strength axis shall be parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.

b. The table is based on wind pressures acting toward and away from building surfaces in accordance with Chapter 27 of ASCE 7. Lateral requirements shall be in accordance with Section 2305 or 2308.

c. Wood structural panels with span ratings of wall-16 or wall-24 shall be permitted as an alternative to panels with a 24/0 span rating. Plywood siding rated 16 o.c. or 24 o.c. shall be permitted as an alternative to panels with a 24/16 span rating. Wall-16 and plywood siding 16 o.c. shall be used with studs spaced a maximum of 16 inches o.c.

6. $V_{eff\text{-}asd}$ shall be determined in accordance with Section 1609.3.1."

W109 Revisions to Table 2308.7.5.
Table 2308.7.5 is amended to read as follows:

"Table 2308.7.5
Required Rating of Approved Uplift Connectors (pounds)[a,b,c,d,e,f,g,h,i]

Effective Allowable Stress Design Wind Speed,	Roof Span (feet)							Overhangs (pounds/ft)[d]
$V_{eff-asd}$, 3-sec gust	12	20	24	28	32	36	40	
85	-72	-120	-144	-168	-192	-216	-240	-38.55
90	-91	-152	-182	-213	-243	-274	-304	-43.22
100	-131	-218	-262	-305	-349	-392	-436	-53.36
110	-175	-292	-350	-409	-467	-526	-584	-64.56
120	-240	-400	-480	-560	-640	-720	-800	-76.83
130	-304	-506	-607	-708	-810	-911	-1012	-90.17

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 1.61 km/hr, 1 pound = 0.454 Kg, 1 pound/foot = 14.5939 N/m.

a. The uplift connection requirements are based on a 30-foot mean roof height located in Exposure B. For Exposure C and for other mean roof heights, multiply the above loads by the adjustment coefficients below.

Exposure	Mean Roof Height (feet)									
	15	20	25	30	35	40	45	50	55	60
B	1.00	1.00	1.00	1.00	1.05	1.09	1.12	1.16	1.19	1.22
C	1.21	1.29	1.35	1.40	1.45	1.49	1.53	1.56	1.59	1.62
D	1.47	1.55	1.61	1.66	1.70	1.74	1.78	1.81	1.84	1.87

For SI: 1 inch – 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 1.61 km/hr, 1 pound = 0.454 Kg, 1 pound/foot = 14.5939 N/m.

b. The uplift connection requirements are based on the framing being spaced 24 inches on center. Multiply by 0.67 for framing spaced 16 inches on center and multiply by 0.5 for framing spaced 12 inches on center.

c. The uplift connection requirements include an allowance for 10 pounds of dead load.

d. The uplift connection requirements do not account for the effects of overhangs. The magnitude of the above loads shall be increased by adding the overhang loads found in the table. The overhang loads are also based on framing spaced 24 inches on center. The overhang loads given shall be multiplied by the overhang projection and added to the roof uplift value in the table.

e. The uplift connection requirements are based upon wind loading on end zones as defined in Chapter 30, Figure 30.5-1, of ASCE 7. Connection loads for connections located a distance of 20 percent of the least horizontal dimensions of the building from the corner of the building are permitted to be reduced by multiplying the table connection value by 0.7 and multiplying the overhang load by 0.8.

f. For wall-to-wall and wall-to-foundation connections, the capacity of the uplift connector is permitted to be reduced by 100 pounds for each full wall above. (For example, if a 500-pound rated connector is

used on the roof framing, a 400-pound rated connector is permitted at the next floor level down.)
g. Interpolation is permitted for intermediate values of basic wind speeds and roof spans.
h. The rated capacity of approved tie-down devices is permitted to include up to a 60-percent increase for wind effects where allowed by material specifications.
i. $V_{eff-asd}$ is determined from Section 1609.3.1”

58. Appendix X – Hawaii provisions for indigenous Hawaiian architecture structures.
Appendix X is added to read as follows:

"APPENDIX X
Hawaii Provisions for Indigenous Hawaiian Architecture Structures

Section X101 General.
X101.1 Scope. The provisions of this appendix shall apply exclusively to Indigenous Hawaiian Architecture Structures. The purpose of these provisions is to acknowledge and establish procedures for designing and constructing indigenous Hawaiian architecture structures.

X101.2 Publications incorporated by reference. The following publications are incorporated by reference and made a part of these provisions. Where there is a conflict between Appendix X and the referenced documents, Appendix X shall prevail.

1. "Hawaiian Thatched House" (1971), by Russell A. Apple, published by the United States Department of the Interior,
2. "Hale Construction Standards" (2000), by Francis Sinenci and Bill Sides,
3. "The Hawaiian Grass House in Bishop Museum" (1988), by Catherine C. Summers, and
4. "Arts and Crafts of Hawaii", Section II, Houses (1957) by Te Rangi Hiroa (Peter H. Buck)

X101.3 Definitions. See Chapter 2 for general definitions. As used in this appendix:

CERTIFIED HALE BUILDER. A person who has obtained a certificate of completion for satisfactorily completing a course in Hawaiian hale construction from the University of Hawaii, or any of its community colleges, or as approved by the Building Official.

GROUP OF STRUCTURES. A group of indigenous Hawaiian architecture structures that are in close proximity to each other and have an aggregate floor area of 1,800 square feet or less.

HALE or INDIGENOUS HAWAIIAN ARCHITECTURE STRUCTURE. A structure that is consistent with the design, construction methods and uses of structures built by Hawaiians in the 1800's, which uses natural materials found in the Hawaiian Islands, and complies with this appendix and references.

SEPARATION. The clear distance between two structures.

SETBACK. The clear distance between a structure and a property line.

Section X201 Material requirements.
X201.1 Hale materials. Hale shall be constructed using only materials grown and harvested in the State of Hawaii.

X201.2 Wood framing material. The wood members for the hale, such as posts and rafters, shall be, but not limited to hardwoods of unmilled, straight sections of trunks or branches of the following species:

1. Casaurina equisitafolia (ironwood).
2. Prosopis-allid (kiawe).
3. Eucalyptus robusta (eucalyptus).
4. Psidium cattleianum (strawberry guava).
5. Metrosideros polymorpha (ohia).
6. Rizophora mangle (mangrove).

Exception: Ardisia elliptica (inkberry) may be used only for roof purlins as an alternative to specified woods listed in Items 1 through 6.

X201.3 Roofing and siding. Thatched roofing and siding materials for the hale may be any grass or leaf material grown and harvested in the State of Hawaii, to include but not be limited to pili, kualohia, pueo, kawelu, sugarcane leaves, and ti leaves.

X201.4 Cord. Natural or synthetic cord used for lashing structural members of the hale shall be 400 pound test. Cord used for tying floating purlins and thatched materials shall be 100 pound test. All cord used on the hale shall be shades of green, tan, brown or black.

X201.5 Metal prohibited. Metal shall not be used for the construction of the hale.

Section X202 Size and location.

X202.1 Height and size limitation. Hale shall be one-story, detached structure not exceeding 1,800 square feet. Hale shall not exceed the size indicated in Table X202.1.

Table X202.1
Maximum Size of Hale (feet)

Hale halawai	Hale ku`ai	Hale noa	Hale wa`a
30 X 60	14 X 20	14 X 24	30 X 60

X202.2 Zoning requirements. Hale shall comply with minimum yard requirements in the zoning codes.

X202.3 Minimum separation. The minimum separation between a hale and another structure shall be at least 10 feet for a one-story structure; 15 feet for a two-story structure; or a distance equal to the height of the hale, whichever is more. The minimum separation between two hale shall be at least 10 feet or a distance equal to the height of the taller hale.

X202.4 Hale Noa. Hale noa structures may only be constructed on property where a separate residence exists on the property.

Section X203 Allowable and prohibited uses.

X203.1 Allowable uses. To the extent permitted by other applicable law, allowable uses for hale structures shall be in accordance with Table X203.1.

Table X203.1
Allowable Use for Each Hale Type

Use	Hale halawai	Hale ku`ai	Hale noa	Hale wa`a
Eating (ai)	Allowed	Allowed	Not permitted	Allowed
Assembling (halawai)	Allowed	Allowed	Not permitted	Allowed
Sleeping (moe)	Not permitted	Not permitted	Allowed	Not permitted
Retailing (e.g., fruits) (ku`ai)	Allowed	Allowed	Not permitted	Allowed
Storage (papa`a)	Not permitted	Allowed	Not permitted	Allowed

X203.2 Prohibited uses and activities. The following uses and activities shall be prohibited from occurring within or near the hale:

1. Cooking.
2. Open flames.
3. Generators.
4. Extension cords.
5. Electrical switches, fixtures, or outlets.
6. Plumbing faucets, fixtures, or drains.
7. Power tools.
8. No screen, mesh, plastic or any other similar material shall be attached to the hale.
9. Hale shall not be used as a food establishment as defined in the administrative rules adopted by the state department of health.

X203.3 Maintenance. The hale shall be maintained by the owner to ensure structural integrity. Repairs for maintenance of the hale shall not require additional building permits.

Section X301 Fire protection.
X301.1 Fire protection classifications. Fire protection for Indigenous Hawaiian architecture structures shall be as required in Table X301.1.

Table X301.1
Fire Protection Requirements Based on Setback

Class	Setback Requirements	Fire Protection Requirements
A	The structure (or a group of structures) is: 1. Located at least 100 feet from any existing structure on the same or neighboring properties; and 2. Located at least 100 feet from any property line, except as follows: a. If the property line abuts a public way, the 100 feet minimum setback for that property line shall be reduced by the width of the public way, b. If the property line abuts the shoreline, the minimum setback for that property line shall be the shoreline setback, or c. For any hale ku'ai in the agricultural district that is less than 200 square feet, that is completely open on three sides, and that is used as an agricultural products' stand and if the property line abuts a public way, the minimum setback for that property line shall be 15 feet.	No fire protection is required for the structure.
B	The structure (or a group of structures) that conforms to applicable zoning setback requirements but does not satisfy Class A setback requirements.	Automatic fire sprinkler system shall be installed in accordance with design standards in Section X301.2. An electrical permit is required for fire sprinklers systems.

X301.2 Automatic fire sprinklers. The design standards for automatic fire sprinklers for Class B indigenous Hawaiian architecture structures shall be in accordance with NFPA 13.

Exception: The design standards for automatic fire sprinklers for Class B indigenous Hawaiian architecture structures shall be permitted as follows:

1. 18 gallons per minute for a single head at 140 square feet maximum coverage of roof area.
2. 13 gallons per minute for each subsequent head at 140 square feet maximum coverage of roof area per head.
3. The minimum supply pressure at the base of the riser shall not be less than 40 pounds per square inch.
4. The minimum residual pressure at the highest sprinkler shall be not less than 12 pounds per square inch.
5. Sprinkler head spacing shall not exceed 14 feet.
6. Sprinkler heads shall be open type upright, pendent, or sidewall with 1/2-inch or 17/32-inch orifice and have a wax corrosion resistant coating.
7. The total number of sprinklers on a branch shall not exceed 6 heads.
8. The total number of sprinklers shall not exceed the quantity shown in Table X301.2(a).

Table X301.2(a)
Total Number of Fire Sprinklers Based on Pipe Size

Piping Size	Number of Sprinklers
1 inch diameter	2 sprinklers
1¼ inch diameter	3 sprinklers
1½ inch diameter	5 sprinklers
2 inch diameter	10 sprinklers
2½ inch diameter	30 sprinklers
3 inch diameter	60 sprinklers

9. The pipe schedule table in Item 8 shall not apply to hydraulically designed systems.
10. The water density shall not be less than 0.10 gpm per square foot.
11. The source of water may be by domestic water meters, detector check meter, underground well, storage tank, swimming pool, ponds, etc., but must meet the design requirements for adequate pressure and duration.
12. Water supply shall be sufficient to provide 30 minutes duration.
13. If domestic water meters are used as the source of water for the fire sprinklers, without a storage tank and booster pump, the maximum number of sprinklers shall not exceed the number shown in Table X301.2(b).

Table X301.2(b)
Total Number of Fire Sprinklers Based on Water Meter Size

Size of Water Meter	Number of Sprinklers
5/8 inch water meter	1 sprinkler
¾ inch water meter	2 sprinklers
1 inch water meter	3 sprinklers
1½ inch water meter	7 sprinklers
2 inch water meter	11 sprinklers
3 inch water meter	27 sprinklers

14. The piping material shall be hard drawn copper with silver solder or brazed fittings, or carbon steel with corrosion-resistant coatings. Plastic pipes shall not be allowed, except for below grade supply pipes.
15. Fire sprinkler system shall be actuated by smoke detectors located at the highest points of the roof and spaced as recommended by the manufacturer.
16. Flow control valves shall be either hydraulically or electrically operated with a manual override switch.
17. Where the width of a roof exceeds the width allowed for one row of sprinklers, two or more rows of sprinklers shall be placed such that the entire roof area is protected.
18. Prevailing wind direction shall be considered in the placement of sprinklers.
19. Deflectors for sprinklers shall be parallel with the roof surface or tilted slightly towards the peak of the roof.

20. Fire sprinklers system shall have a local alarm activated by a smoke detector.

X301.3 Certification of water supply. For any hale that requires fire protection pursuant to Section X301.1, the applicant shall provide a certification from a licensed engineer or a licensed C-20 contractor that the water supply for the fire sprinkler system has been tested and is capable of delivering the required fire flow for 30 minutes duration.

X302 Smoke alarm. Any hale used for sleeping shall have an approved battery operated smoke alarm installed in the hale.

Section X401 Design standards.

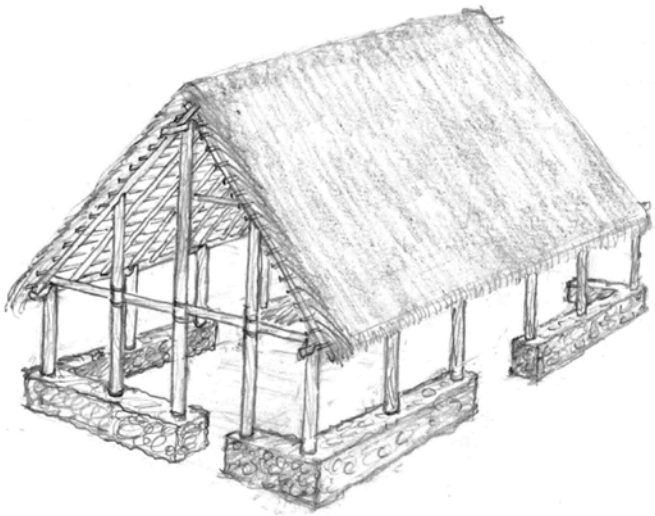
X401.1 General design standards. All types of hale shall be designed and constructed in accordance with the standards set out in this section.

1. The minimum diameter size of all structural members shall be measured at the member's midpoint, except that the minimum diameter size of posts shall be measured at the smaller end. For structure sizes not specifically shown in the tables, the requirements in the next larger width size shall be applicable.
2. The specifications for structural members were estimated based on no wind loads. Hale shall be constructed to allow all thatching materials to separate from the structure prior to adding significant loads.
3. The mix formula for mortar specified in these rules shall be one part portland cement, four parts clean sand, and sufficient fresh water to make the mixture workable.
4. Every hale, except hale noa, shall have at least two sides completely open.
5. Lashing and thatching methods shall comply with illustrations found in "Arts and Crafts of Hawaii" or "The Hawaiian Grass House in Bishop Museum" referenced in Section X101.2.

Section X402 Allowable designs.

Hale shall be designed and constructed in accordance with the requirements in Sections 402.1 through 402.4.

X402.1 Hale Halawai. Each end of the Hale Halawai may be open or thatched. The ends may also be constructed with a thatched roof hip as an alternate design. Hale Halawai shall be designed in accordance with the following schematics and illustrations. Structural components for Hale Halawai shall meet the size and spacing requirements in Table X402.1(a). Foundations for Hale Halawai shall be designed in accordance with Table X402.1(b).



HALE HALAWAI
Open End Style

HALE HALAWAI
Thatched End Style

FRAMING SCHEMATIC

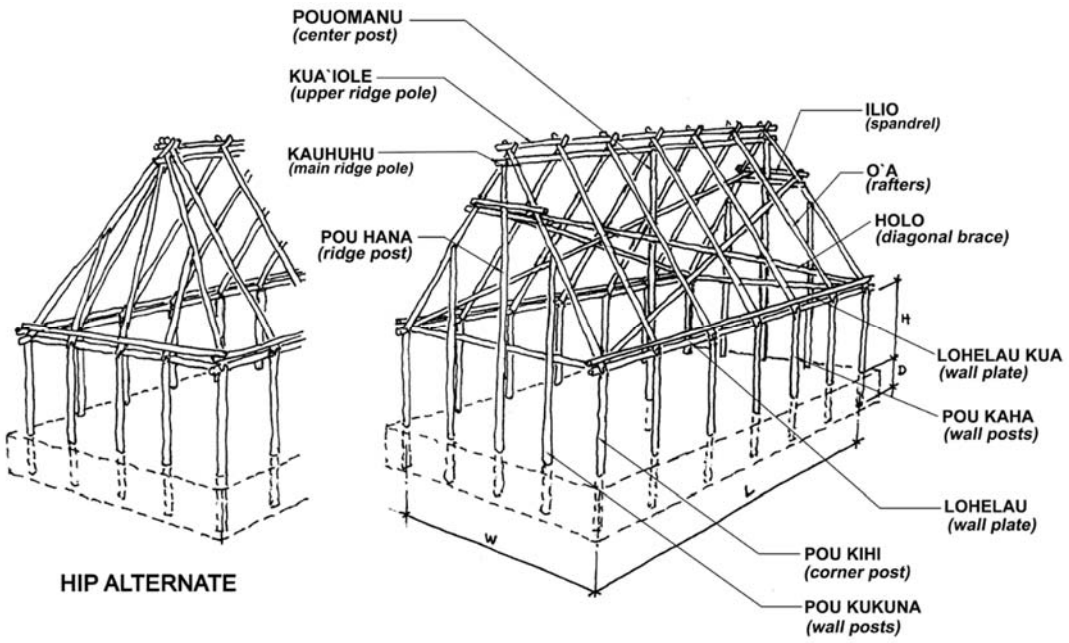
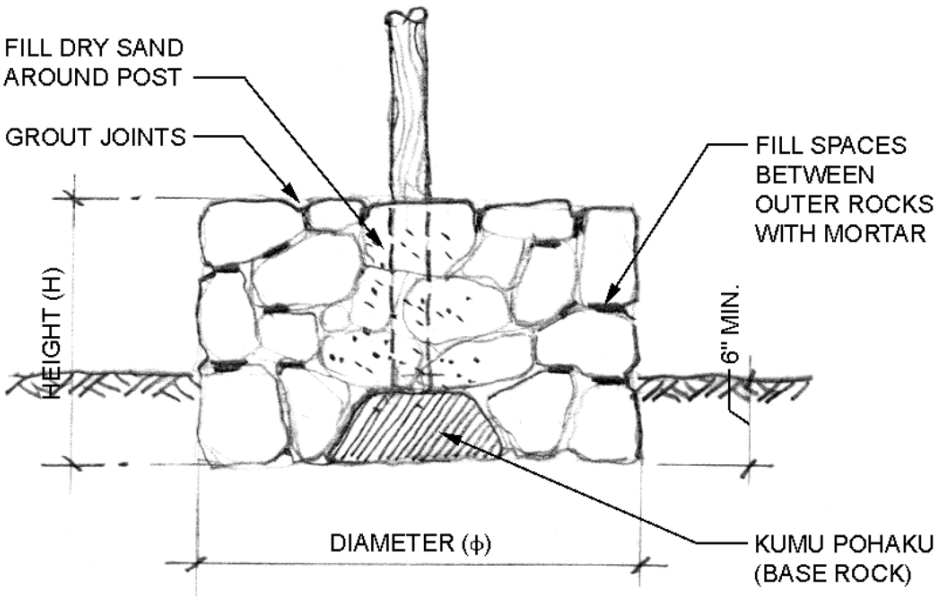
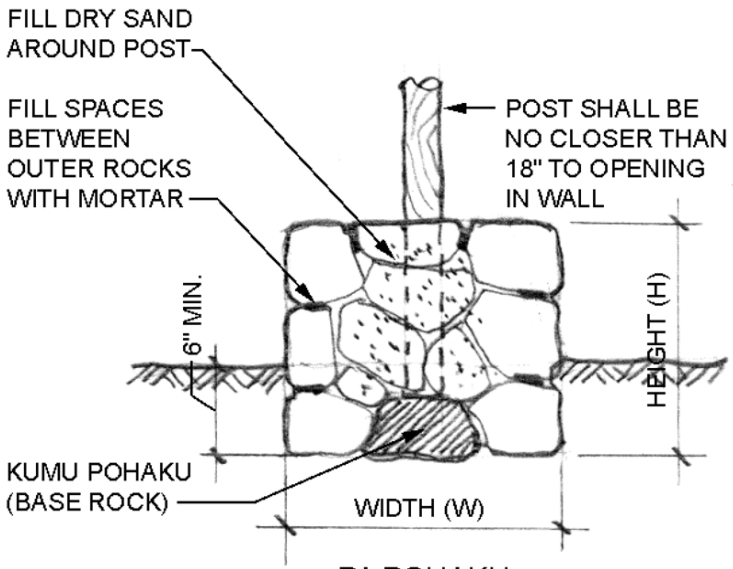


Table X402.1(a)
Size and Spacing Requirements for Structural Components used in Hale Halawai

Size W x L x H	pou kihi	pou kukuna & pou kaha	pou hana & pouomanu	o'a	kuaiole & holo	kauhuhu	lohelau	Maximum post spacing (feet)	Maximum rafter spacing (feet)
	Minimum Diameter (inches)								
12' x 20' x 7'	4	3½	4	3½	2½	3	3	5	3
14' x 24' x 7'	4	4	4½	3½	2½	3	3½	5	3
24' x 30' x 7'	5	4½	4½	4	2½	3	3½	5	3
25' x 50' x 7'	5½	5	5½	4	2½	3	3½	5	3
30' x 60' x 7'	6	5½	6	4½	2½	3	4	5	3



KAHUA
(PEDESTAL)



PA POHAKU
(FOUNDATION WALL)

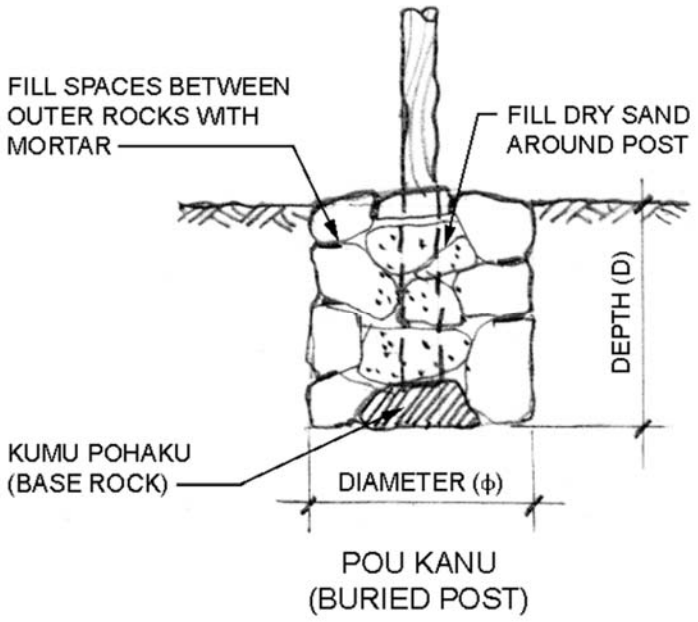
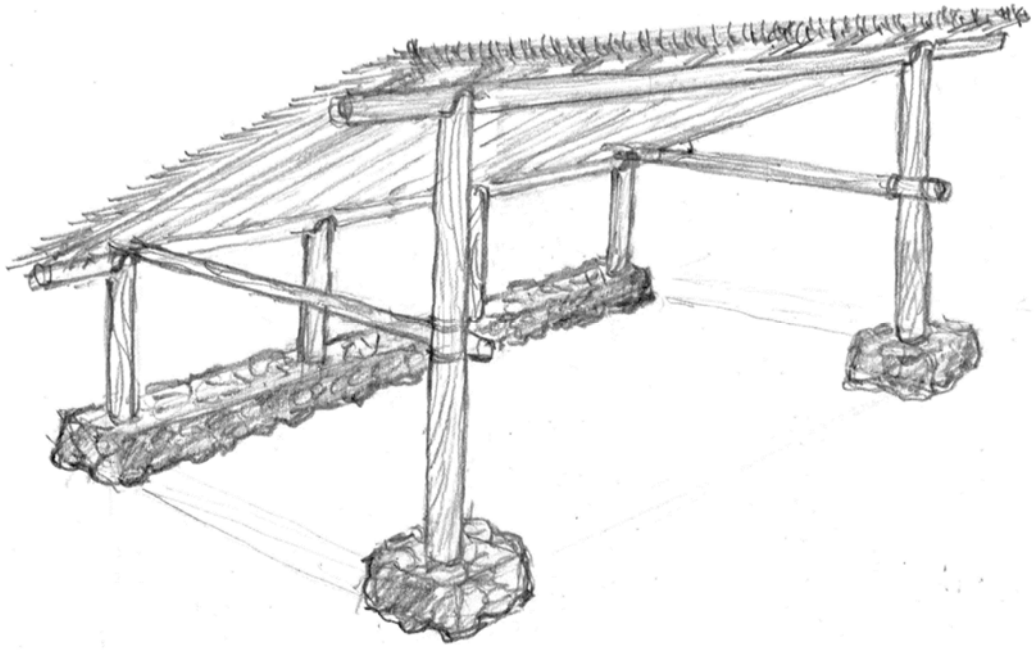


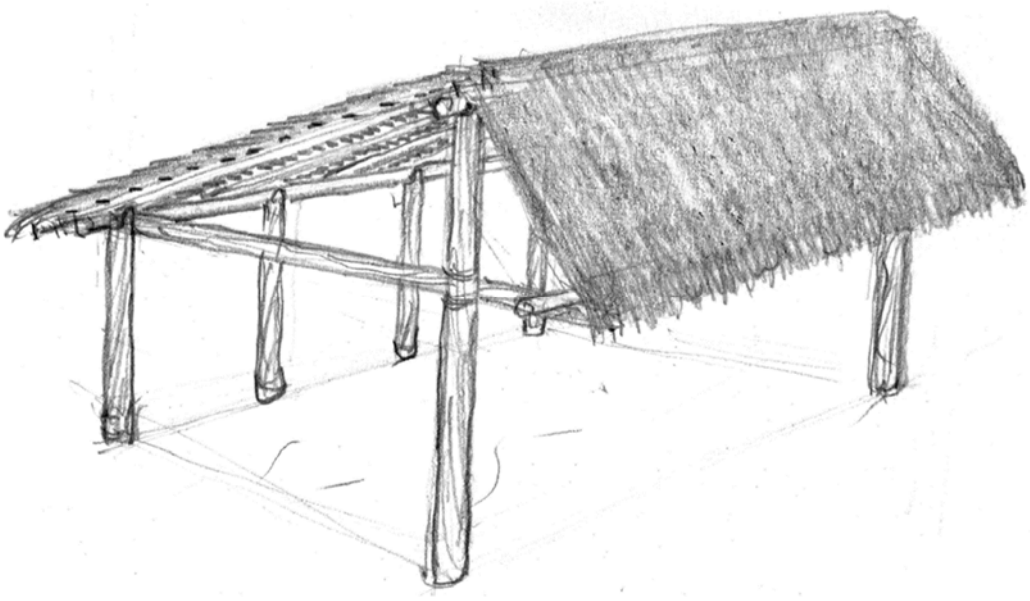
Table X402.1(b)
Foundation Design for Hale Halawai

Size (W x L x H)	Foundation Type		
	kahua Diameter x Height	pa pohaku Width x Height x Length	pou kanu Diameter x Depth
12' x 20' x 7'	3'6"φ x 24"H	2'6"W x 2'8"H x 4'0"L	30"φ x 2'8"D
14' x 24' x 7'	3'8"φ x 24"H	2'6"W x 2'8"H x 4'0"L	30"φ x 2'9"D
24' x 30' x 7'	4'0"φ x 30"H	3'0"W x 3'0"H x 4'0"L	36"φ x 3'0"D
25' x 50' x 7'	4'0"φ x 30"H	3'0"W x 3'0"H x 4'0"L	36"φ x 3'0"D
30' x 60' x 7'	4'0"φ x 30"H	3'0"W x 3'3"H x 4'0"L	36"φ x 3'3"D

**X402.2 Hale Ku`ai.** Hale Ku`ai shall be designed in accordance with the following schematics and illustrations. Structural components for Hale Ku`ai shall meet the size and spacing requirements in Table X402.2(a). Foundations for Hale Ku`ai shall be designed in accordance with Table X402.2(b).

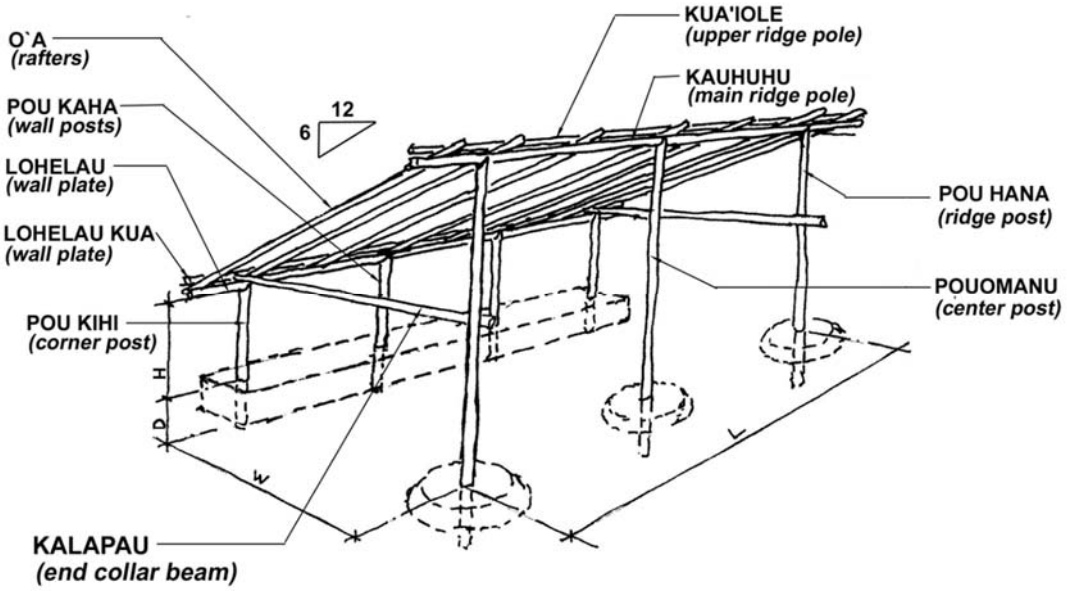


HALE KU`AI
SHED STYLE



HALE KU`AI
GABLE STYLE

FRAMING SCHEMATIC 1



FRAMING SCHEMATIC 2

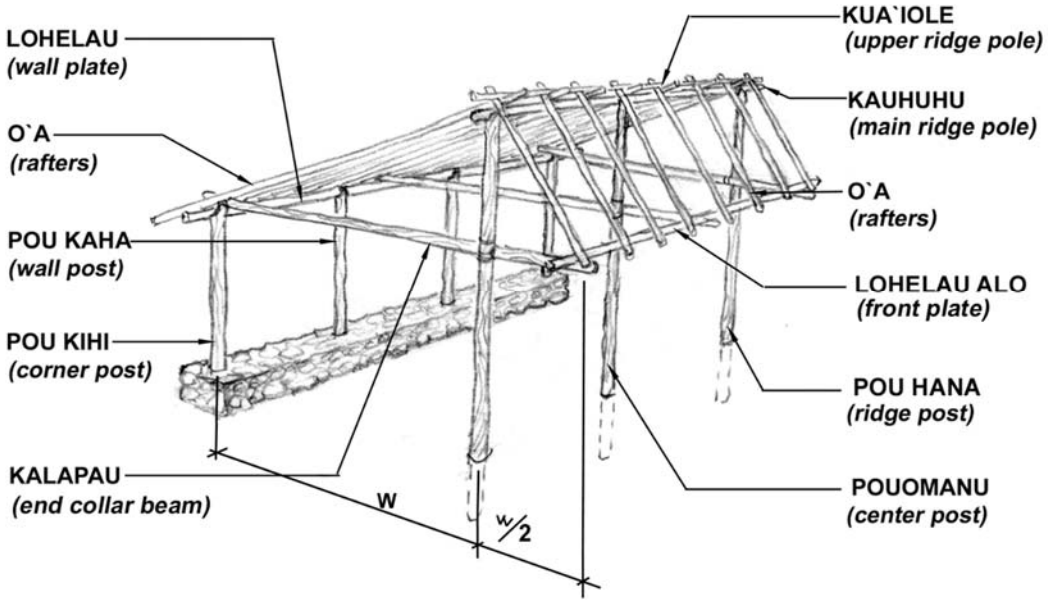
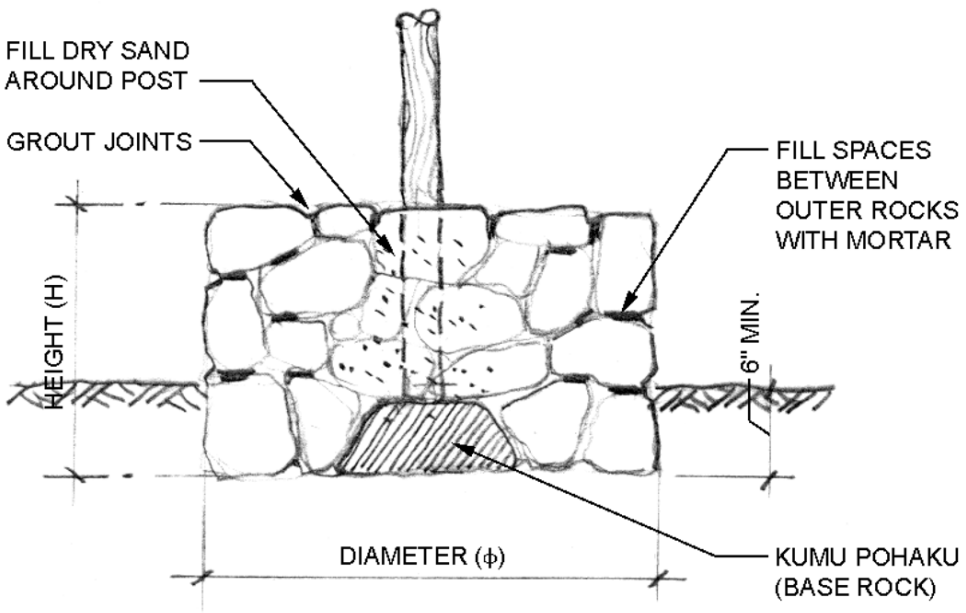


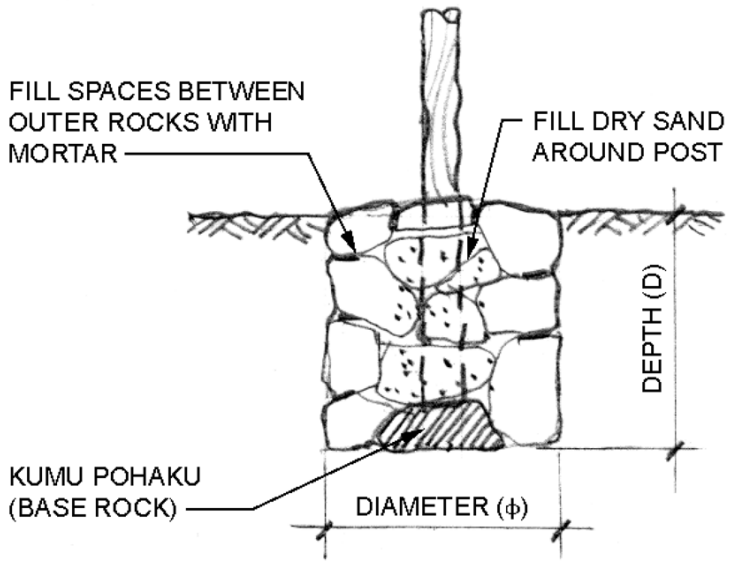
Table X402.2(a)
Size and Spacing Requirements for Structural Components used in Hale Ku`ai

Size (W x L x H)	pou kihi[a]	pou kaha[a]	pou hana[b]	pouo manu[b]	o'a	kuaiole & holo	kauhuhu	lohelau	Maximum rafter spacing (feet)
	Minimum Diameter (inches)								
5' x 10' x 5'	4	3	3	4	3	2	3	2	4
9' x 12' x 5'	4	3	3	4	3	2	3½	2	4
12' x 16' x 5'	4½	3½	4	4	3½	2	4	2½	4
14' x 20' x 5'	4½	3½	4	4	3½	2½	4½	2½	4

[a] The maximum post spacing for pou kihi and pou kaha is five feet.
[b] The maximum post spacing for pou hana and pouomanu is twelve feet.



KAHUA
(PEDESTAL)

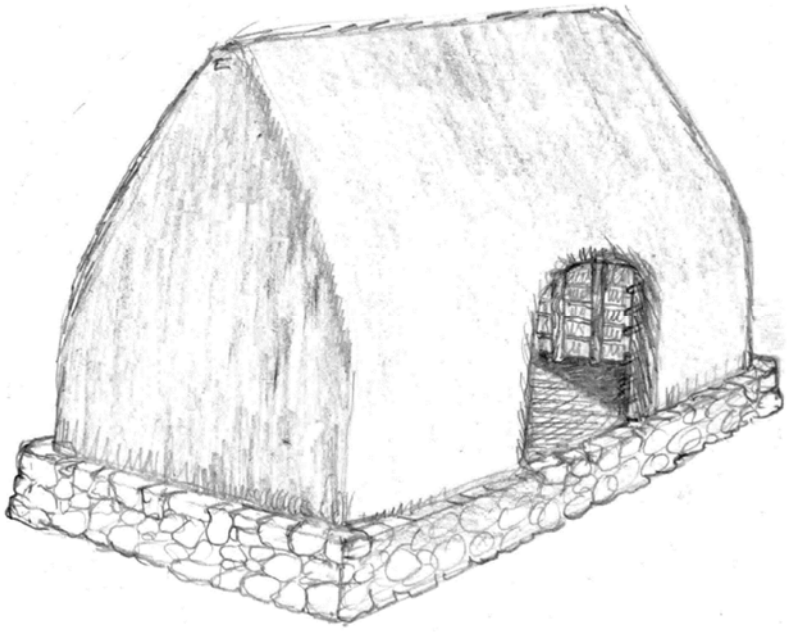


POU KANU
(BURIED POST)

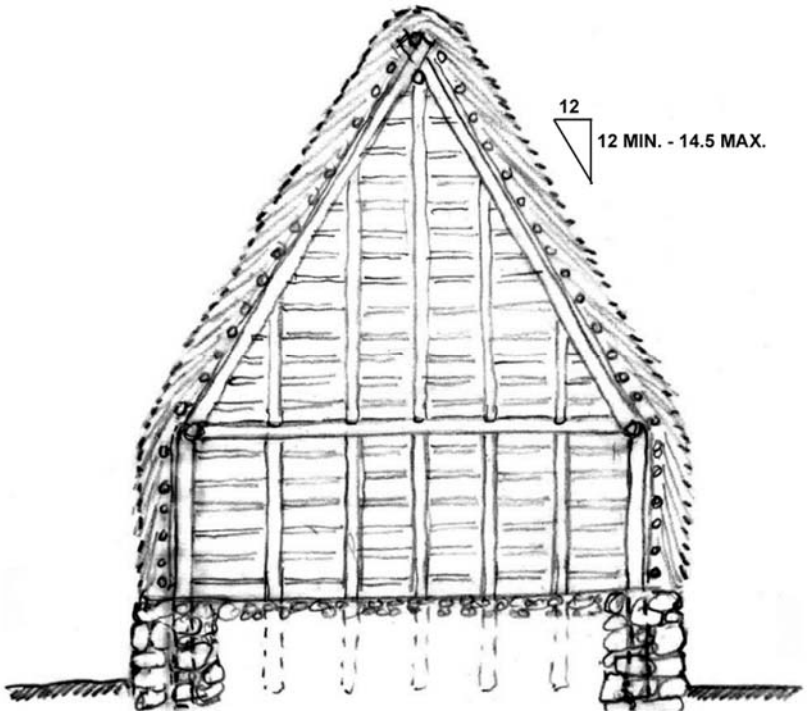
Table X402.2(b)
Foundation Design for Hale Ku`ai

Size (W x L x H)	Foundation Type		
	kahua Diameter x Height	pa pohaku Width x Height x Length	pou kanu Diameter x Depth
5' x 10' x 5'	3'0"φ x 24"H	2'6"W x 2'0"H x 4'0"L	30"φ x 2'6"D
9' x 12' x 5'	3'4"φ x 24"H	2'6"W x 2'0"H x 4'0"L	30"φ x 2'6"D
12' x 16' x 5'	3'6"φ x 24"H	2'6"W x 2'8"H x 4'0"L	30"φ x 2'8"D
14' x 20' x 5'	3'8"φ x 24"H	2'6"W x 2'8"H x 4'0"L	30"φ x 2'9"D

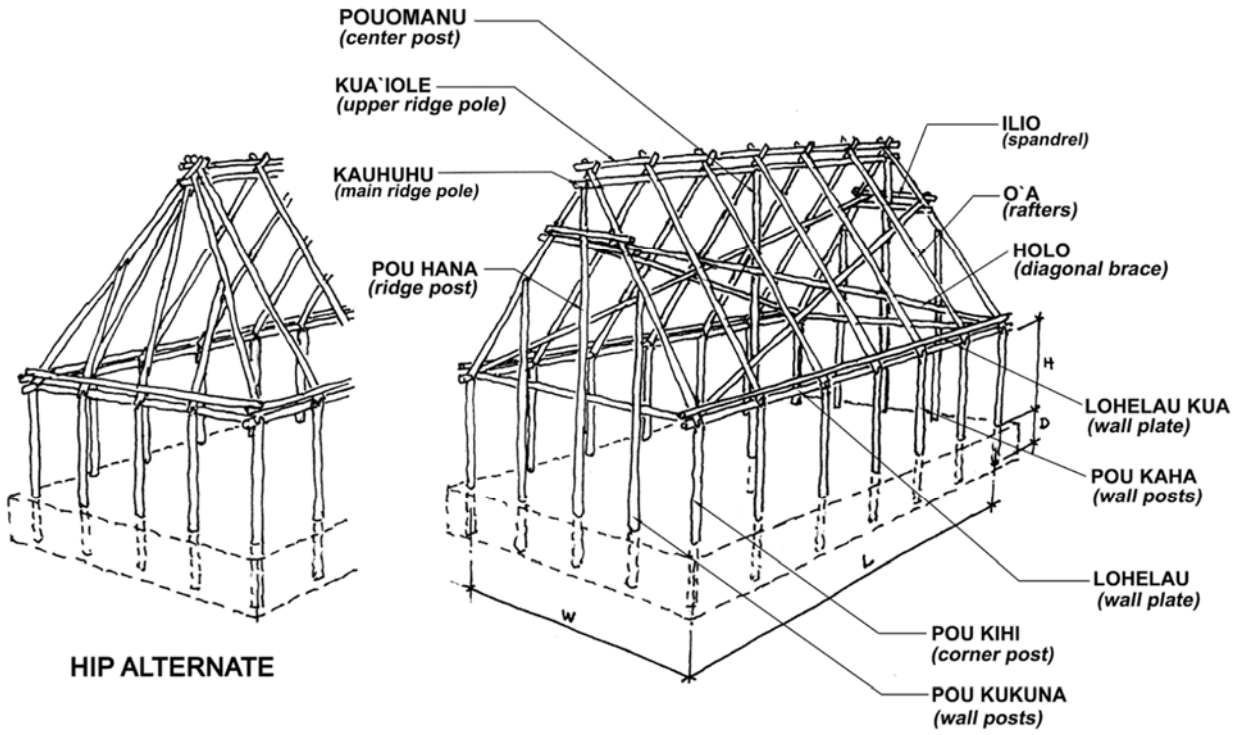
402.3 Hale Noa. Hale Noa shall have at least two openings. One opening shall be at least 3 feet wide and 5 feet high, and the other opening shall be at least 2 feet wide and 3 feet high. Hale Noa shall be designed in accordance with the following schematics and illustrations. Structural components for Hale Noa shall meet the size and spacing requirements in Table X402.3(a). Foundations for Hale Noa shall be designed in accordance with Table X402.3(b).



HALE NOA



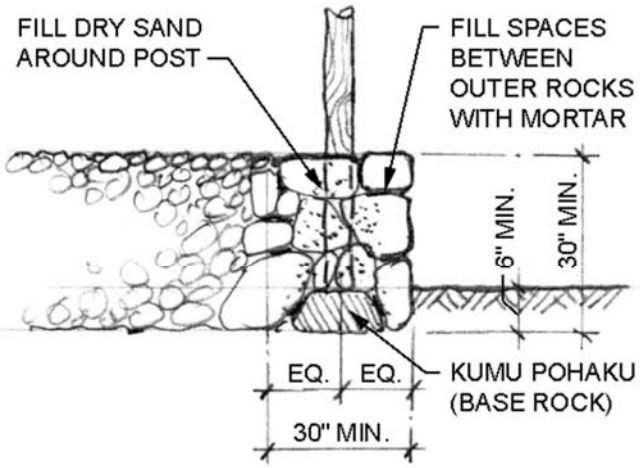
SECTION VIEW



FRAMING SCHEMATIC

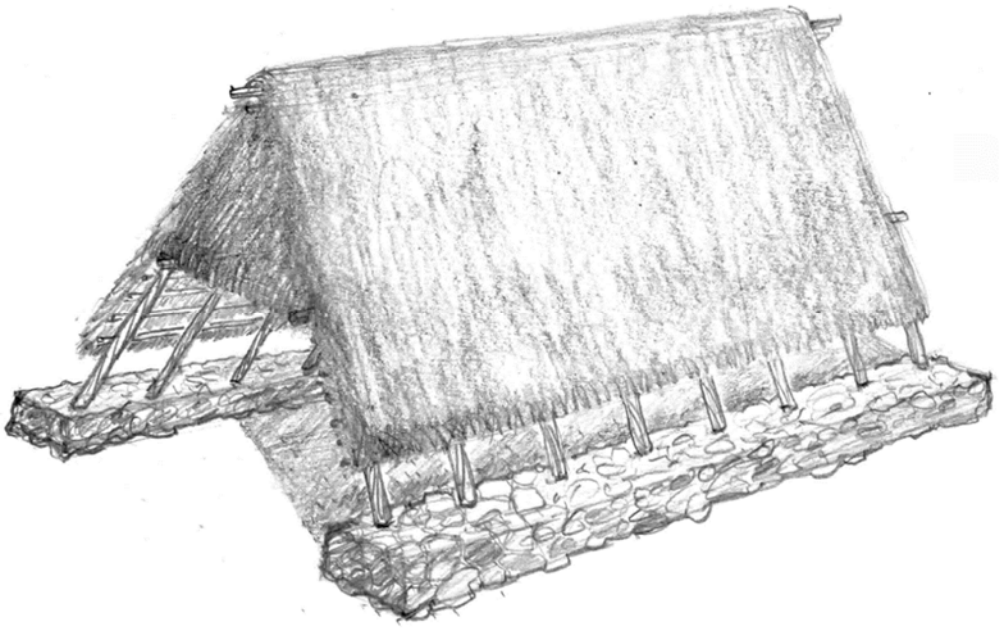
Table X402.3(a)
Size and Spacing Requirements for Structural Components used in Hale Noa

Size W x L x H	pou kihi	pou kukuna & pou kaha	pou hana	pouomanu	o'a	kuaiole & holo	kauhuhu	lohelau	Maximum post spacing (feet)	Maximum rafter spacing (feet)
	Minimum Diameter (inches)									
9' x 12' x 7'	3½	3	4	3	3	2½	3½	2½	6	4
12' x 20' x 7'	4	4½	4	3	3½	2½	3½	2½	6	4
4' x 24' x 7'	5½	4½	4	3	3½	2½	3½	3	6	4

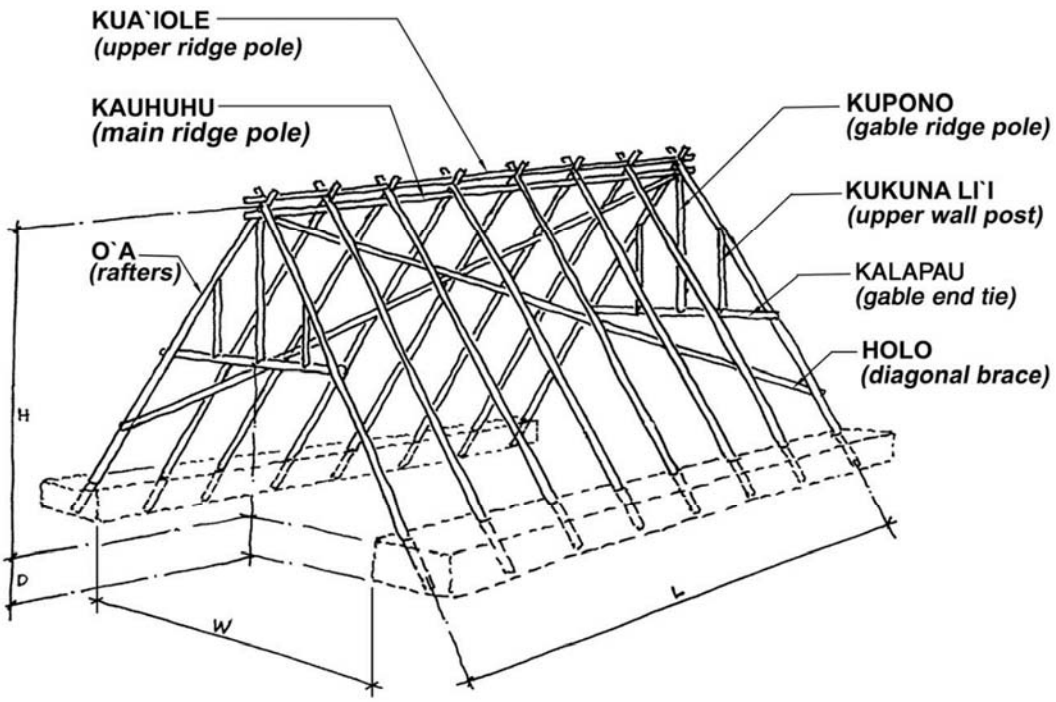


PAEPAE
(HOUSE PLATFORM)

**402.4 Hale Wa`a.** Hale Wa`a shall be designed in accordance with the following schematics and illustrations. Structural components for Hale Wa`a shall meet the size and spacing requirements in Table X402.4.



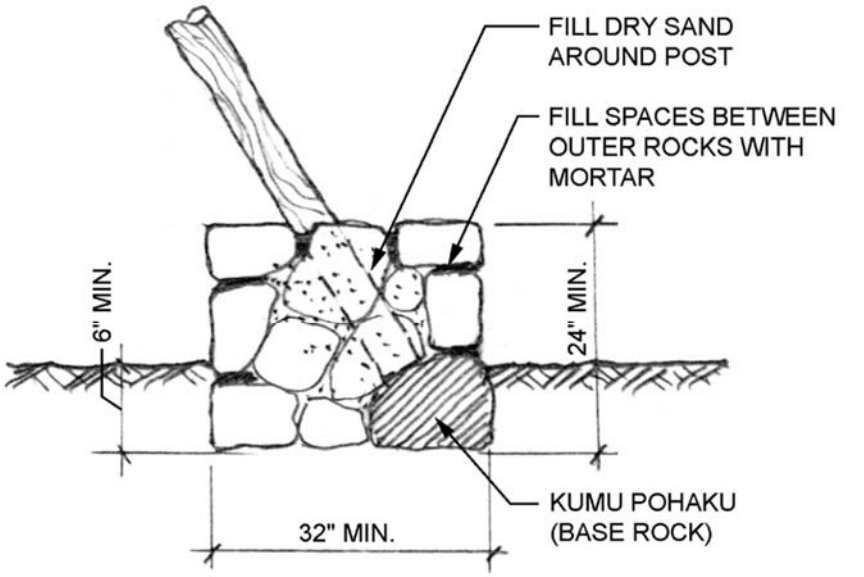
HALE WA`A



FRAMING SCHEMATIC

Table X402.4
Size and Spacing Requirements for Structural Components used in Hale *Wa`a*

Size (W x L)	o'a	kuaiole & holo	kauhuhu	Spacing between Rafters	Minimum Ridge Height (H)
20' x 60'	4"	3"	4"	4' to 5'	22½'
25' x 60'	5"	3"	4"	4' to 5'	27½'
30' x 60'	5½"	3"	4"	4' to 5'	27½'



PA POHAKU
(FOUNDATION WALL)

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