STRUCTURAL NOTES

General (See also Division 1 of the Project Specifications)

A. These notes apply to all drawings and govern unless otherwise noted or specified.

B. Verify all existing conditions and proposed dimensions at the job site. Compare structural drawings with architectural, mechanical, and electrical drawings before commencing work. Notify Architect of any discrepancies and do not proceed with affected work until they are resolved. Do not scale drawings.

C. Unless otherwise shown or noted, all typical details shall be used where applicable.

D. All details shall be considered typical at similar conditions.

E. Shop Drawings shall be submitted and reviewed by the Architect, before fabrication, for the following items:

1. Structural steel
2. Reinforcing bar fabrication for retaining wall on Grid Line 'E'. and floors slab over the dwelling basement and all associated concrete columns and beams.

F. Safety Measures: At all times, the Contractor shall be solely and completely responsible for the conditions of the job site including safety of the persons and property, and for all necessary independent engineering reviews of these conditions. The Architect's or Engineer's job site visits are not intended to include review of the adequacy of the Contractor's safety measures.

Tests & Inspections & Observations (See also Division 1, Section 01400 & 1410 of the Project Specifications)

A. Provide Tests, Inspections and Observations for all items as required by the 1991 Uniform Building Code and the Hawaii County adopted ammendments to the 91 UBC.

B. The Owner shall be responsible for retaining an Independent Testing Lab to perform all required Testing and Inspections.

C. The Contractor shall be responsible for providing the Testing Lab with construction schedules to ensure proper coordination of work.

D. The following specific items shall be inspected and/or tested by a Testing Agent

1. Compaction of all soil including structural fill placed as part of the mass site excavation and recompaction recommended in the soils report.
2. Compaction of all soil below footings and slabs on grade.
3. All structural welding not performed by a certified fabrication shop.
4. All concrete w/specified 28 day strength greater than 2500 psi shall have 7 and 28 day cylinder tests performed at the rate of one set of 3 cylinders for each day of concrete placement or one set for every 100 cubic yards which ever is more frequent.
5. Epoxied all-thread anchor rods at steel column base plates as noted on plans and/or details. See section entitled "Epoxy Dowels & Bolts" below

E. The following items shall be observed by the Structural Engineer:

1. Placement of foundation and concrete or masonry wall reinforcing, including all retaining wall foundation dowels extending from footings into bottom of walls.
2. Placement of reinforcing for all concrete retaining walls, bearing/shear walls & columns. (MANDATORY)
3. Plywood diaphragm construction. (MANDATORY for both roof and shearwall plywood)
4. Structural framing .

The General Contractor shall notify the Structural Engineer of the need for observations a minimum of 72 hours prior to the date for which the observation is requested.

F. See also inspection requirement for foundations listed below.

Design Basis

A. Construct in conformance with the 1991 edition of the Uniform Building Code and all applicable local ordinances. 97 UBC used for Seismic & Wind design.

B. Design loads in pounds per square foot

Floor: 15DL + 50 LL
Deck Area: 12DL + 50 LL
Roof: 19DL + 16LL @ ≥ 4:12 slope & 17 DL + 20LL @ < 4:12

Seismic: Zone 4
Wind: 80 mph Zone, Exposure C
Retaining Walls: Per Soils Report

Site Preparation (See also Division 2 of the Project Specifications)

Sitework shall be carried out as recommended in the soil report.

Foundations

A. The foundation design is based on Preliminary Recommendations provided by Geolabs, Inc., dated June 27, 2008 and any subsequent reports and addenda. A copy of these may be obtained from the Architect

B. Except where otherwise shown, excavations shall be made as near as possible to the neat lines required by the size and shape of the structure. All foundations shall be poured without the use of side forms wherever possible. If the trenches cannot stand, fully form sides to dimensions shown.

C. Do not allow water to stand in trenches. If bottoms of trenches become softened due to rain or other water before concrete is cast, excavate softened material and replace with properly compacted backfill or concrete at no cost to the Owner.

D. All excavations, forms and reinforcing are to be inspected by the local Building Inspector prior to placing concrete.

Concrete (See also Division 3 of the Project Specifications for LEED & LBC criteria)

A. Concrete shall be hardrock concrete and shall attain the following ultimate compressive strength at 28 days.

Location	28 Day Strength	Maximum Aggregate Size
Exterior slabs on grade	3000 psi (6" max. slump)	1 inch
Foundations	3000 psi (4" max. slump)	1-1/2 inch
Interior slabs on grade	3000 psi (4" max. slump)	1 inch
Concrete fill	3000 psi (6" max. slump)	3/4 inch max.- 3/8" min.
Walls, columns & beams	4000 psi (.45 max. w/c ratio)	1 inch
Foundations - CRM Wall Grout/Mortar	2500 psi	

Foundation concrete & Grout used to place and secure stone masonry may be the same material.
Where site mixed Grout is used it shall achieve the specified minimum strength and shall be proportioned as: 1 part cement/lime, not more than 2.5 parts fine aggregate and not more than 2 parts coarse aggegate.
Mix water shl be limited to the amount required to result in a slump of 8 inches or less.
Combined fine & coarse aggregate should be thoroughly blended at the suppliers plant prior to site deleviery.

B. Reinforce all concrete. Install all inserts, bolts, anchors, and reinforcing bars and securely tie prior to placing concrete.

C. Debris: remove all debris from forms before pouring.

D. Concrete shall be placed in a continuous operation between predetermined construction joints.

D. Segregation of aggregates: Concrete shall not be dropped through reinforcing steel (as in walls, columns, and drop capitals), so as to cause segregation of aggregates. Use hoppers, chutes or trunks of varying lengths so that the free unconfined fall of concrete shall not exceed 5 feet, and a sufficient number shall be used to ensure the concrete is being kept level at all times.

E. Concrete shall be continuously cured for 7 days after placement in any approved manner. Footings are excepted from this requirement.

Patching of Concrete

A. All insert holes, she-bolts, etc., and other imperfections on the surfaces of the concrete shall be filled with grout, brushed, and sacked to a uniform finish. All holes through to the outside of the building must be made watertight.

Reinforcing Steel (See also Division 3 of the Project Specifications for LEED & LBC performance criteria)

A. All reinforcing steel bars shall conform with the standard specifications for deformed billet-steel for concrete reinforcement, ASTM designation A615-82, Grade 60 unless otherwise noted.

B. Wire mesh shall conform with ASTM A185-79. 6x6-W2.9xW2.9 (6 gage) galvanized welded wire mesh.

C. Suitable devices of some standard manufacture shall be used to hold reinforcement, including wire mesh in slabs on grade, in its true horizontal and vertical positions. These devices shall be sufficiently rigid and numerous to prevent displacement of the reinforcement during placing of concrete. All such devices shall have prior approval from the Structural Engineer.

D. Lap splice all bars a minimum of 30 bar diameters, unless otherwise noted.

E. Rebar cover: All dimensions showing the location of reinforcing steel not noted as "clear" are to center of steel. Minimum rebar cover for nonprestressed concrete shall be as follows:

	Minimum Cover	Tolerances + or -
Cast against and permanently exposed to earth:	3"	3/8"
Exposed to earth or weather:		
No. 5 and smaller bars	1-1/2"	3/8"
No. 6 and larger bars	2"	3/8"
Not exposed to weather or in contact with the ground:		
Structural slabs and interior walls	3/4"	1/8"
Exterior walls	1- 1/2"	
Slabs on grade	1-1/2"	1/4"

F. Tolerances for rebar placement: Tolerances for longitudinal location of bends and ends of reinforcement shall be plus or minus 2 inches, except at discontinuous ends of members where tolerance shall be plus or minus 1/2 inch.

Geosysthentic Wall Drainage Composites

A. The reinforced concrete retaining wall at the basement of the proposed future energy lab shall have MIRAFI G100N Drainage Composite system applied over the waterproofing system.

Concrete Block Masonry (See also Division 4 of the Project Specifications for LEED & LBC performance criteria)

A. Concrete block masonry units shall be Grade N (f'm = 1500 psi), and conform with ASTM C90-70. PSI at 28 days.

B. Mortar shall conform with ASTM C 270-82A, Type S, and attain a minimum compressive strength of 1800

C. Grout shall conform with ASTM C476 and attain a minimum compressive strength of 3000 PSI at 28 days.

D. All cells shall be filled solid with grout and reinforced as shown in specific details. walls prior to commencing work.

E. Contractor shall submit to the architect for review a drawing locating all proposed control joints in masonry

F. The height of masonry wall construction between grout lifts shall not exceed 5'-4" without providing clean-outs at the bottom of the wall at each vertical bar or 32" o.c., whichever is greater, and special inspection.

Grout

A. Where called for on the structural drawings, grout used under column base plates and for setting anchor bolts into existing concrete shall be non-shrink, non-metallic grout meeting ASTM Standard C109-80, and shall attain a 28 day compressive strength of 6000 PSI.

Epoxy Dowels & All-threaded Rods

A. Where epoxy reinforcing bar dowels or all-threaded rods are called for in the structural drawings, the epoxy used shall be Epoxy-Tie SET from Simpson Strong-Tie. Anchors shall be installed per Simpson Strong-Tie's instructions for Epoxy-Tie SET. Submit manufacturer's literature to architect for review and approval. NO SUBSTITUTIONS without prior approval of the Structural Engineer. All threaded rods to be set in epoxy shall be ASTM A36 Galvanized all-threaded rods of diameter indicated.

Install reinforcing bar dowels or threaded rods in existing concrete as follows:

1. Drill hole to depth shown on drawings. Hole size shall be 1/8" - 1/4" greater than nominal bar diameter.
2. Clean hole with wire bottle-type brush and blow out with oil-free compressed air.
3. Fill hole 1/2-2/3 full, starting from bottom of hole to prevent air pockets. Withdraw nozzle as hole fills up.
4. Insert a clean and oil free anchor , turning slowly until the anchor contacts the bottom of the hole.
5. Remove excess grout from around hole before it hardens. Do not disturb during cure time.

B. SPECIAL INSPECTION

Where indicated in the details all epoxied all-thread anchor rods at steel column base plates shall be provided Special Inspection prior to the installation of the anchor rods.

Special Inspection of epoxied anchor rods and rebar shall be in accordance with ES Report number ESR-1772 (current issue), Section 4.4 and must satisfy the following:

1. Drilled hole diameter and depth. Diameter shall conform to requirement of Simpson Strong Tie Manual C-SAS-2007 or current edition. Depth shall be equal or greater than that specified in the details.
2. Cleanliness of hole after drilling (per Simpson Strong-Tie's instructions for SET epoxy) All holes shall be blown clean first then brushed then blown clean again.
3. All-thread anchor rod or reinforcing bar diameter and length.
4. Type of adhesive.

Framing Lumber (See also Section 6100 of the Project Specifications for LEED & LBC performance criteria))

A. All framing lumber shall be graded per WCLIB Grading Rules No. 16. All framing shall be FSC certified without exception.

B. All framing lumber shall be pressure treated to prevent decay and attack by insects. Pressure treatment shall be in accordance with the American Wood Preservers Association (AWPA) standard C-1 and American Wood Preservers Bureau (AWPB) LP quality assurance procedures. All lumber shall be pressure treated for above ground use unless noted otherwise and shall have preservative retentions recommended by the AWPA Use Classification UC3B for exterior framing lumber and UC2 for material for interior use only. See Project Specification Section 06133 Wood Preservative Treatment.

C. All 4x posts and beams shall be Douglas Fir #1 or better, and all 6x posts and beams shall be Douglas Fir #1 unless noted otherwise on framing plans, treated per AWPA UC3b.

D. All deck joists shall be Douglas Fir #1, treated per AWPA UC3B..

E. All floor joists shall be Douglas Fir #1 Kiln dried to 11% moisture content., treated per AWPA UC2.

F. All purllins and 4x blocking shall be Douglas Fir #2 Kiln dried to 11% moisture content. treated per AWPA UC3A..

G. All studs shall be Douglas Fir, Stud Grade.

H. All plates and miscellaneous lumber shall be Douglas Fir, Construction Grade.

I. Roof Decking

1. All 2x6 T&G roof decking shall be Spruce-Pine-Fir (SPF), Select (WWPA) or Select (WWPA or NLGA) grade. All decking shall be pressure treated per section above.

Glued Laminated Beams (See also Section 6181of the Project Specifications for LEED & LBC performance criteria))

ALL MATERIAL USED TO FABRICATE GLU-LAM BEAM SHALL BE FSC CERTIFIED, without exception

A. All beams shall be fabricated in accordance with AITC 117-82, Design Standard Specifications For Structural Glued Laminated Timber of Softwood Species and Voluntary Product Standard PS 56-73, Structural Glued Laminated Timber. AITC certificates shall be furnished to the Architect for all members.

B. All glue laminated timbers shall be pressure treated to prevent decay and attack by insects. Pressure treatment shall be in accordance with the American Wood Preservers Association (AWPA) standard C28 and American Wood Preservers Bureau (AWPB) LP quality assurance procedures. Members shall be pressure treated for above ground use unless noted otherwise and shall have preservative retentions recommended by the AWPA. Only IPBC/ Chloropyrifos, light organic solvent preservatives "Hi-CLEAR PT" or "TRIB II" solutions are acceptable. No other treatment product(s) shall be used without the written approval of the Structural Engineer. Other treatment products can have a negative effect on the design properties of beams or joists use, and required design strength may not be provided.

C. Use 2 inch nominal lumber grade. Slope in grain in top and bottom 10% of laminations shall not exceed 1:14. End joints shall be either scarfed 1:12 or OSA approved finger joints. Glued laminated beams shall be manufactured to meet the following minimum criteria: Fbxx=2400 PSI; Fbyy=1450 PSI; Fv=240PSI; E=1800000 PSI (24f-V). All Glue-Laminated beams shall be manufactured without camber except where specifically indicated on framing plans. Fabricate all glue laminated members without camber.

D. Moisture content of lumber shall not be less than 7% or greater than 12%.

E. All gluing shall be done in the shop by qualified personnel and conform with all requirements set out in PS 56-73.

F. Use of glues containing only Pheno-formaldehyde is permitted by LSC "grandfathering". Use of other forms of formaldehyde (urea- or melamine) is NOT permitted in the manufacture of any Glue Laminated members.

G. Use exterior glue unless otherwise noted.

Plywood (See also Section 6100 of the Project Specifications for LEED & LBC performance criteria))

All plywood shall be FSC certified with certificates provided.

A. Each plywood sheet shall be identified with the appropriate grade and trademark of the American Plywood Association and shall meet the requirements of the latest edition of the U.S. Product Standard PS-1.

B. Use of glues containing formaldehyde is NOT permitted in the manufacture of any plywood products.

C. All plywood shall be pressure treated to prevent decay and attack by insects. Pressure treatment shall be in accordance with the American Wood Preservers Association (AWPA) standard C9 and American Wood Preservers Bureau (AWPB) LP quality assurance procedures. All plywood shall be pressure treated for above ground use unless noted otherwise and shall have preservative retentions recommended by the AWPA fore Use Classification UC3b.

C. Plywood sheets shall be the thickness noted on the drawings.

E. Plywood sheets at roofs shall be laid with face grain perpendicular to trusses and rafters. Block edges where noted on the drawings.

F. Plywood sheets on walls shall be laid with long dimension vertical. Block all edges.

G. Floor plywood shall be 1.125" inch T&G, APA Rated STURD-I-FLOOR, Exposure 1, with 48" span rating.

H. Roof plywood shall be 3/4 inch T&G, APA Rated Sheathing, Exposure 1, with 48/24 span rating.

J. Exterior and interior wall plywood shall be 15/32 inch or 1/2 inch APA Rated Sheathing, Exposure 1 with 32/16 span rating. See Shearwall Schedule and framing plan for shearwall locations where 15/32" STRUCT I or 19/32" APA Rated Sheathing is required ("E"-type shearwall on Gridline G)

K. Adhesives: Adhesives used to glue plywood to framing shall conform to the American Plywood Association Specification AFG-01. Formaldehyde content is prohibited.

Rough Carpentry

A. For schedule of minimum nailing see Table 23-II-B-1, Uniform Building Code, 1997 Edition. 16 penny vinyl coated sinkers may be substituted for 16 penny box or common nails for rough framing. Sinkers shall not be used with metal connectors.

B. Sills on concrete shall be pressure treated Douglas Fir. Sills shall be fastened to the concrete with a minimum of two fasteners per piece and no fasteners further than 9 inches from end of piece.

C. Fasten all sill plates at non-structural walls to slabs with .145" diameter powder driven fasteners at 16" on center, unless otherwise noted on the drawings.

D. Place joists with crown up.

E. Retighten all bolts prior to closing in walls.

F. Use galvanized nails, bolts, and hardware where exposed to weather. Bolts shall be Hot Dipped Galvanized (HDG) per ASTM A153.

G. Block all joists at supports and under all partitions with minimum 2x solid blocking. Block and bridge roof joists at 10 feet and floor joists at 8 feet where ceiling assembly is not attached directly to bottom of joists.

H. Standard Timber Connections: All timber fasteners not specifically detailed on the drawings shall be Simpson Company's standard fasteners. No substitutions for specified connectors shall be made without written approval by the Structural Engineer. Installation shall be as shown and shall utilize the specific fasteners listed in the Simpson Strong-Tie Catalogue (current edition). The specific number and type of fasteners listed for the specified product shall be used at all times ("nail all holes") unless otherwise noted. All fasteners and connectors used in exposed conditions shall have either Z-MAX coating of G185 thickness or Hot Dip Galvanizing (HDG) per ASTM A153.

I. LOG SCREWS: Blue-MAX Log Screws (BM6 or BM10 in drawings) manufactured by SFS intec Inc. (www.sfsintecusa.com)

J. Adhesives: Adhesives used to glue plywood to framing shall conform to the American Plywood Association Specification AFG-01. Adhesives containing Formaldehyde in any form are PROHIBITED>

Structural Steel and Miscellaneous Iron (See also Section 5100 of the Project Specifications for LEED & LBC performance criteria)

A. All wide flange sections shall conform with ASTM A992. All other structural steel and miscellaneous iron shall conform with ASTM A36, unless otherwise noted.

B. Round Hollow Structural Sections (HSS) shall conform with ASTM A500, Grade B (Fy = 42 ksi)

C. Rectangular Hollow Structural Sections (HSS) shall conform with ASTM A500, Grade B (Fy = 46 KSI).

D. All steel connection bolts shall conform with ASTM A325. Unless noted otherwise tighten all bolts by "snug tight" Method. Anchor bolts and threaded rods shall be ASTM A307 or A36, Galvanized per ASTM 123 G90.

E. Paint steel (except portions to be encased in concrete) with two coats of rust inhibiting primer. All unenclosed steel shall be galvanized to conform with ASTM A123 G90.

F. All work shall be performed in accordance with AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings."

G. Welding shall conform with the latest edition of the AWS Specifications and be done by certified welders. Use E70 electrodes.

H. All headed stud shear connectors shall conform to the requirements of ASTM A108 specifications for grades 1010 and 1020, with a minimum tensile strength of 60,000 psi. All shear studs shall satisfy all other requirements of "American Welding Society" chapter 4 part F.

I. All welded reinforcing required by the details shall conform with ASTM A706 low alloy steel deformed bars for concrete reinforcing and shall be welded in accordance with ANSI/AWS D1.4-79 "Structural Welding Code-Reinforcing Steel".

LIST OF STRUCTURAL DRAWINGS

ENERGY LAB
Hawai'i Preparatory Academy
Kamuela, Hawaii
TMK: 6-5-1: 33

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ELECTRICAL ENGINEERING
Wallace T. Oki, PE, Inc.

WALTER T. VORFELD
LICENSED PROFESSIONAL ENGINEER
NO. 7004 S
HAWAII, U.S.A.
Signature

This work was performed by me or under my supervision and construction of this project will be under my observation (observation of construction as defined in section 16-115-2 of the rules and regulations of the Board of Professional Engineers, Architects and Surveyors of the State of Hawaii).
EXP: 4/30/2010

	PERMIT SET	1/19/09

STRUCTURAL NOTES
STRUCTURAL DRAWING INDEX

PERMIT SET 01-19-09

Drawn by: WTV, RD, KC	Job Number: WVA-28012
Checked by: WTV, RD, KC	Scale: AS NOTED
PERMIT SET	Date: 01/19/2009

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