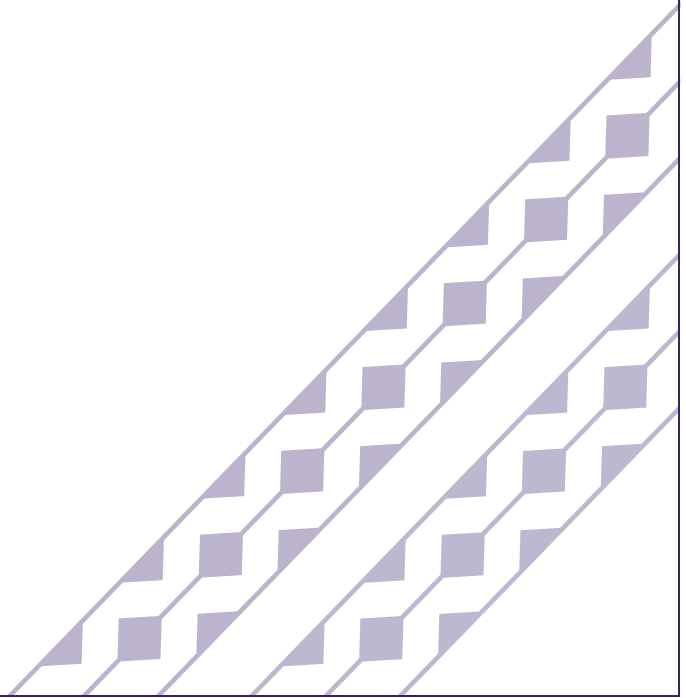




**Hawaiian  
Electric**

The information found in this document are general guidelines that may be used to aid in the preparation of your service request proposal. Please be advised that depending on the specific needs and actual conditions of your project, Hawaiian Electric may require your design to comply with different specifications including specifications that include more stringent requirements than those included in these design specification guidelines. For further guidance and clarification on the actual specifications that will apply to your particular project, please refer to instructions issued by Hawaiian Electric's Planner or Engineer who is assigned to your particular (Project/Review Request/...). Additionally, please be advised that Hawaiian Electric reserves the right to require additional modifications to any approved design if it is determined during actual construction that additional modifications must be made to address certain field conditions that were not detected or Hawaiian Electric was unaware of during the design review process.



GENERAL NOTES:

1. HAWAIIAN ELECTRIC COMPANY (HECO) SHALL HAVE FINAL APPROVAL OF VAULT ROOM, INCLUDING LOCATION.
2. VAULT ROOM SHALL BE LOCATED AT LEAST AT GRADE LEVEL. VAULT ROOM LOCATED BELOW GRADE LEVEL WILL NOT BE ALLOWED.
3. THE VAULT SHALL BE DESIGNED AND, CONSTRUCTED, OWNED AND MAINTAINED BY THE CUSTOMER. REFER TO HECO RULE NO.14.
4. THE VAULT'S DESIGN SHALL COMPLY WITH HECO REQUIREMENTS (AS SPECIFIED IN THIS STANDARD AND ANY PROJECT SPECIFIC REQUIREMENTS), THE APPROPRIATE BUILDING CODES AS WELL AS WITH THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 70: NATIONAL ELECTRIC CODE (NEC), NATIONAL ELECTRIC SAFETY CODE (NESC), INTERNATIONAL BUILDING CODE (IBC), AND OTHER APPLICABLE STANDARDS AND CODES.
5. ALL CONSTRUCTION MUST BE INSPECTED AND APPROVED BY HECO'S CONSTRUCTION AND MAINTENANCE DEPARTMENT - INSPECTION DIVISION PRIOR TO THE INSTALLATION OF ANY HECO FACILITY OR THE ENERGIZING OF THE HECO ELECTRICAL SYSTEM. IF ALL HECO CONSTRUCTION REQUIREMENTS AND STANDARDS ARE NOT MET, THE CUSTOMER RISKS THE CONDEMNATION OF THE CONSTRUCTED VAULT. ANY DEVIATIONS FROM THE VAULT REQUIREMENTS MUST HAVE HECO APPROVAL PRIOR TO THE START OF CONSTRUCTION.
6. INSPECTION: A MINIMUM OF FIVE (5) WORKING DAYS ADVANCE NOTICE IS REQUIRED BY HAWAIIAN ELECTRIC FOR INSPECTION SERVICE. THE CUSTOMER'S CONTRACTOR IS TO CALL HECO CUSTOMER ENGINEER OR THE PLANNER AT 543-.....
7. HAWAIIAN ELECTRIC'S UNDERGROUND DIVISION OF THE CONSTRUCTION AND MAINTENANCE DEPARTMENT IS RESPONSIBLE FOR ANY DUCT ENTRY INTO EXISTING HANDHOLES OR MANHOLES THAT CONTAIN ENERGIZED CABLES. TEN (10) WORKING DAYS ADVANCE NOTICE IS REQUIRED. THE CUSTOMER SHALL COORDINATE WITH HAWAIIAN ELECTRIC'S INSPECTION DIVISION TO SCHEDULE THE HANDHOLE OR MANHOLE PENETRATION.
8. HECO SHALL HAVE 24 HOUR/7 DAY A WEEK ACCESS TO THE VAULT. ACCESS TO THE VAULT THROUGH A SEPARATE LOCKED AREA (WITH NON HECO LOCKS) WILL NOT BE ALLOWED.
9. THE CUSTOMER IS TO PROVIDE A 10 FOOT WIDE MINIMUM, HEAVY VEHICULAR ACCESS TO ENABLE HECO TO INSTALL AND/ OR REPLACE EQUIPMENT UTILIZING CRANES, LIFTS OR OTHER HEAVY EQUIPMENT.
10. ANY RAMP ACCESS TO THE VAULT ROOM SHALL NOT HAVE A SLOPE OF MORE THAN 4 TO 1 (4' RUN TO 1' RISE).
11. THE VAULT SHALL BE LOCKED WITH HECO LOCK AND CONSTRUCTED OF MATERIAL THAT MEETS FIRE RATING REQUIREMENTS.
12. CONSIDERATION SHOULD BE GIVEN TO WHERE THE TRANSFORMER VAULTS ARE TO BE LOCATED SO THAT THE TRANSFORMER SOUND LEVELS DO NOT EXCEED THE LIMITS SPECIFIED IN THE DEPARTMENT OF HEALTH REGULATION, "COMMUNITY NOISE CONTROL FOR OAHU". THE TRANSFORMER SOUND LEVEL WILL BE 50DBA. IT WILL BE THE RESPONSIBILITY OF THE CUSTOMER TO SOUND PROOF THE VAULT IF NECESSARY TO MEET THE ALLOWABLE LEVEL LIMITS OR TO LIMIT OBJECTIONABLE NOISE TO OCCUPANTS IN THE BUILDING.
13. IF A SWITCHGEAR IS REQUIRED THE VAULT SHALL BE SIZED ADEQUATELY TO ACCOMMODATE BOTH THE SWITCHGEAR AND TRANSFORMER (AND ALL THE REQUIRED WORKING CLEARANCES) WITHIN THE SAME VAULT ROOM.

DATE INITIAL REVISION

DRAWN AP	DESIGNED <b>HH</b>	APPD <b>HH</b> <i>W. Jayakumar</i>	REDRAWN
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SUPERSEDES

ENGINEERING STANDARD  
HAWAIIAN ELECTRIC CO., INC.

STANDARD CONSTRUCTION NOTES  
TRANSFORMER AND  
SWITCHGEAR VAULT ROOMS  
UG DUCTS AND STRUCTURES

ORIGINAL <b>AUG 2018</b>	REV
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VAULT STRUCTURE

WALLS, FLOOR, CEILING

1. THE VAULT CONSTRUCTION SHALL CONSIST OF CONCRETE OR MASONRY WALLS, FLOOR AND CEILING WITH A MINIMUM FIRE RESISTANCE OF 3 HOURS.
2. THE VAULT CONSTRUCTION SHALL CONTAIN PULLING IRONS ON THE VAULT WALLS, CAPABLE OF 20,000 POUNDS OF LOAD. PULLING IRONS TO BE AT A HEIGHT OF 4 FEET ABOVE FINISHED VAULT ROOM FLOOR. HECO SHALL DETERMINE THE PULLING IRON LOCATIONS. PULLING IRONS WILL BE TYPE 304 STAINLESS STEEL WITH 7/8" DIAMETER, INSTALLED, AT MINIMUM, OVER INCOMING PRIMARY DUCTS.
3. THE VAULT FLOOR SHALL BE A MINIMUM OF 4 INCHES OF REINFORCED CONCRETE AND SHALL BE DESIGNED TO ACCOMMODATE SPECIFIED LOADING OF INSTALLED EQUIPMENT (TRANSFORMER, SWITCHGEARS, AND EQUIPMENT NEEDED FOR CONSTRUCTION SUCH AS FORKLIFTS.)
4. FOR OTHER REQUIREMENTS NOT SPECIFIED BY HECO FOR VAULT WALLS, FLOOR AND CEILING CONSTRUCTION SHALL CONFORM TO THE LATEST REVISION OF THE NFPA 70/NEC, IBC, AND ALL OTHER APPLICABLE STANDARDS.
5. THE CEILING HEIGHT INSIDE THE VAULT SHALL BE HIGH ENOUGH TO ACCOMMODATE THE INSTALLATION OF THE ROLL UP DOOR ON THE INSIDE WALL ABOVE THE 10'-0" HIGH OPENING.

VAULT DOORS

GENERAL

1. FIRE RATED METAL OR METAL CLAD DOORS AND FRAMES SHALL BE USED PER LATEST VERSION OF NFPA, NEC, AND ANY OTHER APPLICABLE STANDARDS.
2. 6" HIGH SEALED REMOVABLE DOOR SILLS TO CONFINE OIL SHALL BE PROVIDED BY THE CUSTOMER, LOOSELY INSTALLED (NOT SEALED) PRIOR TO FINAL INSPECTION, THEN PERMANENTLY INSTALLED BY CUSTOMER IMMEDIATELY AFTER THE TRANSFORMER IS INSTALLED BY HECO. DOOR SILLS TO EXTEND BEYOND DOOR OPENINGS, BUT SHOULD NOT IMPACT GROUNDING DUCTS OR CABLES.

ROLL UP DOORS

1. ROLL UP DOORS MUST BE MANUALLY OPERATED WITH CHAIN. AUTOMATIC DOORS WILL NOT BE ALLOWED DUE TO POSSIBLE SAFETY HAZARD.
2. AT LEAST ONE ROLL UP DOOR SHALL BE REQUIRED AND THE DOOR SHALL BE INSTALLED AND OPERATED FROM THE INSIDE. IF ADDITIONAL EQUIPMENT IS INSTALLED, ADDITIONAL ROLL UP DOORS MAY BE REQUIRED.
3. ROLL UP DOORS SHALL FRONT THE TRANSFORMER(S) OR SWITCH(ES) TO EASE INSTALLATION AND REPLACEMENT.
4. THE ROLL UP DOOR OPENING SHALL BE AT A MINIMUM 10 FEET WIDE AND 10 FEET HIGH.
5. PAD LOCKS FOR THE ROLL UP DOOR SHALL BE PROVIDED BY HECO, WITH LOCKING LOOPS OR BRACKETS PROVIDED BY CUSTOMER.

PERSONNEL DOOR

1. ONE PERSONNEL DOOR 3'-0" BY 6'-8" SHALL BE INSTALLED. LOCATION SHALL BE APPROVED BY HECO.
2. THE PERSONNEL DOOR SHALL SWING OUTWARDS AND SHALL BE EQUIPPED ON THE INSIDE WITH A PANIC BAR OR OTHER DEVICE THAT NORMALLY LATCHES BUT OPEN UNDER SIMPLE PRESSURE.
3. THE PERSONNEL DOOR MAY BE LOUVERED BUT MUST RETAIN ITS FIRE RATING.

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4. THE DOOR IS TO BE FITTED WITH A CYLINDER LOCK WHICH WILL ACCOMMODATE A "BEST" UNIVERSAL LOCK CYLINDER FOR THE PERSONNEL DOOR. HECO SHALL PROVIDE THE "BEST" UNIVERSAL LOCK CYLINDER.
5. THE PERSONNEL DOOR SHALL BE TAMPER PROOF.

VENTILATION

1. FOR TRANSFORMERS THAT ARE AIR COOLED, THE TEMPERATURE OF THE COOLING AIR (AMBIENT TEMPERATURE) SHALL NOT EXCEED 40 DEGREES C, AND THE AVERAGE TEMPERATURE OF THE COOLING AIR FOR ANY 24 HOUR PERIOD SHALL NOT EXCEED 30 DEGREES C. THE CUSTOMER IS TO PROVIDE A VENTILATION SYSTEM CAPABLE OF TRANSFERRING ----- BTU/MIN. OF HEAT ENERGY (TRANSFORMER LOSSES) DISSIPATED BY THE TRANSFORMERS.
2. ALL VENT LOUVERS SHALL BE FIRE RATED AND BE METAL WITH METAL OR METAL CLAD FRAMES. ALL LOUVERS SHALL BE TAMPER RESISTANT AND SHALL NOT BE REMOVABLE FROM THE OUTSIDE.
3. ALL LOUVERS SHALL BE SCREENED ON THE INSIDE WITH A CORROSION RESISTANT MATERIAL. VENTS WHERE PRACTICAL SHOULD VENT TO THE OUTSIDE. FOR OTHER REQUIREMENTS NOT SPECIFIED BY HECO FOR VENTILATION DUCTS, LOCATION, ARRANGEMENT, SIZE COVERING AND DAMPERS SEE LATEST VERSION OF NEC 450-45, AND ANY OTHER APPLICABLE STANDARDS. EXTERNAL EXHAUST OR OUTSIDE AIR NOT RELATED TO TRANSFORMER COOLING SHALL NOT BE VENTED INTO OR THROUGH THE ROOM.
4. OBTAIN APPROVAL FROM THE FIRE MARSHAL FOR SPECIFIED VENTILATION LOCATIONS. (6 SQ.IN. PER KVA)
5. ALL INLET AND EXHAUST OPENINGS SHALL BE EQUIPPED WITH FIRE DAMPERS AS SPECIFIED BY THE NFPA.
6. PRELIMINARY DRAWING SHOWING THE LOCATION OF THE VENTILATION EQUIPMENT WITHIN THE VAULT SHALL BE SUBMITTED TO HECO FOR APPROVAL. THIS REQUIREMENT IS NECESSARY TO ENSURE ADEQUATE CLEARANCE BETWEEN THE HECO EQUIPMENT AND THE VENTILATING EQUIPMENT CAN BE PROVIDED.

LIGHTING AND POWER

1. THE CUSTOMER IS TO SUPPLY AND INSTALL THE VAULT LIGHTING, OUTLETS AND SWITCHES. THE LIGHTS SHALL BE MOUNTED AT A HEIGHT NO MORE THAN 12 FT AND NO LESS THAN 10 FT.
2. THE CUSTOMER IS TO SUPPLY 120 VOLT POWER FOR THE VAULT LIGHTING AND OUTLETS. FLUORESCENT VAULT LIGHTING IS PREFERRED WITH THE LIGHT SWITCH(ES) LOCATED NEAR PERSONNEL DOOR(S).
3. EMERGENCY VAULT LIGHTING SHALL BE INSTALLED TO ENABLE HECO PERSONNEL TO EXIT VAULT QUICKLY.
4. A SINGLE 120 VOLT GROUNDED OUTLET ON A 15 AMP BREAKER INSIDE THE VAULT SHALL BE INSTALLED.

GROUNDING

1. FOUR COPPER WELD GROUND RODS, 5/8" X 10'-0" SUPPLIED BY HECO ARE TO BE INSTALLED BY CUSTOMER, ONE AT EACH CORNER OF THE VAULT, 4" FROM THE WALLS. RODS SHALL EXTEND 6" ABOVE THE FINISHED FLOOR. TIE ONE ROD TO A WATER PIPE WITH #1/0 BARE COPPER WIRE. THIS TIE MAY BE ELIMINATED

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UG DUCTS AND STRUCTURES

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WHERE THE WATER PIPE IS MORE THAN 25 FEET AWAY, ONE - 2" SCHEDULE 40 PVC DUCT WITH 18" FACTORY BENDS AT BOTH ENDS SHALL BE INSTALLED BELOW THE FLOOR AT ALL ROLL UP AND MAN-DOOR SILLS ALONG WITH ANY AREA WHICH IS IN THE MIDDLE OF A WALKING PATH (EXAMPLE: STAIRWAY LANDING) FOR THE INSTALLATION OF THE VAULT GROUNDING.

2. ANY METAL (VENTS, DOORS, PIPES, ETC.) WITHIN THE VAULT SHALL BE GROUNDED TO AVOID STEP/TOUCH POTENTIALS.
3. IF THE VAULT IS NOT LOCATED ON THE GROUND FLOOR, FOUR 4/0 COPPER GROUND WIRES SHALL BE PROVIDED BY THE CUSTOMER AND HOUSED IN A CUSTOMER PROVIDED 1" PVC DUCT TO THE GROUND FLOOR. EACH OF THE 4 WIRES SHALL TERMINATE 12" ABOVE THE VAULT FLOOR IN EACH CORNER OF THE VAULT. AT THE GROUND LEVEL, EACH OF THE 4 WIRES SHALL TERMINATE TO EACH OF 4 GROUND RODS. THE GROUND RODS SHALL BE DRIVEN NO LESS THAN 6 FEET APART AND SHALL BE BONDED WITH 4/0 COPPER WIRE.

DUCTS

1. THE CUSTOMER INSTALLS ALL DUCTS. THE CUSTOMER INSTALLS, OWNS AND MAINTAINS ALL RACEWAYS, WIRE WAYS AND SECONDARY CABLES. CUSTOMER'S SECONDARY CABLES SHALL BE OF SUFFICIENT LENGTH TO TERMINATE INTO THE HECO TRANSFORMER.
2. SECONDARY DUCTS SHALL BE SEALED WITH FIREPROOF DUCT SEALS INSTALLED BY THE CUSTOMER. DUCTS ENTERING FROM A WALL MUST BE 6" MINIMUM FROM THE FLOOR. DUCT LOCATIONS SHALL BE REVIEWED AND APPROVED BY HECO PRIOR TO INSTALLATION TO INSURE PROPER ALIGNMENT WITH THE HECO TRANSFORMER.
3. ANY DUCT BENDS INTO THE VAULT SHALL HAVE A MINIMUM RADIUS OF 3'-0".
4. ANY DUCTS ENTERING FROM THE FLOOR SHALL EXTEND 6" ABOVE THE FLOOR GRADE WITH A 3" CONCRETE APRON.
5. DUCT LINES SHALL BE PVC SCHEDULE 40 AND REINFORCED CONCRETE ENCASED IF THE DUCT LINES PASS UNDER THE BUILDING STRUCTURE.
6. THE CUSTOMER SHALL INSTALL IN EACH PRIMARY DUCT LINE MULE TAPE.
7. PIPING OR OTHER DUCTWORK FOR VAULT COOLING IS ALLOWED. ANY OTHER PIPE OR DUCT SYSTEM FOREIGN TO THE ELECTRICAL INSTALLATION SHALL NOT ENTER, PASS THROUGH OR TERMINATE IN THE VAULT.
8. DUCT LINE BENDS DUE TO CHANGES OF GRADE ARE TO HAVE A MINIMUM RADIUS OF 20'-0". HORIZONTAL BENDS ARE TO HAVE A MINIMUM RADIUS OF 30'-0".

FIRE PROTECTION

SEE VAULT STRUCTURE. WALLS, FLOOR, CEILING NOTE 1.

NOTE: WATER SPRINKLER SYSTEMS ARE NOT ALLOWED.

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