NAWILIWILI BULK SUGAR FACILITY
(Gay & Robinson Bulk Sugar Facility)
(Kauai Consolidated Terminal Co.)
2670 Niumalu Road
Lihue
Kauai County
Hawaii

HABS HI-567
HABS HI-567

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN BUILDINGS SURVEY
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN BUILDINGS SURVEY

NAWILIWILI BULK SUGAR STORAGE FACILITY
(Gay & Robinson Bulk Sugar Facility)
(Kauai Consolidated Terminal Co.)

HABS No. HI-567

Location: 2670 Niumalu Raod.
Lihue
Kauai County, Hawaii

Lat./Long. Coordinates:
21° 57' 22.25" N
159° 21' 27.50" W

Hawaii TMK # (4) 3-2-005: 009

Date of Construction: 1950

Owner: Gay & Robinson, Inc.

Architect/ Engineer: Stephens Adamson Manufacturing Co., Los Angeles, CA.
Grady and Jost Structural Engineers, Los Angeles, CA.

Builder: Walker-Moody Construction Co., Honolulu, HI.

Present Use: Warehouse and Conveyor 3 are vacant. Scale House is in operation as a truck weighing facility, the Nawiliwili Weigh Station.

Significance: The Warehouse, Scale House, and Conveyor 3 of the Nawiliwili Bulk Sugar Storage Facility are significant for their association with the sugar industry on Kauai and as an example of a bulk sugar storage facility. The facility's ability to store and ship sugar in bulk, rather than as previously done in bags, assisted the expansion of the sugar industry on Kauai.

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Date of Report: February 2015

DESCRIPTION:

This report covers the Bulk Sugar Warehouse, Scale House, and Conveyor 3 of the Nawiliwili Bulk Sugar Storage Facility. The complex of the Bulk Sugar Warehouse, Scale House and Conveyor 3 of the Nawiliwili Bulk Sugar Storage Facility is located on the top of a steep bluff about 75' high that is within 600' of the former bulk sugar loading wharf to the southeast at Nawiliwili Harbor. Adjacent to the southwest of the complex is a recycling transfer station. The bluff borders the complex on the northeast and southeast sides. To the east, there is a wide view of the harbor from the edge of the bluff. To the west, the terrain rises across Niumalu Road and is an overgrown parcel.

The complex formerly operated by receiving bulk sugar trucks at the Scale House where they were weighed and their contents dumped into a conveyor system that carried the sugar to the ridge of the Warehouse, where it was deposited down onto the Warehouse floor. Upon shipment, a series of longitudinal hoppers in the Warehouse floor were opened and the sugar entered another conveyor system below the Warehouse floor level. Sugar was transported out of the Warehouse thru a conveyor portal in the side of the bluff, weighed at the batch scale building, and then conveyored to the loading gallery at the wharf and into a ship's hold.

Warehouse Description

The Warehouse is a large concrete building with corrugated metal siding and a metal frame gable roof covered in corrugated metal panels. The footprint of the main portion of the building is about 380' x 110' with an approximate 12' projection at the northwest end that is about 20' wide. The projection gives the building an overall length of about 392'. The long sides of the building are divided into 20' wide bays by concrete pilasters with engaged concrete buttresses. At nineteen of the bays, the long side walls of the Warehouse building are about 50' high to the closed eaves, and total height of the building is about 85' to the ridge.

The Warehouse has a 9'-0" wide concrete footing foundation beneath the long side walls that is set about 5' below grade. It has a 7" thick concrete slab floor. Running longitudinally, below the center of the floor is a 10'-3" wide concrete tunnel that extends down 11'-4" below the floor slab. This tunnel contained the conveyor system that transported sugar out of the Warehouse. The exterior long side walls are reinforced concrete to 13'-0" high above the floor. These side walls taper upward from a thickness of 1'-3" at the footings to 10" at a height of about 11'. The upper 2' of the concrete then widens to 1'-10" at the top by tapering outward on the exterior. Above this widened portion the exterior has vertically oriented corrugated panels of asbestos-protected metal (A.P.M.) that extend upward to the approximate 50' height of the eaves. End walls of the Warehouse are vertically oriented A.P.M. panels.

The concrete pilasters that define the 20' wide bays of the long sides project 3'-8" from the wall and are 5'-0" wide and about 45' high. The concrete buttresses engaged to the pilasters are 2'-0" thick and about 23' high with a horizontal top surface that projects about 10' from the building wall. The outer edge of the buttresses angles down to grade from the end of the horizontal top. Typically, at grade, the angled edge is 19'-6" from the building wall. However, at the south corner of the building there are six buttresses with double-angled outer edges that extend about 23' from the building wall. Where the buttress edge meets grade, many of these 2'-0" thick buttresses of both lengths have separating concrete that show they were originally 1'-4" thick and have had 4" of concrete applied to both sides. Atop each buttress is an angled steel I beam that extends from the outer end of the horizontal top surface to the pilaster, about 12' above the top of the buttress. This angled steel beam is braced by two steel supports that extend to the

pilaster. Extending horizontally between the buttresses near the outer end of the buttress top surface is a series of metal pipe supports. Also extending horizontally between the pilasters are sections of metal bracing that are laid flat. There are two of these at each bay, one is just above grade and the other is at the top of the concrete section of side wall, about 13' above grade. Each brace is constructed of 2" and 4" steel angle irons and each projects about 3'-2" from the building wall.

The exterior southeast (rear) end of the Warehouse has six concrete buttresses that are on about 20' spacing. Each end buttress is engaged on a pilaster and is about 5' from the corners of the building. Each pilaster projects about 3'-8" from the wall and is about 5'-0" wide with an angled top surface. The four middle buttresses have no pilaster. The buttresses are 2'-0" thick and extend up about 45'. Their upper portion angles out from the wall to a vertical outer edge that extends down to about 8'-4" above grade where it again angles outward to grade. Each buttress has an angled concrete section, 3'-0" thick that extends from the base of the building side wall to the angle of the outer edge at 8'-4" above grade. These buttresses at the southeast end are joined near their upper ends by sections of horizontal metal pipe. Near the midpoint of the southeast end wall, a triangular-section metal brace extends from the building wall down to a concrete pier.

The first 20' bay at the northwest end of the Warehouse has a gable roofline that is about 20' below the roof level of the rest of the building. Eaves at this lowered portion are about 30' high and the gable ridge is about 65' high. Centered on this lowered portion is a full height (approximately 65') vertical section about 20' wide that projects about 12' from the northwest end wall. The top of this vertical section receives Conveyor #3 from the Scale House at its ridge. All exterior walls of this end of the building are vertically oriented corrugated metal siding with no buttresses.

The Warehouse has no windows. At the top of the 20' wide vertical section at the northwest end is an opening with casement sash with corrugated A.P.M. siding in lieu of glazing. Each end of the Warehouse has three openings for ventilation fans, one opening is at the gable and two are on the end wall below. These approximate 4'-10" diameter fans each have a rectangular metal housing on the exterior that projects about 3'-8". Additional ventilation is provided by a three-part opening at the 85' high gable of the northwest end. This has three square openings (two approximately 4' square and one approximately 3' square) with horizontal louvers.

The northwest end has all doors into the Warehouse. There are two large scale metal roll up doors about 14' wide and about 24' high. Next to each roll up door is a hinged, pedestrian scale metal door about 3'-6" x 7'-0". A third hinged metal door, 2'-6" x 7'-4" is at the north corner of the 20' wide vertical section.

The interior of the main floor of the Warehouse is a large open space. The long sides of the interior are unfinished concrete with a horizontal seam about 13' above the level of the concrete floor. In areas the concrete is spalling away from this seam to reveal a corroded, horizontal angle iron. The long side walls above the 13' level have an unfinished concrete surface, presumably with the metal frame of the building beneath. The roof framing is exposed and consists of rafters formed of flat trusses about 5' high on approximate 20' spacing. Purlins span the truss rafters and corrugated roof sheathing (probably A.P.M.) is laid over them. At the apex of the roof ridge there is an approximate 14' wide space formed by the angling of the lower chord of the trusses toward the apex. Within this space, down the length of the building, ran the conveyor system that deposited sugar into the Warehouse. This space was not accessed and it

is not known if any of the conveyor system remains. This conveyor was referred to as Conveyor 4[1] and was driven by an electric motor located at the southeast end of the conveyor.

Running down the center of the concrete floor of the Warehouse is a row of thirty-six metal hoppers that extend below floor level into the tunnel below. The tops of the hoppers are flush with the floor and the rectangular top opening of each is about 10' x 11'. The metal sides of each hopper taper down to a bottom opening about 2'-10" x 3'-10", which is about 4' below the level of the floor. Below the main floor of the Warehouse, the longitudinal conveyor tunnel beneath the center of the Warehouse provides access to the bottom doors of each hopper.

The conveyor tunnel is accessed by metal stairs at the center of the northwest end of the Warehouse, within the 20' wide section that projects from this end of the building. The tunnel is about 9' wide x 7' high and formerly contained the conveyor that carried sugar coming out the bottom of the hoppers. The bottom of each hopper has an opening in its southeast side with a door that is controlled by a 2' diameter hand wheel. When the hopper door was opened, the sugar was conveyored out of the Warehouse at the southeast end and into the batch scale building. This conveyor was referred to as Conveyor 5 and was driven by an electric motor located in the batch scale building, about 200' southeast of the Warehouse. The belt of Conveyor 5 was about 4' wide and traveled on sets of three steel rollers that were positioned to give it a concave shape when carrying a load of sugar. The conveyor itself has been removed, but some of its framework remains bolted to the floor. These frames are approximate 1'-6" high legs and crossbeams of steel channel. The tunnel opening for Conveyor 5 in the side of the bluff at the southeast end of the Warehouse has been sealed by CMU and mortar.

Warehouse Alterations

Alterations to the Warehouse are complicated and not easily dated or understood. The building was built with side walls approximately 30'-0" high with concrete walls and pilasters at the lower 13'-0" portion with no buttressing.[2] Above these concrete side wall sections was steel framing sheathed with A.P.M. Historic photos show two roll up doors in the southeast (rear) end of the building with square vent housings above and human scale doors to the sides, all with the same configuration and position as the doors and vent housings extant on the northwest end. The roll up doors and building side walls indicate that the original eave height for the entire building was about 30' as shown on original plans.

Sometime after April 1960 the building was altered by raising the sidewalls about 20' at all bays except the northwest end bay where Conveyor 3 enters the building. This alteration appears to have utilized the original roof framing, raising it up on the heightened walls. The doors in the southeast end wall were probably eliminated at this time.

The addition of the building's exterior buttressing was likely begun at the same time that the side walls were heightened. Anecdotal reports received during the site visit for this report

[1] Conveyor 2 was the sugar conveyor under the hopper in the Scale House. Conveyor 3 ran from the Scale House to the bulk sugar warehouse. Conveyor 4 was at the ridge of the bulk sugar warehouse. Conveyor 5 was in the tunnel under the warehouse floor and continued out to the batch scale building. Conveyor 6 went from there to the sugar loading gallery above the Pier 2 Transit Shed. Conveyors 7 & 8 were in the sugar loading gallery.

[2] Camera Hawaii, photograph "Nawiliwili Harbor." Collection of Hawaii State Archives, folder PP47-8, photo .034. ca. 1950s. And Bishop Museum Photo Collection, photograph "EBM 33401B Harbor scene, Nawiliwili" by Ray Jerome Baker in folder Geography, Kauai, Nawiliwili, 1900-, folder 2. April 1960.

indicate this might have been prompted by a failure of the building walls. Field work observations for this report indicate that 1'-4" thick buttresses and 5'-0" thick pilasters were added. Later, a 4" thickness of concrete was added to both sides of the buttresses. The sections of horizontal pipe bracing at the upper edge of the buttresses were likely added then, with their ends imbedded in the 4" thick concrete. The flat-laid metal bracing was likely added at the same. Drawings show that the original exterior support of the 13' high concrete sidewalls was 2'-0" wide pilasters that projected 6" from the exterior wall. These were covered over by subsequent buttressing. The interior side wall surfacing of concrete above the 13' level is another alteration accomplished after the roof was raised 20'. It is presumed that this interior concrete surfacing was accomplished over the steel framing.

Scale House

The Scale House is a single story, steel frame, gable roof building with corrugated A.P.M. siding and roof sheathing. The building has a concrete slab floor with a concrete curb foundation that typically extends about 1' above grade. Alongside the curb, on the exterior of the long sides of the building are concrete in-ground channels for rainwater that are 1'-0" wide. The Scale House is about 21' high at the eaves and about 28'-6" high at the ridge. The main portion of the building has a rectangular footprint measuring 76'-6" x 33'-8". An approximate 20' wide section that contains an office projects about 10' north at the northeast corner of the building. This section gives the building an overall width of about 44'. The conveyor that transferred sugar from the Scale House to the Warehouse exits the Scale House going east at the northeast corner.

Windows in the Scale House are located along the long sides of the building and on the north side of the 20' wide office section. The windows on the long sides are fixed light, 2'-0" wide x 3'-9" high and glazed with translucent acrylic sheet. A band of twelve windows is along the south long side at a level about 10' above the concrete foundation wall. The north long side has nine windows at the same level. The north side of the office section has a pair of 7'-0" x 4'-6" window openings with steel frame twelve-light windows with four-light pivot sash in the center.

There are two large-scale doors and two pedestrian-scale doors to the Scale House. The large scale door openings are each 14'-0" wide x 14'-8" high, with metal roll up doors. One door is located on the northwest end and the other on the southeast end. One of the pedestrian-scale doors is located on the northwest end, adjacent to the roll up door. This is a 3'-0" x 6'-7" high opening with a hinged metal single-panel door. The other pedestrian-scale door is in the southeast end of the 20' wide office section. This is a 2'-6" x 6'-7" high opening with a hinged, single-panel metal door with a four-light vision panel.

The interior of the Scale House has a driveway that extends between the two roll up doors. On the driveway is the 60'-0" long truck weighing scale. Next to the scale is a 45'-0" long hopper to accept the bulk sugar that is tipped off of the truck's bins. The hopper system feeds the sugar into the conveyor that exits the Scale House near the northeast corner and conveys it to the Warehouse.

The interior of the Scale House has a concrete floor with a worn painted finish and a concrete curb about 1' high around the perimeter. The perimeter walls are the steel framing of the building and the corrugated A.P.M. panels. The framing is 20'-3" high posts of 12x6 steel H-beams on about 25' spacing along the side walls that are spanned with four horizontal 3" steel channel irons that the exterior corrugated siding is attached to. The ceiling has exposed metal trusses and the underside of the corrugated roof sheathing.

At the northeast corner of the interior there is an enclosed office suite measuring about 20' wide that projects about 11' into the interior space from the north long side wall. This office suite is enclosed with corrugated A.P.M. panels and includes the 20' wide portion that projects off the north wall. A doorway near the east end provides access to the office suite from the main interior space. This suite has three windows looking onto the truck scale and hopper of the interior. In the south wall is a 7'-0" x 4'-6" window opening with steel frame twelve-light windows with four-light pivot sash in the center. Next to this is an opening about 4' x 2' with a fixed light. At the west wall is an approximate 7' x 4'-6" opening that has been filled with a fixed light. This office suite contains rooms for the former superintendent's office, former sample room (now the electronic scale room), toilet room, and a small room with a concrete stairway down to the area below the hopper that contains the leading end of the conveyor to the Warehouse.

In the main interior space of the Scale House, the 10'-0" wide truck weighing scale platform is located with its longitudinal center line 14'-0" from the south long side wall. The 60'-0" long platform is centered along the length of the building and is about 7'-6" inside each of the roll up doors at either end of the building. The platform is concrete-surfaced and is flush with the Scale House floor so that trucks can drive onto it easily. Against the south long side wall, near the midpoint, is a small, fixed-windowed enclosure about 8' long that projects about 2'-6" from the side wall and contains the balance beam of the scale apparatus formerly used to weigh trucks. The doorway to this enclosure was closed and blocked with furniture and this small room was not accessed. This scale beam is no longer used to weigh trucks, an electronic scale with a readout in the former sampling room (in the office suite) that takes a reading from the scale platform is used instead.

The rectangular hopper parallels the scale platform, adjacent on the north side. It is 11'-0" wide and about 9' deep. It extends about 4' above the floor of the Scale House and at its upper lip has a narrow catwalk of metal grating with metal pipe handrails on its north and east sides that is accessed by stairs at the east end where it abuts the office suite. The wide top opening of the hopper has an angled steel grating to break up the sugar as it is dumped in. Spanning the top opening of the hopper are three catwalks of metal grating with handrails that extend from the longitudinal catwalk against the side wall.

To dump the sugar from a truck parked on the scale platform, the 12x6 steel H-beam building framing posts on each side wall are spanned by longitudinal 12x6 steel H beams about 15' above the floor that carry the transverse steel tracks of five electric hoists that formerly lifted one side of the bins on the sugar trucks to empty them into the hopper.

Four of these hoists still have a lifting bar attached to the pulley of their lifting cables. This bar is an approximate 6" diameter steel pipe, about 10' long with short chains and steel hooks at each end. The lifting pulley of the hoist is attached to the midpoint of the bar. To operate, the steel hooks were attached to the side of the truck bins opposite the hopper and upon lifting that side, the bins would tip their sugar into the hopper.

The bottom opening of the hopper is about 34' long and 1'-6" wide. It empties onto a horizontal conveyor (Conveyor 2) about 37' long that is positioned under the hopper's bottom opening and serves to move the dumped sugar toward the east and onto the inclined conveyor (Conveyor 3) that will carry it up to the ridge of the Warehouse.

Conveyor 3

The conveyor that carried bulk sugar from the Scale House to the Warehouse was referred to during the time of its operation as Conveyor 3. It began at the northeast corner of the Scale House. The conveyor itself was a continuous loop of belt running up to the Warehouse on sets of three steel rollers that were positioned to give it a concave shape when carrying a load of sugar. At the Warehouse the belt looped down over a large diameter roller and returned back down to the Scale House below the concave rollers that had carried it up.

The structure that houses Conveyor 3 is about 179' long from the Scale House to the Warehouse. It is steel-framed, covered with corrugated A.P.M. and measures 8'-8" wide x about 8'-0" high in cross section. The roof is corrugated A.P.M. that is formed into a slight arch. Most all of the length of the Conveyor 3 structure is angled upward, supported in the air as it rises from grade level at the Scale House to approximate 57' height where it enters the Warehouse. A 36'-7" long section at the Scale House is level and set on a concrete curb foundation at about 1'-4" above grade. At the end of this section, the conveyor structure begins its rise above grade at an approximate twenty degree angle. The approximate 142'-5" long portion of the structure between the Warehouse and where it leaves grade is supported at two points by steel supports. The first is at a point about 34'-8" from where the structure leaves grade, and the second is about 75' from where it leaves grade.

The first support point incorporates a device that tensions the conveyor belt. At this point the structure is about 13' above grade. The supports here are five, approximate 3" diameter vertical steel pipes on a 9'-4" x 7'-0" rectangular pattern. Pipes are located at each corner of this rectangle with the fifth pipe near the midpoint of the south long side. Vertically oriented A.P.M. attached to the steel pipes sheaths this rectangle from the lower edge of the conveyor structure down to a level about 6' above grade. This opening below the sheathing allows access to the conveyor tensioning device within the rectangle.

The tensioning device consists of two vertical steel pipes, about 6" diameter and about 4'-6" apart that extend down from the underside of the conveyor structure to concrete foundations about 1' wide x 4' long that are about 2' above grade. Sliding vertically on the two steel pipes is a steel cross member with a large diameter steel roller (about 2' diameter) and a large concrete weight. There is a rectangular opening in the floor of the conveyor structure between the steel pipes with two large diameter steel rollers. In operation, as the belt of Conveyor 3 was returning back down to the Scale House, a loop of it passed out, through the floor opening and over the roller that slid up and down on the vertical pipes. The concrete weight kept tension on the conveyor belt via this loop.

The second support point, about 75' from where the conveyor structure begins its ascent from grade, is about 29'-6" in total height. It is two, angled 10" x 5" I beam legs that rest on a transverse concrete wall foundation that is about 25' long, 2'-6" high, and 1'-6" thick. The angled I beam legs are set 18'-5" apart on the foundation wall and angle up to 8'-8" apart at the bottom of the conveyor structure.

The I beam legs are joined at their base and at heights of about 9' and 18' above the top of the foundation by horizontal steel members with diagonal cross bracing within each 9' high cell. Atop the I beam legs, at the bottom of the conveyor structure, the legs are fixed to a transverse horizontal 10" x 5" I beam about 12' long. The projecting ends of this transverse I beam have struts extending up to the eaves of the conveyor structure.

The conveyor structure has ten fixed windows on each side. All are 2'-0" wide x 3'-9" high and are glazed with translucent acrylic sheet. Three windows are on each side of the level, at grade portion of the structure on variable spacing of about 10'. The remaining are in the elevated portion on variable spacing of about 20'. There are two doors to access the conveyor structure, one on either side of the level, at grade portion. Each are metal, single-panel doors in openings about 2'-8" wide x 6'-7" high.

The interior of the conveyor structure is the interior surface of the corrugated A.P.M. panels on steel framing. The framing is 10' spaced bents of vertical 4" steel channel iron 8'-0" high at the side walls with a 6" horizontal channel across the top. The bents are braced by diagonal 3" angle irons and by a horizontal angle iron about 3'-4" above the floor. The conveyor belt itself has been removed, but the steel channel iron supports and transverse 42" wide sets of rollers remain on about 6' spacing, running down the center of the structure. On each side of the conveyor are steps constructed of steel plate.

At the lower end of Conveyor 3, it continues on its downward angle, below grade, to a point below the end of the Scale House hopper. The sidewalls and floor of the below grade portion of the conveyor structure are concrete.

HISTORIC CONTEXT:

Nawiliwili Bulk Sugar Storage Facility

Construction of the bullk sugar facility began on August 8, 1949 by the Walker Moody Construction Company of Honolulu. Walker Moody supplied the construction labor for the project and the materials were supplied by Lihue Plantation.[3] The Warehouse, Scale House, and conveyor system were designed by the Stephens – Adamson Manufacturing Company of Los Angeles in June 1949. This firm also designed the sugar loading gantry at the transit shed at Pier 2.

Total cost for the project was $1.25 million. Sugar from the 24,000 ton capacity Warehouse could be moved into a waiting ship at a rate of between 600 to 700 tons per hour. The transit shed at Pier 2 was constructed at the same time as the Bulk Sugar Facility system.

When it opened on May 23, 1950, the Nawiliwili Bulk Sugar Storage Facility received sugar from Lihue Plantation Co., Grove Farm Co., and Kilauea Plantation Co. The first shipment out of the plant was on August 20, 1950. 31,785 tons of sugar were shipped out of the plant during that year. The plant handled all of Kauai's bulk sugar shipping.[4] This amounted to as much as 200 tons per year (1990).[5] When the sugar from several plantations was mixed at the bulk sugar plant, a system was devised that took the proceeds from the yield of sugar that was produced at the mainland refinery and distributed them to the individual plantations based on the weights and polarizations (sugar quality) of the bulk sugar when it was received at the bulk facility.

Very shortly after the Bulk Sugar Storage Facility was completed, on January 1, 1951, it was sold to a newly formed co-operative, Kauai Consolidated Terminal Company. This company

[3] Barlow Hardy, "Work Starts on Lihue's Bulk Sugar Warehouse," Honolulu Advertiser, August 14, 1949. P. 4.
[4] Lihue Plantation Co., Annual Report, "Permanent Improvements." 1950. N.p.
[5] William H. Dorrance, and Francis S. Morgan, *Sugar Islands, The 165-Year Story of Sugar in Hawaii*. (Honolulu: Mutual Publishing), 2000. P. 24.

was formed to pool the shipping of bulk sugar from Kauai and after its formation, it handled bulk sugar shipments from all plantations on the island thru the Nawiliwili facility.

Upon completion, the Warehouse building used two electrically powered, seventy-five horsepower crawler cranes with power shovels. These operated on the Warehouse floor to distribute the sugar falling down from Conveyor 4 above and to move sugar off the floor and in to the hoppers of Conveyor 5. By the 1980 these electric shovels had been replaced by diesel powered end loaders.

In 1973, due to inefficiencies that arose from transporting bulk sugar on the same ships and runs that hauled other goods in containers, the Hawaiian Sugar Transport Company (HSTC) was established by Matson Lines. This service operated two dedicated bulk sugar transport vessels, the *Mokupahu* and the *Sugar Islander*. HSTC moved bulk sugar from many Hawaii ports to the C & H sugar refinery at Crockett, California. Previous to the HSTC, sugar was bulk loaded on the same ship that carried containers to various other ports and the sugar companies costs included the extra travelling time. The two HSTC ships were dedicated sugar haulers in the sense that when on a sugar run from Hawaii to California they were direct, one-cargo vessels. When sugar was not scheduled for delivery, they were used to transport other bulk cargoes, often grain.

In August 2009, the cables extending the gantry boom snapped while the boom was in the horizontal position, dropping it into the hold of the ship it was loading. Two men were on the boom at the time and were injured. Because the collapsed boom was pinning the sugar ship to Pier 2 and there was an inbound passenger vessel that needed the pier for berthing, the boom was cut away from the gantry. This allowed the sugar ship, with the severed boom in its hold, to be moved from Pier 2 so the passenger ship could dock. The damaged boom was then removed from the hold. After the passenger ship had departed, a temporary sugar loading boom was rigged using the conveyor from a rock crusher. The loading of the sugar ship was completed using this makeshift conveyor. After the August incident, the rock crusher conveyor was left in place and it was used to accomplish the final shipment of bulk sugar from Kauai in November 2009. After the final shipment of sugar from this bulk sugar facility, the rock crusher conveyor was removed from the gantry. The rigging of the rock crusher conveyor would not allow the gantry to be moved back and forth along the galley to distribute the sugar evenly in the ships hold, as the intact gantry and boom had done. A bulldozer was lowered into the hold of the ship to distribute the sugar. This compacted the sugar caused problems when the ship was unloaded at Crockett, California. The normal sugar collector in Crockett could not gather the compacted sugar and it had to be excavated before the collector could gather it.[6]

Bulk Sugar Shipping in Hawaii

The shipping of Hawaiian sugar in bulk, rather than in burlap sacks (break-bulk loading) was begun at Kahului Maui in 1942.[7] That year 40,000 tons of unbagged sugar was shipped by Hawaiian Commercial Sugar Co., Maui Agricultural Co., Wailuku Sugar Co., and Pioneer Mill Co. from Kahului. The first three mills sent the sugar to Kahului via rail cars, Pioneer Mill used dump trucks to transport sugar from its mill to the wharf. The sugar was loaded from the wharf onto ships using a conveyor belt. That year the four mills also shipped a combined weight of 150,000 tons of bagged sugar.

[6] Howard Green, Environmental Manager, Gay & Robinson. Interview by the author, April 25, 2012, Nawiliwili, Kauai.
[7] "Maui Begins Bulk Sugar Shipments." Honolulu Advertiser, January 7, 1943. P. 5.

The installation of bulk sugar shipping was a cost saving measure. Although the installation of bulk storage facilities and conveyor systems were expensive, the plantation's labor costs were reduced. There were also savings in freight charges and burlap sacks, which was not insignificant during World War II when the supply of jute (mostly from India) was sharply reduced and bag prices doubled.[8] During WW II burlap sugar sacks were washed to recover any remaining sugar and reused up to five times for raw sugar shipments from Hawaii.[9]

The 1950 Bulk Sugar Storage Facility at Nawiliwili was the third in Hawaii. After the 1942 Kahului facility, a bulk sugar plant was completed in Hilo in 1949. The Hilo plant used four large silos as a storage facility, while the Nawiliwili and Kahului plants used warehouse buildings with flat floors and a central tunnel and conveyor running the length of the building to move the sugar out of the warehouse. Both types loaded the sugar into ship's holds with conveyor belt systems. The Nawiliwili plant was set up to handle an average of 600 tons of sugar per hour, occasionally operating at a rate of up to 750 tons.[10] Other bulk sugar plants opened in Hawaii in the following years; Honolulu in 1955, and Kawaihae in 1959.

The Nawiliwili facility operated until November 2009 when Gay & Robinson made its last sugar shipment from the harbor.

Nawiliwili Harbor

Construction of the Nawiliwili Harbor improvements and breakwater was begun about 1921 by the U.S. Army Corps of Engineers. The Corps undertook these improvements on the condition that the plantations of south Kauai link their railroads into a continuous system and that a connection be built linking the new wharf at Nawiliwili to this plantation rail system. In 1919 Lihue Plantation assured the U.S. government that this connection would be built and the funds were released for the harbor improvement on June 10, 1920. Although this contiguous rail system (and harbor connection) would improve the military defense of the island,[11] the more pressing reason was "to ensure the use of Nawiliwili as a terminal port to justify the expenditure of public funds…providing the island of Kauai at least one much needed and safe harbor."[12]

Breakwater construction lasted until 1926. In 1929, dredging of the harbor was begun and in July 1930, the harbor was opened. It had a 35-foot deep entrance channel and harbor basin, a jetty, and about 900' of wharf with a large concrete transit shed at Pier 1. Although all steamship passenger traffic used the harbor, by 1935 there was still more commercial (sugar) shipping going out of Ahukini Wharf at Hanamaulu than from Nawiliwili Wharf.[13] This was due to Lihue Plantation using Ahukini as their port for bagged sugar shipments. Nawiliwili was not set up for shipping bagged sugar, Lihue Plantation's preferred method of shipment.

By 1939 the Port of Nawiliwili was operating at a yearly loss of up to $40,000 and the harbor commissioners were looking to sway Lihue Plantation from their facilities at Ahukini Wharf to begin using Nawiliwili, which would put it in the black.[14] However, shipments of sugar from

[8] "Third Bulk Sugar Plant to be Completed in 1950." Honolulu Advertiser, January 6, 1949. P. 2.
[9] "Burlap Bags Re-used in Sugar Emergency." Honolulu Advertiser. October 21, 1943. P. 2.
[10] "Third Bulk Sugar Plant," Honolulu Advertiser. January 6, 1949. P. 2.
[11] Dorrance, *Sugar Islands*, 2000. P. 168.
[12] "Added Expense at Nawiliwili Not Desirable. Honolulu Star Bulletin. February 21, 1939. P. 1.
[13] Erwin N. Thompson, Pacific Ocean Engineers: History of the U.S. Army Corps of Engineers in the Pacific. (USACOE), 1980. P. 59.
[14] "Kauai Port at Ahukini May Close." Honolulu Advertiser. February 17, 1939. P. 1.

Ahukini Wharf by Lihue Plantation did not cease until August 1950, when the Bulk Sugar Facility at Nawiliwili was completed and bulk sugar began to be shipped out of Nawiliwili Harbor.

Bulk sugar facility loading structures had been planned at Nawiliwili wharf since at least 1947 when funds of $150,000 for the project had been appropriated by the territorial legislature.[15] The Bulk Sugar Facility was built as Lihue Plantation finally decided to abandon its Ahukini wharf and bagged sugar loading. This was due to the use of larger size freighters to transport sugar, which could not safely dock at the Ahukini Wharf and also to the development of bulk sugar handling equipment. Lihue Plantation was responsible for building the Bulk Sugar Facility on the bluff above the wharf.[16]

Included in the project along with the Warehouse, Scale House, Conveyor 3 were the 400' long transit shed at Pier 2 (with a capacity of about 18,000 tons of sugar), and the conveyor system linking the shed and the Warehouse, to be used "if and when a bulk sugar storage plant is installed at Nawiliwili."[17] The Bulk Sugar Facilities at Pier 2, including the transit shed and conveyer system along with two molasses tanks, equipment barn, and administration building were completed in the second half of 1950.[18] The transit shed was built by Hawaiian Dredging Co, LTD at a cost of $376,995

In 1956 further improvements of the harbor were undertaken by Hawaiian Dredging which included deepening the entrance channel to 40 feet, enlarging the interior basin, and building up about 21 acres of new land at the west end of the harbor with the dredging spoils.

Sources

A. Architectural Drawings:

Thirty-four sheets of original drawings of the Bulk Sugar Warehouse, Scale House, and Conveyor 3 are available as electronic files (pdf) at the offices of the leasee of the property, Island Self Storage/ Guardian Self Storage, 1481 Haleukana St. Lihue HI.

Likely sources not yet investigated.
A possible source of drawings is the Environmental Office of Gay & Robinson, Kaumakani, HI.

B. Early Views:

Bishop Museum Archives. Accession # 2003.129, Folder 5, Kauai, Nawiliwili Harbor, Bulk Sugar Loading Facility, 1949. This folder has numerous photos taken during the construction of the facility, about seventeen photos showing the Warehouse, Scale House, and Conveyor 3.

[15] Barlow Hardy, "News from Kauai, Plans Readied for Shed on Wharf at Nawiliwili," *Honoulu Advertiser*, April 1, 1948. P. 18.
[16] "Kauai Harbor Hearing to Decide Fate of 2 Ports," Honolulu Advertiser. February 3, 1949. P. 2.
[17] Barlow Hardy, "News from Kauai, Plans Readied for Shed on Wharf at Nawiliwili," *Honoulu Advertiser*, April 1, 1948. P. 18.
[18] Annual Reports, Board of Harbor Commissioners, Territory of Hawaii, Fiscal year ending June 30, 1950. P. 11. and Aerial photo K-2-1, dated December 22, 1950 in Hawaii State Archives folder PPA-28-4.

Bishop Museum Archives. Folder; Geography, Kauai, Nawiliwili, 1900-, Folder 2. This folder has an April 1960 view (EBM 33401B) of the loading facility showing the southeast end of the Warehouse in its originally constructed configuration.

Bishop Museum Archives. Folder; Agriculture, Sugar, Shipping. This folder has an interior view of a bulk sugar warehouse (likely at Honolulu) that shows electric crawler shovels moving sugar into floor hoppers

Camera Hawaii, photograph "Nawiliwili Harbor." Collection of Hawaii State Archives (HSA), folder PP47-8, photo .034. ca. 1950s. Note that this photo in the Hawaii State Archives is not allowed for reproduction without the written permission of Camera Hawaii.

Cozad, Stormy. *Kauai.* Charleston: Arcadia Publishing. 2008. Page 111 of this book has an aerial photo, dated ca. late 1950s, showing the Warehouse

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"Kauai Harbor Hearings to Decide Fate of 2 Ports." February 3, 1949. P. 2.

"Big Island Bulk Sugar Plant Now in Operation. April 26, 1949. P. 13.

Hardy, Barlow. "Work Starts on Lihue's Bulk Sugar Warehouse." Aug. 14, 1949. P. 4.

"Sugar Shipped After Strike Sets Record." January 1, 1950. P. 1.

"Kauai Bulk Sugar Plant Starts Monday." May 28, 1950. P. 4.

"TH Sugar Storage Emergency Looms." June 7, 1952. P. 1.

"Emergency Storage at 2 Sugar Ports." June 14, 1952. P. 1.

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"Higher Price for Hawaii Molasses Permitted." April 2, 1946. P 16.

"Kauai Harbor Hearings Set for February 17." January 25, 1949. P. 3.

"50 Percent Decline in Molasses Income Feared." February 2, 1949. P. 1.

"Kauai Unanimous in Urging Retention of Two Harbors." February 18, 1949. P. 5.

"News of the Waterfront, Harbor Improvements." March 9, 1950. P. 5.

"Matson Takes 1st Bulk Sugar Cargo to Philadelphia." November 7, 1951. P. 23.

"Garden Isle Harbor Job in Indorsed." September 24, 1953. P. 5.

"Large Tanker Loads Molasses on Big Island." September 13, 1955. P. 5.

"Molasses Ahoy." September 27, 1955. P. 15.

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Ruzicka, Dee. "Bulk Sugar Plant Overview, Conveyor System, Molasses Tanks and Pump House, Office Building, and Equipment Barn." Five reports documenting portions of the Bulk Sugar Facility at Nawiliwili. Prepared for Hawaii State Historic Preservation Division. June 2012.

Treiber, Gale E. *Hawaiian Railway Album Volume 4 – Plantation Railways on Kauai and the Remaining Islands*. Hanover PA: The Railroad Press. 2007.

PROJECT INFORMATION

This HABS documentation was produced in advance of the alteration of the Bulk Sugar Warehouse to a self-storage facility. Field work, research and writing of this report was done by Dee Ruzicka of Mason Architects, Inc. in January and February, 2015. Archival photographs were taken by David Franzen of Franzen Photography Inc. in January 2015.

Location map.