HISTORIC STRUCTURE REPORT
Riggers Loft
Richmond Shipyard Number Three
Richmond, California



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INTRODUCTION

At the request of the City of Richmond, Wiss, Janney, Elstner Associates, Inc. (WJE) has prepared a Historic Structure Report (HSR) for the Riggers Loft, Building No. 6 in Shipyard Number Three. The Historic Structure Report has been developed in accordance with *Preservation Brief 43: The Preparation and Use of Historic Structure Reports*, as prepared by the Technical Preservation Services of the National Park Service (NPS), and the Secretary of the Interior's Standards for the Treatment of Historic Properties. The HSR provides a framework for the future rehabilitation of the Riggers Loft as part of the overall planning and design effort for Shipyard Number Three, and the Rosie the Riveter World War II Home Front National Historical Park, and is intended to provide guidance to property owners, managers and tenants, preservation consultants, all design professionals, contractors, and project reviewers prior to any treatment of the building.

EXECUTIVE SUMMARY

The Riggers Loft was constructed as part of Richmond Shipyard Number Three, one of the four shipyards constructed in Richmond between 1941 and 1942 as part of the push to provide ships for the war effort. The Riggers Loft, which also housed the Sheet Metal Shop and Paint Shop, was one of the ancillary buildings that provided support to the prefabrication and assembly of the ships in the adjacent graving yards.

The Riggers Loft is a contributing building to the Richmond Shipyard Number Three Historic District, which is listed on the National Register of Historic Places. It is significant under criterion A, as an important link to the period of World War II, and its association with the overall National war effort; and under the criterion C, for its association with the new shipyard designs that were developed to speed the construction of ships.

The Riggers Loft is of a streamline moderne design consistent with the overriding design aesthetic established for all the buildings in Shipyard Number Three. The utilitarian materials, including the continuous band of industrial sash windows and doors low on the facade and the corrugated metal siding, are the character defining features of the building. The interior is dramatic in its simplicity, defined by the exposed wood frame walls and the exposed wood trusses.

The Riggers Loft retains a high degree of integrity, and retains its ability to convey its significance as defined by the National Register. However, many original exterior materials, including the sheet metal siding, the metal sash, the metal rollup doors, and the metal clad pedestrian doors, have undergone significant deterioration. On the interior, the lack of exterior maintenance has allowed for water intrusion, causing a roof collapse in the Paint Shop, and the failure of additional roof trusses in the Sheet Metal Shop. These conditions should be addressed, repairs made, and long term maintenance performed in order to preserve the building.

Structurally, the design of the Riggers Loft is adequate to support gravity loads, however water intrusion and wood decay, and the deterioration of one, and possibly additional wood piles have severely impacted the load carrying capacity. If these issues are addressed

and repairs made, the structural system will not require additional strengthening of the gravity system. The wood trusses and wall frames are adequate to brace the building laterally with the addition of connectors that will transfer the loads to the stronger elements.

Geotechnical surveys have determined that the Riggers Loft site may be subject to liquefaction during a seismic event, causing structural deformation, and possibly collapse, of the structure. Measures to tie the concrete slab to the perimeter footing may mitigate this hazard, however, if the sea wall to the south is not adequate to retain the soils, the structure will be subject to collapse regardless. The sea wall should be evaluated as part of future investigations.

The Riggers Loft is a valuable historic component of Shipyard Number Three, and is worthy of rehabilitation.

ADMINISTRATIVE DATA

Project Scope and Methodology

The purpose of the Historic Structure Report is to provide a compilation of the findings of research, investigation, analysis, and evaluation of the historic structure. The preservation objectives for the historic property are identified and treatment measures are recommended for implementing and accomplishing these objectives. The report also serves as a record document of existing conditions and as a basis for planning future preservation and maintenance.

The Historic Structure Report addresses key issues specific to the Riggers Loft, including the construction chronology of the building and surrounding shipyard; the existing physical condition of the exterior envelope, interior spaces, features, and structure; and the historic significance and integrity of the building and its elements. A geotechnical investigation and an assessment of hazardous materials have been included as an appendix to this report.

Research and Document Review

Archival research was performed to gather information about the original construction and appearance, the historic use of the building, and past modifications and repairs to the building for use in assessing existing conditions and developing treatment recommendations. Documents reviewed included the Historic Architectural and Engineering Record (HAER) and National Register Nomination for Shipyard Number Three, drawings and specifications, historic photographs, and other written histories of Henry J. Kaiser and the Richmond Shipyards. Sources included the City of Richmond, The Richmond Museum of History, NPS, the Library of Congress and the University of California Bancroft Library. The research for this study is built upon the extensive historical and archival research performed by others. A list of reference sources and documents reviewed for this study is included in the bibliography in this report.

Development of Chronology of Construction and Evaluation of Significance

Based on historical documentation and physical evidence gathered during the study, a chronology of construction was developed for all of Shipyard Number Three, including construction of the Riggers Loft. An evaluation of the significance was also prepared, taking into consideration previous historical assessments including the HAER documentation and other reference documents, as well as guidelines provided by *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*.[1]

Condition Assessment and Documentation

Concurrent with historical research, a condition survey of the building was performed and observations documented with digital

[1] *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation* (Washington, D.C.: National Park Service, National Register of Historic Places, 1990, revised 1995).

photographs, field notes, and annotation on baseline drawings. For purposes of the field survey, drawings were developed based on the floor plan and perspective drawing provided by the City of Richmond. The condition assessment addressed the exterior walls, roof, windows, and interior surfaces as well as primary interior spaces and features of significance. These elements were examined from the exterior and accessible locations of the building interior.

Structural Analysis and Schematic Design for Rehabilitation

WJE performed a limited survey of the building to generally determine its structural condition. The survey was primarily comprised of visual observation and awl probing to determine the presence of decay. Six borings with a 'Resistograph' to detect wood decay within thick members were taken. Consistent with safety, six structural wood samples and one split ring connector sample were taken from the Paint Shop area and dimensional and density measurements were made.

Structural calculations were performed to determine the building's adequacy to resist vertical dead and live loads, horizontal wind and seismic loads and wind uplift.

Guidelines for Preservation and Treatment Recommendations.

Based on the evaluation of historical and architectural significance of the structure, guidelines were prepared to assist in the selection of preservation treatments. Following these guidelines, specific recommendations were prepared for the treatment of significant exterior, interior, and site features. These recommendations addressed observed distress conditions as well as preservation guidelines and objectives. All recommendations were developed following the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.[2]

Preparation of Historic Structure Report

Following completion of research, site work, and analysis, a narrative report was prepared summarizing the results of the research and inspection and presenting recommendations for treatment. The HSR was compiled following the organizational guidelines of the National Park Service in *Preservation Brief 43: The Preparation and Use of Historic Structures Reports*,[3] with modifications to organizational structure as required by the City of Richmond for purposes of this project.

BUILDING DATA

A summary of key information for the building included in this study has been prepared for reference. This information is presented in the following table.

[2] Kay D. Weeks and Anne E. Grimmer, *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings* (Washington, D.C.: U.S. Department of the Interior, National Park Service, 1995).

[3] Deborah Slaton, *Preservation Brief 43: The Preparation and Use of Historic Structures Reports* (Washington, D.C.: National Park Service, Technical Preservation Services, 2005).

Riggers Loft	
HSR creation date	April 23, 2010
Building ID	Building 6
Current building name	Riggers Loft / Building 6
Historic building name	Riggers Loft - Paint Shop - Sheet Metal Shop
Building status	Owned by City of Richmond / Port of Richmond
Location Summary	
Address	Canal Blvd, Richmond, CA
GIS	37° 54′ 20″ N / 122° 21′ 53″ W
Size and Dimensions	
Floor area total (gsf)	27,140
Riggers Loft floor area (gsf)	6,140
Sheet Metal Shop floor area (gsf)	15,370
Paint Shop floor area (gsf)	5260
Bathroom annex floor area (gsf)	370
Stories/levels	1
Perimeter (linear feet)	706
Height (lf)	25
Length (lf)	220
Depth (lf)	132
Construction History	
Historical function	Riggers Loft, Sheet Metal Shop and Paint Shop
Other functions	NA
Current use	Vacant
Date of construction	1942
Status	Extant
Historical Designation	
National Register	Richmond Shipyard Number Three Historic District (contributing)
National Historical Park	Rosie the Riveter / World War II Home Front National Historical Park (contributing)
State/local designation	Richmond Shipyards California Historic Landmark (contributing)
Other Documentation	
HABS/HAER	HAER Nos. CA-326, CA-326-L, CA-326-M

DEVELOPMENTAL HISTORY

HISTORICAL BACKGROUND AND CONTEXT

The Riggers Loft was constructed as part of Richmond Shipyard Number Three, one of the four shipyards constructed in Richmond between 1941 and 1942 as part of the effort to provide ships for the war effort. The Riggers Loft, which also housed the Sheet Metal Shop and Paint Shop, was one of the ancillary buildings that provided support to the prefabrication and assembly of the ships in the adjacent graving yards.

Richmond Shipyard Number Three was constructed in 1942 by the Kaiser Corporation. It is the third of four shipyards constructed between 1941 and 1942 in Richmond. These Shipyards were dedicated to producing cargo and troop transport ships for the efforts of World War II. Because speed of production was imperative, several innovations to shipbuilding were incorporated into the design of the Shipyard. These include pre-fabrication of large elements of the ship, moving and assembling these elements via cranes and joining the metal with arc welding rather than riveting.

The 140 acre space is organized around a rational system that allows materials to be transported from storage to prefabrication locations to dry dock basins for assembly. Large pieces of steel plate and prefabricated assemblies were moved by industrial cranes and railroad cars between the areas of the Shipyard. Because of these innovations, as well as the popularization of electric arc welding, the Richmond shipyards produced a staggering 747 ships in a four year span, more than any other entity in history.

Historical Context

On the eve of WWII, the United States maritime fleet was ill prepared for war. Following the build-up and oversupply of ships produced for the First World War, shipbuilding in the United States languished, with many of the shipyards closing. The Shipyards that remained open did so by performing repairs on the aging fleet. What little shipbuilding was done followed the same technology of the previous century, with each ship taking an average of 253 days to produce[4].

As tensions grew in Europe, Great Britain approached the United States for assistance with supplies and military machinery. They had been engaged in fighting since 1939 and were losing their merchant fleet at an alarming rate. German U-boats were destroying ships at twice the rate that the United States and Britain combined could produce them.[5]

Although the United States had not entered into the war in Europe, President Franklin Roosevelt declared a national emergency on May 27, 1941, committing the nation to a massive industrial mobilization to manufacture ships, weapons and combat vehicles.

The following month, Congress passed the Merchant Marine Act and created the United States Maritime Commission (USMC). This five-man entity was tasked with expanding the woefully inadequate supply of ships and constructing new ocean-going freighters capable of transporting supplies and, if necessary, troops.

Under the leadership of Admiral Emory Land, the USMC revived the shipbuilding industry by increasing orders for new ships. This revitalized the Shipyards that survived from World War I and also provided a demand for the construction of new Shipyards. In November 1940, the

[4] *A Booklet of Illustrated Facts about the Shipyards at Richmond, California.* Richmond, CA: Permanente Metals Corporation, 1944, pg. 10.
[5] HAER No. CA-326-M, pg 25.

British Merchant Shipbuilding Mission and the USMC agreed to a plan to construct new shipyards in the United States solely for the purpose of producing sixty new ships for the war effort.

Two locations - South Portland, Maine and Richmond, California - were selected as the sites for the new Shipyards. The contract for building these Shipyards and producing the sixty new ships was awarded to the Todd-California Corporation. This partnership was formed specifically to pursue the shipbuilding contract. It consisted of two distinct entities - the Todd Shipbuilding Corporation and the "Six Companies".

The Six Companies were a consortium of west coast contractors who had built the Hoover Dam as well as other large-scale New Deal projects. They consisted of Morrison-Knudsen; Utah Construction Company; Pacific Bridge Company; Bechtel-Kaiser; MacDonald and Kahn; and J.F. Shea. The Six Companies had experience with large scale, complex construction projects, but had never built a single ship.

To supplement this lack of ship building experience, the Six Companies approached Todd Shipyards Corporation. Henry J. Kaiser, one of the members of the Six Companies, dispatched his employees to Tacoma, Washington to observe the construction of the new shipbuilding yards that the Todd Corporation was undertaking. In this way, the Todd-California partnership proved to be mutually beneficial to Todd and the Six Companies, each learning from the other's area of expertise.

In 1940, the USMC awarded another contract to the Todd companies. This contract was to produce sixty ships for the British government. The work was split between the existing Todd-Bath Iron Shipbuilding Corporation in South Portland, Maine and a new seven-shipway yard to be built in Richmond, California, and run by Todd-California.

Kaiser also dispatched employees to the Richmond mudflats to find suitable land on which to build a new shipyard. The Richmond site was selected because of its deep water port, proximity to existing railroad lines, and large amounts of open space that would allow for construction and laying out prefabricated portions of ships. Construction of the "Todd-Cal" yard began in January, 1941.

Both the construction and operation of Shipyard Number One (as the Todd-Cal would later become known), was overseen by Todd-Cal's general manager Clay Bedford. Ultimately, Mr. Bedford would oversee construction of all four shipyards in Richmond. As the war efforts escalated, the shipyards expanded in keeping with the increased demand for ships. Construction of a new Shipyard Number Two, began on April, 1941.

The Maritime Commission declared September 27, 1941 "Liberty Fleet Day" in honor of launching of the first newly produced ships. At Richmond, Shipyard Number One launched two new ships.

On Dec. 7, 1941, Pearl Harbor was bombed by the Japanese and the United States entered into the Second World War. At this point only two of the shipyards had been constructed and were producing Victory Ships - vessels specifically designed to transport cargo.

On January 9, 1942 Henry J. Kaiser secured a government contract to construct Shipyard Number Three. This yard would produce a new type of transport ship, the C-4, designed to transport large numbers of troops across the ocean. Ground was broken four days after the contract was signed.

Completing the picture of the Richmond Shipyards, on June 2, 1942, construction of a fourth yard was commissioned for the construction of Landing Ship Tanks (LSTs).

Construction of Shipyard Number Three (January 1942-September 1943)

Shipyard Number Three was designed on the principles of efficiency and performance. Unlike its predecessors, it was intended to be a permanent installation. The USMC contracted with Kaiser to build a p that would repair ships following the war and serve as an investment to the maritime infrastructure for building new ships, should the need arise.

The Kaiser Corporation secured the contract for building and operating Shipyard Number Three separately from both Todd and the other members of the Six Companies consortium. This was one of the factors that led to the dissolution of the Todd-Cal partnership in early 1942.

While Shipyard Number Three mirrors many of the principals and structures found in Shipyards One and Two, it differs in two distinct ways.

First, Shipyard Number Three features below-grade graving basins, rather than shipways. Shipways were built on grade and required scaffolding and wood skids launch a ship into the water. Because graving basins were built below sea level, they could double as a dry dock for repairing existing ships. They also had the advantage of allowing a much safer launching that put less strain on the newly built ship.

The second major difference between Shipyard Number Three and Shipyards Number One and Two is that its buildings were of more robust construction than their counterparts at the other yards. This was in keeping with the intention that they last beyond the war effort.

Despite the planning that went into the shipyards's construction, the design is not well documented. This was due in large part to the necessity of immediate production brought on by the bombing of Pearl Harbor and the United States' entry into World War II. The practice of building "before blueprints were completed" seen in Shipyards Number One and Two continued in the construction of Shipyard Number Three.[6]

To date, only schematic level elevation drawings of any of the buildings have been discovered, and these were executed in 1944 - over a year after the completion of the buildings they depict. Shipyard Number Three did however, have the benefit of having the same team of architects and engineers who had constructed the previous two shipyards.

The construction team of Shipyard Number Three was led by Clay Bedford; a civil engineer who had worked for the Kaiser corporation since 1925. Bedford is pictured in Figure 1-1. He rose up the Kaiser ladder working on several large construction projects such as the Hoover and Grand Coulee dams. In 1940, he was called off a Kaiser project in Texas to oversee the construction and operation of the Shipyards Number One and Two.

In his work for the newly formed Todd-Cal partnership, Bedford assembled a team of Einar Larsen, who was the Chief Engineer; Harry Bernat the marine design engineer; and Morris Wortman the chief architect.[7] The team was headquartered in Kaiser's office in the Latham Square Building in Oakland, California.

Despite the looming dissolution of the Cal-Todd partnership, Kaiser Officials were able to visit the Todd-Bath shipyards in South Portland to learn about the design and construction of graving basins - a defining feature of the planned Shipyard Number Three. Morris Wortman and Harry Bernat traveled to Maine to observe the Todd-Bath basins in South Portland. Because the Kaiser Corporation lacked the specialized experience to build basins, they

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[6] Foster, Mark. *Henry J. Kaiser: Builder in the Modern American West,* Austin: University of Texas, 1989. Pg. 75.

[7] Heiner, Albert. *Henry J. Kaiser: American Colossus.*, pg. 120

retained L.H. Nishkian of San Francisco as a consulting engineer.[8]

Of the four shipyards developed in Richmond, Shipyard Number Three required the most extensive development of the existing landscape. Construction of the Shipyard necessitated literally moving mountains. Brooks Point, the selected site, extended southward into San Francisco bay. Its original natural boundaries were similar to the current Shipyard area, and featured a small mountain that was bordered to the east by the Inner Richmond Channel and to the west by a swampy lagoon.

With the design team in place, the first obstacle to overcome was leveling the site of the new Shipyard. On January 13, 1942, demolition of the mountain and excavation of the new graving basins began. A team of machine operators and dynamiters was used to move 2,200,000 cubic yards of rock and earth. So skilled were Kaiser's workers at earth moving that it was claimed that construction of new buildings proceeded within feet of where dynamite blasting occurred.

The mountain was leveled and the bedrock 25 feet below sea level excavated to accommodate the basins. The displaced soil was used to infill and level the lagoon. It was also used to form coffer dams at that allowed the construction of the new graving basins. Nearly every square foot of the Shipyard was paved with asphalt to address the challenge of wet soil and mud that had plagued the construction of Shipyards One and Two.

The layout of the Shipyard and relationship of the structures to one another was dictated by the ship building process. Like Shipyard Numbers One and Two, Bernat configured the buildings and structures in a straight line from north to south, following the path of the assembly process. Steel plates and other raw materials were stored on the north end of the Shipyard.

From the steel yard, the plate would be hoisted to the Plate Shop for cutting, shaping and partial assembly. Portions of the slabs could be pre-assembled into units inside the Plate Shop. The lifting capacity of the cranes within the shop limited the weight of the units that could be pre-assembled to ten tons.

Contained within the Plate Shop were the Prefabrication Engineering Department and the Mold Loft. This loft was called the "heart of the shipyard", as it was the point at which all of the pieces and patterns for creating a ship were created.[9] The cut plates and assemblies fabricated in the Plate Shop were transported to the adjacent Pre-Assembly Platforms via railroad tracks.

On the second floor of the Plate Shop above the workers cutting and shaping steel, was the model and design offices. Here, engineers and draftsmen would refine the templates for the plates that formed the hull. Also on the second floor of the Plate Shop was the model shop. Models were an important tool in designing the new ships and conveying the design. At Shipyard Number Three, the model shop was under the supervision of Julian Mesic, an artist and designer who has worked for Julia Morgan.

Immediately south of the Plate Shop were the Pre-Assembly Platforms (also called platens). The platens were outdoor areas aligned with each of the five basins that were outfitted with elevated jigs and platforms. From these platforms, welders could assemble large elements like the deck houses of the C-4s. When complete, the pre-assembled unit would be lifted by whirley cranes into position on the ship hull in the basin. Whirley cranes were a type of portal crane which could move laterally along steel tracks. Atop the moving portal the crane was capable of rotating 360 degrees, hence its "whirler" or "whirley" moniker.

[8] HAER No. CA-326, pg. 66

[9] Kaiser Employee Handbook, pg. 42

South of the Pre-Assembly Area are the five graving basins. They were constructed of a concrete slab with three concrete walls. In place of a fourth wall, the south end of each basin was fitted with large steel gates. The gates held back the seawater from flooding the basins. After construction or repairs were completed, the basins were flooded and the gates opened so that the ship could be towed directly into the open water.

The basins are separated by areaways upon which moveable cranes rested. Each areaway is 35 feet wide and spans the length of the basin. The cranes were used to lower shell plates and pre-assembled units into position on the ships. Once placed, these elements would be welded together in the basin. While the use of cranes in ship assembly was not new technology (it was being used extensively in Europe), the magnitude of pre-fabrication employed at Shipyard Number Three was unprecedented. Such large assemblies required cranes that could lift 40, 60, or even in excess of 100-ton units into place. At times, two or more cranes would be used in tandem to lift large deckhouse assemblies.

In total, the area between the Plate Shop and gates of the basins spans nearly 1500 feet. This zone, dedicated to Pre-Assembly had other buildings and equipment that supported this function, including the Oxygen and Acetylene buildings. When a ship was launched from the basins, thus exiting the Pre-Assembly zone, it was effectively an empty hull.

To the east of Pre-Assembly zone is the Outfitting zone. This area was the location of a number of support buildings, all dedicated to the activities of finishing a ship after it has been launched. These included the Machine Shop, the Forge Shop, the Sheet Metal Shop/Rigger's Loft, the Yard Office Building, the Pipe Shop, the Fitting Office, the Electric Shop, the Yard Office Annex, the General Warehouse, the Fittings Warehouse, the Matron's Building, and the Shore Power Building. As the names of the individual buildings implies, each served a distinct purpose in assembly of pre-fabricated elements of the ships and their outfitting following launch.

Northeast of the ship building areas were another collection of buildings, predominantly dedicated to administration and training functions. These were clustered between the First Aid and Cafeteria buildings. They included the Administration Building, the Check Station & Guard House, the Maintenance Building & Fire Station, the Switch House, the Oxygen Building, the Yard Garage, the Payroll & Personnel Building, and the Personnel & Training Center.

The buildings of Shipyard Number Three were each designed with specific functions, all relating to the fastest and most efficient means of constructing a ship. Each of the buildings and equipment were organized spatially, with the pre-fabrication buildings running in a north-south axis from the steel yard to the basins. Parallel to this were the outfitting buildings, which also run in a north-south axis between the prefabrication building group and the Inner Richmond Channel. The strategy behind arranging the buildings in such a fashion was to promote efficiency of construction. In this configuration, construction travels in a straight line; there is no doubling back or crisscrossing paths of travel in the assembly process.

The buildings of the shipyard are unified in design as well as purpose. Though utilitarian in nature, they were all executed in a Streamline Modern style detailing. Examples of this at the General Warehouse, Machine Shop and Forge Shop are shown in Figure 1-2. This is a rare example of Streamline Moderne applied to industrial or naval design, made even more remarkable given the accelerated construction schedule.

On August 13, 1945, the last C-4 troop ship produced by Shipyard Number Three, the *S.S. Marine Snapper* was launched. The following

day, Japan announced their surrender, bringing World War II to its end. In August of 1946, Shipyard Number Three was declared surplus by the War Assets Administration and closed as a government yard. In 1959 Shipyard Number Three was sold to the Willamette Iron and Steel Co. for ship repair and storage.

After the War (Post-1945)

The end of World War II in 1945 signaled the end of the Shipyard's short yet robust production lifetime. The unpredictability of war provided Richmond with little warning of the sudden withdrawal of its main industry. Although Shipyard Number Three was constructed to be able to serve to repair ships following the war and serve as an investment to the maritime infrastructure for building new ships,,, there was not an obvious pre-war industry poised to move in and take over operations of the buildings and graving basins. The War Assets Administration declared Shipyard Number Three as surplus in August of 1946, and the site was officially closed.

In the years following the war, the buildings and ways of Shipyards Numbers One, Two and Four were almost entirely demolished and filled in. Shipyard Number Three avoided this fate, as it was originally designed to be a permanent installation and the construction of its buildings and dry basins reflected that fact. Sitting mostly vacant for years, the Shipyard was finally sold to Williamette Iron and Steel Company in 1959 for ship repair and storage, realizing the original vision of converting the shipyards into repair ports following the war. Over the years, some buildings have been demolished, but the Riggers Loft remains intact. Presently, the Riggers Loft is owned by the City of Richmond and not in use.

RIGGERS LOFT

The Sheet Metal Shop/Riggers Loft/Paint Shop was completed in August, 1942. It was one of the buildings constructed adjacent to the Graving Basins in the fitting out area, to provide support services and prefabricated elements for fitting out the ships constructed in the Shipyard. It was built as a one-story rectangular building with a projecting volume on its east side. As the name implies, the interior of the building was subdivided into three distinct areas. The northern half of the building was split between the Riggers Loft in the northeast corner and the Paint Shop, in the northwest corner. The Sheet Metal Shop comprised the southern half of the building and extended eastward of the Riggers Loft portion by approximately forty feet.

All three functions housed in this building related to the post-launch efforts of shipbuilding. After a hull was constructed in the basins, the ship consisted essentially of a seaworthy hull fitted with deckhouses. The outfitting work - installing sheet metal, electrical systems, plumbing connections and armaments - all took place at the Fitting Out Dock after the ship was launched. A completed C-4 Troop ship moored at the Outfitting Dock is shown in Figure 1-3. At Shipyard Number Three, the Fitting Out Dock is a reverse L-shaped structure that wraps around the east side of the Shipyard, adjacent to the Inner Richmond channel.

The Sheet Metal Shop/Riggers Loft/Paint Shop is located midway between Basin No. 5 and the Fitting Out Dock. The proximity to the Fitting Out Dock was a planned function of the Sheet Metal and Paint Shops. Rigging was a much broader function of shipbuilding that required several skill sets that were utilized at virtually every stage of the production process.

The Riggers

There were several types of riggers at Shipyard Number Three. In general, the term refers to the people who worked in tandem with the crane operators, estimating the weight and balance points of items to be lifted by the cranes. The riggers would attach the ropes, cables or straps to these elements and to the cranes for lifting and transportation.

However, two exceptions to this category should be noted. ***Loft Riggers*** are a category of skilled workers who make wire and manila rope that is used aboard the ship and for its mooring lines. Rope, chain and cable makers are shown at work in Figure 1-4. Related to this, are ***Ship Riggers***, who would take the lines and cables produced by the loft riggers and install them on the ship and anchors, shown in Figure 1-5.

Stage Riggers, shown in Figure 1-6, are workers who erect, maintain, service and dismantle the scaffolding around the hulls of a ship. Unlike the other categories of riggers, which were tied to the local Boilermakers union, stage riggers were members of the local Carpenters & Joiners union.

The broadest category of riggers were the ***Crane Riggers***. As a general category of worker, they were responsible for attaching slings to the crane hooks and to the loads to be lifted. They were also responsible for selecting slings with the appropriate weight carrying capacity and length to fit around the load. Crane riggers would attach the slings in such a way that the loads would not shift during transport and would be set at the proper declivity for easy installation.

Within the crane riggers category existed subdivisions that indicated levels of training and experience. These were: slingers; plate hangers; and machine riggers. ***Slingers*** had the least training of the three levels. They were qualified to attached slings to steel in storage or in the shop for transport. ***Plate Hangers*** had received training and were skilled enough to attach slings to plates and assembled units ready to be positioned on hulls. At the highest level of training were the ***Machine Riggers***, who were qualified to attach slings to machinery for installation on the hulls and in the launched ships. Both the machinery they rigged for lifting and the placement of the machinery within the ship were delicate, and required skill in handling.

Unlike the other trades at the shipyards, which tended to specific skill sets that tied them to particular portions of the shipyard, the crane riggers would follow the progress of a ship throughout its construction. Riggers were required to move steel from the storage yard to the Plate Shop; from the Plate Shop to the Pre-Assembly Areas; and from Pre-Assembly to the graving basins. Following launch, riggers were required to assist in mooring the hull at the Fitting Out Dock, which was also equipped with cranes.

By the nature of their work, crane riggers worked closely with the engineers who calculated the weight of the loads being lifted and the crane operators. They also had people on the Shipyard who communicated with the crane operator via a system of hand signals as the loads were being moved and lifted.

Figures -
Developmental History



Figure -1-1. Clay Bedford, civil engineer for Kaiser corporation and leader of the Shipyard Number Three construction team



Figure 1-2. General Warehouse, Machine and Forge Shops in background all exhibit streamline moderne details

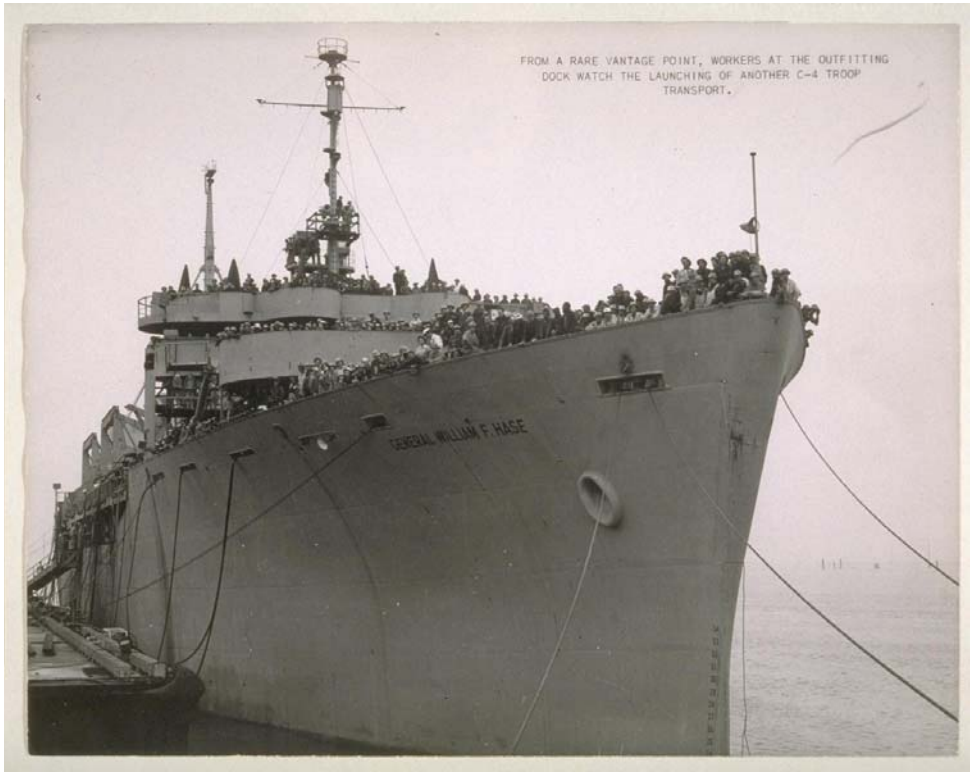


Figure 1-3. Completed C-4 Troop ship moored at Outfitting Dock, ready for delivery



Figure 1 4. Rope, chains and cable makers



Figure 1-5. Ship riggers



Figure 1-6. Dockmen and storage riggers

CONSTRUCTION CHRONOLOGY

The construction history of Shipyard Number Three has been interpreted primarily through the 2000 National Register of Historic Places Registration Form; Historic American Engineering Record (HAER) No. CA-326-M; *Henry J. Kaiser Papers (1873-1982)*; and Fore n' Aft articles written during the Shipyard's period of significance (1941-1944).

1941

January 14, 1941	Construction of Shipyard Number. One by Todd-Six Corporation begins in Richmond.
April 22, 1941	Construction of Shipyard Number Two by Kaiser begins in Richmond.
August 16, 1941	Launch of first Victory Ship, OCEAN VANGUARD, produced by Shipyard Number One.
September, 1941	Preliminary plans for additional shipyard developed by Kaiser Corporation Engineers at Latham Square Building, Oakland, CA.
December 7, 1941	Japan attacks American fleet at Pearl Harbor, damaging 30 ships of the U.S. fleet, 12 of which were beyond repair. United States declares war on Japan and enters into the Second World War.
December 31, 1941	Launch of first Victory Ship, JAMES OTIS, produced by Shipyard Number Two.

1942

January 9, 1942	Contract signed for the construction of Shipyard Number Three. Four days later, demolition of the hill and leveling of the land begins.
February 12, 1942	Construction of the General Warehouse Building and Plate Shop commences.
March 3, 1941	Excavation of graving basins commences.
March 4, 1942	Construction of the Plate Shop commences.
April, 1942	Subsidence of fill on east side of new Shipyard occurs, requiring relocation of Machine Shop and Yard Office. Shoring measures designed.
May 14, 1942	Keel for the first vessel built by Shipyard Number Three laid.
July 22, 1942	First hull laid in basin 5, bringing all five basins into service.

February, 1942	Sheet metal piling shoring measures on east side of Shipyard begin failing, requiring additional repair work.
November 25, 1942	First C-4 ship (GENERAL GEORGE O. SQUIER) built by Shipyard Number Three is launched.
September, 1943	Construction of Shipyard Number Three Cafeteria on Canal Street is completed?
May 8, 1945	Victory in Europe (V-E) Day.
August 13, 1945	Last C-4 (S.S. MARINE SNAPPER) launched from Shipyard Number Three.
August 15, 1945	Victory over Japan (V-J) Day.
August 1946	Shipyard Number Three declared surplus by the War Assets Administration and closed as a government Shipyard.
Mid-1959	Shipyard Number Three sold to the Willamette Iron and Steel Co. for ship repair and storage.
1985	Plate Shop demolished.

EVALUATION OF SIGNIFICANCE

Overall Significance

The Criteria for Evaluation for listing on the National Register of Historic Places state:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, association, and:
>
> A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> B. That are associated with the lives of persons significant in our past; or
>
> C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> D. That yielded, or may be likely to yield, information important in prehistory or history.[10]

The Riggers Loft is a contributing building to the Richmond Shipyard Number Three Historic District, which is listed on the National Register of Historic Places. It is significant under criterion A, for its association with the large scale campaign to build shipyards and ships to support the war effort during World War II, and its association with the overall National war effort. Henry J. Kaiser capitalized on this effort and became the largest producer of ships in the country. The shipyards he constructed in Vancouver, Washington; Portland, Oregon, and Richmond, California contributed to making the Bay Area the largest producer of ships in the world at that time. Shipyard Number Three is the only surviving Kaiser shipyard from this period of expansion on the west coast.

Shipyard Number Three is also significant under criterion C for its association with the new shipbuilding technologies that were developed for this huge effort. Shipyard Number Three characterized the advances in efficiency made by Kaiser in the construction of his shipyards, including a design that allowed for the prefabrication of units and unobstructed flow of materials to facilitate the rapid production of ships. These innovative designs set a standard for shipyard construction nationwide.

Character-Defining Features

The Riggers Loft was designed in the Streamline Moderne style; an austere architectural building style developed in the 1930s, and characterized by long horizontal elements, curved lines, metal finishes, and often associated with nautical themes. The following existing exterior and interior elements and features contribute to the historic character of the building.

Exterior

Walls

- Corrugated sheet metal siding
- Concrete walls
- Continuous band of steel framed windows coupled with sheet metal panels
- Roll up metal doors

[10] *Code of Federal Regulations, Title 36, Part 60.* "The National Register Criteria for Evaluation."

Facade Components

- Surface mounted letters spelling out 'RIGGERS LOFT', 'SHEET METAL SHOP' and 'PAINT SHOP' (missing) and other signage
- Curved canopy at north wall
- Rectilinear canopy at south wall
- Steel ladders at east and west walls
- Industrial lighting

Roof

- Parapet wall with sheet metal coping at top
- Sheet metal registers at roof ridge lines

Interior

Floors

- Original concrete floor
- Circular steel plates embedded in the floor of the riggers loft

Walls

- Exposed wood framing at exterior walls
- Painted board-formed concrete at paint shop
- Tongue-and-groove wood siding at interior walls
- Painted and mounted signage on both sides of the demising wall
- Steel opening and locking elements at windows
- Steel grilles at tool shops

Ceilings

- Exposed wood Pratt trusses
- Suspended track used for rigging in riggers loft

Other Features

- Expansive uninterrupted space at sheet metal shop
- Wood columns supporting roof trusses.

Assessment of Integrity

Assessment of integrity is based on an evaluation of the significance and condition of the physical features which date to a property's period of significance, taking into consideration the degree to which the individual qualities of integrity are present. The seven aspects of integrity as defined in the National Register Criteria for Evaluation are location, design, setting, materials, workmanship, feeling, and association. As noted in *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*:

> Location is the place where the historic property was constructed or the place where the historic event occurred. . . . Design is the combination of elements that create the form, plan, space, structure, and style of a property. . . . Setting is the physical environment of a historic property. . . . Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property. . . . Workmanship is the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory. . . . Feeling is a property's expression of the aesthetic or historic sense of a particular period of time. . . . Association is the direct link between an important historic event or person and a historic property.[11]

National Register Bulletin 15 defines integrity as "the ability of a property to convey its significance."[12]

The primary historical significance of the Riggers Loft is related to the development of Shipyard Number Three, the Richmond Shipyards District California Historical

[11] *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*, 44–45.
[12] Ibid.

Landmark, and the Rosie the Riveter/World War II Home Front National Historical Park; and its contribution to the production of ships for the war effort. The integrity of the exterior facades, the interior layout of primary and secondary rooms, and its place within the overall Shipyard are the most important physical aspects that convey this significance. The discussion below considers each of the seven aspects of integrity as they relate to the Riggers Loft.

Integrity of Location

The Riggers Loft retains a high degree of integrity of location in relationship to its site. The building location and the boundaries of its site are unchanged since the Riggers Loft was completed in 1942.

Integrity of Design

The Riggers Loft retains a high degree of integrity of design. There have been no significant changes to the design since its initial construction in 1942. Some new door openings have been created on the interior and some exterior doors have been modified, however, the overall original design remains intact.

Integrity of Setting

The Riggers Loft retains a high degree of integrity of setting. The area surrounding Shipyard Number Three has developed over time, but the Shipyard itself retains a high degree of integrity. The building is still bordered by the waterfront to the south and east: the General Warehouse to the north; and the graving basins to the west.

Integrity of Materials and Workmanship

The Riggers Loft retains a moderate degree of integrity of materials and workmanship. Many original exterior materials including the sheet metal siding, the metal sash, the metal rollup doors, and the metal clad pedestrian doors, have undergone significant deterioration requiring repair. Many of the historic interior materials are also present, although moisture-related deterioration and loss of finishes is widespread.

Integrity of Feeling

The Riggers Loft retains a high degree of integrity of feeling. Despite some changes to the building and significant deterioration of the built fabric, the building still conveys the historic and aesthetic feeling of the period of significance.

Integrity of Association

The Riggers Loft is significant primarily for its association with the Shipyard Number Three. As a contributing structure in the National Register District, and the National Historical Park, the Riggers Loft conveys its role in the historic development of ships in support of the war efforts during World War II.

PHYSICAL DESCRIPTION AND CONDITION ASSESSMENT

OVERALL DESCRIPTION

Riggers Loft is a single-story high-bay structure, rectangular in plan with a projection on the east end. The building is twenty-five feet tall and encompasses approximately 27,000 square feet. It is divided into three primary spaces: the Sheet Metal Shop housed in the southern half of the building, the Paint Shop in the northwest corner, and the Riggers Loft in the northeast corner as shown in Figure 2-1. There is a small bathroom suite, shorter in height than the rest of the building, located in the northeast re-entrant corner as shown in Figure 2-2.

The building's exterior is utilitarian in design; however the continuous line of industrial sash windows that band the building low on the facade give it a streamline moderne appearance, which is consistent with the overriding design aesthetic established for all the buildings in Shipyard Number Three. The majority of the four facades are clad with vertically applied corrugated sheetmetal; however the Paint Shop, located in the northwest corner, is constructed of concrete with no exterior finish. Figures 2-3 through 2-6 show the overall appearance of the building facades. The perimeter walls are supported by piles and a concrete grade beam that projects approximately six inches above grade.

The roof edge rises to approximately twenty-five feet in height, and is topped by a continuous flat, level parapet. The tall section of wall above the window band accentuates its streamline character. The low-sloped roof is constructed of two parallel gables that reflect the interior division of the building. The ridge of each gable is topped by a low roof monitor that provides interior ventilation. The roof is hidden from view by the parapet, and is covered in built up roofing, as shown in Figure 2-7

The interior of the structure is equally utilitarian, but dramatic in its simplicity. The interiors of the Sheet Metal Shop and Riggers Loft are characterized by exposed wood framed walls and exposed wood Pratt trusses that span the full sixty-two and seventy foot spans of these spaces. The bottom chords of the trusses are fourteen feet above the concrete slab floor, and the ridges rise to twenty-five feet.

The interior of the Paint Shop is equally utilitarian, however the walls are of exposed concrete, and the bottom chord of the trusses originally supported a plaster board ceiling. The plaster ceiling and concrete walls that define the Paint Shop are likely a design response to the combustible nature of the paints stored within this portion of the building.

The Sheet Metal Shop is the most dramatic example of the character of the space, providing an unobstructed view for 220 feet before being interrupted by the only partition wall in the space.

Figures -
Overall Description

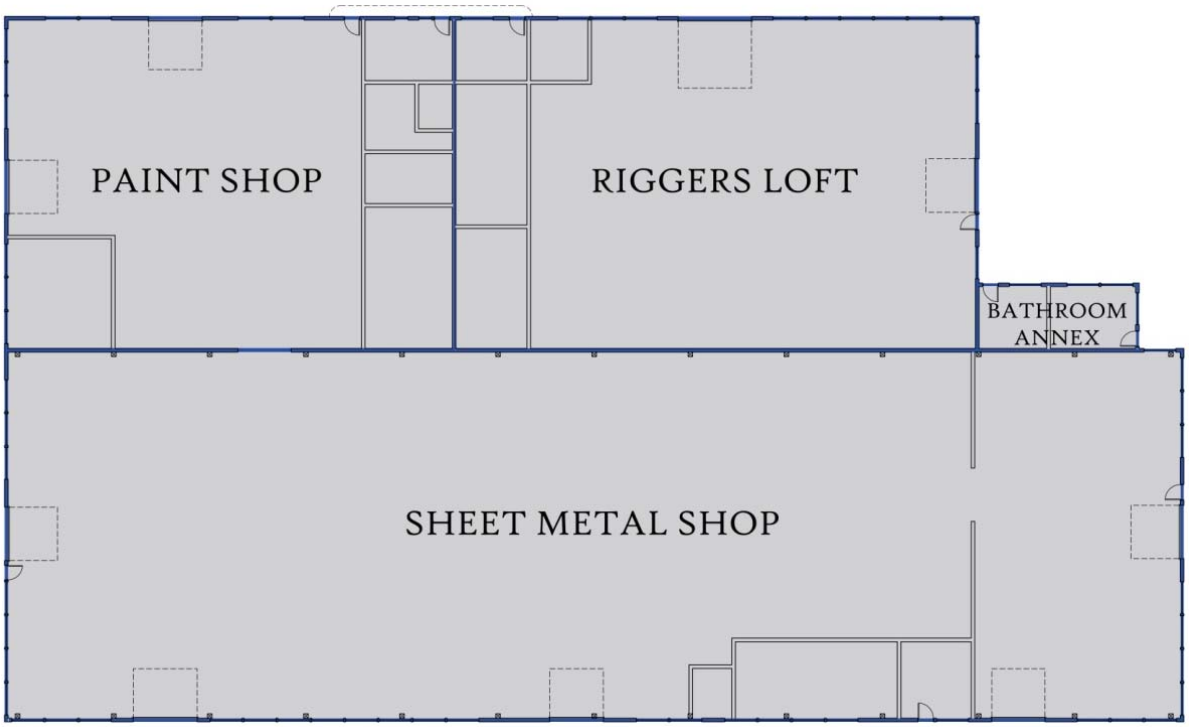


Figure 2-1. Riggers Loft floor plan



Figure 2-2. Bathroom unit at northeast re-entrant corner



Figure 2-3. North elevation



Figure 2-4.East elevation



Figure 2-5.South elevation



Figure 2-6.West elevation



Figure 2-7. Double-ridged built-up roof with parapet and ridge vent shrouds

EXTERIOR EVALUATION

Description

Metal Siding

The metal siding is composed of 30-inch wide, eighteen gauge, corrugated, galvanized metal panels with a pitch of $2\ ^{21}/_{32}$ inches and a depth of $^{1}/_{2}$ inch. A detail of this siding is shown in Figure 3-1. The siding was originally galvanized and painted white. The panels are lapped approximately three inches at the vertical edges resulting in a twenty-four inch exposure. The siding below the window band has no horizontal joints. Above the window band, there is one continuous horizontal joint located seven and a half feet above the window header. The siding is fastened to the building with nails at the studs. There is sheet metal flashing at the top of the parapet wall.

Windows and Doors

The window band is formed by two continuous four inch wide sheet metal strips at the top and bottom of the steel sash window units. The window units are a standard sized module six feet wide and five feet one inch tall with three rows of five lights separated by slender muntins. The window units are installed in groups of one to ten modules connected with two inch or four inch metal filler plates, and separated by sheet metal siding with a twelve inch standing seam pattern that is different than the typical siding. About sixty percent of the windows are fixed sash, and about forty percent of the units have an operable pivoting sash comprised of the central six lights in the top two rows of the unit. Figure 3-2 shows typical window units. The windows are glazed with clear glass and glazing putty, except for the windows at the bathroom suite, which have obscured glass. The north elevation concrete wall of the Paint Shop contains two atypical window units: thirty-one inch wide, six-light, steel window units with an operable pivot sash as shown in Figure 3-3.

The building is accessed at all elevations through a combination of metal overhead roll-up service doors and standard size pedestrian doors. The service doors are ten feet wide and extend to the top of the window band. The doors are mounted on the interior, and the jambs typically have full-height protective steel angles covering the wood framing. A typical service door is shown in Figure 3-4.

The pedestrian doors have generally been modified or replaced over the years but appear to have originally been three foot wide wood sash doors clad with painted, galvanized sheet metal. The doors contained a four light fixed steel window in the upper half of the door as shown in Figure 3-5. Some of these doors have been modified, with the introduction of louvered panels and the removal of glazing. The doors are sometimes coupled with a transom window that extends to the height of the window band header. The transoms have three horizontal lights, exhibited in Figure 3-6.

Canopies & Appendages

The north elevation has a canopy located at the header line of the window band. The canopy is wood framed with a painted plywood soffit and sheet metal flashing at the vertical face. It is approximately forty feet long, and spans the intersection of corrugated metal and concrete walls, sheltering three doors, two accessing the Paint Shop and one serving the Riggers Loft. There is a much smaller canopy located near the center of the south elevation. It is of similar construction, and covers a door serving the offices in the Sheet Metal Shop. Figures 3-7 and 3-8 show the north and south canopies, respectively.

There are two steel ladders attached to the side of the building that provide access to the roof. One ladder, shown in Figure 3-9, is located at the north end of the west elevation and starts above the window band. The second ladder is located at the south end of the east elevation and extends all the way to the ground.

Galvanized metal piping that appears to be original is mounted along the top of the window band header trim along the entire perimeter. These pipes penetrate the building in various locations through the facade. There are also a number of sheet metal vents at various locations throughout the facade.

There are original light fixtures located above the roll-up doors and at the roof parapet. Additionally, some modern light fixtures have been added to the facade. The locations are indicated on the elevation drawings. There is surface mounted conduit running along the south parapet that serves the contemporary light fixture noted above. Figure 3-10 shows electrical units mounted at the south elevation.

Signage

The building as originally constructed had signage mounted to the exterior walls representing the various uses of the building components. The approximate size and location of the signage can be observed from ghosting of the letters and patterns of abandoned fastener holes. Individual letters were mounted to the facade just below the roof line with metal anchors drilled into the concrete or through the corrugated metal. 'RIGGERS LOFT' was mounted at the east end of the Riggers Loft's north wall, the outline of which can be seen near the top of the wall in Figure 3-11. 'PAINT SHOP' was mounted on the west end of the Paint Shop's north wall, and "PAINTING centrally located above the roll up door on the Paint Shop's west wall. The remaining metal anchors are shown in Figure 3-12. 'SHEET METAL' also appeared in two locations, at the south end of the sheet metal's east and west walls. The outline of these letters is visible in Figure 3-13, again near the top of the wall. All of the letters have been removed, and their previous locations are signaled by the anchor penetrations and ghost outlines of the letters on the facade surfaces. Figures 3-14 and 3-15 show details of the letter ghosts. The lettering style is represented in an early photograph of the Electrical Shop shown in Figure 3-16.

Riggers Loft was building number six in the original plan of Shipyard Number Three, as indicated by additional signs on the exterior walls. The south elevation has two circular signs, one at each end. The signs are blue with the text '6A' in white font, as shown in Figure 3-17. These signs are centered on the horizontal siding joint. On the north elevation, directly adjacent to the 'R' from 'RIGGERS LOFT' there is a red rectangular metal sign with '6' in yellow font affixed to the siding as shown in Figure 3-18.

There is a sign that appears to be non-original painted on the north wall of the Paint Shop. It consists of a white rectangle of white paint located above the window band with the words 'SHIPPING AND RECEIVING' painted within the rectangle in black block letters.

Conditions

Concrete Facades

In general, the concrete facade suffers moderate deterioration. The most common condition noted was concrete spalling. Other forms of deterioration include: cracks, abandoned inserts, failed form-tie plugs and the paint coating has reached the end of its service life. The concrete spalling occurs at about fifty locations each ranging between one to three square feet each. The spalls are universally caused by corroding rebar within the wall. Figures 3-19 through 3-21 show typical examples. For buildings of this vintage, the rebar was generally specified to have 3/4 inch cover from the face of the concrete, as compared to today's requirement of 1 ½ inch cover. Due to construction tolerances, the bars often have less than three quarter inch cover. The shallow cover, combined with the natural carbonation of the concrete and the deteriorated coating, have left the steel susceptible to corrosion, and when corrosion occurs the expansive forces associated with rust formation create internal bursting forces that crack and ultimately spall off the cover concrete. Once the concrete cracks, water infiltration increases and the corrosion and associated

spalling accelerates. This process is clearly under way and absent intervention, will continue at an accelerating pace.

The other concrete deterioration conditions are less onerous than the spalling. Relatively few cracks were noted, and where noted the cracks were relatively narrow, non-structural, and there was typically no secondary deterioration associated with the cracks. Figure 3-22 shows typical examples. The abandoned metal inserts were originally used to fasten now abandoned signage over a roll-up door as shown in Figure 3-23. Over time that will corrode and lead to spalling. The form tie patches are small mortar plugs installed during the original construction that have come loose and require replacement. Figure 3-24 shows a typical example. Finally, the paint coating on the concrete is worn and peeling in some areas, and has clearly reached the end of its service life. The coating is an important component of the wall because it protects the concrete from carbonation and water infiltration and thus protects the rebar from corrosion. The existing coating will need to be removed in order to provide a suitable substrate for a new coating. Paint coatings of this vintage typically contained lead or other hazardous materials and thus will require special precautions during the removal and disposal process.

Sheet Metal Components

The exterior cladding is primarily composed of galvanized and painted sheet metal components including the corrugated and standing seam siding, parapet coping, window band and canopy fascias, cladding on the interior side of the parapets and exterior vent stacks and shrouds.

The exterior sheet metal suffers the following typical forms of deterioration: corrosion, holes, penetrations, dents, warps, open seams, and coating failure. The extent and severity of deterioration varied depending upon the exposure and facade placement. The north elevation generally had the heaviest corrosion followed by the west and south elevations. Siding below the window band was generally most deteriorated within any specific elevation, followed by locations immediately above the window band. The siding below the window band has severe corrosion throughout, due to earth contact and water splash. Large sections have completely corroded through at the wood sill plate, rendering them unsalvageable due to the loss of fastening. Roughly eighty-five percent of the lower band of corrugated siding requires replacement. The portions of siding immediately above the window band flashing had the second highest rate of through-thickness corrosion. The above-window corrosion was typically limited to roughly the bottom six-inches of the panel but this is where the bottom of the panel is fastened to the framing so the loss of panel section is more serious. Figures 3-25 through 3-29 show representative conditions. A similar phenomenon exists at the standing seam siding panels immediately above the bottom window band flashing. The area immediately below the window band also showed a slightly higher rate of corrosion but this was better correlated to defects in the window band flashing. The interior face of the roof parapet wall is clad with flat sheets of sheet metal siding that show heavy corrosion and will require replacement. Figures 3-30 and 3-31 show representative conditions.

The sheet metal siding contains numerous (non-corrosion) holes throughout. The holes range in size from small holes less than an inch diameter to larger holes of several inches diameter to occasional holes of more than one square foot. The small holes (less than one inch diameter) are typically bolt sized holes concentrated in the area of abandoned signage, presumably from the original fasteners, as shown in Figures 3-32 and 3-33. The larger holes (exceeding one inch diameter) occur less frequently and appear to be from abandoned pipes or ducts. The most common size range is three inches to six inches in diameter. Holes through the siding are obviously problematic in that they allow water into the building. Holes in severely corroded panels will be addressed with panel replacement.

Holes in otherwise sound panels can be repaired in a variety of ways depending upon the size. Fastener sized holes can be plugged with new bolts using neoprene washers or patched with an automotive body metal filler, such as Bondo. Both methods will be visible. Holes larger than about one inch diameter can be patched with small pieces of siding similar to the existing patch shown in Figure 3-34. This method is functional but not ideal because the patch will not be weather lapped and will depend upon sealant to shed water, but nonetheless could be acceptable for some situations.

The sheet metal components also had numerous locations with dents, warps or open joints. The flashings above and below the window band are most affected, typically at joints, corners or the end of a run. In some instances the existing flashing can be repaired and in some cases the flashing will require replacement. The parapet coping will need replacement as part of the roofing and parapet interior siding repair. Figures 3-35 and 3-36 show representative conditions.

The sheet metal was originally galvanized and painted, but over time the paint has worn away, and the galvanizing has been consumed. The condition is most pronounced on the west and south elevations. Surprisingly, there are fewer locations on these elevations with through thickness corrosion, possibly due to more rapid drying of moisture from increased exposure to the sun and the prevailing winds. A new paint coating will protect the existing siding that is retained but the loss of the galvanizing has removed the “backup” corrosion protection and diligent maintenance of the coating will be needed to preserve the sheet metal.

Windows & Doors

The exterior facade contains a near continuous band of steel framed windows punctuated with steel overhead rollup doors and standard pedestrian doors. The overall condition of the doors and windows is typically moderate to poor but most of the windows and several of the rollup doors can be repaired in place; however most of the pedestrian doors have been replaced with new leafs that do not match the original design.

The building contains sixty-six steel framed windows. The windows suffer from several typical forms of deterioration including: deteriorated coatings and corrosion, inoperable sashes, broken, warped or racked frames, missing or retrofitted units and numerous broken glazing panes. The original paint coatings have worn away, allowing corrosion of the steel frame on all units. The corrosion is typically surficial and repairable, but roughly a quarter of the units have short lengths ranging from one to five feet where significant section loss has occurred due to corrosion. This is most common on the north elevation and west elevation, typically affecting the muntins above the operable sash or the sill portion of the frame. Figures 3-37 through 3-40 show representative conditions.

Twenty-six of the units have operable sashes, twenty-five of which appear to be inoperable due to missing hardware, corrosion at hinges or bent stay bars. Nearly every sash has a retrofit nut and bolt added to serve as a locking device. In some cases, the frame is warped or broken, hindering operability. There is one frame with broken muntins and one frame in the zone of building settlement that has racked out of square. Several other have more moderate bowing of the muntins that appears repairable. There are four windows that are missing, these have been replaced with aluminum windows or have been removed for added equipment or enclosures. Finally, numerous pieces of glass are either broken, or missing, and any remaining glazing compound is deteriorated or has been sloppily replaced with sealant. Figure 3-41 shows representative conditions.

There are nine steel overhead rollup doors distributed throughout the facades. The paint coating on the doors is generally deteriorated and all doors suffer some surficial corrosion.

Three doors have severe corrosion or are otherwise damaged and require replacement. The operating hardware for all of the doors appears to be non-functional due to missing components or simple deterioration. Six of the rollup doors appear to be salvageable with a thorough tune up. Figures 3-42 through 3-44 show representative conditions.

There are nine pedestrian doors distributed throughout the facades, typically two feet six inch wide by six feet 8 inch doors. Most of the original doors leafs have been replaced with new leafs that do not match the original metal clad wood doors. Figure 3-45 shows one of the original doors. The new leafs required altering the original metal frames so all of the original frames will also require replacement to accommodate new leafs. Figures 3-46 through 3-48 show representative conditions.

Roof

The original roof consisted of a built-up roofing membrane. The existing roofing is severely deteriorated and requires complete replacement. For structural considerations, the new roof system should be a light weight material that does not require ballast. The new roofing work will need to be coordinated with associated work to replace decayed wood sheathing, and the parapet wall sheet metal cladding and coping. Figures 3-49 through 3-51 show representative conditions.

Miscellaneous Facade Components

The exterior facades contain a number of miscellaneous components such as canopies, ladders, stacks, vents, pipes, conduits and light fixtures.

Canopies

A thirty-eight foot long canopy exists on the north elevation and an eight foot canopy is located on the south elevation. Both canopies have a built-up roof, a sheet metal fascia and a painted plywood soffit. The plywood soffit at the eastern end of the north canopy and the entire south canopy has deterioration consistent with water leakage, indicating that the roofing membrane is at the end of its service life. The sheet metal fascia is generally in good condition, though the south canopy has more surface corrosion. All paint coatings are worn. Figures 3-52 and 3-53 show representative conditions.

Ladders

The 2 surface mounted metal ladders are generally sound with the exception of the anchorage plates that are typically heavily corroded at the connection between the plate and the ladder. Figures 3-54 and 3-55 show representative conditions.

Stacks & Vents

A number of sheet metal vents and stacks penetrate the siding or shroud the roof ridge vents. These elements show general signs of corrosion and deteriorating paint coatings. The portions of the roof shrouds over broken or collapsed trusses are deformed but could be partially salvaged depending upon the demolition methods used. Figure 3-56 shows representative conditions.

Pipes & Conduits

Pipes and conduits are mounted to the exterior face of the building including the interior side of parapets. It is presumed that the great majority of these components are abandoned and non-functional. Some of the conduit, primarily at the top of the facade, is presumed to be associated with the contemporary security lights located at the corners of the building. As discussed above, where the pipes penetrate through the siding gaps and holes exist that will require patching or sealing. The specific nature of repair will depend upon if the pipes are retained or removed. Figures 3-57 and 3-58 show representative conditions.

Light Fixtures

Light fixtures are located throughout the facades. Several of the original flood lights remain at the top of the building and portions of abandoned fixtures are also located above several doors. None of the original exterior fixtures are functional. There are also contemporary flood lights located at the south east and south west corners of the building. Figures 3-59 through 3-61 show representative conditions.

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Figures -
Exterior Description and Conditions



Figure 3-1. Corrugated metal siding with horizontal and vertical laps



Figure 3-2. Typical window units: fixed on the left, operable on the right



Figure 3-3. Atypical six light windows at the paint shop's north elevation



Figure 3-4. Typical service door



Figure 3-5. Typical exterior pedestrian door



Figure 3-6. Modified pedestrian door with typical three light transom



Figure 3-7. North Canopy



Figure 3-8. South Canopy



Figure 3-9. Steel ladder at west elevation



Figure 3-10. Electrical units at the south elevation



Figure 3-11. Ghost of 'RIGGERS LOFT' letters at north elevation



Figure 3-12. Metal anchors for 'PAINT SHOP' letters at the paint shop's west elevation



Figure 3-13. Ghost of 'SHEET METAL' letters at east elevation



Figure 3-14. Detail of letter anchors for 'P' at concrete wall of paint shop



Figure 3-15. Detail of sheet metal penetrations for 'TAL' at east elevation



Figure 3-16. Early photo of the Electric Shop, with lettering similar to what existed at Riggers Loft



Figure 3-17. Original signage and non-original light fixtures at the south elevation



Figure 3-18. Original sign and original light at the north elevation



Figure 3-19. Concrete spall with exposed rebar



Figure 3-20. Concrete spall beneath window sill



Figure 3-21. Incipient concrete spall



Figure 3-22. Narrow non-structural cracking



Figure 3-23. Metal inserts above roll-up door; corrosion from these metal components will lead to spalls over time



Figure 3-24. Mortar plugs at form tie patches



Figure 3-25. Typical sheet metal corrosion beneath band of windows



Figure 3-26. Detail of severe sheet metal corrosion at interface with window band



Figure 3-27. Rusting through sheet metal siding above window band



Figure 3-28. Sheet metal siding in contact with the ground



Figure 3-29. Widespread corrosion of sheet metal siding at south elevation



Figure 3-30. Typical corrosion at standing seam sheet metal siding panels



Figure 3-31. Corroded metal siding at inside of parapet wall



Figure 3-32. Small holes in sheet metal siding resulting from previously mounted 'SHEET METAL' sign at west elevation



Figure 3-33. Small holes in sheet metal siding from previously mounted 'SHEET METAL' sign at east elevation



Figure 3-34. Existing sheet metal patching job at east elevation; this patch style can be mimicked in fixing other large holes



Figure 3-35. Warped and corroded sheet metal flashing at base of window band



Figure 3-36. Corroded sheet metal coping at top of parapet wall



Figure 3-37. Typical window units



Figure 3-38. Window frame bent out of plane



Figure 3-39. Severe corrosion at window sill



Figure 3-40. Corroded window muntin profile



Figure 3-41. Typical example of missing window panes at window band



Figure 3-42. Typical roll-up door



Figure 3-43. Corroding L-Bracket at roll-up door jamb



Figure 3-44. Damaged roll-up door at north elevation



Figure 3-45. Original pedestrian door with lights removed and modified hardware



Figure 3-46. Non-original pedestrian door



Figure 3-47. Door removed and filled in with plywood at bathroom annex



Figure 3-48. Modified original door at east elevation



Figure 3-49. View of roof looking west showing widespread deterioration



Figure 3-50. View of roof looking north showing widespread deterioration



Figure 3-51. View of roof looking northwest showing widespread deterioration



Figure 3-52. North canopy



Figure 3-53. South canopy



Figure 3-54. Ladder at east elevation



Figure 3-55. Corrosion at ladder connection



Figure 3-56. Deformed sheet metal shrouds at roof ridge



Figure 3-57. Miscellaneous pipes penetrating façade

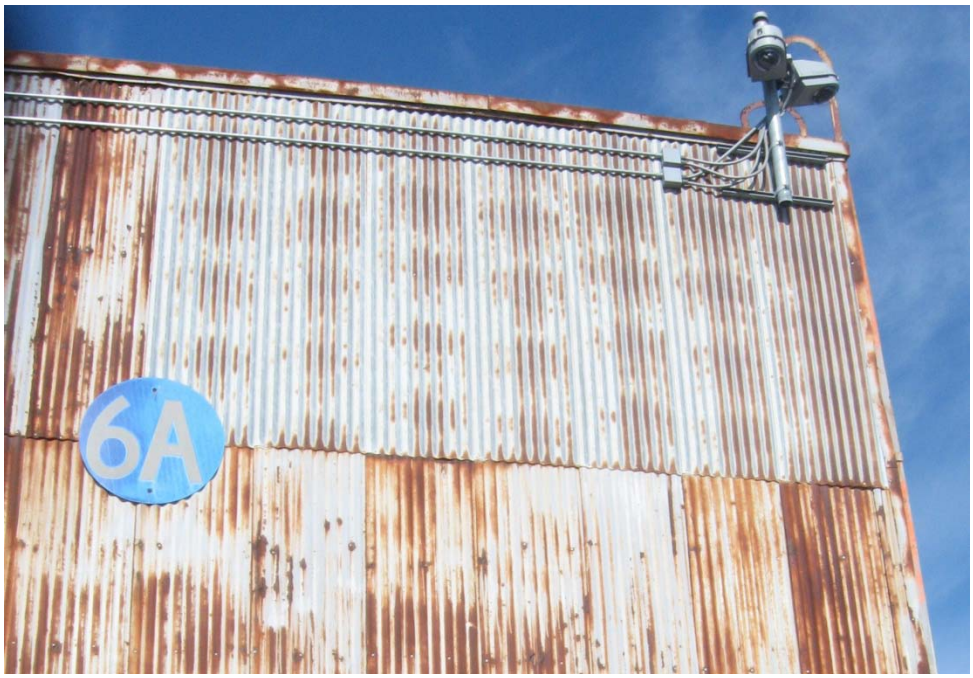


Figure 3-58. Conduit running along top of south elevation with modern security light fixture at the end



Figure 3-59. Original light fixture above roll-up door at east elevation



Figure 3-60. Original flood light at roof



Figure 3-61. Modern replacement light above roll-up door at west elevation

INTERIOR EVALUATION

Description

General

The interior spaces are typically unfinished throughout the building, generally consisting of exposed concrete slabs, exposed painted wall framing, the painted back side of the metal siding, and exposed painted wood trusses and wood roof decking. Also, all of the numerous pipes, conduits and vent stacks are exposed. The longitudinal demising wall between the Riggers Loft and the Sheet Metal Shop on line C has horizontal wood sheathing on both sides. The walls of the Paint Shop are board-formed painted concrete. Selected portions of some spaces were finished, as discussed below, typically in office spaces. A brief description of the three primary spaces is presented below. Figures 4-1 through 4-6 show the typical appearance of the building interior.

Sheet Metal Shop

The Sheet Metal Shop comprises the southern half of the Riggers Loft. The shop is seventy feet wide and two hundred-twenty feet long in the east-west direction. The space is divided at line eleven by a stud wall that extends to the bottom of the roof truss, with access provided by a ten foot wide opening. The wall is clad with corrugated metal siding on the east side and horizontally applied painted wood siding on the west. The Sheet Metal Shop has the prototypical interior finishes described above and found throughout the building.

There is a cluster of small rooms with low ceilings along the south wall of the Sheet Metal Shop adjacent to the Line C partition. The rooms include a small bathroom with a water heater and toilet, a tool room, and an adjacent small office at the north wall. The tool room has built-in wood shelving with a sheet metal clad counter top, shown in Figure 4-7. The north wall of the tool room has a series of diamond mesh panels with one operable sash centrally located above the service counter, presumably to allow exchange of tools with the shop. Access to the office from the shop has been blocked with a plywood enclosure, and it can only be accessed from the outside. There is a narrow set of wood stairs running along the interior side of these rooms providing access to a loft room over the office. This room has double-hung wood windows on the north wall, overlooking the Sheet Metal Shop. The office and tool rooms have painted 1x horizontal board finish facing toward the main shop area and the loft room has a painted plywood finish.

There is an additional, non-original, partition wall located in the eastern two bays of the Sheet Metal Shop (Line C.5 between Lines 11-13) that divides the east section of the shop in two. This partition extends to the lower truss chord and has plywood panels on one side.

Originally, the line C demising wall that forms the north boundary of the Sheet Metal Shop was unpenetrated by openings, but a three-foot pedestrian door was later added to provide access to the Riggers Loft area and a ten foot wide opening has been cut into the concrete wall common to the Paint Shop, shown in Figure 4-8.

Riggers Loft

The Riggers Loft occupies the northeast quadrant of the building, and is very similar in architectural character to the Sheet Metal Shop. The Riggers Loft consists of one large open room with a row of offices lining the west wall, adjacent to the Paint Shop. These rooms are divided by short wood framed walls. A wood stair structure was added to provide access to an open loft area above the west offices.

The concrete floor, exterior wood framed walls, concrete wall common to the Paint Shop and the wood truss roof system of the Riggers Loft match those elements in the Sheet Metal Shop. The band of windows and doors continues along the north and east walls in the Riggers Loft in the same fashion as throughout the rest of the building. Access is provided by a roll-up door in the north wall, and a pedestrian door that

provides access to the office lobby, noted below. The north roll-up door appears to have originally been the same size as the typical doors seen in other areas, but based on the visible and uneven modification to the concrete curb, it appears to have been enlarged to its present size. Figures 4-9 through 4-12 show the general appearance of the Riggers Loft area.

The rooms lining the west wall of the Riggers Loft consist of a lobby, an office, a lavatory, a locker room, and a tool room. The rooms are divided by short wood-framed walls. The tool room has similar diamond mesh panels on the east wall (facing the Riggers Loft) and has the same operable sash as the tool room in the Sheet Metal Shop. There is a non-original door opening at the south end of the east wall providing access to the exterior bathroom suite. Figures 4-13 through 4-19 show representative conditions.

The main shop area contains metal pendant lights that appear to be original, which are suspended from the roof trusses and ceiling, and organized in a roughly five foot by seven foot grid, although they are not present at all vertices. Similar fixtures are present in the locker room and tool room.

There are eight round steel plates, resembling man-hole-covers, embedded in the concrete floor slab. The plates are set in two rows, running east/west in the southern portion of the shop floor. A lighter colored mortar patch around the perimeter of the plates and the solid mortar fill immediately below the one loose plate suggest that the plates were added after the original construction. Figures 4-20 and 4-21 show the typical conditions.

A steel track rail is suspended from the roof trusses along the north, east and south walls with strap hangers. This track was likely used to move equipment around the Loft to what appear to be a set of storage areas along the south wall (Line C). The storage areas have a heavy wood beam that is supported by evenly spaced square wood posts. These posts divide the storage area into six sections, labeled in orange and black paint: ‘2 Ton’, ‘3 Ton’, ‘5 Ton’, ‘10 Ton’, ’16 Ton’, and ‘20 Ton’. The posts have steel pegs embedded in them, which may have been a place to hang and organize slings of various sizes and weight capacities for use by the Crane Riggers. Figures 4-22 through 4-24 show the track and storage areas.

A small storage area was created at the east end within the truss depth by adding wood planks to span between adjacent trusses. A steel ladder mounted to the east wall provides access to this storage area.

Built-in work benches adorn the north wall of the loft below the window sill with a section at the west end used as a plan desk as shown in Figure 4-25.

Paint Shop

The Paint Shop is a rectangular room located at the northwest corner of the building, enclosed on all sides by reinforced concrete walls, which defers from the rest of the wood-frame structure. The plan dimensions of the Paint Shop are roughly eighty-five feet by sixty-three feet. There is a row of wood framed rooms on the east side of the Paint Shop, divided with walls extending to the bottom of the roof trusses, and an additional room in the southwest corner. According to the original plans, the east rooms consisted of an office, a furnace room, a lavatory, and a locker room. Overall views of the Paint Shop are shown in Figures 4-26 and 4-27. There was originally a similar row of rooms along the south wall of the Paint Shop, but all that remains is an office in the southwest corner.

The roof in the Paint Shop has collapsed, as shown in Figure 4-28, creating unsafe conditions and preventing a thorough survey of the space. The following observations were made from the Sheet Metal Shop.

The Paint Shop has a painted concrete slab-on-grade floor that abuts the concrete grade beams at the exterior walls. The walls are painted board-formed concrete. There are concrete pilasters along the north and south walls spaced approximately eighteen feet on center supporting the roof truss system, similar to that in the rest of the building. The ceiling was finished with a painted button board plaster assembly at the bottom truss chord level, evidenced by sections of ceiling material on the floor and the unpainted condition of the trusses. Roof purlins in this room are four feet by twelve feet, possibly to provide additional support for the ceiling. The decking is 2x8 tongue and groove.

The window band as described in the other rooms continues at the north and west walls, but the windows are mounted in the concrete wall openings. The Paint Shop has two roll-up doors, one each at the west and north walls, and there are two pedestrian doors at the north wall, one opening up into the main Paint Shop space and one providing access to the east row of offices. The west wall of the offices has a band of six light windows, allowing a view into the Paint Shop from the offices. These elements are visible in Figure 4-29.

Exterior access is provided by two pedestrian doors on the north wall and two service doors, one on the north and one on the west. A ten foot wide opening, without a door, has been cut into the south wall to provide access to the Sheet Metal Shop as shown in Figure 4-30.

Exterior Bathrooms

The two bathrooms located in the northeast re-entrant corner of the building were originally only accessible from the outside. The bathrooms have concrete slab-on-grade floors, wood-framed walls finished with plywood, and a flat wood framed ceiling also finished with plywood. Both bathrooms have the window band continuing on their exterior walls. These windows originally had obscured glass lights, as compared to the typical transparent lights, although some have been replaced with transparent lights.

The east bathroom has a small anteroom separating the entrance from the stalls and sink. The west bathroom, shown in Figure 4-31, is one open room with wooden shelves constructed around the perimeter; all original lavatory fixtures have been removed. The door to the exterior has been boarded up on both sides, and access is now provided from the Riggers Loft through a non-original wood door at the west wall.

Conditions

Roof: Trusses and Decking

The roof has suffered from partial roof collapse and wood decay from water intrusion. The most significant condition apparent on inspection is the total collapse of the roof over the Paint Shop. This has been attributed by Port of Richmond staff to the failure of roof drainage and the ponding of water on the roof, resulting in overloading of the trusses. In addition, three roof trusses in the Sheet Metal Shop, located at columns C/7, E/8 and E/12, have partially collapsed, and are temporarily shored. The failures at C/7 and E/12 are attributable to either ponding of water or deterioration caused by water penetration. The failure at E/8 is attributable to additional stress introduced by the deflection of the grade beam over a deteriorated pile.

In those roof areas that are intact, the exposed decking is showing signs of significant roof leakage, including staining, deterioration and decay. The truss members are also showing signs of leakage including staining, but the truss members seem to be generally in better condition than the decking. These issues and the failures noted above are addressed more fully in the structural evaluation.

Exterior Walls: Framing, Siding

The simple construction of the perimeter walls is one of the more prominent aspects of the space. The exposed framing is painted and generally appears to be in sound condition. As noted for the exterior siding there are portions of the siding that have experienced through-thickness corrosion which has, in turn, exposed the framing. The most vulnerable areas are the sole plates bearing on the concrete, the window sills and the headers above the windows. Figure 4-32 illustrates the conditions of concern. Conditions related to the sheet metal siding are discussed in the exterior evaluation.

Interior Wall: Finishes, Wood Siding

The interior spaces contain a number of roughly finished walls, including the longitudinal demising walls, and the framed-in office spaces. The demising walls in the Sheet Metal Shop have a painted tongue-and-groove wood finish that contains areas of decay, usually associated with roof leakage. It is estimated that twenty-five percent of the boards are decayed to the point of requiring replacement, primarily near the Paint Shop. Figures 4-33 and 4-34 show examples. The paint coating on the boards is generally worn and soiled.

Ancillary Spaces finishes, Doors/Windows, Floors at Loft

Sheet Metal Shop

The ancillary spaces in the Sheet Metal Shop have horizontal wood siding finish facing the main shop area with metal screen dividers. The original walls are in generally sound condition and the screened portions of the walls sound. The enclosed loft area above the tool area has painted plywood finish and wood double hung windows that all appear sound. The wood flooring of the upper loft is severely decayed from roof leakage and not salvageable. The original fixtures remain in the small bathroom but the toilet has been removed from the remaining original stall and stored under the sink. The ceiling plywood finish is severely decayed and the fixtures do not appear to be functional. An overall view of the bathroom is shown in Figure 4-35. The bench in the tool room is in good condition.

Riggers Loft

The ancillary spaces in the Riggers Loft area have a 1x wall finish facing the main open space which is generally in good condition. Also, the metal screens and wood sash windows within these walls are sound except for broken glass. The office area at the north east portion of the Riggers Loft has a painted plywood finish on the interior that is very decayed from water infiltration and cannot be salvaged as shown in Figure 4-36. Also, portions of the wood loft flooring above the south end storage rooms show signs of decay, shown in Figure 4-37. The doors are generally in good condition except for broken glass but salvageable. Within the main Riggers Loft space the north side benches are generally in rough but sound condition with portions of the top work surface warped and decayed from water intrusion. The work benches are shown in Figure 4-38.

The small room off the east end of the Riggers Loft has a non-original plywood paneling that is decayed from water damage, a non-original door, and worn paint. These conditions are shown in Figure 4-39.

Paint Shop

The ancillary spaces in the Paint Shop were not accessible due to the collapsed roof but it is reasonable to assume that the exposure to the elements has severely damaged all of the wood framing and complete replacement will be required.

Floors

The concrete slabs throughout have a worn surface texture. The concrete is generally sound in that there are no major cracks, spalls or divots noticeable. There is some settlement associated with decayed piles on the south wall but this has occurred over a relatively long span that is it not readily perceived within the overall rough finish of the space. A portion of the slab at the “Ship

Disconnect" area of the Sheet Metal Shop has settled as shown in Figure 4-40.

The steel plates embedded in the Riggers Loft floor are tight fitting, with only minor surface corrosion. One plate is missing.

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Figures -
Interior Description and Conditions



Figure 4-1. View looking west in the sheet metal shop showing some typical finishes of the building: exposed concrete slab floor, exposed painted wall framing, painted back side of the metal siding, and exposed painted wood trusses



Figure 4-2. Detail showing exposed painted wall framing, painted back side of metal siding, exposed painted wood trusses and wood roof decking



Figure 4-3. Detail of roof trusses



Figure 4-4. Electrical units and exposed pipes mounted to the wall



Figure 4-5. Horizontal wood sheathing at the longitudinal demising wall. Note the surface mounted conduit at the top of the wall.



Figure 4-6. Board-formed painted concrete wall at the paint shop



Figure 4-7. Built-in shelving and service counter in tool room



Figure 4-8. Door opening added between the sheet metal shop and the riggers loft



Figure 4-9. View looking north in the riggers loft



Figure 4-10. View looking east in the riggers loft



Figure 4-11. View looking south in the riggers loft



Figure 4-12. View looking west in the riggers loft



Figure 4-13. View of tool shop (left) and locker room (right) from the riggers loft



Figure 4-14. Exterior view of the office and locker room from the riggers loft



Figure 4-15. Office and lobby rooms in northwest corner of the riggers loft



Figure 4-16. Lavatory in the riggers loft



Figure 4-17. View looking south in the locker room



Figure 4-18. View looking northeast in the tool room



Figure 4-19. Non-original door opening leading to exterior bathroom suite



Figure 4-20. Round steel plate set in the concrete floor of the riggers loft. Note the lighter colored mortar patch around the perimeter.



Figure 4-21. Solid mortar fill below missing steel plate



Figure 4-22. Track suspended from ceiling with storage area at the south wall



Figure 4-23. Storage areas at south wall of the riggers loft, with orange signs indicating '5 Ton', '10 Ton', '16 Ton', and '20 Ton' from left to right



Figure 4-24. Lower portion of storage areas at south wall of the riggers loft



Figure 4-25. Built-in cabinetry / plan desk at north wall of the riggers loft



Figure 4-26. - View in the paint shop looking north with east rooms on the right



Figure 4-27. View in the paint shop looking west



Figure 4-28. Collapsed paint shop roof



Figure 4-29. View in the paint shop looking north with the service door and band of windows visible on the north wall



Figure 4-30. View from sheet metal shop showing cut-out opening in the paint shop's southern wall



Figure 4-31. West bathroom



Figure 4-32. Corrosion through sheet metal siding at window sill, exposing interior wood framing



Figure 4-33. Decaying tongue-and-groove wood finish at sheet metal shop wall



Figure 4-34. Decaying tongue-and-groove wood finish at sheet metal shop wall



Figure 4-35. Bathroom in sheet metal shop



Figure 4-36. Deteriorated plywood finish in office in the northeast corner of the riggers loft



Figure 4-37. Signs of decay at wood flooring above riggers loft storage rooms



Figure 4-38. Work benches at the north side of the riggers loft in generally sound condition with deterioration of the top work surface



Figure 4-39. Small room off the east end of the riggers loft



Figure 4-40. Slab settlement at the "Ship Disconnect" area of the sheet metal shop

STRUCTURAL EVALUATION

Description

The Riggers Loft is a single story industrial high-bay building constructed predominantly of heavy wood frame, but with portions also constructed of reinforced concrete. The building is shown in perspective in Figure 5-1. A plan view, with an assigned gridline system is given in Figure 5-2, and a building section is shown in Figure 5-3. The building is approximately two-hundred thirty-one feet long in the east-west direction, one-hundred thirty-two feet wide in north-south direction, and twenty-five feet high at the ridge. The building perimeter walls and the interior wall on Line C are supported by concrete grade beams founded on timber piles. The floor throughout the structure is a concrete slab-on-ground. The slab is supported independently by the site soils and is not connected to the grade beam/pile system.

There are three distinct portions of the building that were named based on their historic use: the southern portion of the building (between gridlines C-E and 1-13) is the Sheet Metal Shop; the northwest portion of the building (between gridlines A-C and 1-5.5) is the Paint Shop; and the northeastern portion of the building (between gridlines A-C and 5.5-11) is the Riggers Loft. The Sheet Metal Shop is framed with thirteen wood roof trusses that span seventy feet in the north-south direction. These trusses are spaced at approximately eighteen feet on center. The Paint Shop and Riggers Loft are framed with eleven wood trusses, also spanning in the north-south direction; these trusses span sixty-two feet and are collinear with the trusses in the Sheet Metal Shop. A typical truss is shown in Figure 5-4. The top and bottom chords of the roof trusses are connected with bolted steel plates at each end to 10x12 wood columns to form vertical and lateral load-resisting frames. This connection is shown in Figure 5-5. All of the posts are connected to the concrete grade beam with a bolted steel moment resisting connector. The roof trusses have 2x and 3x chords, vertical and diagonal members fastened by four-inch diameter split-ring connectors with 3/4 inch diameter bolts as shown in Figure 5-6. Similar wood trusses frame into 10x12 posts on the wood frame exterior walls (along Lines A/5.5-A/11, E/1-E/13, C/11-C/13) to form east-west lateral load-resisting frames. There is a bracing truss line at the two ridge lines of the roof trusses. This bracing truss line can be seen in Figure 5-7.

The truss top chords are pitched at one inch per foot in each direction from the truss midspan, which results in roof ridges on gridlines B and D, and a valley on gridline C. Typically, 3x12 wood purlins spanning between the roof truss top chords at the truss panel points support 1-1/2 inch thick tongue-and-groove roof planking. An example of this is shown in Figure 5-8. In the Paint Shop only, the purlin size is 4 x 12. There are linear roof monitors along most of the length of the northern and southern roof ridges. A view of these monitors from the exterior is shown in Figure 5-9.

The four walls that enclose the Paint Shop are constructed of reinforced concrete. The Paint Shop has a plastered ‘button-board’ ceiling at the lower roof truss chord level, penetrated by a large opening to the ridge vent. The reinforced concrete walls are seven and a half inches thick with reinforcing bars spaced at twelve inches on center vertically and horizontally. The exterior walls for the balance of the building are wood-framed with 2x6 studs that support corrugated sheet metal exterior siding and steel sash windows. The two major full-height demising walls (at C/5.5-C/11 and C/11-E/11) are wood frame, the first sheathed in horizontal 1x8 siding on both sides, and the second with 1x8 siding on the west side, and corrugated metal siding on the east. In total, the lateral force resisting system for the building includes timber truss-column frames, wood-sheathed walls, and reinforced concrete walls. Figures 5-10 through 5-13 show the overall appearance of these components.

Condition and Analysis

WJE performed a limited survey of the building to generally determine its structural condition. The survey was primarily comprised of visual observation and awl probing to determine the presence of decay. Six borings with a 'Resistograph' to detect wood decay within thick members were taken. Six structural wood samples and one split ring connector sample were taken from the Paint Shop area, and dimensional and density measurements were made.

Structural calculations were performed to determine the building's adequacy to resist vertical dead and live loads and horizontal and uplift wind and seismic loads.
The building has generally suffered from partial roof collapse and wood decay from water intrusion. The entire roof of the Paint Shop has collapsed as shown in Figure 5-14. Port of Richmond maintenance staff attributes the collapse to the restriction of roof drainage and the ponding of water at the Paint Shop roof.

In the Sheet Metal Shop, roof trusses have partially collapsed at C/7, E/8, and E/12. These are currently inadequately supported by shoring that is either improperly located, structurally inadequate or not in contact with the trusses. At column E/8, the concrete perimeter foundation has deflected downward approximately nine inches, evident in Figure 5-15. This deflection is the likely cause of the partial collapse of the roof truss at that location. A geotechnical test pit at the grade beam supporting this column revealed that the upper portion of the timber pile exposed — at minimum the top three feet — has decayed to the point that it has become disengaged from the grade beam, and no longer provides support.

At least fifty percent of the roof wood sheathing has decayed to an unserviceable condition, and rainwater enters the building at numerous locations. The 10x12 wood columns at C/10 and C/11 have decayed at their bases, and column C/6 has even more extensive decay, including some above the base. Figure 5-16 shows this wood decay at the columns. The sill plates and many of the studs and sheathing boards of the wood-framed wall along C/10-C/11, which is directly under the roof valley, have decayed, and the wall at C/5.5-C/10 also has decay, but to a lesser extent. Most of the truss members appear to be undamaged, except at the locations noted above.

Checking was observed in some of the wood columns, and splits were observed in some of the truss members. Splits, seen in the ends of several truss members in connections, do not significantly weaken split ring connections, and none were seen that would render a wood truss member unserviceable. The interior sides of the concrete walls are in good condition; the exterior sides have spalling at many locations as shown in Figure 5-17.

We performed preliminary calculations on the truss capacity. All of these calculations assume that the current roof membrane will be replaced by a lightweight roof membrane. The wood member capacities for this calculation were based on values for 'Douglas Fir/larch - select structural' grade wood. Our preliminary structural calculations for the seventy foot span roof trusses indicated that the 2-2x6 diagonal web members in the second bay from the support column were overstressed in tension for full roof dead and live loading by about ten percent, using the 2007 California Building Code (CBC) for loading and wood member capacities.

At some locations where two split ring connectors were installed at a single truss panel point, the spacing between the split rings is less than the minimum spacing required to achieve the full structural capacity of both split rings. An example of this is shown in Figure 5-18. Our calculations for the seventy foot span roof trusses indicate that the split ring connectors at the 2-2x8 diagonal web members in the first bay from the support column are overstressed in tension for full roof dead and live loading by

between three percent and twenty-seven percent. This range of overstress is a function of the spacing between the paired split ring connectors. The calculations for the sixty-two foot span roof trusses indicate no web member overstresses and overstresses of up to twenty percent for split ring connectors with close spacing.

However, a detailed inspection of the 'annual ring count' of the wood members in-situ and the wood samples extracted from the building show that the subject truss members more closely resemble and are better classified as 'Douglas Fir/larch - **dense** select structural' grade. This grade of wood was designated in earlier editions of the CBC but is not listed in the current edition of the CBC because wood of this high quality is no longer available. In addition to the dense ring count, the subject members also have fewer and smaller knots than allowed for 'Douglas Fir/larch - select structural' wood by current grading rules. These superior wood characteristics increase both the wood section capacity and, less directly, the connector capacity.

The Riggers Loft, as a contributor to a National Register District, is eligible to use the California Historical Building Code (CHBC). This code was developed to recognize and respond to the unique conditions present with historic structures. The CHBC allows for judgment in the appropriate capacities of non-code conforming materials. In the case of Riggers Loft, we believe that the CHBC will allow us to take into consideration the characteristics of the wood, including the density, the slope of the grain, and the lack of knots, when assessing the capacity of the structural members. When these characteristics are taken into consideration in assessing wood and connector capacities, it appears that all of the diagonal web members are adequate, and only the seventy foot truss split ring connectors with the closer spacing are overstressed by about eight percent.

We performed structural calculations to determine the adequacy of the structure to resist horizontal wind and seismic forces in accordance with 2007 CBC criteria. Oftentimes, we will calculate seismic demands based on the CHBC, but in this case the modifications needed to bring the building into compliance with current code are not incrementally difficult to achieve and do not have significant historic impacts. Therefore, we do not see significant benefit to CHBC seismic criteria and are basing our recommendations on the 2007 CBC with some modification.

In general, the structure has adequate shear wall and frame capacity to resist the lateral loads, but is lacking adequate connections between elements. In the north-south direction, the reinforced concrete walls of the Paint Shop area are adequate to brace Lines 1 through 5 of the western side of the building, although given the collapsed roof, an adequate roof diaphragm no longer exists. The connections of trusses C/E-1 through C/E-5 to the new trusses and new roof diaphragm above the Paint Shop are adequate, although they will require some modification to incorporate the new roof. The roof truss frames on Lines 6 through 13 are adequate to brace the eastern side. Similarly, for lateral forces in the east-west direction, the reinforced concrete walls of the Paint Shop will brace Lines A-C of the northern side and middle of the building, although adequate ties do not exist between these concrete walls and the roof diaphragm to the west. The bracing truss frames on Line E will adequately brace the southern side.

Geotechnical Analysis

In addition to our survey, a geotechnical investigation was undertaken by Treadwell and Rollo to develop an assessment of subsurface conditions. The report is attached as Appendix C. The field investigation consisted of one boring, three cone penetration tests, and the excavation of one test pit at an area of deflection of the perimeter foundation.

The geotechnical field investigation indicates that the site is covered by a layer of fill consisting of clay, sandy clay gravel and cobbles that extends to a depth of ten to thirteen feet below grade. The fill is underlain by loose to medium dense sand, stiff clay to a depth of sixteen to twenty-four feet below grade. Saturated loose to medium dense sand and silty sand were encountered at depths between eleven and seventeen feet below grade. The top of bedrock is approximately sixteen feet below grade at the north side of the building and twenty-four feet below grade at the south.

The geotechnical analysis concludes that the site of the Riggers Loft is subject to strong or very strong shaking during a major earthquake at one of a number of nearby faults. The saturated layers of sand are continuous, and are potentially susceptible to liquefaction during a strong earthquake, which may cause settlement of the structure on the order of one to two inches. In addition, if the existing seawall to the south fails to restrain the lateral movement of liquefied soil, the Riggers Loft may be adversely affected by any ground displacement due to lateral spreading of the soil.

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Figures -
Structural Description and Conditions

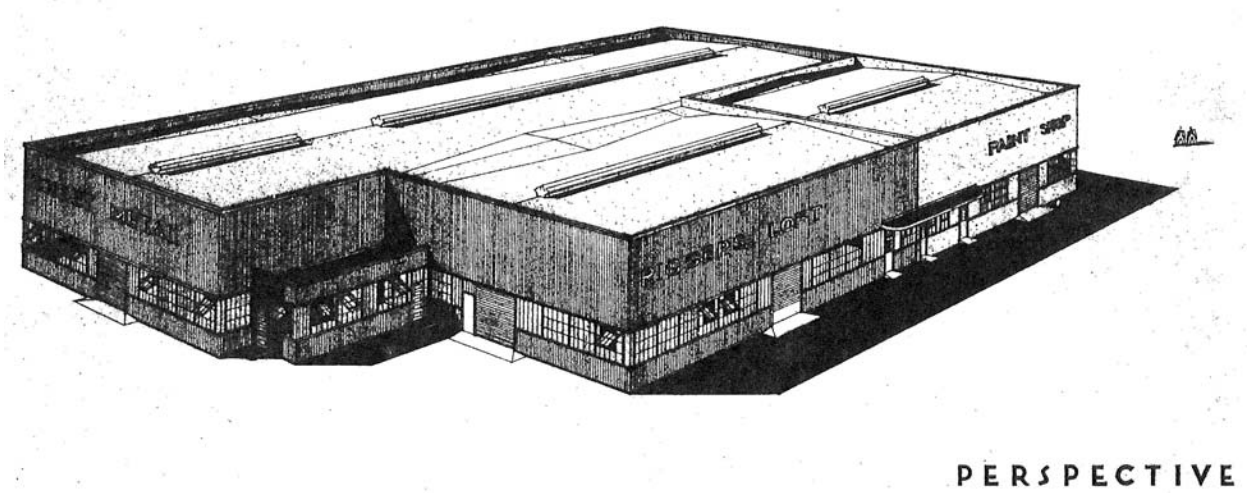


Figure 5-1. Perspective drawing of Riggers Loft from original construction drawings

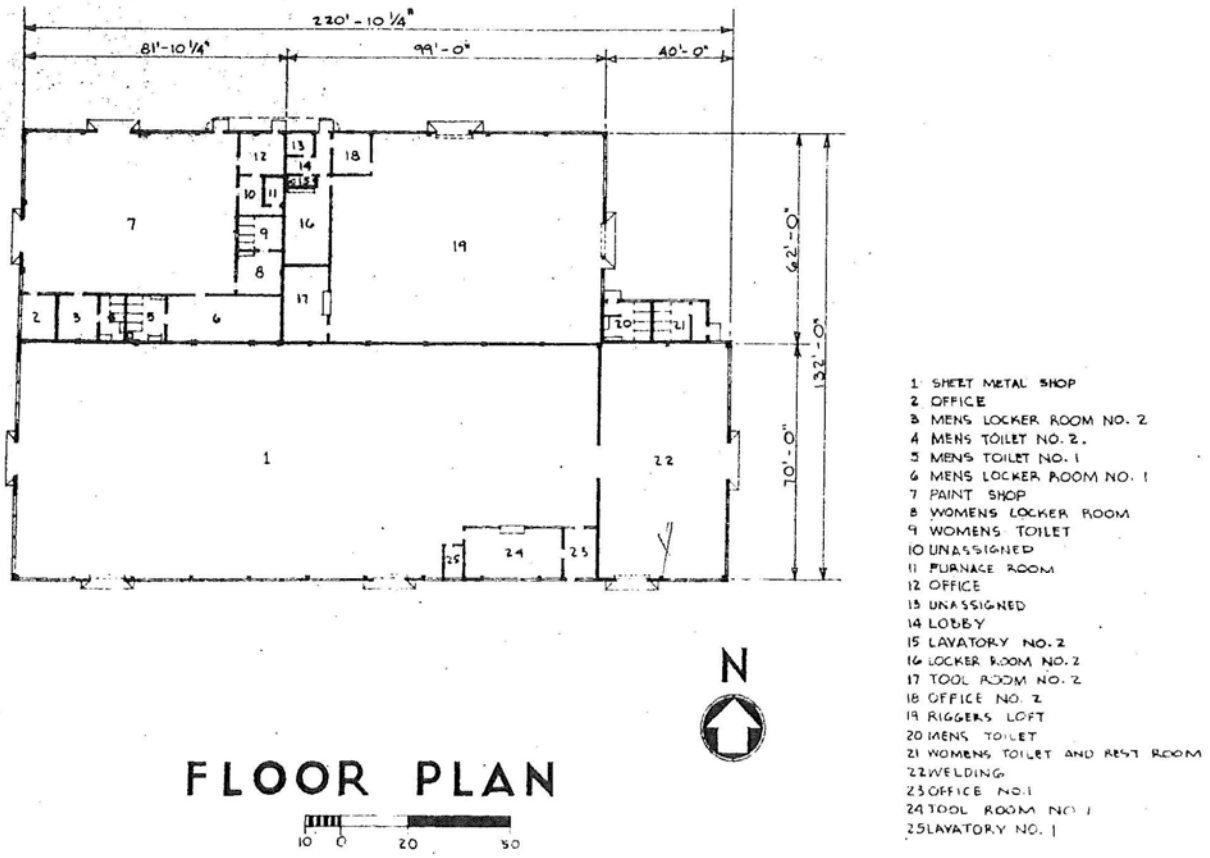


Figure 5-2. Floor plan of Riggers Loft from original construction drawings

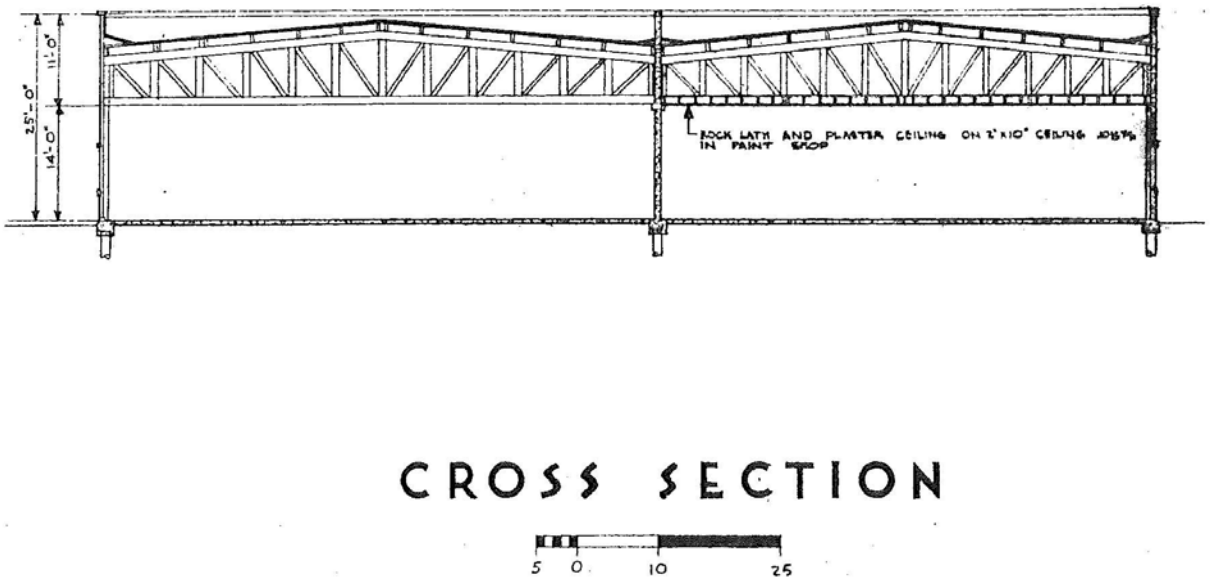


Figure 5-3. Building cross section of Riggers Loft from original construction drawings



Figure 5-4. Typical roof trusses



Figure 5-5. Steel plates connecting top and bottom chords of a roof truss to a wood column



Figure 5-6. Roof truss chord members connected by split-ring connectors



Figure 5-7. Bracing truss line running along the ridge line of the sheet metal shop



Figure 5-8. Tongue-and-groove roof planking spanning between roof trusses



Figure 5-9. Roof monitors at ridge line



Figure 5-10. Remains of 'button-board' ceiling at the lower roof truss chord level in the paint shop



Figure 5-11. Exterior walls, wood-framed with 2x6 studs supporting corrugated sheet metal exterior siding and steel sash windows



Figure 5-12. Interior demising wall sheathed with 1x8 siding



Figure 5-13. Interior demising wall sheathed with corrugated metal siding



Figure 5-14. Collapsed paint shop roof



Figure 5-15. Deflection in the perimeter foundation, evident in the sagging of the building, particularly at the top of the window band



Figure 5-16. Decayed timber pile, disengaged from grade beam



Figure 5-17 Spalled concrete at exterior wall



Figure 5-18. Two split rings with spacing less than the allowable spacing

RECOMMENDATIONS FOR TREATMENT

GUIDELINES AND STANDARDS FOR TREATMENT

Selecting the Appropriate Treatment Standards

The U.S. National Park Service has developed definitions for the four major treatments that may be applied to historic structures: preservation, rehabilitation, restoration, and reconstruction. The four definitions are as follows:

> **Preservation** is defined as the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.
>
> **Rehabilitation** is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values.
>
> **Restoration** is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project.
>
> **Reconstruction** is defined as the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.[13]

The appropriate treatment for Riggers Loft is dependent on the future use selected for the structure. If the Riggers Loft were to be retained and used for museum or interpretive purposes, the appropriate treatment would be ***Restoration.*** If the building were to be adapted to a new use, the appropriate treatment is ***Rehabilitation***.

Given the historical significance of the Riggers Loft, and the anticipated adaptation of the structure for a compatible reuse, the treatment ***Rehabilitation*** has been designated. The Secretary of the Interior's Standards for Rehabilitation are as follows:

Secretary of the Interior's Standards For Rehabilitation

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or

[13] *The Secretary of the Interior's Standards for the Treatment of Historic Properties*.

alteration of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.

6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.[14]

Specific Guidelines for Treatment

Guidelines and requirements for treatment have been defined based on the historic value of the Riggers Loft. All treatment guidelines and recommendations were developed in accordance with the *Secretary of Interior's Standards for Rehabilitation*. For the Riggers Loft, the following guidelines have been prepared to assist in the application the Secretary of the Interior's Standards for Rehabilitation to specific project work.

Building Treatment Standards

All work on the historic building should be undertaken in accordance with the Secretary of the Interior's Standards.

1. Minimum alteration should be made to the historic building or site to meet current use and code requirements.

2. Deteriorated building fabric should be repaired rather than replaced.

[14] Ibid.

When material deterioration prohibits repair, replacement materials should match the original in material, color, and texture.

3. Rehabilitation work should retain original windows, window openings, doors and door locations.
4. All work should be designed and executed in a manner that minimizes damage to or removal of character defining elements or significant fabric of the building, structure or setting.
5. All exterior work should be executed in a manner that minimizes damage to significant landscapes or site features adjacent to the building or structure.

Interior Treatment Standards

Proposed design and new uses should integrate and preserve the original interior plan configuration, spaces, features, and finishes.

1. All work should be executed in a manner that retains and does not damage interior features, finishes and original room configuration.
2. Rehabilitation of the building interiors should avoid subdividing the interior rooms, removing original partitions.
3. Design should avoid installation of dropped ceilings or mechanical equipment that will result in the damage or covering of exposed trusses and roof framing.
4. New design should avoid the addition of new finish material that would cover exposed wall framing and exposed concrete floors.

The guidelines listed above should be considered in light of the overarching guidance provided by the Secretary of the Interior's Standards.

Guidelines for Prioritization of Work

Based on the condition assessment performed as part of the Historic Structure Report, the following general prioritization is indicated for anticipated work on the Riggers Loft. Depending on the sequence and phasing of work, several of these categories of work (e.g., exterior envelope weatherproofing and full rehabilitation) may be performed simultaneously.

1. Structural Stabilization: Implement structural stabilization repairs as needed to address structural deficiencies and unstable conditions, particularly proper shoring of broken trusses.

2. Exterior Envelope Weatherproofing: Perform exterior repairs to prevent water infiltration and deterioration of building envelope materials, and to address conditions that may lead to continued deterioration and loss of historic fabric. These types of repairs may include temporary closure of openings in walls and roofs prior to rehabilitation efforts, or could be incorporated in the rehabilitation effort.

3. Rehabilitation of the Building Shell: Perform Permanent repairs to the structural system and building envelope as outlined in the Recommendations for Treatment in this report. This phase can be performed simultaneously with the modifications for reuse.

4. Modifications for Reuse: Perform repairs and modifications to the building interior and systems to permit reuse as offices and for related support functions. These types of repairs and modifications include work required to meet code, for disabled access, for egress, for structural capacity upgrades, to rehabilitate interior finishes, and to provide new mechanical, electrical, and plumbing systems to permit building occupancy and reuse.

5. Cyclical Inspection and Maintenance: In addition to the specific repairs recommended, cyclical maintenance tasks such as inspection, painting of exterior wood and metal elements, replacement of joint sealants, maintenance of roof and drainage systems, and other ongoing maintenance tasks must be continually implemented to avoid damage to the historic building fabric and to reduce the need for large-scale repair projects in future.

All work performed on the subject buildings should be documented through notes, photographs, and measured drawings and/or sketches, or with as-built annotations to construction documents at project completion. These records should be permanently archived as a record of the buildings prior to adaptive reuse, for future reference, and to provide information for future maintenance of the buildings. In addition, these records will allow future observers to identify which materials are historic.

EXTERIOR RECOMMENDATIONS

Concrete Facades

Spalling:

- Remove loose and deteriorated concrete
- Clean exposed steel and apply corrosion inhibitive coating
- Dowel-in new stainless steel rods where rebar has excessive section loss if necessary
- Install stainless steel anchors and wire mesh patch reinforcement
- Install portland cement based patching mortar to match the profile and texture of the surrounding concrete
- Cure patch with plastic covering
- See Elevation Drawings for the size and location of patching
    - Apply a factor of 2 to all patch sizes noted

Cracks:

- Repair cracks wider than 20 mils.
- See Elevation Drawings for the location of concrete cracks

Abandoned Inserts:

- Remove all abandoned inserts not associated with historic signage as described below
- Small inserts
    - Core drill around insert approximately 2” diameter by 3” deep
    - Remove plug. Prepare and patch hole with mortar
    - Allow for removing fifty small inserts
- Remove larger inserts
    - Core or chip concrete around insert to about 3” depth
    - Cut out steel to a minimum depth of 2” below exterior face of concrete
    - Square up edges of hole. Prepare and patch hole with mortar
    - Allow for repairing twenty larger abandoned inserts

Form Tie Patches:

- Remove loose mortar plug
- Roughen substrate
- Install new mortar plug

Coating:

- Remove existing coating to a sound substrate
- Install a new acrylic latex coating system
    - Install prime coat and two finish coats
    - Coat all exterior concrete surfaces, including the inside face of the parapets

Sheet Metal Components

Corrosion:

- Remove and replace severely corroded siding panels
    - See Elevation Drawings for panel replacement
    - Replace one-hundred percent of cladding at interior face of parapet
- Remove and replace one-hundred percent of parapet coping

Holes & Penetrations:

- Apply sealant to open gaps around items penetrating the siding. Allow for sealing two-hundred locations
- Small Holes Less Than 1" Diameter
  - Allow for repairing three hundred locations using either of two options below
  - Option A: Install a nut and bolt with neoprene washers
  - Option B: Fill hole with automotive body filler; Sand and finish to match profile of siding
- Large Holes: Greater Than 3" Diameter
  - Repair holes up to 6" diameter with automotive body filler reinforced with fabric mesh
  - Allow for repairing fifty holes using this method
- Large Holes: Greater Than 6" Diameter
  - Patch with a piece of siding
  - Allow for patching ten holes with siding

Dents, Warps and Open Seams:

- Dents: No repair required
- Warps: No repair required
- Open seams:
  - Remove loose fasteners along seam
  - Clean substrate and apply coating to contact surfaces
  - Bed sheet metal components in sealant bead
  - Install new back-up framing as needed
  - Fasten component with new screws

Coating:

- Remove existing coating
- Prepare substrate
- Install new high performance coating system
  - Apply one primer coat and two finish coats

Windows & Doors

Windows:

- Remove and replace severely corroded, warped or racked units, and missing units
  - Install new steel framed unit with similar configuration and muntin dimensions as original units
  - Salvage components from removed units for repair of retained units
- Tune-up all windows designated to remain
  - Remove all corrosion
  - Cut out severely corroded segments of frames and weld in new or salvaged pieces
  - Restore operability to retained units
    - Remove corrosion
    - Lubricate hinges
    - Replace damaged or missing hinges, latches and stays
  - Remove all glass and glazing compound, install new glazing
  - Prepare and paint frames with high performance coating system
    - Apply one primer coat and two finish coats
    - Paint interior and exterior portions of frame

Rollup Doors:

- Remove existing coatings from all existing door and hardware components
- Restore operability
  - Disassemble and clean and repair existing salvageable components
  - Replace missing or damaged components
  - Reassemble components and adjust operation
- Replace severely deteriorated doors with new doors to match original
  - Allow for replacing three rollup doors
- Prepare and paint all doors and associated components

Pedestrian Doors

- Remove all existing pedestrian doors and frames
- Install new doors and frames to match original configuration

Roof

Sheathing

- Remove existing sheathing in areas where deterioration has rendered the material structurally unstable
- Replace sheathing in Paint Shop area with plywood sheathing (see structural assessment)
- Replace sheathing in all other areas with either nominal 2x8 or 2x12, tongue and groove decking, to match the existing sheathing adjacent

Roofing

- Replace existing roofing with a new, lightweight thermoplastic polyolefin (TPO) single ply membrane roof
- If a Class A roof is required, install two layers of thermal barrier below the membrane roof

Miscellaneous Facade Components

Canopies

- Remove corrosion and repaint sheet metal fascia
- Replace the deteriorated portions of the plywood soffits. Repaint to match existing
- Replace roof membrane with single ply membrane roofing (see roofing above)

Historical Signage

- Replace missing surface-mounted signage indicating the Riggers Loft, Sheet Metal Shop and the Paint Shop at the north, east and west walls, matching the original signs in font, style and character based on the existing fastener patterns, the shadows from the letters on the walls and previous drawings and photographs.
- Retain other historical signage mounted at exterior walls

Ladders

- Repair welds at connections between anchorage plates and ladder stringers
- Remove surface corrosion and repaint ladders

Pipes & Conduit

- Retain original piping and conduit
- Remove conduit associated with the contemporary security lights located at the corners of the building along with light fixtures (see below)
- Where pipes and conduit to be retained penetrate the siding, seal the surrounding opening. Where pipe or conduit is to be removed, patch the openings as described under Sheet Metal. The specific nature of repair will depend upon if the pipes are retained or removed.

Light Fixtures

- Retain and repair original flood lights and exterior lighting fixtures. Repair, refurbish or replace as necessary
- Remove contemporary flood lights located at the south east and south west corners of the building. If necessary, consider replacing with more compatible fixtures

INTERIOR RECOMMENDATIONS

General

- Recommendations for the treatment of the roof trusses and roof decking are included in the structural recommendations section.
- Remove and replace decayed portions of wall framing with new wood of the same dimensions and appearance.
- Prepare and paint all interior walls including the interior side of exterior wall siding and framing.
- Remove non-original partial height wall added in the east portion of the Sheet Metal Shop.
- Remove and replace decayed wood wall finish on C-Line demising wall.
- Retain all original exposed pipes, conduit and electrical circuit boxes. Prepare and paint.
- Remove non-original pipes, conduit and electrical boxes.
- Retain miscellaneous signage.

Ancillary Spaces

- Retain all ancillary spaces in Sheet Metal Shop and Riggers Loft.
- Replace decayed wall and floor finishes to match original.
- Replace areas where boards are cut out.
- Retain all work benches; restore functionality of damaged drawers or doors.
- Repair damaged windows, restore operation, and replace broken glass, clean paint from existing glass.
- Repair all doors including hardware.
- Remove and replace carpet in Riggers Loft Office Space.
- Repaint all previously painted surfaces.
- Rebuild ancillary spaces in Paint Shop to match original configuration and materials.
- Remove added interior enclosure in Sheet Metal Shop at electrical service for SS Red Oak, and relocate electrical service. Level slab with a cementitious topping compound.

East Bathrooms

- Retain remaining toilet stall partitions, repair or replace missing or damaged doors and partitions.
- Install new basin sink to match original.
- Prepare and paint all previously painted surfaces.
- Fixtures
  - Retain all existing incandescent shroud light fixtures. Restore missing components and rewire for operability.
  - Remove florescent and other non-original light fixtures. LMS 12/3 #199.
  - Replace missing sections of ceiling track in Riggers Loft, fabricate new track to match original including hangers and missing wood support framing.

Miscellaneous

- Fabricate and install missing metal plate in slab of Riggers Loft to match existing.

STRUCTURAL RECOMMENDATIONS

As indicated in the conditions survey, the partially collapsed trusses at column lines C/7, E/8 and E/12 are improperly shored. Emergency stabilization measures should be undertaken to properly support these trusses to prevent further damage to the roof structure.

It is recommended that additional test pits be excavated to investigate pile heads and pile to grade beam connections at approximately 5% of the existing columns. These investigations should include the piles at column lines E/7 and E/9. In addition, annual field surveys should be performed to monitor future settlement of the building. Additional pile head investigation should be performed at any areas where settlement is measured.

As detailed in the geotechnical investigation, the adjacent seawall may be inadequate to resist lateral spreading of the site during an earthquake. If it fails, structural rehabilitation of the Riggers Loft may not be adequate to prevent possible collapse. It would be prudent to

investigate and evaluate the seawall for its capacity to resist lateral spreading before proceeding with structural rehabilitation of the Riggers Loft.

Perform a complete survey the wood members of the building for decay and damage to fully determine which specific wood members are of impaired condition to resist their imposed loads.

The concrete grade beam, wood pile, and concrete floor slab adjacent to E/8 should be realigned and repaired.

- Excavate pile cap to expose sound material. Form and pour steel reinforced concrete pile cap.
- Jack wood column to level truss above. Shore temporarily.
- Demolish areas of grade beam and slab that have deflected. Re-pour at proper elevation.

The concrete slab and perimeter grade beam should be tied together structurally to reduce the potentially for lateral separation of the foundation elements.

Replace the roof trusses, roof diaphragm, roof membrane, and ceiling in the Paint Shop where the roof has collapsed. With the ceiling in place, the roof trusses and diaphragm are not visible. Install a new plywood roof diaphragm to replace the original tongue and groove decking. The new roof trusses in the Paint Shop must be connected structurally to the existing Line E-to-C trusses at C/1-5 using steel ties, similar to those now in place. These ties will not be visible, after the reinstallation of the ceiling in this area. The walls and ceilings of enclosed rooms within the Paint Shop that were damaged by the roof collapse should also to be repaired. These partitions do not contribute to the structural capacity of the structure.

Repair the broken portions of the roof trusses at 7/C, 8/E, and 12/E. Laminated veneer lumber (LVL), is recommended for this repair, to achieve the necessary strength. LVL stock and the split ring connectors for this repair are readily available commercially, and the LVL, once painted, should be indistinguishable from the original members.

The 10x12 wood column at 6/C will likely need replacement. The 10x12 wood columns at 10/C and 11/C, and elsewhere where decay may be observed at the base only, may have adequate bearing cross section to be kept in service if the source of moisture is eliminated and the post base is dried.

As detailed above, our calculations indicate that selected wood truss diagonal members and split ring connectors are overstressed for full dead and live load, when evaluated using the 2007 California Building Code (CBC), although they appear to have met the requirements of the prevailing code at the time of construction. The 2007 CBC calculations indicate that the trusses are sufficient for dead loads, however, we have the following recommendations to minimize future roof loading:

- Replace existing built-up roof with a lightweight roofing membrane (see Exterior Recommendations).
- During re-roofing operations restrict live loads on the roof to well below the code-assumed twelve pounds per square foot by requiring placement of materials and roofing operations to be executed in a way to minimize superimposed loading to six pounds per square foot or less. Install signage at roof hatch entrances and parapets indicating enforcement of a lower live load limit for roofing operations. The City of Richmond Building Department should be notified and a comment to this effect be added to the permitting database.

Analyze existing roof drainage prior to installation of new roof, and install enhanced primary and secondary drainage to reduce the possibility of ponding loads, if there are drainage deficiencies. Perform regular roof maintenance to reduce the risk of ponding.

Replace the decayed tongue-and-groove roof decking with either nominal 2x8 or 2x12, depending on its location. Nominal 2x8 tongue-and-groove roof decking is locally available 'off-the shelf'. Nominal 2x12 tongue-and-groove roof decking is not locally available 'off-the shelf', but can probably be economically milled to order for a project of this scale.

Identify the spalled areas in concrete walls via a hammer sounding survey. Unsound concrete can then be removed, the reinforcing bars cleaned of corrosion and new concrete patches installed. See exterior recommendations for installation of patches.

We recommend some modifications to the building to provide adequate strength and stiffness to resist wind and seismic loads. The modifications are shown in plan in Appendix A and are described below for each plan direction. Most of the modifications will not be visible in the completed building.

- To resist seismic loads in both plan directions, a new plywood roof diaphragm should be installed in the Paint Shop area as described above. The new diaphragm will provide for needed lateral capacity in this area. This plywood roof must be adequately nailed and be well-connected to the reinforced concrete walls through the roof framing, using standard detailing methods. Steel plate collectors should be provided to transfer the loads from the roof diaphragms between column lines 5.5 and 13 to the concrete walls at column lines A and C.
- The existing ties at the trusses at column lines 1 through 5 should be modified to attach through the concrete wall at column line C to the new trusses over the Paint Shop.
- Similarly, for lateral forces in the east-west direction, the reinforced concrete walls of the Paint Shop will brace Lines A-C of the northern side and middle of the building, and the bracing truss frames on Lines E will brace the southern side. The bracing truss on Line A/6-11 should be connected structurally to the reinforced concrete wall on Line A/1-A/5.5 with a steel plate or strap. The bracing truss on Line C/11-C/13, and the roof diaphragm along C/5.5-C/11 should be connected structurally to the reinforced concrete wall on Line C/1-C/5.5 with a 'collector' strut along C/5.5-C/11.
- As an option, the interior wood-framed wall on Line 11/C-E could be strengthened by installing plywood behind the corrugated metal siding to decrease the horizontal deflection of the roof diaphragm at the west side. This wall would provide added lateral strength through the connections at the posts at either end without the addition of a foundation below.

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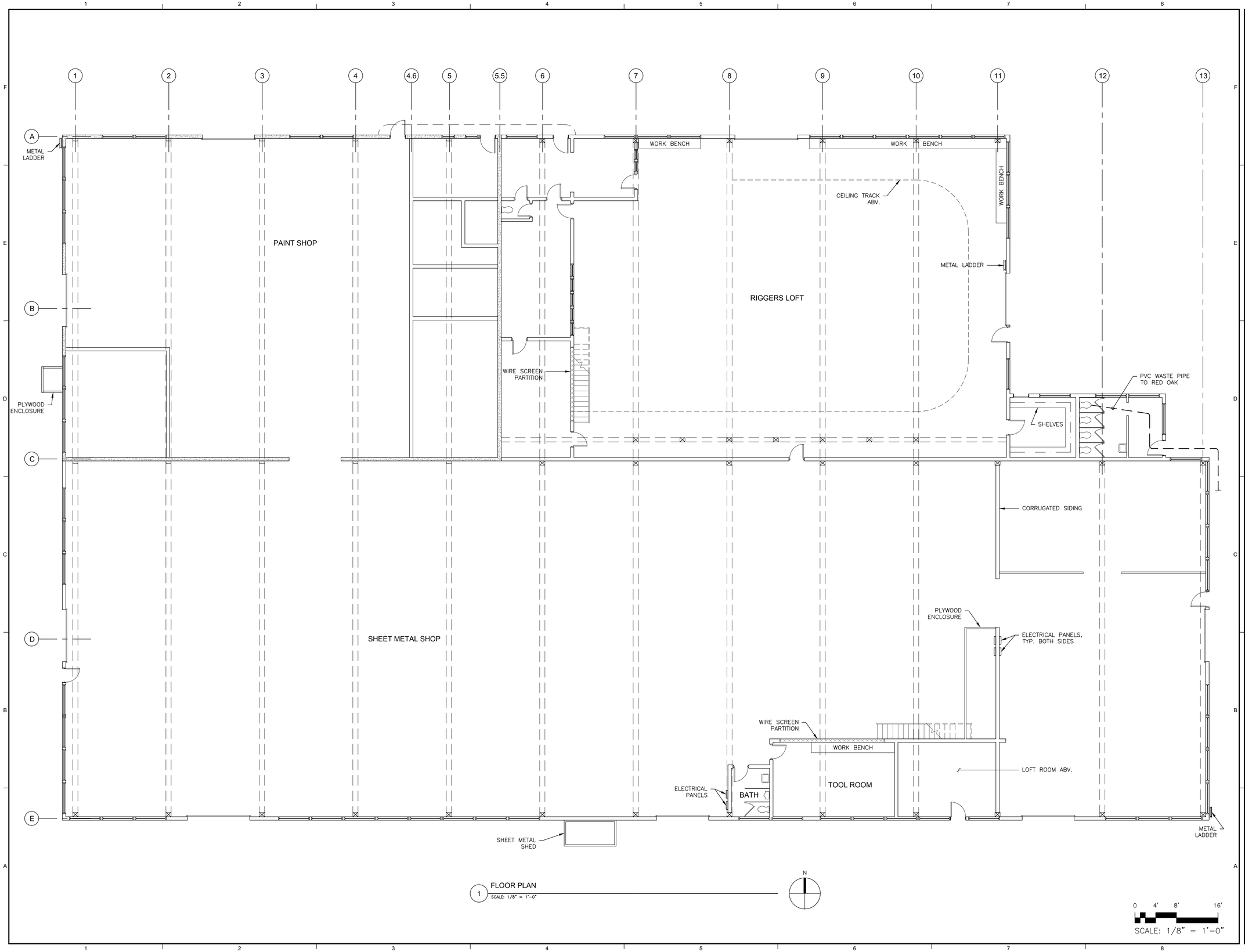
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APPENDIX A
Schematic Repair Drawings

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Consultants

Project

Riggers Loft and SD for Rehab
Richmond, CA

Client

City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Mark	Date	Description

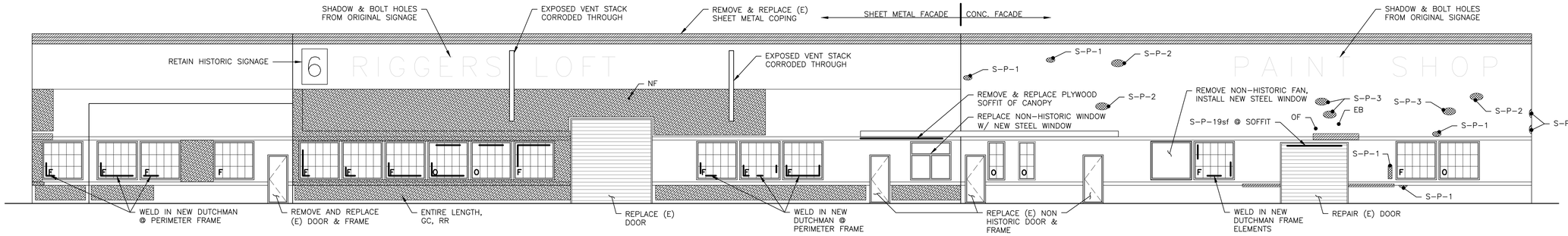
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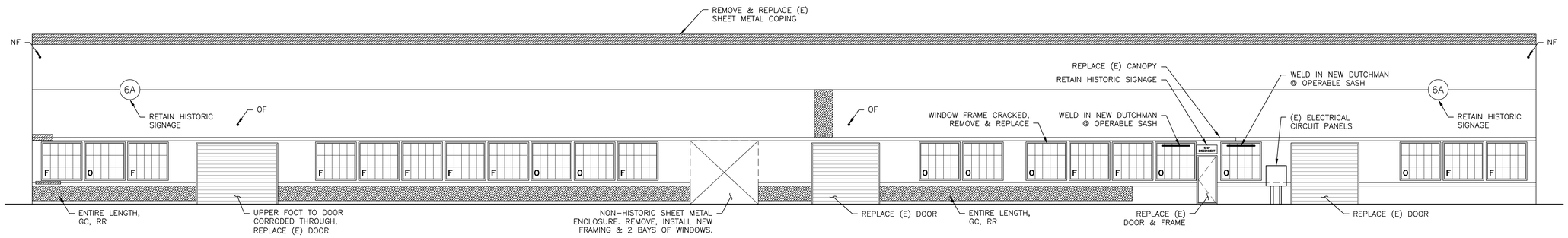
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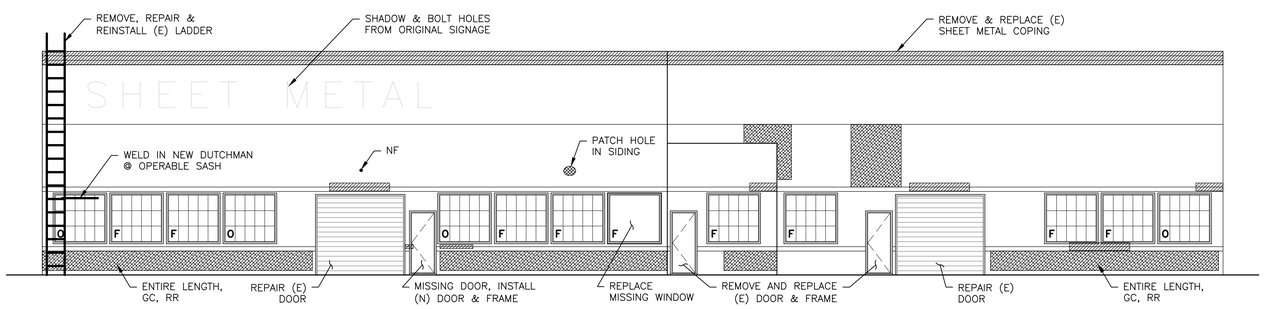
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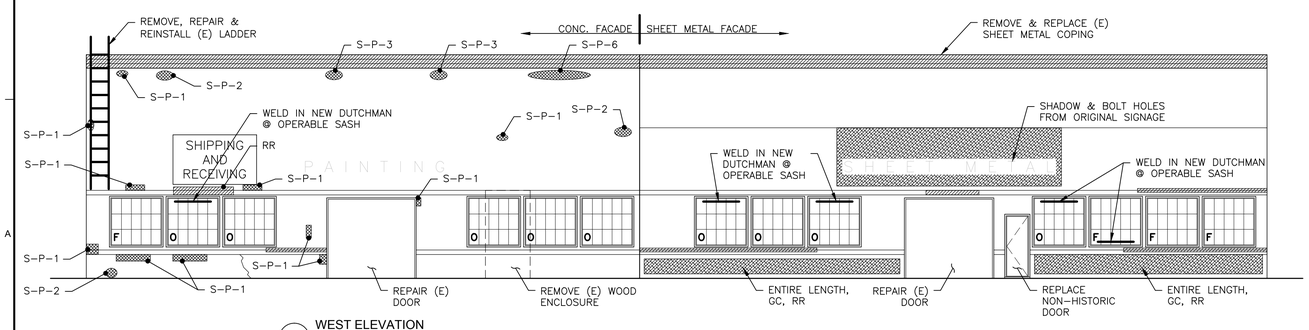
1 NORTH ELEVATION
SCALE: 1/8" = 1'-0"



2 SOUTH ELEVATION
SCALE: 1/8" = 1'-0"



3 EAST ELEVATION
SCALE: 1/8" = 1'-0"



4 WEST ELEVATION
SCALE: 1/8" = 1'-0"

Facade Repair Legend

General Format: Condition Symbol / Repair Symbol / Quantity Symbol

Condition Symbol		Treatment Symbol		Quantity Symbols		
Concrete						
S	Spall at Concrete Areas	**P**	Install mortar patch.	#	Sq. Ft	
C	Crack	**RP**	Rout & Patch w/ Mortar.	#	Length (ft)	
		LPI	Low pressure epoxy injection	#	Length (ft)	
		EPA	Epoxy pin anchor.	#	Length (ft)	
		HPI	High pressure epoxy injection	#	Length (ft)	
EB	Efflorescence, Biological Growth or Paint Haze	**CL**	Clean affected surface.			
Windows & Doors		**RTM**	Replace to match original.	#	Units	
F	Fixed sash	**RR**	Remove and replace.	#	Units	
O	Operable sash	**RTM**	Replace to match original.	#	Units	
		RR	Remove and replace.	#	Units	
▬	Corroded frame	**RCW**	Remove corroded segment of frame and weld in new matching segment.			
Sheet Metal						
▩	Deteriorated corrugated siding	RR	Remove and replace.			
▨	Sheet metal components.	RR	Remove and replace.			
Fixtures		**RF**	Restore fixture.			
OF	Original fixture	RTM	Replace to match original.			
NF	New fixture	**RFC**	Remove fixture and conduit.			
		RR	Remove and replace w/ compatible fixture.			

Notes:
1. Multiple repair and quantity symbols can be used for a single noted condition.
2. "1-" indicates less than 1 unit of quantity.

Notes:
1. All replacement windows to match original.
2. all replacement pedestrian doors to match original located at South Office Entry.

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

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Scale	As Noted

EXTERIOR ELEVATIONS

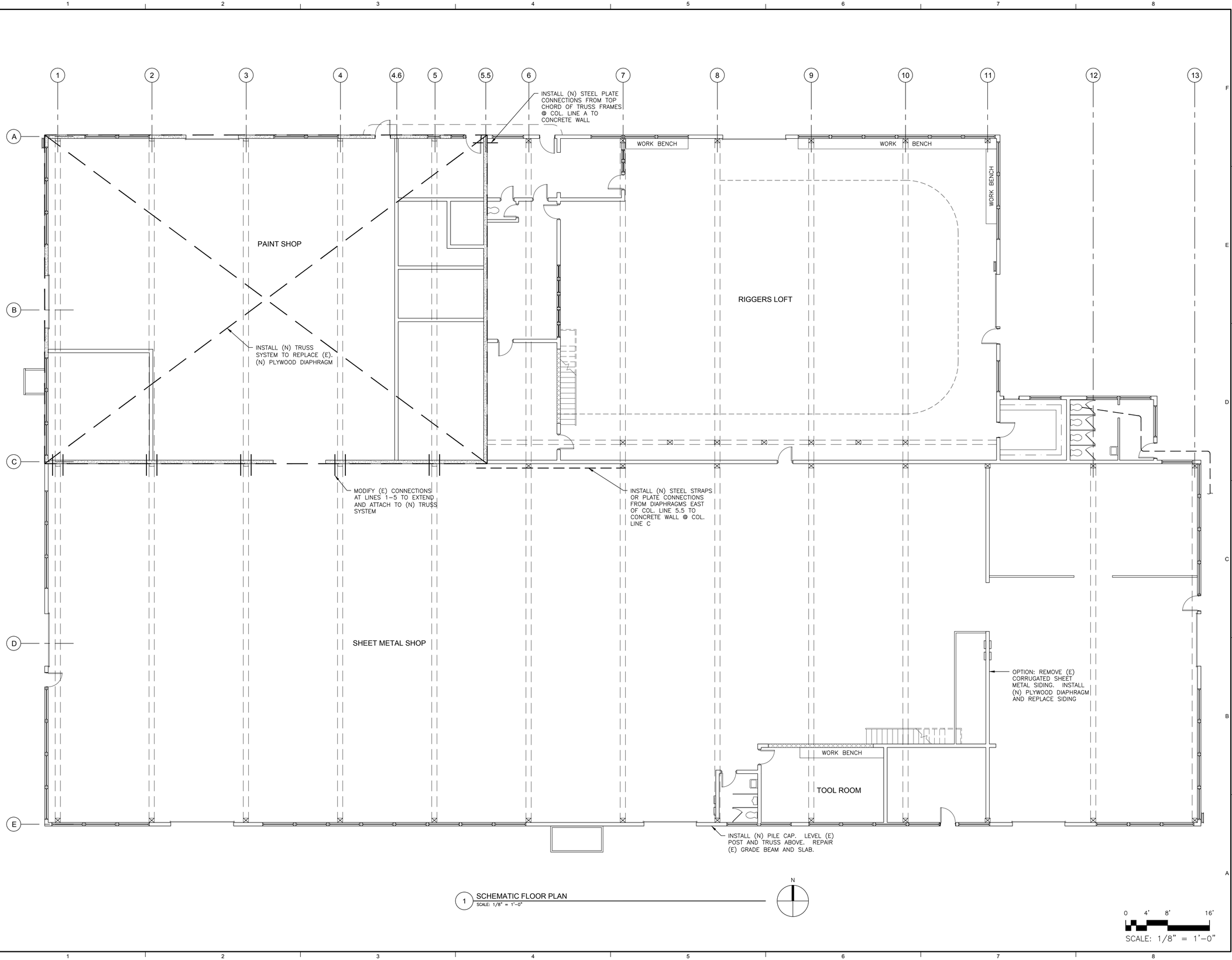
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1 SCHEMATIC FLOOR PLAN
SCALE: 1/8" = 1'-0"

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Consultants

Project

Riggers Loft and SD for Rehab
Richmond, CA

Client

City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Mark	Date	Description

Project No.	2009.3054
Date	Feb. 19, 2010
Drawn	SJF
Checked	DHE
Scale	As Noted

SCHEMATIC DESIGN

Sheet Title

Sheet No. **S101**

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

APPENDIX B (Provided on CD only)
Class "C" Cost Estimate

RIGGERS LOFT
RICHMOND SHIPYARD #3
HISTORIC STRUCTURE REPORT
Richmond, California

Opinion of Probable Construction Cost
Class "C" Cost Estimate

Prepared for : Wiss, Janney, Elstner Associates, Inc.

March 22, 2010

by:

DTA **DON TODD ASSOCIATES, INC.**
Project and Construction Management Services
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RIGGERS LOFT
RICHMOND SHIPYARD #3
HISTORIC STRUCTURE REPORT
Richmond, California

EXECUTIVE SUMMARY

Introduction:

This Class "C" Cost Estimate represents the probable construction cost of the Riggers Loft, Richmond Shipyard #3, Historic Structure Report, Richmond, California. Allowances have been made when detail description of equipment, work definition, or quantities are not available. Material pricing and labor costs are obtained from historical data and similar projects. The unit costs include material, labor, and subcontractor's markup, and are based on the design level of documents received.

Documents Received as a Basis of Cost Estimate:

The following documentation was used in preparation of this estimate:
- Draft Historic Structure Report dated February 19, 2010.

Exclusions:

The following items are excluded:
- Change Order Contingency
- Cost of money
- Hazardous Material Abatement & Disposal
- Professional Consultants' and Construction Management fees
- Administrative costs
- Land costs
- Fees for testing construction materials
- Plan checks and inspection
- Permits
- Off-site utilities
- Legal and financing costs
- Contractor off-hours and compressed-time work schedule, if required
- Construction phasing
- Furnishings, furniture, and equipment
- Relocation costs, if required

Possible Additional Cost Items:

Items that may change the Estimate of Probable Construction Cost include, but are not limited to, the following:

- Modifications to the scope of work, drawings, specifications included in this estimate
- Unforeseen conditions
- Construction phasing requirements
- Excessive contract and general conditions, and restrictive technical specifications
- Equipment, material, systems or product that cannot be obtained from at least three different sources

- Delays beyond the projected schedule
- Any other non-competitive bid situations
- Any addenda, changes not included in the basis of estimates.

Escalation:

Escalation is included in the estimate @ the rate of 3.0% per annum, assumed midpoint of construction of 12 months from March 31, 2010.

ESTIMATING ASSUMPTIONS AND COMMENTS

General:

a. Scope of work based on the Historic Structure Report
b. Quantities were obtained as shown on the drawings.
c. Material prices are at 1st Quarter 2010 levels; include taxes and contractor's markups.
d. This estimate can vary due to change in scope.
e. Installation cost, supervision, and coordination for material and equipment are included in the estimate.
f. General conditions include insurance, office personnel costs, dust control, construction safety and occupational health, site maintenance and protection, temporary facilities & control not mentioned in General requirements and extensive field engineering.
g. Design Contingency of 20% is included in the cost estimate due to the level of information available.

ESTIMATE OF PROBABLE CONSTRUCTION COST

The estimated Probable Construction Costs reflects the anticipated cost of the **Riggers Loft, Richmond Shipyard #3 Historic Structure Report, Richmond, CA.** This estimate is based on a competitive open bid process.

Cost of materials, labor, equipment or services furnished by others, and the contractors' or vendors' methods of determining prices are determined by market and/or economic conditions. Hence, the Estimator cannot and does not guarantee that proposals, bids or actual project costs will not vary from this Estimate of Probable Construction Cost.

This Estimate of Probable Construction Cost is exclusive of all costs associated with changes, modifications or addenda to the drawings and/or specifications subsequent to the preparation of this estimate.

DON TODD ASSOCIATES, INC.
Project & Construction Management Services
1000 Broadway, Suite 610, Oakland, CA 94607
Telephone: (510) 251-1007 - Fax: (510) 251-1008

PROJECT: RIGGERS LOFT
RICHMOND SHIPYARD #3

LOCATION: Richmond, CA

DESCRIPTION OF WORK:	Type of Estimate:	Date:	22-Mar-10
Structural Repair of (E) Shipyard	Class C	Revision:	10-140
		Estimator:	EEV/ARB

SUMMARY OF PROBABLE CONSTRUCTION COST

DIVISION	DESCRIPTION		AMOUNT	%
1	GENERAL REQUIREMENTS		$ 14,200	1.25%
2	SITEWORK		$ 155,567	13.74%
3	CONCRETE		$ 28,050	2.48%
4	MASONRY		$ -	0.00%
5	METALS		$ 18,150	1.60%
6	WOOD & PLASTICS		$ 132,009	11.66%
7	THERMAL & MOISTURE PROTECTION		$ 246,396	21.76%
8	DOORS & WINDOWS		$ 216,780	19.15%
9	FINISHES		$ 300,063	26.50%
10	SPECIALTIES		$ 1,000	0.09%
11	EQUIPMENT		$ -	0.00%
12	FURNISHINGS		$ -	0.00%
13	SPECIAL CONSTRUCTIONS		$ -	0.00%
14	CONVEYING SYSTEMS		$ -	0.00%
15	MECHANICAL		$ 10,000	0.88%
16	ELECTRICAL		$ 10,000	0.88%
	SUBTOTAL - DIRECT CONSTRUCTION COSTS		$ 1,132,215	100.00%
	Published Location Factor (Estimate priced to SF)	0%	$ -	
	Remoteness Factor (Project is in urban constr. market)	0%	$ -	
	Federal Wage Rate Factor (60% Labor)	6%	$ 40,760	
	Design Contingency	20%	$ 226,443	
	TOTAL - DIRECT CONSTRUCTION COSTS		$ 1,399,418	
	Standard General Conditions	15%	$ 209,913	
	Government General Conditions	5%	$ 69,971	
	Historic Preservation Factor	10%	$ 139,942	
	SUBTOTAL - NET CONSTRUCTION COSTS		$ 1,819,243	
	Overhead	10%	$ 181,924	
	Profit	10%	$ 181,924	
	ESTIMATED NET CONSTRUCTION COSTS		$ 2,183,092	
	Contracting Method Adjustment	5%	$ 109,155	
	Escalation @ 3% per annum; midpoint of construction is 12 months from march 31, 2010	3%	$ 65,493	
	TOTAL ESTIMATED NET CONSTRUCTION COSTS		$ 2,357,739	
	OPTION - REMOVE/REPLACE CORRUGATED METAL SIDING		$ 41,726	

Estimate of Probable Construction Cost

RIGGERS LOFT				Estimate Type:	Class C
RICHMOND SHIPYARD #3				DTA Job Number:	10-140
Richmond, CA				Date:	3/22/2010
	BUILDING FOOTPRINT: 27,140	SF		Revised:	
Don Todd Associates	TOTAL BLDG AREA : 27,140	SF		Estimator:	ARB

Div	Description	Qty	Unit	Cost	Extension	Total
Description:	Structural Repair of (E) Shipyard					
1	GENERAL REQUIREMENTS					
	Clean exterior concrete wall of efflorescence, biological growth or paint haze	3,600	SF	2.00	7,200	
	Jack wood column @ Line E/8 & shore temporarily, allow	1	LS	2,500	2,500	
	Shore trusses @ column lines C/7, E/8, & E/12, allow	1	LS	4,500	4,500	
	TOTAL - GENERAL REQUIREMENTS					$14,200
2	DEMOLITION					
	Remove (e) roll-up doors	7	EA	300.00	2,100	
	Remove (e) exterior pedestrian doors & frames, single	7	EA	150.00	1,050	
	Remove (e) exterior frame	1	EA	100.00	100	
	Remove non-historic window	2	EA	100.00	200	
	Remove cracked window frame segment	1,342	LF	10.00	13,420	
	Remove (e) sheet metal coping	560	LF	2.00	1,120	
	Remove deteriorated corrugated siding	1,550	SF	3.50	5,425	
	Remove concrete spall	71	SF	25.00	1,775	
	Remove (e) ladder	2	LOC	75.00	150	
	Remove (e) wood enclosure	90	SF	3.00	270	
	Remove (e) sheet metal enclosure	100	SF	3.00	300	
	Remove (e) built-up roofing membrane	27,140	SF	2.00	54,280	
	Remove (e) tongue & groove decking @ Paint Shop	5,084	SF	2.50	12,710	
	Remove (e) tongue & groove decking @ other locations	8,486	SF	2.50	21,215	
	Remove plywood soffit of (e) canopy @ north elevation	36	SF	2.50	90	
	Remove (e) canopy @ south elevation	24	SF	5.00	120	
	Remove truss system @ Paint shop	5,084	SF	3.00	15,252	
	Remove carpet in Riggers Loft Office Space	1,100	SF	2.00	2,200	
	Remove added enclosure in Sheet Metal Shop, allow	240	SF	5.00	1,200	
	Remove non-historic fan	1	EA	50.00	50	
	Disposal of waste materials	322	CY	70.00	22,540	
	TOTAL - DEMOLITION					$155,567
3	CONCRETE					
	Install (n) pile cap to realign grade beam & concrete floor slab	6	LF	500.00	3,000	
	Repair (e) grade beam & slab, allow	32	SF	100.00	3,200	
	Install mortar patch w/ reinforcements @ areas of concrete spalling	71	SF	150.00	10,650	
	Repair concrete cracks, allowance	1	LS	10,000	10,000	
	Level slab @ Sheet Metal shop where interior enclosure was remove, allow	240	SF	5.00	1,200	
	TOTAL - CONCRETE					$28,050
4	MASONRY					
	Not Used					
	TOTAL - MASONRY					$0

Estimate of Probable Construction Cost

RIGGERS LOFT
RICHMOND SHIPYARD #3
Richmond, CA

Estimate Type: Class C
DTA Job Number: 10-140
Date: 3/22/2010
Revised:
Estimator: ARB

BUILDING FOOTPRINT: 27,140 SF
TOTAL BLDG AREA : 27,140 SF

Don Todd Associates

Div	Description	Qty	Unit	Cost	Extension	Total
Description:	Structural Repair of (E) Shipyard					
5	METALS					
	Weld in (n) dutchman @ perimeter frame	107	LF	50.00	5,350	
	Install (n) steel plate connections from top chord of truss frames@ col. line A to concrete wall, allow	1	LOC	500.00	500	
	Fabricate & install missing plate in slab of Riggers Loft to match existing, allow 10% of Riggers Loft floor area	615	SF	20.00	12,300	
	TOTAL - METALS					$18,150
6	WOOD & PLASTICS					
	Install (n) truss system to replace (e) truss	5,084	SF	5.50	27,962	
	(N) Plywood diaphragm @ Paint Shop	5,084	SF	3.00	15,252	
	(N) 2x8 or 2x12 T&G decking to replace the decayed T&G	8,486	SF	7.50	63,645	
	Modify (e) connections @ Lines 1-5 & extend to (n) truss system	5	LOC	300.00	1,500	
	Repair broken portions of the roof trusses, use LVL	3	LOC	550.00	1,650	
	Replace 10 x 12 wood column @ 6/C, 10/C, & 11/C	3	LOC	1,500.00	4,500	
	Level (e) post & truss affected by construction of new pile cap, allow	1	LOC	1,000.00	1,000	
	Install (n) steel straps	30	LF	50.00	1,500	
	Repair decaying wood members, allowance	1	LS	10,000	10,000	
	Restore functionality of damaged drawers & other casework, allow	1	LS	5,000.00	5,000	
	TOTAL - WOOD & PLASTICS					$132,009
7	THERMAL & MOISTURE PROTECTION					
	(N) Corrugated metal siding	1,626	SF	10.00	16,260	
	(N) Roofing	27,140	SF	7.00	189,980	
	(N) Sheet metal coping	560	LF	30.00	16,800	
	Install enhanced primary & secondary drainage prior to installation of (n) roof to reduce ponding loads, allow	27,140	SFRoof	0.40	10,856	
	Repair parapet affected by roof replacement, allowance	1	LS	10,000	10,000	
	Caulking & sealant, allow	1	LS	2,500.00	2,500	
	TOTAL - THERMAL & MOISTURE PROTECTION					$246,396
8	DOORS & WINDOWS					
	(N) Single door, frame, & hardware	9	EA	2,030.00	18,270	
	(N) Roll-up door, 10'-0" x 9'-0"	2	EA	6,000.00	12,000	
	(N) Roll-up door, 12'-0" x 9'-0"	1	EA	6,500.00	6,500	
	(N) Roll-up door, 12'-0" x 12'-0"	1	EA	8,000.00	8,000	
	Repair (e) roll-up door, 10'-0" x 9'-0", allow	5	EA	3,000.00	15,000	
	Repair (e) interior doors & replace hardware, allow	25	EA	1,000.00	25,000	
	Install (n) steel window, 6'-0" x 5'-1"	5	EA	2,500.00	12,500	
	Replace sash of 6'-0" x 5'-1" fixed window	35	EA	1,100.00	38,500	
	Replace and match sash of 6'-0" x 5'-1" operable window	27	EA	1,220.00	32,940	
	Replace and match sash of 2'-6" x 5'-1" operable window	2	EA	550.00	1,100	
	(N) Window frame segment	1,342	LF	35.00	46,970	

Estimate of Probable Construction Cost

RIGGERS LOFT				Estimate Type:	Class C
RICHMOND SHIPYARD #3				DTA Job Number:	10-140
Richmond, CA				Date:	3/22/2010
	BUILDING FOOTPRINT: 27,140	SF		Revised:	
Don Todd Associates	TOTAL BLDG AREA : 27,140	SF		Estimator:	ARB

Div	Description	Qty	Unit	Cost	Extension	Total
Description:	Structural Repair of (E) Shipyard					
	TOTAL - DOORS & WINDOWS					$216,780
9	FINISHES					
	Repair walls of enclosed rooms w/in the Paint Shop that were damaged by roof collapse, allow	600	SF	15.00	9,000	
	Rebuild ancillary spaces in Paint Shop to match original configuration & materials, allow	2,000	SF	15.00	30,000	
	Replace rock lath & plaster ceiling o/ 2 x 10 framing @ Paint Shop	5,084	SF	20.00	101,680	
	Replace missing sections of ceiling track in Riggers Loft; match original materials, allow	1,535	SF	10.00	15,345	
	(N) Carpet in Riggers Loft Office Space	1,100	SF	6.00	6,600	
	Replace decayed floor finishes to match original, allow 20% of building area	5,000	SF	5.00	25,000	
	Painting					
	Interior walls & ceiling, allow	1	LS	30,000.00	30,000	
	Exterior walls	17,650	SF	2.00	35,300	
	(N) Walls	1,200	SF	2.00	2,400	
	(N) Plaster ceiling	5,084	SF	2.00	10,168	
	(N) Doors & Frames	9	EA	200.00	1,800	
	(N) & (E) Windows	69	EA	330.00	22,770	
	Repair work - interior walls	1	LS	10,000.00	10,000	
	TOTAL - FINISHES					$300,063
10	SPECIALTIES					
	Retain (e) historic signages, clean , allow	1	LS	1,000.00	1,000	
	TOTAL - SPECIALTIES					$1,000
15	MECHANICAL					
	Allowance for mechanical repair affected by structural work	1	LS	$ 2,500	2,500	
	Repair & replace damaged partitions	1	LS	$ 2,500	2,500	
	Install new basin sink to match original	1	LS	$ 5,000	5,000	
	TOTAL - MECHANICAL					$10,000
16	ELECTRICAL					
	Allowance for electrical repair affected by structural work	1	LS	$ 5,000	5,000	
	Remove conduit associated with contemporary security lighting	1	LS	$ 1,000	1,000	
	Seal where pipes and conduit to be retained	1	LS	$ 1,500	1,500	
	Repair, refurbish or replace as necessary original flood lights and exterior lighting fixtures	1	LS	$ 1,500	1,500	
	Remove & replace contemporary flood lights	2	loc	$ 500	1,000	
	TOTAL - ELECTRICAL					$10,000

Estimate of Probable Construction Cost

RIGGERS LOFT
RICHMOND SHIPYARD #3
Richmond, CA

Estimate Type: Class C
DTA Job Number: 10-140
Date: 3/22/2010
Revised:
Estimator: EEV/ARB

BUILDING FOOTPRINT: 27,140 SF
TOTAL BLDG AREA : 27,140 SF

Don Todd Associates

Div	Description	Qty	Unit	Cost	Extension	Total
Description:	Structural Repair of (E) Shipyard					
2	DEMOLITION					
	Remove (e) corrugated metal siding	925	SF	3.00	2,775	
	TOTAL - DEMOLITION					$2,775
6	WOOD & PLASTICS					
	(N) Plywood diaphragm	925	SF	5.00	4,625	
	TOTAL - WOOD & PLASTICS					$4,625
7	THERMAL & MOISTURE PROTECTION					
	(N) Wall siding	925	SF	10.00	9,250	
	TOTAL - THERMAL & MOISTURE PROTECTION					$9,250
9	FINISHES					
	Patch floor and ceiling, allow	1	LS	1,000.00	1,000	
	Painting					
	(N) Walls	925	SF	1.50	1,388	
	TOTAL - FINISHES					$2,388
16	ELECTRICAL					
	Relocate 2 eletrical panels, allow	1	LS	$ 1,000	1,000	
	TOTAL - ELECTRICAL					$1,000
	SUBTOTAL - DIRECT CONSTRUCTION COSTS					$ 20,038
	TOTAL WITH MARK-UPS	2.0824				$41,726

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

APPENDIX C (Provided on CD only)
Geotechnical Investigation Report

GEOTECHNICAL INVESTIGATION
RIGGERS LOFT
HISTORIC STRUCTURE REHABILITATION
Richmond, California

Mr. Alan Dreyfuss
Wiss Janney Elstner Associates, Inc.
Emeryville, California

8 March 2010
Project No. 5033.01

Treadwell&Rollo
Environmental & Geotechnical Consultants

Treadwell&Rollo

8 March 2010
Project No. 5033.01

Mr. Alan Dreyfuss
Wiss Janney Elstner Associates, Inc.
2000 Powell Street, Suite 1650
Emeryville, California 94608

Subject: Geotechnical Investigation
Riggers Loft Historic Structure Rehabilitation
Richmond, California

Dear Mr. Dreyfuss:

We are pleased to present our geotechnical investigation report for the rehabilitation of the Riggers Loft Historic structure in Richmond, California. Our services were provided in accordance with our proposal dated 29 October 2009. Copies have been distributed as indicated at the end of this report.

The site is located southeast of the southern terminus of Canal Boulevard and in Shipyard No. 3 of Richmond. The Riggers Loft structure is one of the six surviving original buildings of Shipyard No. 3 and is a contributing structure to the Richmond Shipyard No. 3 Historic District listed on the National Register of Historic Places, Richmond Shipyards California Historic Landmark and the Rosie the Riveter World War II/Home Front National Historical Park. While the Riggers Loft structure is considered to be in salvageable condition, it is endangered and suffers from progressive damage. Therefore, the City of Richmond is planning to rehabilitate and preserve the Riggers Loft building.

Subsurface information from our field investigation indicates the site is blanketed by fill consisting of clay and sandy clay with abundant gravel and cobbles that extends to a depth of about 10 to 13 feet below the ground surface (bgs). The fill is underlain by loose to medium dense sand with variable amounts of silt and gravel and stiff clay with variable amounts of sand, silt and gravel to 16 to 24 feet bgs. Bedrock, consisting of sandstone and shale, was encountered beneath 16 to 24 feet bgs, where explored.

We conclude from a geotechnical engineering standpoint, the Riggers Loft structure can be rehabilitated as proposed, provided the recommendations presented in this report are incorporated into the project plans and specifications, and are implemented during construction. We recommend annual foundation elevation surveys be performed to identify locations where damaged piles may exist; and additional test pits be excavated to evaluate the conditions of existing timber piles and the pile-grade beam connections. Where additional vertical support is needed beneath column locations, we recommend installing micropiles that gain support in the underlying bedrock. Additional lateral resistance or structural rigidity, if needed, can be accomplished by adding new grade beams or connecting the existing floor slab to the existing grade beams.

Our recommendations for existing and new foundations, seismic design, and other geotechnical aspects of the project are presented in this report. The recommendations are based on limited subsurface exploration and laboratory testing programs. Consequently, variations between expected and actual soil conditions may be found in localized areas during construction. Therefore, we should be engaged to review the results of the foundation elevation surveys, check grade beam excavations, check compaction of fill, and observe the installation of new micropile foundations, during which time we may make changes in our recommendations, if deemed necessary.

We appreciate the opportunity provide our services to you on this project. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Linda H.J. Liang
Geotechnical Engineer

50330101.OAK

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GEOTECHNICAL INVESTIGATION
RIGGERS LOFT
HISTORIC STRUCTURE REHABILITATION
Richmond, California

Mr. Alan Dreyfuss
Wiss Janney Elstner Associates, Inc.
Emeryville, California

8 March 2010
Project No. 5033.01

Treadwell&Rollo
Environmental & Geotechnical Consultants

Treadwell&Rollo

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DISTRIBUTION

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Treadwell&Rollo

GEOTECHNICAL INVESTIGATION
RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
Richmond, California

1.0 INTRODUCTION

This report presents the results of the geotechnical investigation performed by Treadwell & Rollo, Inc. for the rehabilitation of the Riggers Loft historic structure in Shipyard No. 3 in Richmond, California. Our services were performed in accordance with our proposal dated 29 October 2009.

The Riggers Loft structure is located southeast of the southern terminus of Canal Boulevard and in Shipyard No. 3 of Richmond, as shown on the Site Location Map, Figure 1. The Riggers Loft structure is one of the six surviving original buildings of Shipyard No. 3 and is a contributing structure to the Richmond Shipyard No. 3 Historic District listed on the National Register of Historic Places, Richmond Shipyards California Historic Landmark and the Rosie the Riveter World War II/Home Front National Historical Park.

The Riggers Loft building is roughly rectangular in shape with a notch in the northeast corner and has plan dimensions of about 130 feet by 220 feet, as shown on the Site Plan, Figure 2. The structure is a single-level wood-frame structure with corrugated iron and steel sash exterior, except for the paint shop, which has reinforced concrete walls. According to the Structural Engineer, Wiss Janney Elstner Associates (WJE), the building is supported on timber piles that are tied together by a perimeter grade beam and an interior grade beam. Available document provided by the City of Richmond indicate the timber piles are creosoted. WJE estimated existing interior column loads to be on the order of 30 kips and exterior column loads to be on the order of 15 kips for dead plus live loads.

While the building is considered to be in salvageable condition, it is endangered and suffers from progressive damage. Damage includes broken trusses at the southeast corner caused by the weight of rain water collecting on the roof because of a backed up roof drain, broken trusses or trusses exhibiting deflections, localized wood decay in the roof deck, columns, and framing with active leaks, and differential foundation settlement.

2.0 SCOPE OF SERVICES

Our scope of services, presented in our proposal dated 29 October 2009, consisted of exploring the subsurface conditions at the site and performing engineering analyses to develop conclusions and recommendations regarding:

- soil and groundwater conditions at the site
- site seismicity and seismic hazards, including the potential for liquefaction and liquefaction-induced settlement
- cause of observed building settlements
- design capacities for the existing pile foundations, including vertical (compression and uplift) and lateral capacities
- the most appropriate foundation type(s) for new structural elements
- design criteria for the new foundations, including vertical (compression and uplift) and lateral capacities
- estimates of total and differential settlement under the anticipated foundation loads
- criteria for fill placement and compaction, if needed
- 2007 California Building Code (CBC) soil profile type and design seismic parameters
- construction considerations.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

Prior to performing our field investigation, we obtained a drilling permit from Contra Costa Environmental Health, notified Underground Service Alert, and retained a private underground utility locating service to check that locations of exploratory points were clear of existing utilities.

Subsurface conditions were explored by drilling one boring, designated B-1, and advancing three cone penetration tests (CPTs), designated CPT-1 through CPT-3. The condition of the pile head and grade beam near a damaged truss along the south exterior wall was explored by excavating one test pit, designated TP-1. The approximate locations of the boring, CPTs, and test pit are presented on Figure 2. Details of our field investigation are described in the remainder of this section.

3.1 Boring

On 8 January 2010, we drilled boring B-1 to a depth of 50 feet below the ground surface (bgs) using a truck-mounted rotary wash drill rig. Drilling was performed by Pitcher Drilling Company of Palo Alto under the direction of our field engineer. During drilling, our field engineer logged the boring and obtained representative samples of the soil and rock encountered for classification. The boring log is presented in Appendix A on Figure A-1. The soil and rock encountered in the boring were classified in accordance with the soil and rock classification systems presented on Figures A-2 and A-3.

Soil samples were obtained using the following samplers:

- Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside and 1.5-inch inside diameter, without liners
- Sprague & Henwood (S&H) split-barrel sampler with a 3.0-inch outside diameter and 2.5-inch inside diameter, lined with 2.43-inch inside diameter brass tubes.

The sampler types were chosen on the basis of soil type being sampled and desired sample quality for laboratory testing. In general, the S&H sampler was used to obtain samples in medium stiff to very stiff cohesive soil and the SPT sampler was used to evaluate the relative density of sandy soil.

The SPT and S&H samplers were driven with a 140-pound, above-ground, automatic safety hammer falling about 30 inches. The samplers were driven up to 18 inches and the hammer blows required to drive the samplers every six inches of penetration were recorded and are presented on the boring log. A “blow count” is defined as the number of hammer blows per six inches of penetration or 50 blows for six inches or less of penetration. The blow counts required to drive the S&H and SPT samplers were converted to approximate SPT N-values using factors of 0.7 and 1.2, respectively, to account for sampler type and hammer energy and are shown on the boring logs. The blow counts used for this conversion were: 1) the last two blow counts if the sampler was driven more than 12 inches, 2) the last one blow count if the sampler was driven more than six inches but less than 12 inches, and 3) the only blow count if the sampler was driven six inches or less.

Upon completion, the borehole was backfilled with cement grout under the observation of Contra Costa Environmental Health grout inspector. Soil cuttings and drilling fluid generated from drilling were placed in drums and stored on site. The drum contents were tested for the presence of hazardous materials and subsequently disposed of at an off-site facility.

3.2 Test Pit

Test pit TP-1 was excavated by Pioneer Builders of San Francisco on 8 January 2010. The test pit was located at the south side of the building at the approximate location of a damaged truss, as shown of Figure 2. The test pit was about 4.6 feet by 4.6 feet in plan dimensions and extended to about 2.9 feet bgs. A decayed timber pile head was encountered beneath the perimeter grade beam at the northern limit of the test pit. Portions of the decayed timber were removed to investigate the width of the perimeter grade beam, the timber pile diameter, and height of timber pile embedded into the pile cap.

Our field engineer logged the soil encountered and measured the dimensions of the exposed portions of the grade beam and timber pile. A log of test pit TP-1 is presented in Appendix A on Figure A-4. The materials encountered are classified according to the soil classification system described on Figure A-2. Upon completion, the test pit was backfilled with soil that was previously excavated from the test pit.

3.3 Cone Penetration Tests

Three CPTs were performed by California Push Technologies, Inc. of Menlo Park on 22 January 2010 to provide in-situ soil data. The CPTs were pre-probed to 5, 10, and 12 feet bgs for CPT-1, CPT-2, and CPT-3, respectively, to advance through the gravel and cobble fill at the site. Subsequently, the CPTs were advanced to refusal at 10, 18, and 19 feet bgs for CPT-1, CPT-2, and CPT-3, respectively. At CPT-1, after the CPT probe encountered refusal at 10 feet bgs, a Geoprobe DT22 tooling was used to advance from 10 to 16 feet bgs; the Geoprobe encountered refusal in bedrock at 16 feet bgs. The CPT logs, showing tip resistance and friction ratio by depth, as well as interpreted SPT N-values and an interpreted soil classification are presented in Appendix B.

The CPTs were performed by hydraulically pushing a 1.4-inch-diameter, cone-tipped probe with a projected area of 10 square centimeters into the ground. The cone tip measures tip resistance and the friction sleeve behind the cone tip measures frictional resistance. These data were continuously measured for the entire depth advanced and recorded by a computer while the tests were conducted. Accumulated data were then processed by computer to provide engineering information such as the types and approximate strength characteristics of the soil encountered. Upon completion, all CPT holes were backfilled with cement grout under the observation of Contra Costa Environmental Health grout inspector.

3.4 Laboratory Testing

We re-examined the soil samples obtained from our boring to confirm the field classifications. Due to the low recovery of the soil samples and the abundant cobble and rock fragments in the recovered soil samples, we were not able to select representative samples for laboratory testing.

4.0 SUBSURFACE CONDITIONS

Subsurface information from our field investigation indicates the site is blanketed by fill consisting of clay and sandy clay with abundant gravel and cobbles. Metal and plastic debris was also encountered in the fill in our test pit. The bottom of the fill is about 10 to 13 feet bgs, where explored. The fill is underlain by loose to medium dense sand with variable amounts of silt and gravel and stiff clay with variable amounts of sand, silt and gravel to depths of 16 to 24 feet bgs. Bedrock, consisting of sandstone and shale, was encountered at depths below 16 to 24 feet bgs, where explored. The top of bedrock is about 16 feet bgs at the north side of the building, at the location of CPT-1. The top of bedrock is about 24 feet bgs at the south side of the building, at the location of boring B-1. The bedrock encountered in boring B-1 is generally low hardness, friable to weak, and deeply weathered.

Groundwater level in the borehole was obscured by the drilling method. Due to the close proximity of the site to the San Francisco Bay (Bay), we anticipate the groundwater level at the site to be similar to the water level at the Bay. Considering the site is at about Elevation 6 feet (Mean Lower Low Water), we estimate the groundwater level to be about six feet bgs. We anticipate the groundwater level to fluctuate on the order of several feet as a result of tidal fluctuation in the Bay.

5.0 REGIONAL SEISMICITY AND FAULTING

The major active faults in the area are the Hayward, San Andreas, San Gregorio, and Calaveras Faults. These and other faults of the region are shown on Figure 3. For each of the active faults, the distance from the site and estimated mean characteristic Moment magnitude1 [2007 Working Group on California Earthquake Probabilities (WGCEP) (2007) and Cao et al. (2003)] are summarized in Table 1.

[1] Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 1
Regional Faults and Seismicity

Fault Segment	Approx. Distance from fault (km)	Direction from Site	Mean Characteristic Moment Magnitude
Hayward-Rodgers Creek - NH	6	Northeast	6.5
Hayward-Rodgers Creek - NH+RC	6	Northeast	7.1
Hayward-Rodgers Creek - SH+NH	6	Northeast	6.9
Hayward-Rodgers Creek - SH+NH+RC	6	Northeast	7.3
Hayward-Rodgers Creek - SH	16	East	6.7
Hayward-Rodgers Creek - RC	21	North	7.0
San Andreas - 1906 Rupture (SAS+SAP+SAN+SAO)	23	West	7.9
San Andreas - floating	23	West	
San Andreas - SAN	23	West	7.5
San Andreas - SAN+SAO	23	West	7.7
San Andreas - SAP+SAN+SAO	23	West	7.8
San Andreas - SAS+SAP+SAN	23	West	7.8
San Andreas - Peninsula (SAP)	23	Southwest	7.2
San Andreas - SAS+SAP	23	Southwest	7.4
San Gregorio - SGN	27	Southwest	7.2
San Gregorio - SGS+SGN	27	Southwest	7.4
Mt Diablo - MTD	29	East	6.7
Concord/GV - CON	29	East	6.3
Concord/GV - CON+GVS	29	East	6.6
Concord/GV - CON+GVS+GVN	29	East	6.7
Concord/GV - GVS	29	East	6.2
Concord/GV - GVS+GVN	29	East	6.2
West Napa	31	Northeast	6.5
Calaveras - CC+CN	33	East	6.9
Calaveras - CN	33	East	6.8
Calaveras - CS+CC+CN	33	East	6.9
Point Reyes	41	West	6.8
Concord/GV - GVN	44	Northeast	6.0
Greenville - GN	47	East	6.7
Greenville - GS+GN	47	East	6.9
Great Valley 6	52	East	6.7
Monte Vista-Shannon	53	South	6.8
Great Valley 5	57	East	6.5
Great Valley 4	60	Northeast	6.6
Hunting Creek-Berryessa	63	North	6.9
Hayward - South East Extension	64	Southeast	6.4
Greenville - GS	66	East	6.6

Fault Segment	Approx. Distance from fault (km)	Direction from Site	Mean Characteristic Moment Magnitude
Calaveras - CC	71	Southeast	6.2
Calaveras - CS+CC	71	Southeast	6.4
Great Valley 7	76	East	6.7
Maacama-Garberville	80	North	7.5
San Andreas - Santa Cruz Mnts. (SAS)	87	Southeast	7.0
Great Valley 3	91	Northeast	6.8
Sargent	93	Southeast	6.8
Zayante-Vergeles	97	Southeast	6.8

Figure 3 also shows the earthquake epicenters for events with magnitude greater than 5.0 from January 1800 through December 2000. Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale (Figure 4) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, Mw, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to a Mw of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), a Mw of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989, in the Santa Cruz Mountains with a Mw of 6.9, approximately 106 km from the site.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably a M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake (M_w = 6.2).

The 2007 WGCEP at the U.S. Geologic Survey (USGS) predicted a 63 percent chance of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area in 30 years. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

TABLE 2
WGCEP (2007) Estimates of 30-Year Probability of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	31
N. San Andreas	21
Calaveras	7
San Gregorio	6
Concord-Green Valley	3
Greenville	3
Mount Diablo Thrust	1

6.0 DISCUSSION AND CONCLUSIONS

Our discussion and conclusions regarding seismic hazards, structural damage, foundation capacity, settlement, and other geotechnical aspects of this project are presented in this section.

6.1 Seismic Hazards

During a major earthquake on one of the nearby faults, strong to very strong shaking is expected to occur at the site. Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zone Act, and no known active or potentially active faults exist on the site. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure at the site is very low.

During a major earthquake on a segment of one of the nearby faults, strong to very strong shaking is expected to occur at the site. Strong shaking during an earthquake can result in ground failure such as

that associated with soil liquefaction[2], lateral spreading[3], and differential compaction[4]. We used the results of the boring and CPTs to evaluate the potential of these phenomena occurring at the site.

Saturated, loose to medium dense sand and silty sand were encountered in boring B-1 and CPT-2 and CPT-3 at depths between 11 and 17 feet bgs. Our engineering analyses indicate the saturated layers of sand and silty sand will liquefy during a strong earthquake. We estimate earthquake-induced settlement resulting from post-liquefaction reconsolidation will be on the order of 1 to 2 inches. Furthermore, the potentially liquefiable soil layer is continuous and we conclude that the site may susceptible to lateral spreading. The potential for lateral spreading to occur at the site is dependent upon several factors, some of which are beyond the scope of this investigation. This investigation has concluded that the site is underlain by a layer of sand and silty sand that is continuous and potentially susceptible to soil liquefaction during a large earthquake. Information that is beyond the scope of this study is the design and construction of the existing seawall located at the face of the wharf adjacent to the Riggers Loft site, and the capability of the existing seawall to restrain the lateral movement of liquefied soil. Further evaluation of the existing seawall will be necessary in order to determine if the Riggers Loft structure will be adversely affected by ground displacements associated with lateral spreading.

6.2 Existing Foundations

The existing foundation system for Riggers Loft building consists of a perimeter grade beam and an interior grade beam bearing on driven timber piles. The portion of grade beam exposed in test pit TP-1 is about 24 inches wide, 14 inches deep, and is embedded about 10 inches below the adjacent exterior ground surface. The timber pile remnant exposed in TP-1 was about 12 inches in diameter and was embedded about six inches into the perimeter grade beam, as shown on Figure A-4 in Appendix A.

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[2] Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

[3] Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

[4] Differential compaction is a phenomenon in which non-saturated, cohesionless soil is densified by earthquake vibrations, causing differential settlement.

6.3 Structural Damage

We excavated one test pit near the location of a damaged truss at the south exterior wall of the structure to evaluate the condition of the foundation system. Along the south side of the building, we observed two cracks on the grade beam approximately 60 and 112 feet west of the southeast corner of the building, which corresponds to 36 feet east and 18 feet west of the test pit TP-1, respectively. We also observed differential settlement of the grade beam. At distances of 60, 76, 94, and 112 feet west from the southeast corner of the structure, we measured relative differences in elevation of the grade beam of 0, 7, 9, and 1 inch, respectively. More specifically, the grade beam appears to have settled about nine inches near test pit TP-1, which coincides with the location of the damaged truss.

The timber pile remnant exposed in TP-1 was 12 inches in diameter and embedded about six inches into the concrete grade beam. The upper 28 inches of this timber pile was completely decayed We also observed several pipelines that entered the building near location of the damaged truss. Although available drawings describe “creosoted timber piles”, we conclude that the creosote wood-treatment was not able to protect the upper portion of the pile from damage associated with wood decay. Consequently, the damaged timber pile was not capable of transferring building loads to competent soil and rock that underlie the site, which in turn, resulted in about nine inches of grade beam settlement and localized damage to the building truss.

Based on the condition of timber pile observed in the test pit, we conclude that other piles beneath the structure may also be susceptible to wood decay. Therefore, ongoing monitoring and repairs may be necessary to reduce the potential for future building damage.

7.0 RECOMMENDATIONS

Our recommendations regarding proposed building monitoring and repairs are presented in this section.

7.1 Foundation Elevation Surveys and Test Pits

To further investigate the conditions of pile heads and pile-grade beam connections, we recommend additional test pits be excavated at approximately five percent of the existing column locations. In addition, we recommend annual foundation elevation surveys be performed to monitor existing and future settlement of the building. The purpose of the proposed additional test pits is to expose and examine the general condition of the existing timber pile foundations and the connections to the grade

beams and pile caps. The proposed foundation elevation surveys should be performed by establishing monitoring points at grade beam and column locations, and monitoring these points for vertical movement. Where settlement of the grade beams or columns are measured, we recommend performing additional foundation studies by excavating test pits at these locations to expose the condition of the underlying timber piles and investigate the cause of settlement. Where appropriate, we recommend additional foundation elements be installed to mitigate further settlement and to restore vertical and lateral support, as necessary. Appropriate foundations for support of the building are presented in Section 7.2.

7.2 Existing Foundations

We anticipate the entire structure is supported on driven 12-inch-diameter timber piles. Considering bedrock is relatively shallow at the site, we conclude the timber piles likely gain support through end-bearing in bedrock. We estimate the allowable design compressive load for 12-inch-diameter timber piles driven into bedrock to be on the order of 50 kips for dead plus live loads; this value includes a factor of safety of at least 3.0. For total load conditions, the allowable design compressive load may be increased by 1/3. We recommend that the timber piles should not be used to resist uplift loads because the connection of the timber piles to the existing grade beams do not appear to be capable of transferring axial tension loads.

Resistance to lateral loads can be evaluated using passive pressure acting on the embedded vertical faces of the grade beams. Passive resistance can be calculated using a uniform pressure (rectangular distribution) of 650 pounds per square feet (psf) in fill. Passive resistance at the upper foot of finish grade should be neglected unless the adjacent ground surface is covered by a floor slab or pavement.

7.3 New Foundations

7.3.1 Grade Beams

As discussed in Section 6.1, the building site may be susceptible to lateral spreading following a major earthquake. The magnitude of lateral ground deformation is dependent on the design and construction of the adjacent seawall. Should the adjacent seawall fail to resist lateral spreading at the wharf, we anticipate the soil beneath the Riggers Loft structure would spread several feet and adversely impact the existing building. However, if the seawall is designed and constructed to resist lateral spreading, we estimate that lateral ground movement could be limited to several inches. Therefore, we recommend

that the existing seawall be evaluated to determine if it is capable resisting lateral earth pressures associated with the potentially liquefiable soil at the Riggers Loft site. Also, we recommend the foundation elements of the building be tied together by adding structural elements, such as grade beams or structural connections to the concrete floor slab to reduce the potential for lateral separation of foundations that support existing columns.

New grade beams can also be used to resist lateral building loads. We recommend new grade beams that are not supported on piles be designed using the recommendations provided for the existing grade beams in Section 7.2 and friction along the bases of the grade beams using a base friction coefficient of 0.35 between grade beams and fill. These values include a factor of safety of at least 1.5.

The proposed excavations for new grade beams should be free of standing water, debris, and disturbed materials prior to placing concrete. The bottoms and sides of excavations should be maintained in a moist condition until concrete is placed. We should check foundation excavations prior to placement of reinforcing steel to confirm suitable bearing material is present.

7.3.2 Micropiles

We conclude micropiles are the most appropriate foundation system to restore vertical support to existing building columns that are underlain by damaged timber piles. As previously discussed, remnants of a decayed timber pile were observed in test pit TP-1 and ongoing settlement monitoring program and additional test pits are recommended in Section 7.1 to characterize the general condition of the timber piles and detect locations where additional decayed timber piles may be present. Where supplemental vertical support is needed, we recommend using micropiles that gain support through skin friction in the underlying bedrock. Micropiles typically consist of threaded steel bars (Dywidag bars), placed within 6- to 12-inch-diameter drilled shafts that are backfilled with high-strength cement grouted under high pressures. Because the shafts are grouted under pressure, relatively high skin friction can usually be obtained between the micropiles and the surrounding bedrock.

The micropiles should be spaced at least three shaft diameters or four feet apart, center-to-center, whichever is greater. Industry publications list a wide range for transfer loads for different soil types. These transfer loads are dependent on site-specific soil characteristics, groundwater conditions, and the contractor's method(s) and skill of installation. Therefore, it is not possible to give specific recommendations for micropile capacities. For planning purposes, we recommend using an ultimate

transfer load of 12 kips per foot for a 10-inch-diameter, pressure-grouted micropile. Micropiles can be used to support dead plus live loads and total loads (including wind and seismic); however, the ultimate transfer load should be reduced by a factor of safety of at least 2.0 and 1.5, respectively, when determining the allowable transfer loads. Vertical support from skin friction in the soil above the rock should be ignored. The specialty contractor should determine the actual transfer load (which may be less), and may use higher transfer loads provided they are verified by a load-test program.

The micropiles will be installed below the water table; therefore, the contractor should be prepared to use an auger-cast system or to case the holes if caving soil is encountered. Poor construction techniques (i.e., allowing the drilled holes to fill with water for several days) may result in softening of the sides of shaft and low micropile capacities. If water is present in the shaft, concrete should be placed using a tremie system. Because the micropiles will be permanent, we recommend they be double corrosion protected.

The required micropile bond length should be confirmed by a performance- and proof-test program conducted under the observation of an engineer from Treadwell & Rollo. We recommend 10 percent of the micropiles be performance-tested to 150 percent of the design seismic load. At least 25 percent of the remaining micropiles or at least one micropile per cap, whichever is greater, should be proof-tested to 125 percent of the design seismic load. If the micropiles will be used to support both compressive and uplift loads, we recommend one-third be tested in compression and two-thirds in tension.

During testing, the deflection of each micropile should be monitored with a free-standing, tripod-mounted dial gauge accurate to at least 0.001 inches. We recommend deflection of the micropiles be measured at the following load increments during the performance test, in sequence: 50, 75, 100, 125, 150, 100, 50, and 10 percent of the design load. For the 125-percent proof test, the 150-percent load increment can be omitted. The maximum test load should be held for a minimum of 10 minutes, with readings taken at 0, 1, 3, 6, and 10 minutes. If the difference between the 1- and 10-minute readings is more than 0.08 inches, the load should be held for an additional 50 minutes, with additional readings taken at 15, 20, 30, 45 and 60 minutes. If the deflection is more than 0.08 inches between the 10- and 60-minute readings or the total deflection is greater than 3/4 inch at the design load, the design load should be re-evaluated. Replacement micropiles should be provided, as directed by the structural engineer, for micropiles that fail the test. After testing, the micropiles should be loaded to 10 percent of the design load (higher if specified by the structural engineer) and locked off. The additional compression loading from the locked-off micropiles should be considered in the design of the foundations.

7.4 Subgrade Preparation and Fill Placement

Where fill or backfill placement is required, the base of the excavation should be scarified to a depth of at least six inches, moisture-conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction.[5]

Excavations should be backfilled with properly compacted fill. Fill should consist of on-site soil or imported soil that is non-corrosive, is free of organic matter or other deleterious or hazardous material, contains no rocks or lumps larger than four inches in greatest dimension, has a liquid limit of less than 40 and a plasticity index lower than 12, and is approved by the Geotechnical Engineer. Fill should be placed in horizontal lifts not exceeding eight inches in uncompacted thickness, moisture-conditioned to near optimum moisture content, and compacted to at least 90 percent relative compaction. Fills deeper than five feet should be compacted to at least 95 percent relative compaction.

7.5 2007 California Building Code Mapped Values

For seismic design in accordance with the provisions of 2007 California Building Code (CBC) we recommend the following:

- Maximum Considered Earthquake (MCE) S_s and S_1 of 1.50g and 0.60g, respectively.
- Site Class D
- Site Coefficients F_A and F_V of 1.0 and 1.5
- Maximum Considered Earthquake (MCE) spectral response acceleration parameters at short periods, S_{MS}, and at one-second period, S_{M1}, of 1.50g and 0.90g, respectively.
- Design Earthquake (DE) spectral response acceleration parameters at short period, S_{DS}, and at one-second period, S_{D1}, of 1.00g and 0.60g, respectively.

8.0 ADDITIONAL GEOTECHNICAL SERVICES

Prior to construction, Treadwell & Rollo should review the project plans and specifications to check their conformance with the intent of our recommendations. During construction, our field engineer should provide on-site observation and testing services during excavation and installation of new building

[5] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D-1557-07 laboratory compaction procedure.

foundations, and fill placement and compaction. These observations will allow us to compare the actual with the anticipated soil conditions and to check that the contractor's work conforms with the geotechnical aspects of the plans and specifications.

9.0 LIMITATIONS

The conclusions and recommendations presented in this report result from limited engineering studies based on our interpretation of the geotechnical conditions existing at the time of the investigation. Actual subsurface conditions may vary. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that described in this report, Treadwell & Rollo, Inc. should be notified to make supplemental recommendations, if necessary.

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Treadwell&Rollo

FIGURES



Base map: The Thomas Guide
Contra Costa County
1999

0 1/4 1/2 Mile

Approximate scale

N

RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
Richmond, California

SITE LOCATION MAP

Treadwell&Rollo

Date 01/29/10	Project No. 5033.01	Figure 1



EXPLANATION

B-1 — Approximate location of boring by Treadwell & Rollo, Inc., January 2010

TP-1 — Approximate location of test pit by Treadwell & Rollo, Inc., January 2010

CPT-1 — Approximate location of cone penetration test by Treadwell & Rollo, Inc., January 2010

N

0 80 Feet

Approximate scale

Reference: Goggle Earth, 2009.

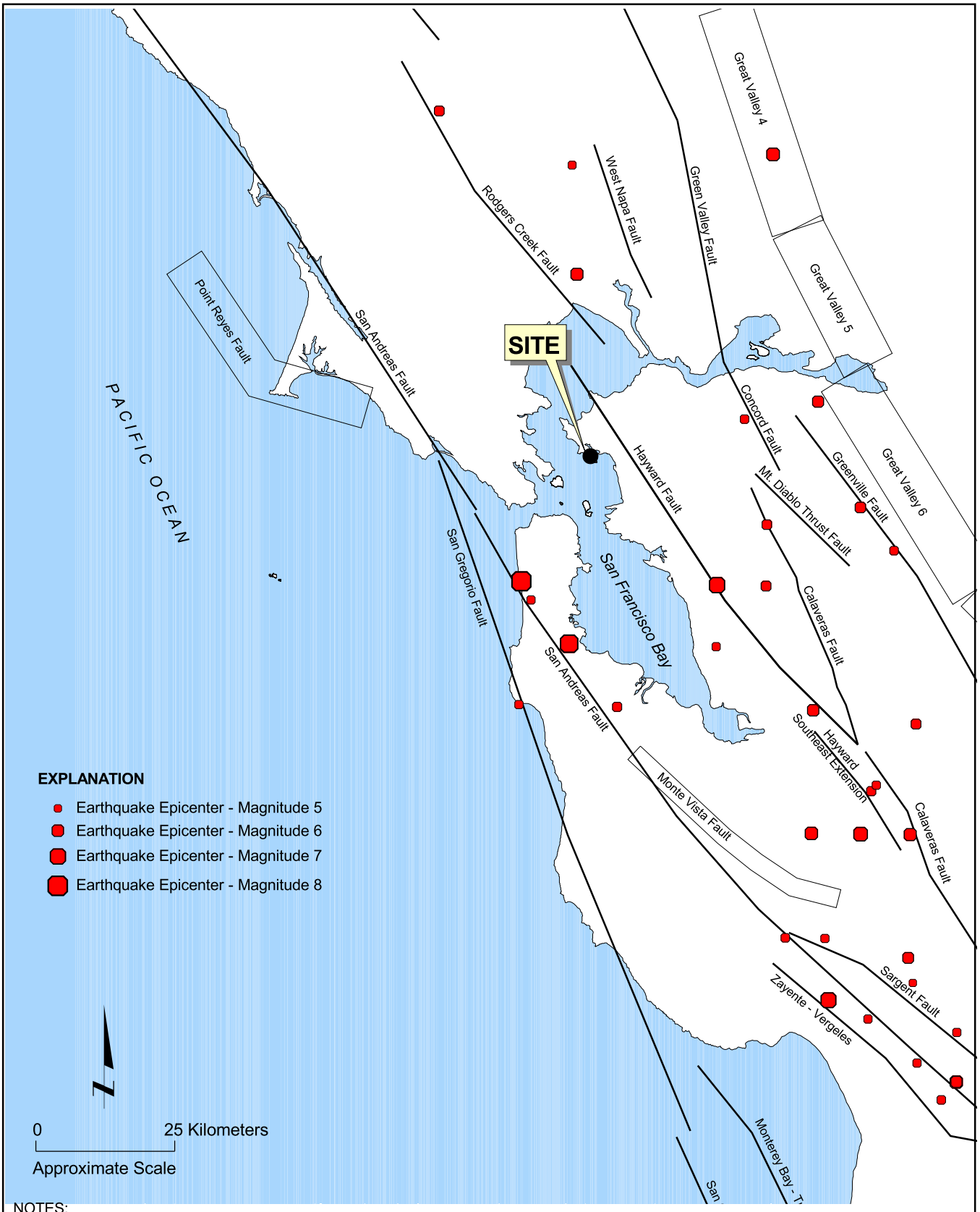
RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
Richmond, California

SITE PLAN

Treadwell&Rollo

Date 01/29/10 | Project No. 5033.01 | Figure 2

S:\Trgraphics–Oak\5000's\5033.01\5033.01 Site Plan.dwg 3/02/10



NOTES:
Digitized data for fault coordinates and earthquake catalog was developed by the California Department of Conservation Division of Mines and Geology. The historic earthquake catalog includes events from January 1800 to December 2000.

RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
Richmond, California

Treadwell&Rollo

MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS IN THE SAN FRANCISCO BAY AREA

Date: 01/29/10	Project No. 5033.01	Figure 3

I **Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced.**
Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.

II **Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons.**
As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.

III **Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases.**
Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.

IV **Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside.**
Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeably.

V **Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors.**
Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerably. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.

VI **Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors.**
Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows break. Knickknacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.

VII **Frightens everyone. General alarm, and everyone runs outdoors.**
People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.

VIII **General fright, and alarm approaches panic.**
Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters varies. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures. Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

IX **Panic is general.**
Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings - some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.

X **Panic is general.**
Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.

XI **Panic is general.**
Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.

XII **Panic is general.**
Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
Richmond, California

MODIFIED MERCALLI INTENSITY SCALE

Treadwell&Rollo

Date 01/29/10	Project No. 5033.01	Figure 4

Treadwell&Rollo

APPENDIX A
Logs of Boring and Test Pit

PROJECT: **RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION**
Richmond, California

Log of Boring B-1

Boring location: See Site Plan, Figure 2
Logged by: M. Pinheiro
Date started: 1/8/10 Date finished: 1/8/10
Drilling method: Rotary Wash
Hammer weight/drop: 140 lbs./30 inches Hammer type: Automatic Down Hole
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION (Ground Surface Elevation: 6 feet[2])	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0						2-inches asphaltic concrete						
1						SANDY CLAY (CL) yellow-brown, moist, stiff, with gravel and cobbles						
2												
3					CL							
4												
5												
6	S&H		7 14 10	17								
7					CH	CLAY with GRAVEL (CH) gray, stiff, moist, cobble at 6.5 feet — FILL						
8						SANDY CLAY (CL) yellow-brown, stiff, moist						
9												
10	S&H		8 8 9	12	CL	sandstone fragment						
11												
12												
13												
14						SAND with GRAVEL (SP) brown, loose, wet						
15	S&H		0 0 3	2								
16												
17	SPT		3 3 3	7	SP							
18												
19						fine-gravel						
20												
21	SPT		4 4 5	11	CL	SANDY CLAY with GRAVEL (CL) gray and yellow-brown, stiff, wet						
22												
23					SP	SAND (SP) brown, wet, coarse-grained with shell fragments						
24	S&H		50/ 6"	35/ 6"		SHALE gray, closely to intensely fractured, low hardness, weak						
25												
26												
27						— BEDROCK						
28												
29	SPT		50/ 5.5"	60/ 5.5"								
30												

Treadwell&Rollo

Project No.: 5033.01 Figure: A-1a

TEST GEOTECH LOG 5033.01.GPJ TR.GDT 3/2/10

PROJECT: **RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION**
Richmond, California

Log of Boring B-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31						SANDTONE yellow-brown and gray, crushed, low hardness, friable, deep weathering						
32												
33												
34	SPT		50/ 5"	60/ 5"		SHALE dark gray and yellow-brown, crushed, soft to low hardness, friable, deep weathering						
35												
36												
37												
38												
39												
40	SPT		50/ 4"	60/ 4"		BEDROCK						
41												
42												
43												
44												
45												
46												
47												
48												
49												
50	SPT		50/ 2"	60/ 2"								
51												
52												
53												
54												
55												
56												
57												
58												
59												
60												

Boring terminated at a depth of 50 feet below ground surface.
Boring backfilled with neat cement grout.
Groundwater obscured by drilling method.

[1] S&H and SPT blow counts for the last two increments were converted to SPT N-Values using factors of 0.7 and 1.2, respectively to account for sampler type and hammer energy.
[2] Elevations based on Mean Lower Low Water

Treadwell&Rollo

Project No.: 5033.01
Figure: A-1b

TEST GEOTECH LOG 5033.01.GPJ TR.GDT 3/2/10

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 4.76
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.075
coarse	No. 4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.420 to 0.075
Silt and Clay	Below No. 200	Below 0.075

Unstabilized groundwater level

Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS



Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered



Classification sample taken with Standard Penetration Test sampler



Undisturbed sample taken with thin-walled tube



Disturbed sample, hand auger



Sampling attempted with no recovery



Core sample



Analytical laboratory sample



Sample taken with Direct Push sampler

SAMPLER TYPE

C Core barrel

CA California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter

D&M Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube

O Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube

PT Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube

S&H Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter

SPT Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter

ST Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
Richmond, California

CLASSIFICATION CHART

Treadwell&Rollo

Date 01/29/10 | Project No. 5033.01 | Figure A-2

I FRACTURING

Intensity	Size of Pieces in Feet
Very little fractured	Greater than 4.0
Occasionally fractured	1.0 to 4.0
Moderately fractured	0.5 to 1.0
Closely fractured	0.1 to 0.5
Intensely fractured	0.05 to 0.1
Crushed	Less than 0.05

II HARDNESS

1. **Soft** - reserved for plastic material alone.
2. **Low hardness** - can be gouged deeply or carved easily with a knife blade.
3. **Moderately hard** - can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
4. **Hard** - can be scratched with difficulty; scratch produced a little powder and is often faintly visible.
5. **Very hard** - cannot be scratched with knife blade; leaves a metallic streak.

III STRENGTH

1. **Plastic** or very low strength.
2. **Friable** - crumbles easily by rubbing with fingers.
3. **Weak** - an unfractured specimen of such material will crumble under light hammer blows.
4. **Moderately strong** - specimen will withstand a few heavy hammer blows before breaking.
5. **Strong** - specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
6. **Very strong** - specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

IV WEATHERING - The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

D. Deep - moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration; many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.

M. Moderate - slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected. Moderate to occasionally intense discoloration. Moderately coated fractures.

L. Little - no megascopic decomposition of minerals; little of no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture surfaces.

F. Fresh - unaffected by weathering agents. No disintegration of discoloration. Fractures usually less numerous than joints.

ADDITIONAL COMMENTS:

V CONSOLIDATION OF SEDIMENTARY ROCKS: usually determined from unweathered samples. Largely dependent on cementation.

U = unconsolidated
P = poorly consolidated
M = moderately consolidated
W = well consolidated

VI BEDDING OF SEDIMENTARY ROCKS

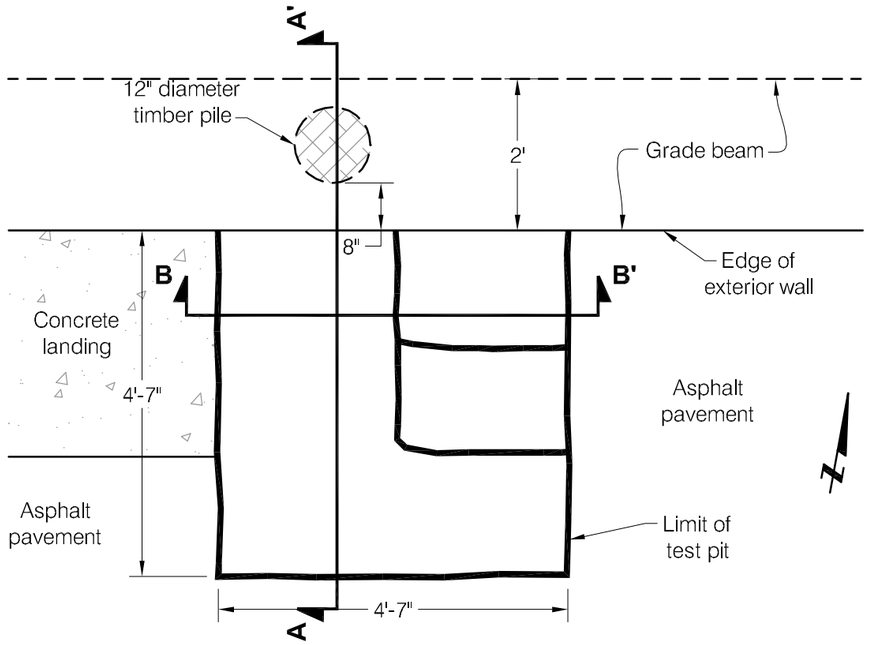
Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft.	very thick-bedded
Blocky	2.0 to 4.0 ft.	thick bedded
Slabby	0.2 to 2.0 ft.	thin bedded
Flaggy	0.05 to 0.2 ft.	very thin-bedded
Shaly or platy	0.01 to 0.05 ft.	laminated
Papery	less than 0.01	thinly laminated

RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
Richmond, California

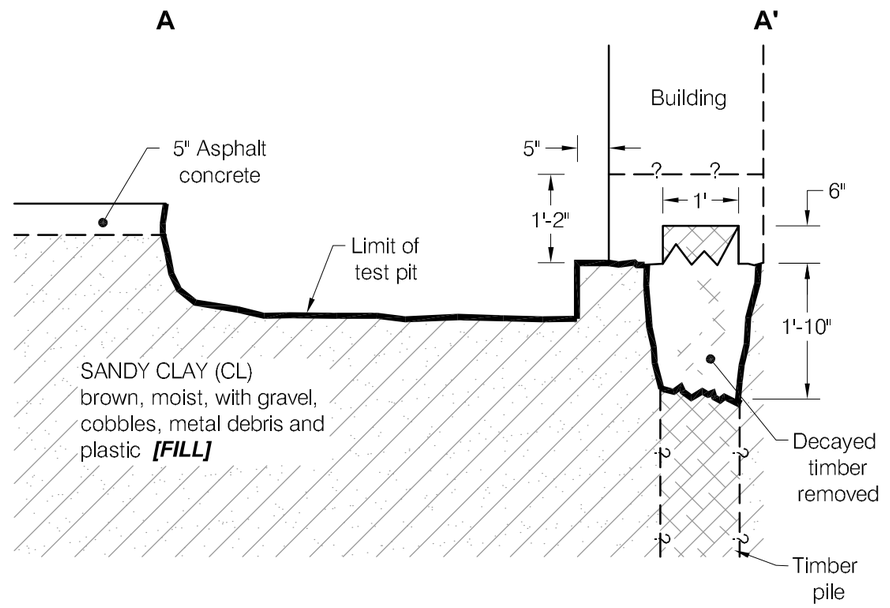
PHYSICAL PROPERTIES CRITERIA FOR ROCK DESCRIPTIONS

Treadwell&Rollo

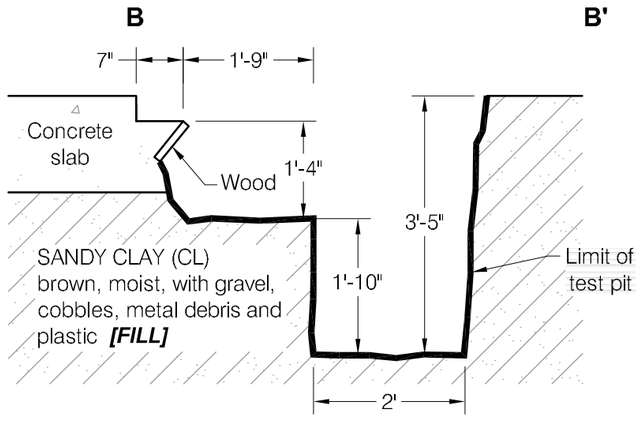
Date 01/29/10 | Project No. 5033.01 | Figure A-3



PLAN VIEW



ELEVATION A - A'



ELEVATION B - B'

0 2 Feet
Approximate scale

RIGGERS LOFT HISTORIC STRUCTURE REHABILITATION
San Francisco, California

LOG OF TEST PIT TP-1

Date 01/29/10	Project No. 5033.01	Figure A-4

Treadwell&Rollo

S:\Trgraphics-Oak\5000's\5033.01\5033.01 Log of Test Pit TP-1.dwg 3/02/10

Treadwell&Rollo

APPENDIX B
Cone Penetration Test Results

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

California Push Technologies Inc.
104 Constitution Drive Suite 2
Menlo Park CA 94025
(C-57 License #884827)

office: 650 854 0300
fax: 650 854 0301

www.cptinc.com

Cone penetration testing and soil sampling methods description.

Rig Description

Our services are based on the state-of-the-art, Geoprobe Model 6625CPT rig, a limited-access, self-anchoring, 20-ton push capacity, track-mounted push platform for dedicated Geotechnical CPT applications with the unique and valuable added ability to quickly perform intermittent or continuous soil sampling.

Weight = ~ 9,500 pounds
Surface load = ~ 4.5 psi
Push capacity = ~ 20 tons; self-anchoring achieved using 10- or 15-inch diameter helical soil anchors driven 4- to 10-feet into the soil
Sampling hammer percussion rate = 32 Hz & 20,000 lbs force/blow
Length = ~ 12 feet; Width = ~ 7 feet
Height (folded) = 7 feet; Height (unfolded) = 14 feet

CPT Description

Our Geoprobe 6625CPT incorporates the Swedish-made Geotech AB Cone Penetration Testing tools which meet the ASTM D-5778 Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils. Cones have 10 cm^2 tips and 150 cm^2 friction sleeves, and include a porous filter and pressure sensor located in the u_2 position directly behind the cone. The cone and porous filter are saturated under vacuum with glycerin to promote rapid equilibration with in-situ pore pressures. Cones are advanced at the ASTM standard rate of 2 cm/second. Baseline readings are performed both before and after each push to check for load cell drift. The cone measures bearing (max load = 100 MPa ~ 1044 TSF), friction sleeve (max load = 1.0 MPa ~ 10.4 TSF), and dynamic pore pressure (max load = 2.5 MPa ~ 363 psi) at 2 cm or 4 cm intervals (client's choice) and this data is plotted in real-time and recorded on a laptop computer adjacent to the push platform. Holes are grouted upon completion of each push, or at the end of each day, as site conditions and regulations warrant.

The basic equation to determine the depth to the free water surface from the pore pressure dissipation test is;

Depth to phreatic surface = [Dissipation depth] – [equilibrium pore pressure / unit weight of H2O x unit conversation factor]

…where;

1) Surface elevation is always assumed to be 0 feet
2) Dissipation depth = the depth (feet) below surface elevation where the cone advancement was paused while waiting for equilibrium pore pressure to be achieved
3) Equilibrium pore pressure = the pore pressure after an elapsed time where no increase or decrease in pore pressure is occurring, in pounds per square inch (psi)
4) Unit weight of water = 62.3 pounds per cubic foot (lb/ft^3)
5) Unit conversion factor (for dimensional analysis): 1 psi = 144 lb/ft^3

From the dissipation plots, simply read the dissipation depth and dissipated pressure for the values to plug into the equation above. On the plots, pore pressure (psi) is on the abscissa and log time (seconds) is on the ordinate.

Sampling Description

Geoprobe® brand Dual Tube Sampling Systems are efficient methods of collecting continuous soil cores with the added benefit of a cased hole. Dual tube sampling uses two sets of probe rods to collect continuous soil cores. One set of rods is driven into the ground as an outer casing (2.2 or 3.25 inches in diameter). These rods receive the driving force from the hammer and provide a sealed hole from which soil samples may be recovered without the threat of cross contamination. The second, smaller set of rods are placed inside the outer casing. The smaller rods hold a sample liner in place as the outer casing is driven one sampling interval. The small rods are then retracted to retrieve the filled liner. Soil samples are collected in 1.85-inch diameter or 1.125-inch diameter clear PVC sample sheaths.

Interpretations

Soil behavior type (SBT), SPT N60 energy ratio, undrained shear strength, OCR, and unit weights are calculated and/or are interpretations generated by the CPT-Pro software based on empirical relationships derived in the following references;

P.K. Robertson, R.G. Campanella, D. Gillespie, and J. Greig, 1986, Use of Piezometer Cone Data, Proceedings of the ASCE Specialty Conference In Situ '86: Use of In Situ Tests in Geotechnical Engineering; pp. 1263-1280.

P.K. Roberston, 1990, Soil Classification Using the Cone Penetration Test, Canadian Geotechnical Journal, 27(1), pp. 151-158.

T. Lunne, P.K. Robertson, and J.J.M. Powell, 1997, Cone Penetration in Geotechnical Practice, Taylor and Francis Publishing.

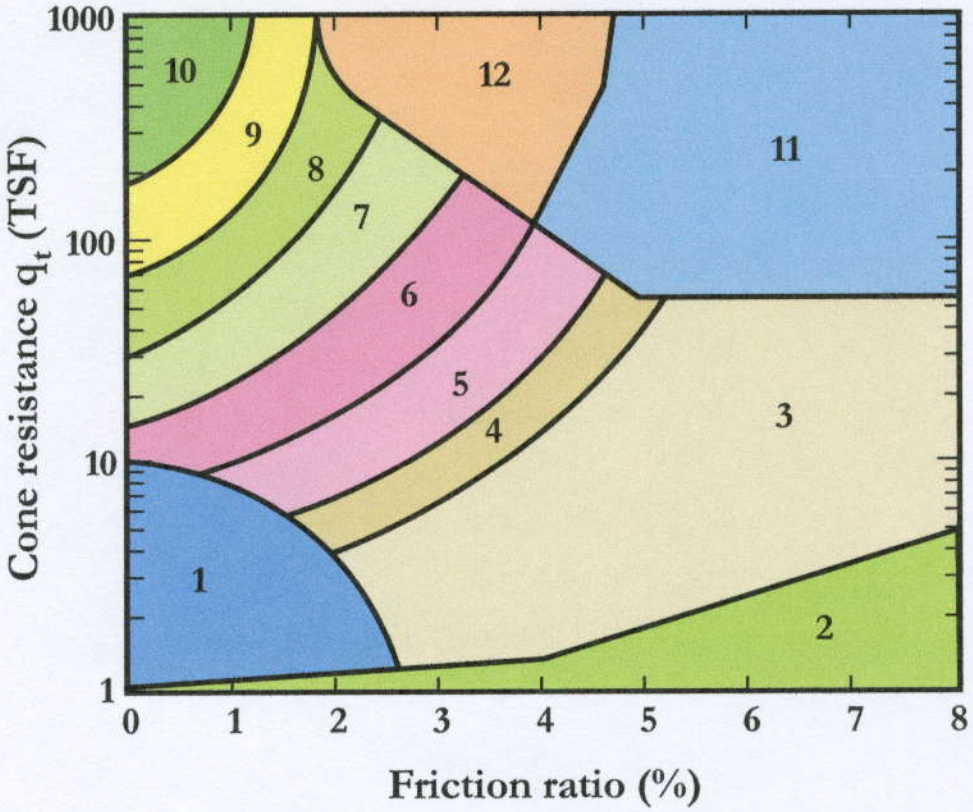
CPT Inc. makes no recommendation on which soil behavior type analysis is "most-correct". The engineer should be aware of the limitations of using CPT data to derive soil behavior type and other engineering parameters and is encouraged to review the above references to better understand the applicability and limitations of CPT data. It is sometimes not possible to determine soil type based solely on tip resistance, sleeve friction, and dynamic pore pressure response, and confirmatory samples may be required.

Please do not hesitate to contact CPT Inc. if you have questions.

Sincerely,
John Rogie



President
California Push Technologies, Inc.

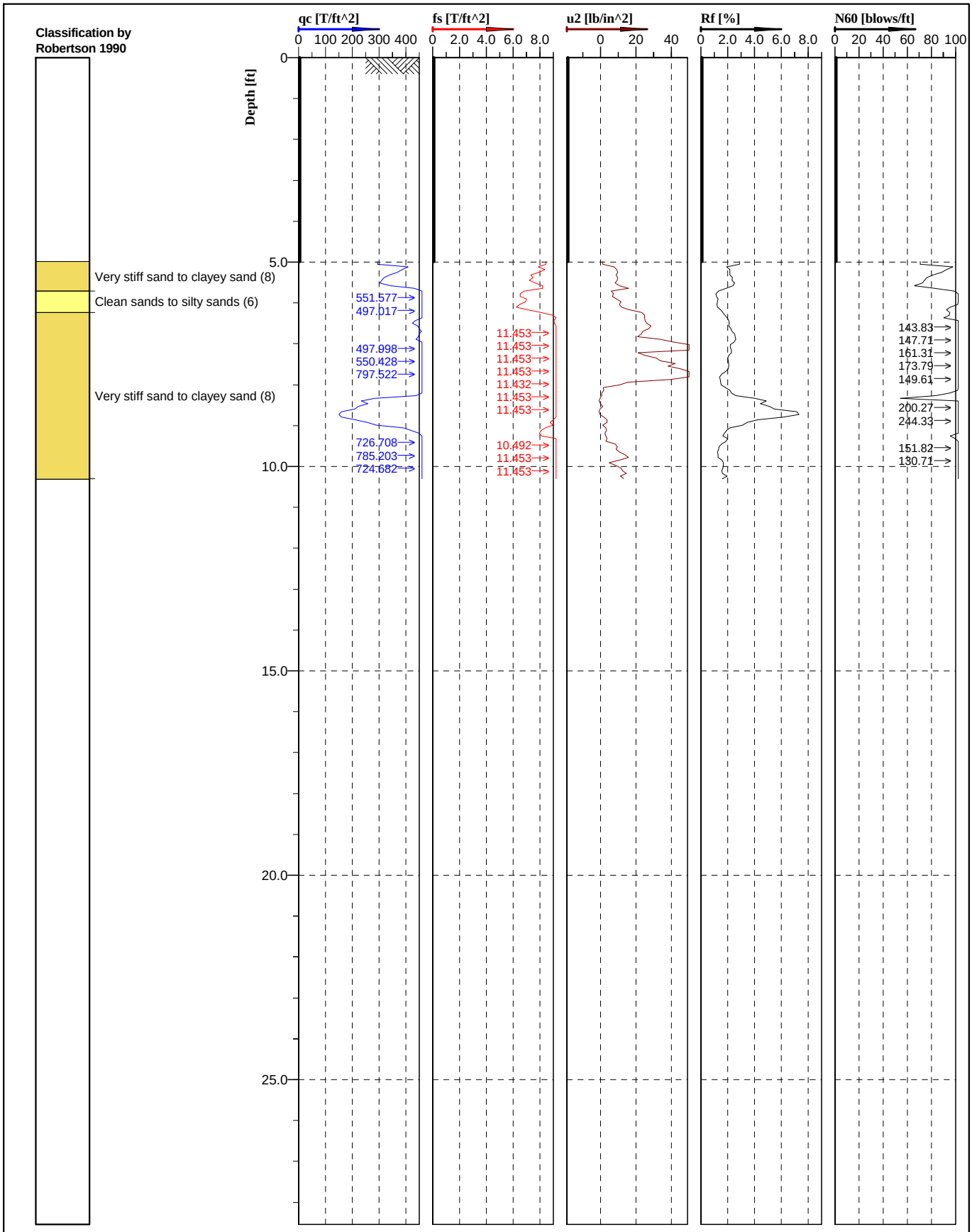


Zone	Soil Behavior Type
1	sensitive fine grained
2	organic material
3	clay
4	silty clay to clay
5	clayey silt to silty clay
6	sandy silt to clayey silt
7	silty sand to sandy silt
8	sand to silty sand
9	sand
10	gravelly sand to sand
11	very stiff fine grained (overconsolidated or cemented)
12	sand to clayey sand (overconsolidated or cemented)

Source: Robertson, P.K., Campanella, R.G., Gillespie, D., and Greig, J., 1986, Use of Piezometer Cone Data. Proceedings of the ASCE Specialty Conference In Situ 86: Use of In Situ Tests in Geotechnical Engineering.

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Soil Behavior Type (SBT) Model

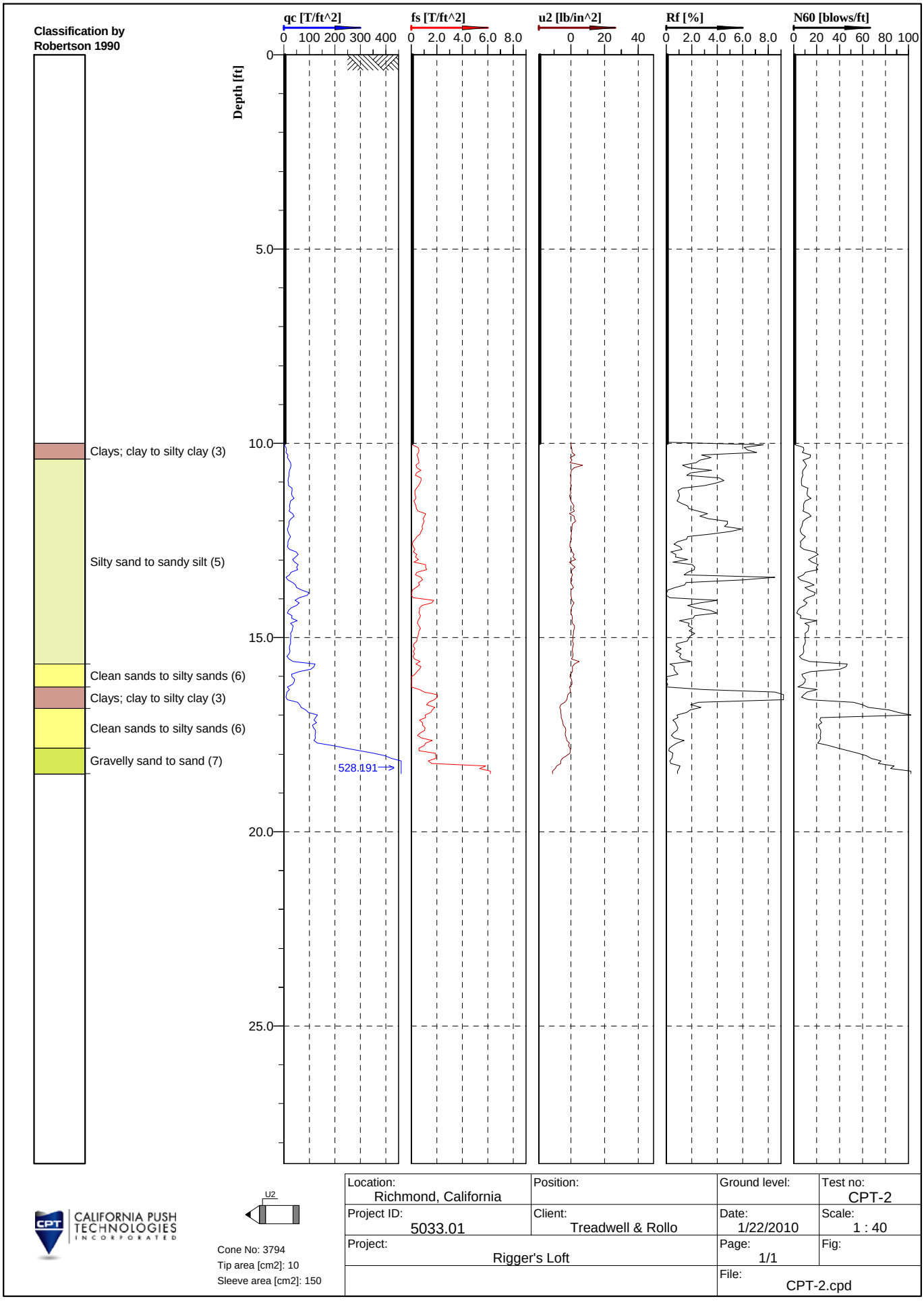


CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

U2

Cone No: 3794
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Richmond, California	Position:	Ground level:	Test no: CPT-1
Project ID: 5033.01	Client: Treadwell & Rollo	Date: 1/22/2010	Scale: 1 : 40
Project: Rigger's Loft		Page: 1/1	Fig:
		File: CPT-1.cpd	

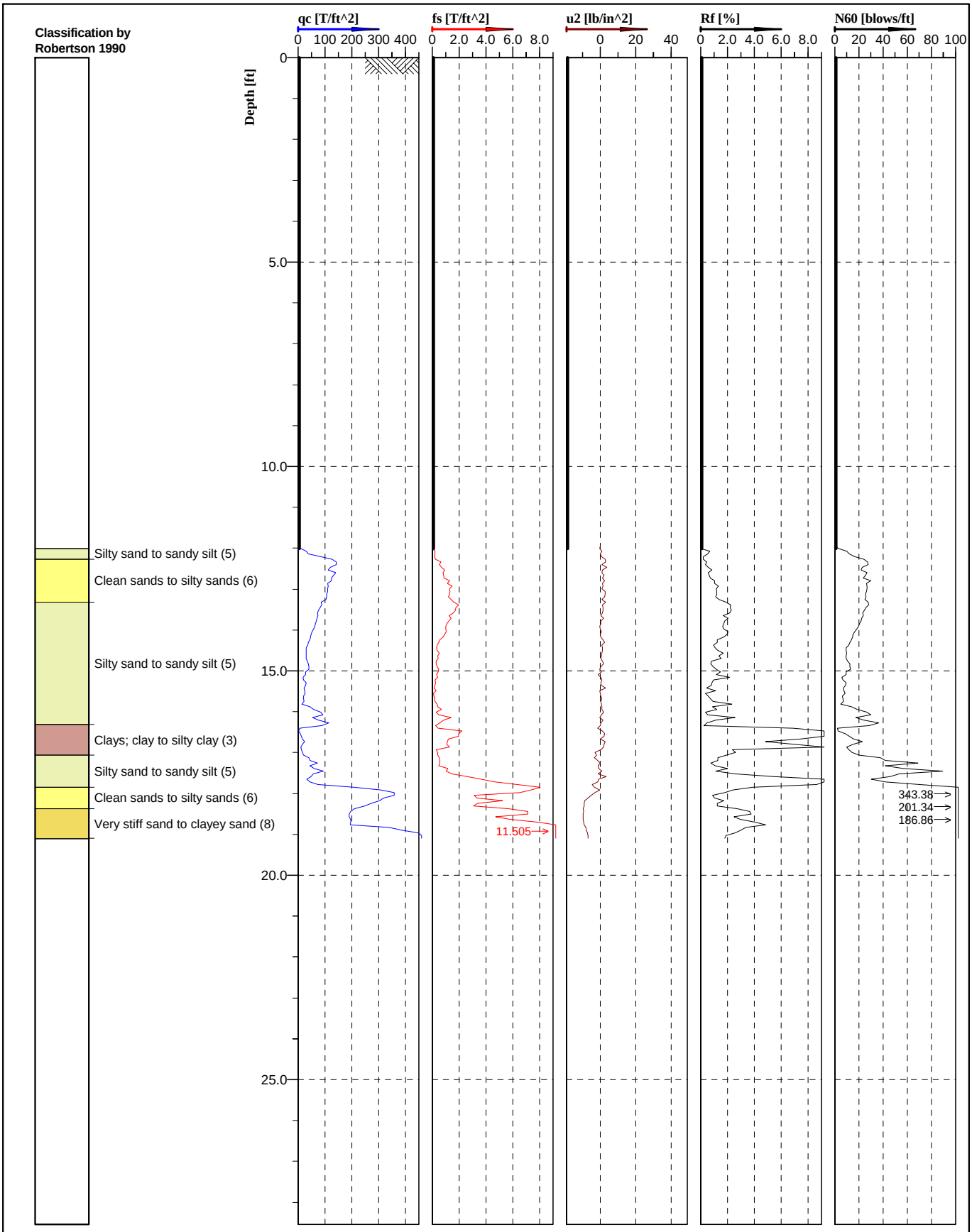


CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

U2

Cone No: 3794
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Richmond, California	Position:	Ground level:	Test no: CPT-2
Project ID: 5033.01	Client: Treadwell & Rollo	Date: 1/22/2010	Scale: 1 : 40
Project: Rigger's Loft		Page: 1/1	Fig:
		File: CPT-2.cpd	



CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

U2

Cone No: 3794
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Richmond, California	Position:	Ground level:	Test no: CPT-3
Project ID: 5033.01	Client: Treadwell & Rollo	Date: 1/22/2010	Scale: 1 : 40
Project: Rigger's Loft		Page: 1/1	Fig:
		File: CPT-3.cpd	

Treadwell&Rollo

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Wiss Janney Elstner Associates, Inc.
2000 Powell Street, Suite 1650
Emeryville, California 94608

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APPENDIX D (Provided on CD only)
Phase I Environmental Site Assessment

WJE ENGINEERS ARCHITECTS MATERIALS SCIENTISTS

APPENDIX E (Provided on CD only)
Limited Soil Sampling Report