



PIER INFRASTRUCTURE ASSESSMENT STUDY

Phase 1 - EXISTING CONDITIONS
VOLUME 1

NOVEMBER 17, 2008



Santa Monica Pier Infrastructure Assessment Study

Phase 1 – Existing Conditions Volume 1

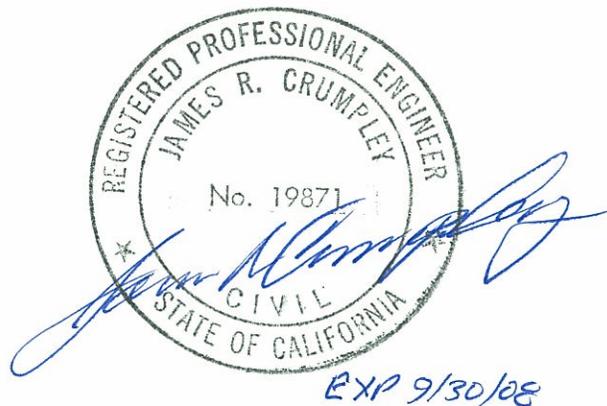
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Santa Monica Pier Infrastructure Assessment Study

Phase 1 – Existing Conditions

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Santa Monica Pier Infrastructure Assessment Study

Phase 1 – Existing Conditions

Introduction

This report represents the first phase of three phase study of the Santa Monica Pier infrastructure. This phase assesses the existing condition of the various infrastructure systems of the pier. The second phase will entail upgrade studies for the various systems and construction cost estimates for implementation of those proposed upgrades. The third phase will present the proposed upgrades along with anticipated major maintenance programs in a ten years improvement plan.

General Discussion

The Santa Monica Pier is comprised of two separate structures, the Municipal Pier and the Newcomb Pier.

The Municipal Pier extends from the concrete approach bridge to and including the end platform for an overall length of approximately 1480 feet. This pier forms the main thoroughfare for pedestrian and vehicular access to the commercial and recreational areas of the Santa Monica Pier. All except the Westerly 440 feet of the Municipal Pier is timber, while the Westerly 440 feet including the end platform is concrete with timber decking.

The Newcomb Pier is approximately 1050 feet long by 265 feet wide and supports the majority of the commercial enterprises, an amusement park, an historic carousel, and on-deck parking for passenger cars. The majority of this pier is also made of timber, except for 350 foot by 135 foot section in the Southwest corner which supports the amusement rides. This section has concrete piles and beam with timber stringers and decking.

Both concrete sections are relatively new compared with the timber section and are generally in good condition. The timber sections vary from good in the recently upgraded portions to poor in some elements of the Newcomb Pier deck system.

Utility supports are generally in bad to poor condition which is in turn causing damages to the supported utilities.

Approach to Phase 1

During the months of September, October, and the first week of November, Moffatt & Nichol along with sub consultants Wallace Roberts & Todd (WRT) and Spec Systems performed a visual inspection of the various Santa Monica Pier infrastructure systems.

Fixtures and furnishings supported by the pier deck were inspected by WRT, and their findings are presented in the Urban Furnishing Assessment section of this report.

The fire prevention system was inspected by Spec Systems, and their findings are presented in the Fire Prevention section of this report.

All main line utility systems supported by the pier structure and the pier structural members, including underwater pile inspection, were inspected by Moffatt and Nichol engineering personnel. Findings are presented in the Structural, Mechanical, and Electrical sections of this report.

In each report section, other than Urban Furnishings, there is a brief written discussion followed by transcribed field notes and photographs. The photographs are referenced in the field notes, and in some cases within the discussion.



Santa Monica Pier

Pile Numbering System

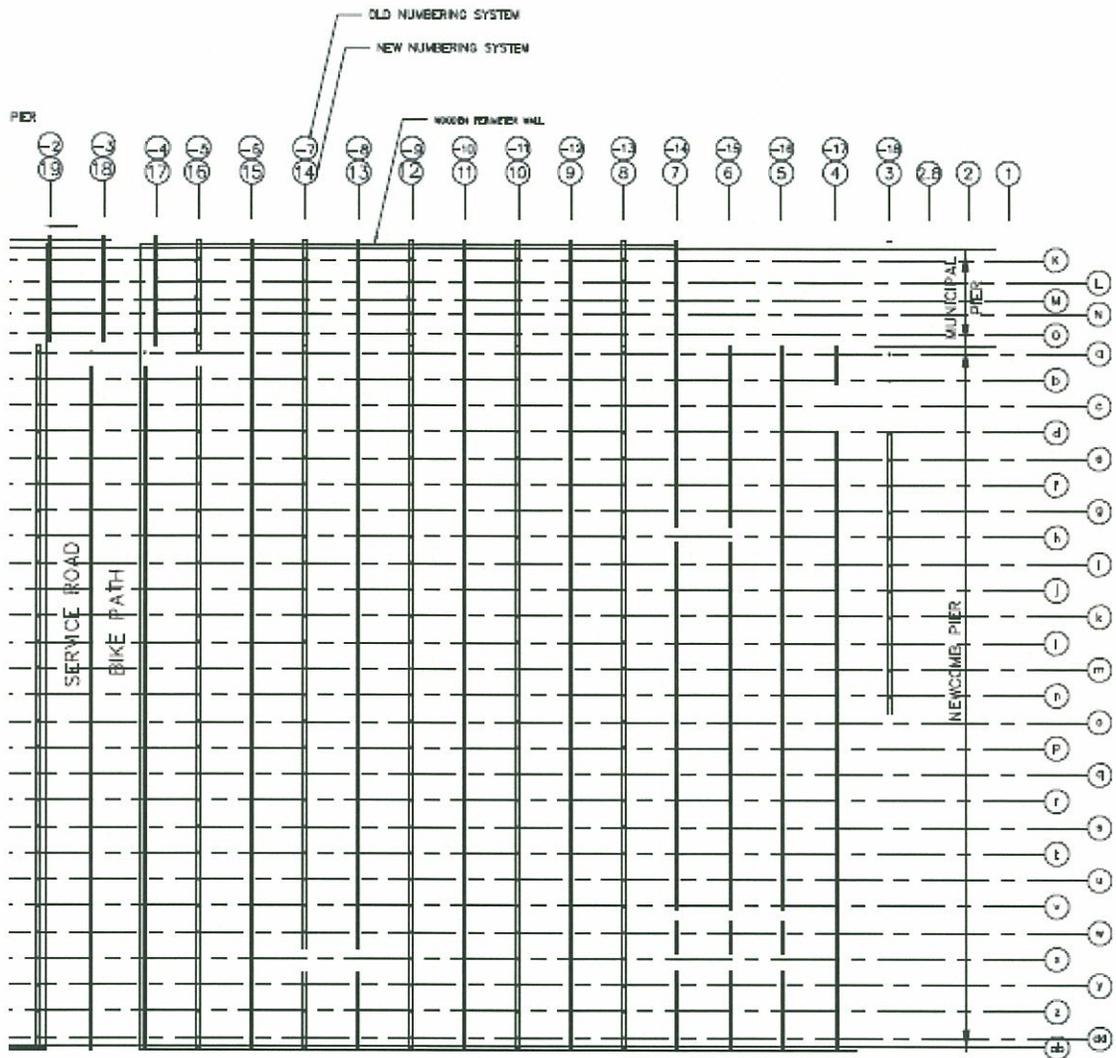
To facilitate the inspection effort and to have a common location reference, a new pile numbering system was established and reference numbers painted on piles. In some cases every pile in a bent was marked, and in some cases, every second, third or fourth pile was marked. To eliminate confusion with prior numbering schemes, old markings on the piles were painted out using black paint. The new numbers were painted in white. In this numbering system the pile bents are numbered consecutively starting at “1” for the first pile bent at the East end of the Newcomb Pier. The piles in each bent are assigned a letter designation with the Municipal Pier piles being assigned upper case letters while Newcomb Pier piles being assigned lower case letters to distinguish between the two structures. See the following photos plan (4 parts) for the numbering system. All elements inspected have their location designated with respect to the pile numbering system. Also shown for reference on the plan is a second set of bent numbers representing the old system. They are the top set of numbers and include negative numbering.



Typical Municipal Pier Pile Number

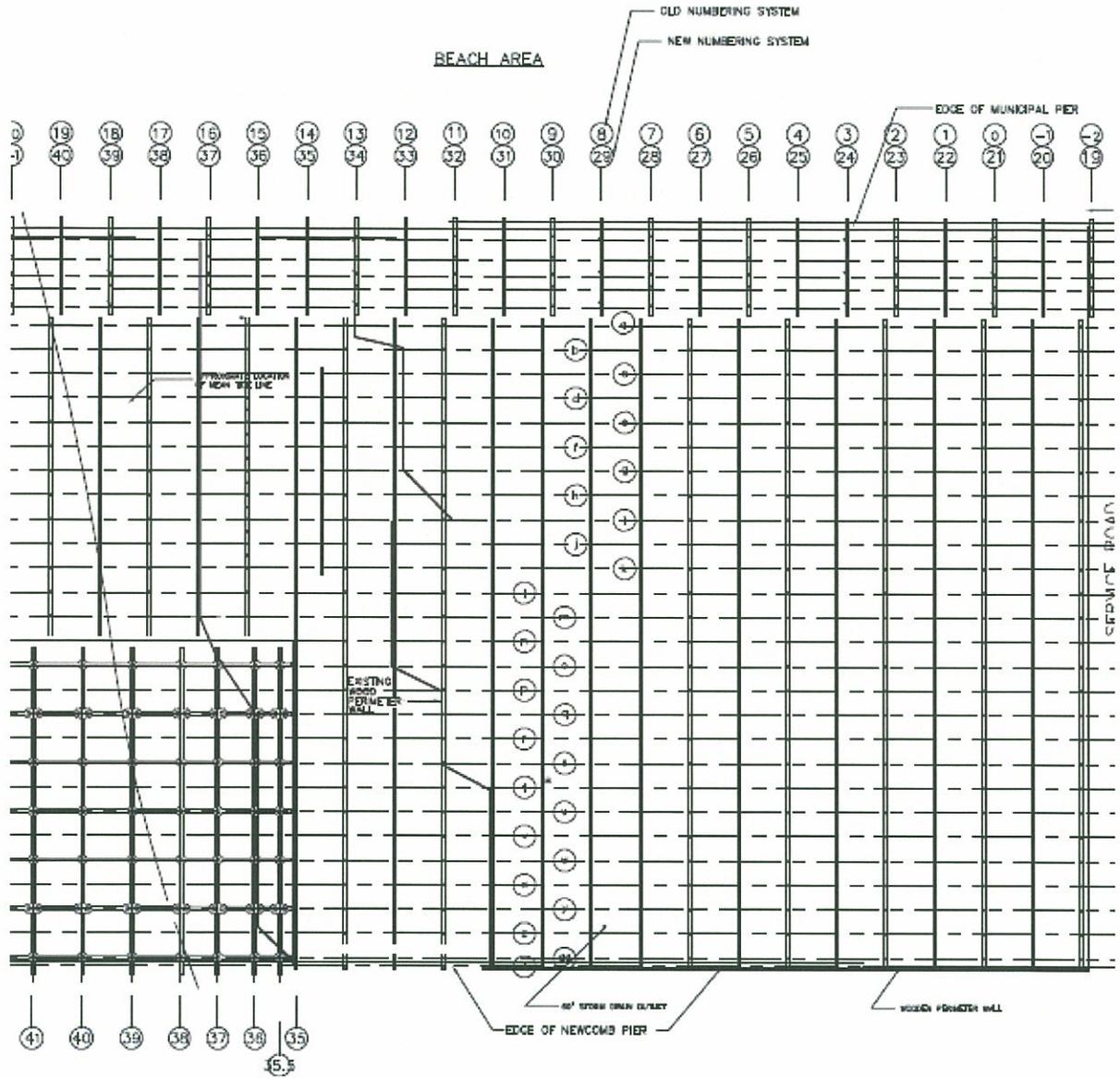


Typical Newcomb Pier Pile Number

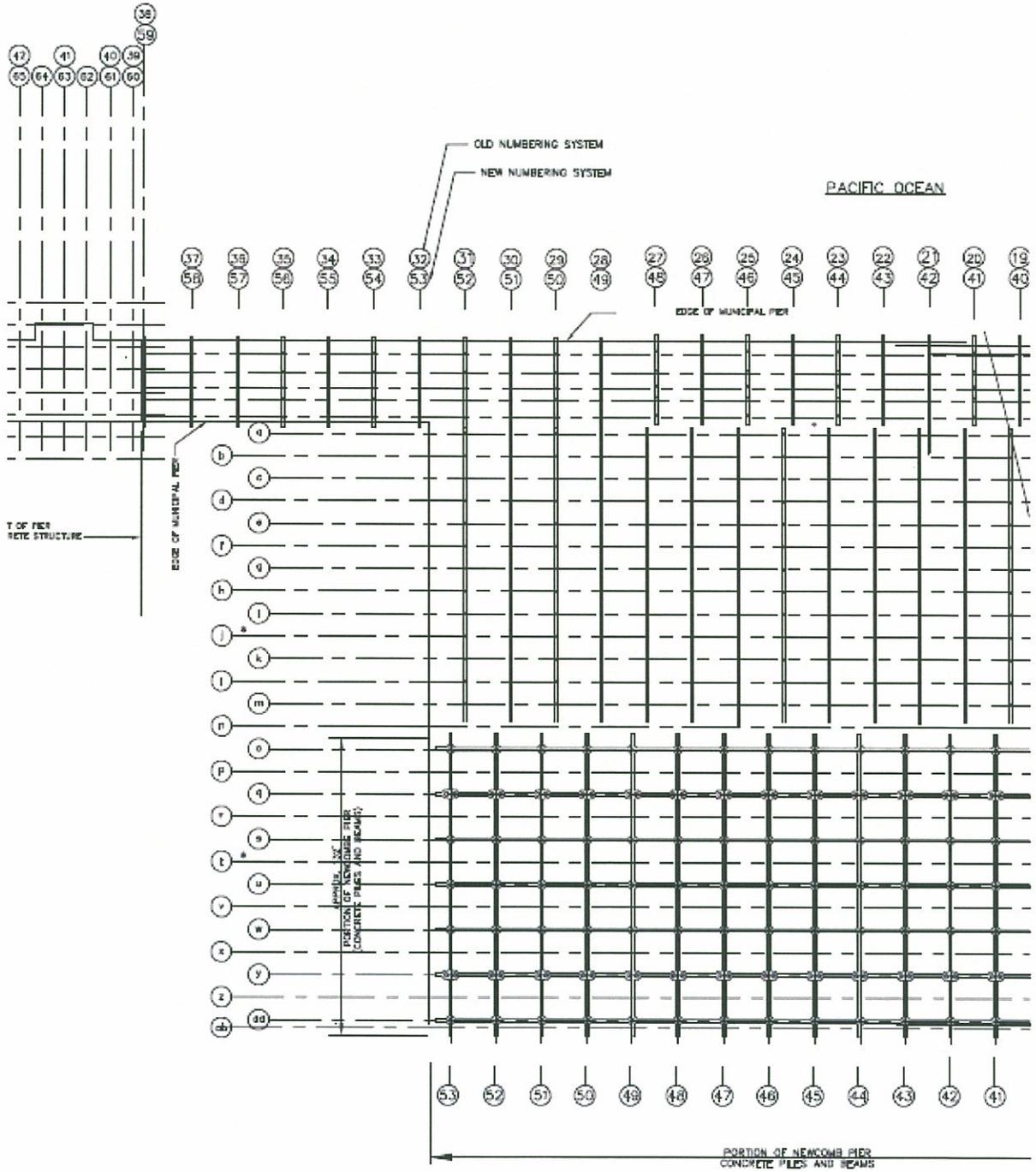


SANTA MONICA PIER
PILE NUMBERING SYSTEM

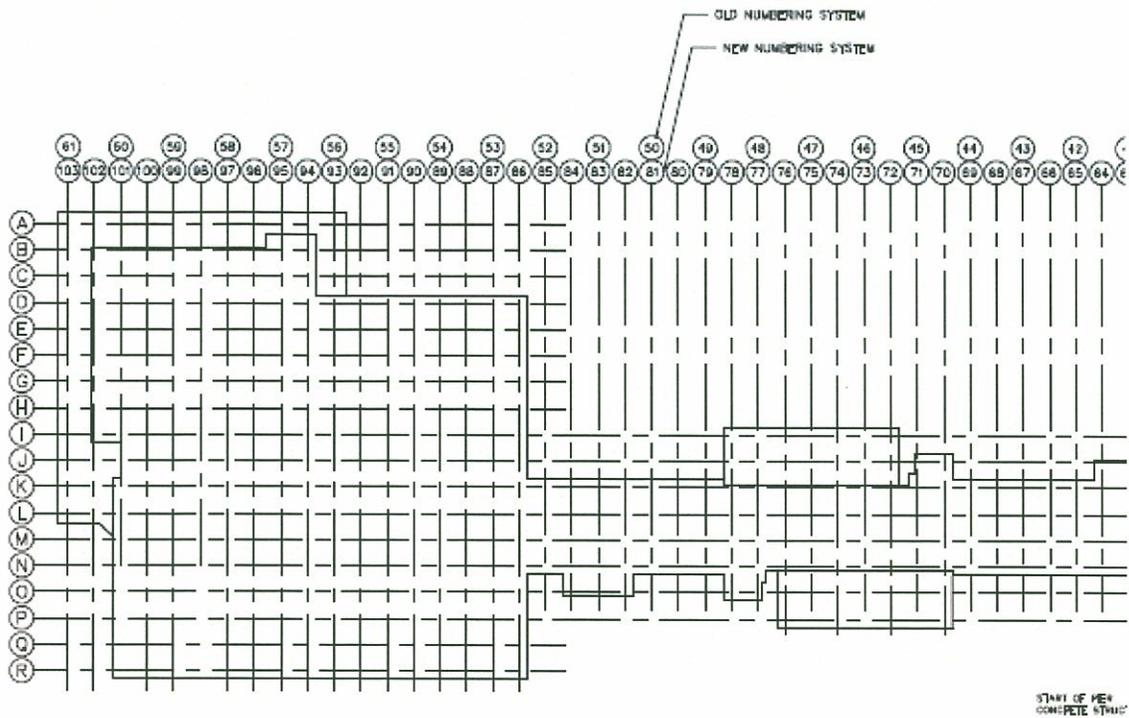
Area 1



Area 2



Area 3



Area 4

Santa Monica Pier Mechanical Field Inspection and Utilities Assessment Report

Field Inspection Dates: 9/12-14/07, 9/17-18/07, 11/7/07

Personnel: Julia Hornby, Dan Martin

Utilities Inspected: Potable water distribution, sewer/drain lines, natural gas lines, some fire protection.

Overview

This portion of the work was to inspect and assess the condition of the mechanical utilities under the Municipal and Newcomb Piers that together form the Santa Monica Pier. The field inspection was conducted over an initial five day period, with one follow-up day to finalize the field work. The inspection began at the eastern-most accessible area under the pier adjacent to the Aquarium, including the equipment room where the water heater serving the public restrooms under the pier is located. The fenced-in area that encloses the Aquarium pumps and filtering system was not part of the inspection. The inspection proceeded westward to the waterline, at which point the pier's under-deck catwalk system was utilized to inspect the utilities over the water. The condition of the various piping systems, and their associated hangers and supports, was inspected. Areas and points of concern were noted and photographed, including some elements that were part of the inspection scope of other disciplines, such as fire protection and structural. While the inspection was as comprehensive as project resources could provide, without high-powered fixed lighting and direct access to overhead utilities, some items may not have had a close inspection. However, the findings of the inspection make possible an overall assessment of the condition of the utilities. The field notes made during the inspection have been transcribed and are included in Appendix __ of the report, along with the photographs of the conditions noted herein. All photo locations are noted by the piling grid system developed for the inspection.

Each utility inspected will be discussed as a separate section, followed by a summary of the conditions .

Potable Water

Potable water is supplied to various service points on the pier by a mainly fiber-glass reinforced pipe (FRP) loop with 8" diameter lines paralleling the north and south edges of the pier, connected by an 8" diameter line at the western edge of the Newcomb Pier along Bent 52. Various branches off of this loop supply the automatic fire sprinkler system (covered in another section of this report) protecting the pier as well as the service points at the restaurants, police and lifeguard buildings, and entertainment venues on the pier. The FRP loop is in good condition. The hangers are also in good condition for the most part, with adequate spacing. In several locations, however, lengths of lumber are being used to improperly support the line (see Photos 1, 2, and 3).

Generally, the various branches off of the potable water loop are in fair to good condition, although on small PVC branches it appears that the ease of installation and the

flexibility of the material resulted in improper and haphazard installation (see Photo 6), particularly along Bent 8 between pile rows "a" and "c", and out along the catwalks at the southwest corner of the Newcomb Pier. The small-to-medium diameter water piping in many areas is supported by galvanized or plastic "plumber's tape", or just wire, which is minimally adequate in most of the instances of its use, and is inadequate/poorly installed in others (see Photos 4 and 5). At sometime in the not-too-distant past, much of the old cast iron drainage system under the pier was replaced with new Acrylonitrile Butadiene Styrene (ABS) lines and stainless steel hangers. At the same time, water lines serving the plumbing fixtures that discharge into the new ABS drains were replaced with new copper lines. Consequently, there is a roughly equal amount of poorly used plumber's tape and properly installed hangers. One location was noted where duct tape was being used to support a water line from a natural gas line (see Photo 7).

One large area where the water piping is in poor condition is under the main deck at the western (seaward) end of the pier. The exteriors of the copper branch lines there are heavily scaled and pitted. In addition, carbon steel hangers and supports were used almost exclusively on the potable water, natural gas, and fire lines in this area (see Photos 8 and 9). The moist marine conditions have caused heavy corrosion on the supports and hangers, with numerous hanger and support failures to be found. This will be discussed in other sections of this report as well. The failure of these supports place additional load on adjacent supports. The 8" diameter FRP main that supplies the end of the pier is in good condition, as are its hangers, but the actuators on the isolation valves out over the water are in general very corroded and their operability is questionable (see Photo 10).

Sanitary Sewer, Drains and Vents

The pier is divided by the bike path into two parts, east and west, in regard to sanitary sewer requirements. Each portion is served by a 6" diameter ABS sewer main that runs along the north side of the pier. One main, suspended below the deck between pile rows "a" and "b", serves the area east of the bike path that crosses under the pier between Bents 17-19, and the other, running between rows "M" and "O", serves the pier west of the bike path. Sewer and waste from the buildings on the pier drain into branches that all connect back to one of the two mains. There are several issues regarding the sewer piping.

On the east side of the bike path, where the 6" main is nearing the end of its run and is close to the ground, it is being deflected by bearing pressure from a dirt slope next to the line (see Photo 11). The deflection is also affecting a 4" branch that is coming into the main vertically. Another issue that occurs on both the east and west 6" mains is periodic 4" diameter risers that come from small grates at the deck level (see Photo 12). They were either intended to be vents, or they are area drains to collect surface storm runoff. As vents, they are required by code to be run 10' above the deck level. As area drains, they are not allowed by code to drain into the sanitary sewer system. Either way, they are in violation of code unless a waiver has been granted by the City of Santa Monica or approved by the City inspector.

The piping in most of the sewer system under the pier appears to have been upgraded in the recent past. What was once a cast iron system has been replaced by an ABS system with new stainless steel hangers. Existing cast iron risers coming down through the deck were cut a foot or so below the deck (see Photo 13), and the old cast iron branch piping downstream of these points was replaced. As a result most of the hangers are "new" as well. In some places the sewer lines are supported by plumber's tape. In other places, the old carbon steel hangers are still in place, with the ABS piping threaded through the old hangers and new hangers installed adjacent to the old hangers. New hangers were installed on existing cast iron lines as well, with the old hangers remaining in place (see Photo 14). In several areas, old cast iron piping that is no longer in service is still hanging below the deck. (see Photo 15).

There are several "unique" styles of hanging and supporting piping that are currently in use on the sewer system. Some of them are adequate and meet code, and some are not. One example of non-compliance is a section of the main 6" sewer serving the eastern portion of the pier that is supported by a mismatched series of stacked wooden blocks (see Photo 16). In other areas, pieces of lumber are notched and mounted at angles to support a 4" branch. Plastic plumber's tape, as well as the more common galvanized plumber's tape, is also in use (see the left side of Photo 35, where plastic plumber's tape is supporting a sagging drain line). In at least one place a branch is supported by the end of a bolt protruding from the pier structure (see Photo 17). In another area, plastic zip ties are being used to "bundle" pipes together (see Photo 18).

Lastly, there are several instances where a trap arm to a floor drain or floor sink has been installed at a length longer than allowed by code, which for a 2" trap is 5'-0" (see Photo 19).

Natural Gas

The onshore natural gas system--a mix of wrapped steel pipe and composite pipe--for the pier appears to be in overall good condition. There are areas where supports are more widely spaced than code requires, and areas where the wrapping prevented inspection of the surface of the pipe. One area of extreme concern was noted. At the offshore western end of the pier, under the main platform where the Mariasol Restaurant and the Lifeguard Building are located, the carbon steel hangers supporting the gas lines are badly corroded and many have already failed (see Photos 20-22).

Storm Drainage/Area Drainage

In a number of areas under the pier, downspouts from gutters and roof drains above the deck are discharging directly at the base of piles (see Photo 23), or discharging just under the deck, eroding the ground. Also, there are a number of 3" diameter ABS drains suspended below the deck that serve a gutter drain adjacent to the Aquarium. Those drains run west past the fenced Aquarium utility area and terminate with long flexible hoses (see Photo 24) that at one time appear to have been directed to a swale in the ground under the pier that collected the discharge from the 3" drains and routed it to

another area where it could drain away. The hoses are now snaking all over the area between Bents 4 and 6 and south from pile rows "a" to "j".

Miscellaneous Items

Almost all carbon steel (galvanized or not) hangers and supports and piping served by the catwalk system are heavily corroded and in danger of failing. Extreme corrosion was noted on hangers and seismic bracing, as well as piping and valves (see Photos 25 and 26).

Fire sprinkler control valves for sprinkler zones 407 and 408 appear to be heavily corroded (see Photo 27). Corrosion was also noted on steel piping and supports serving fire hydrants above the deck (see Photos 28 and 33).

There are several scattered areas of active leaks through the deck, causing staining of the structure and possibly compromising the integrity of piping supports, deck planking, and substructure in those areas. Some of them appear to be from hose wash down activity by the various vendors, but in one instance it appears to come from leaking pipes in a restroom above. In this particular location, structural damage is occurring (see Photos 29 and 30).

Conclusions and Recommendations

There are too many abandoned/out-of-service utility lines suspended below the deck. They interfere with identification and inspection of utilities still in service, and they create a hazard for inspectors in some instances. It is recommended that out of service utilities and related hardware be removed and disposed of properly. Future maintenance and inspection would be facilitated by a general clean-up (see Photo 34). Removing out-of-service utility lines will reduce clutter, and will prevent these lines from collapsing on functioning lines. Proper installation of new lines will be facilitated.

Style and spacing of supports for the various piping systems should be standardized. Poorly installed or corroded plumber's tape hangers should be reconfigured to provide better support, or replaced altogether with new rod-type hangers. Hangers being used to support piping from other piping (see Photos 7 and 31) should be reconfigured so piping is supported by structural or foundational elements. All temporary supports such as duct tape, wire, plastic zip ties, stacked wooden blocks and pieces of lumber should be replaced with conventional hangers, supports, and brackets. All carbon steel hangers and supports seaward from the high tide line should be replaced by stainless steel or an approved corrosion-resistant material. This is *especially* critical on the natural gas lines and fire service lines over the water at the end of the pier. Most of these supporting elements are in imminent danger of failing. Some have already failed.

Many of the copper water branch lines at the end of the pier are in poor to fair condition. Up to 30% of the branch piping may need replacing.

Some of the older cast iron sewer lines that were not replaced with PVC are near the end of their usefulness, and should be replaced (see Photo 32).

Almost all the natural gas lines are in good condition, as are most of their hangers and supports. Some supports need to be added where spacing is inadequate, and as has been stated, all the carbon steel hardware on the end of the pier must be replaced.

See Appendix A for potable water distribution, sewer/drain line, and natural gas line field inspection logs

REPORT PHOTOS



PHOTO 1



PHOTO 2



PHOTO 3



PHOTO 4

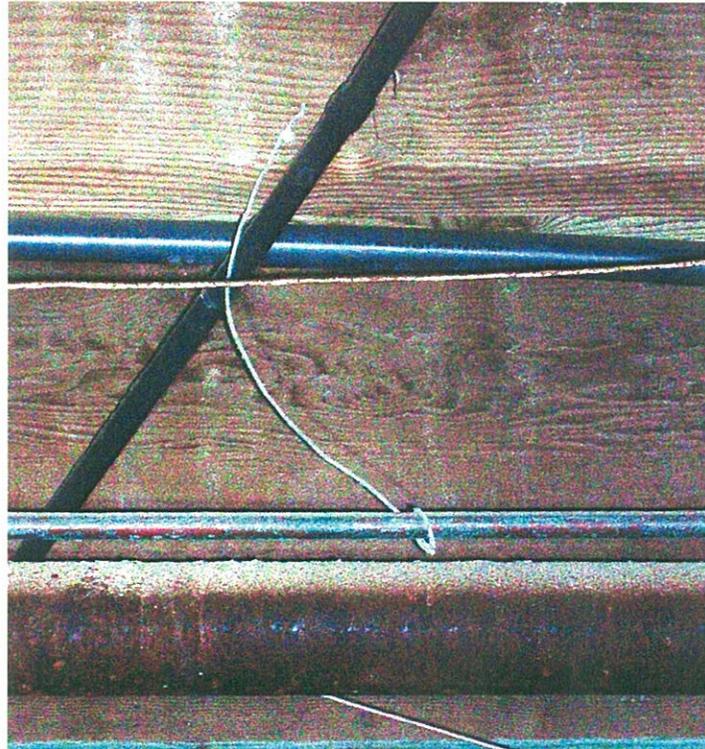


PHOTO 5



PHOTO 6



PHOTO 7



PHOTO 8

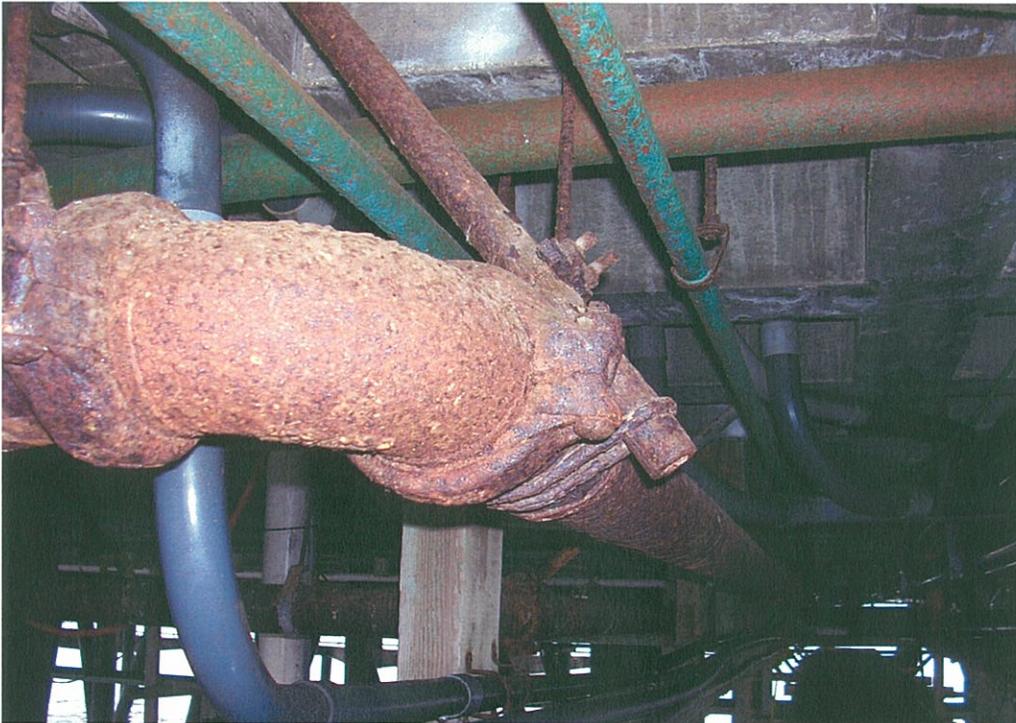


PHOTO 9



PHOTO 10



PHOTO 11



PHOTO 12



PHOTO 13



PHOTO 14



PHOTO 15



PHOTO 16

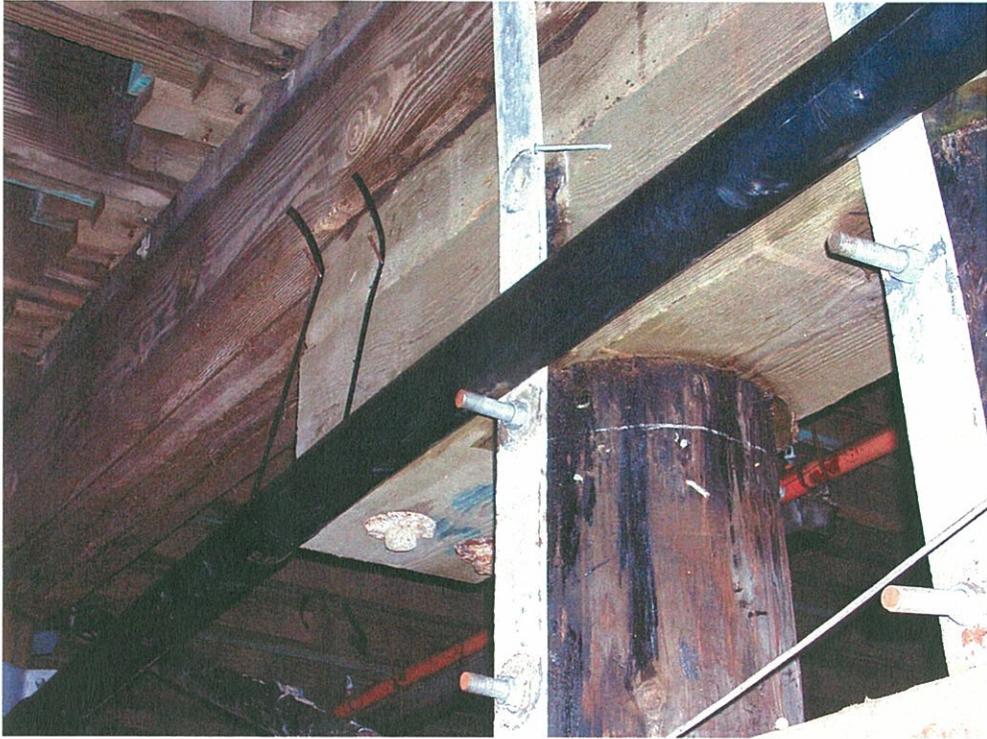


PHOTO 17



PHOTO 18



PHOTO 19



PHOTO 20



PHOTO 21



PHOTO 23



PHOTO 24

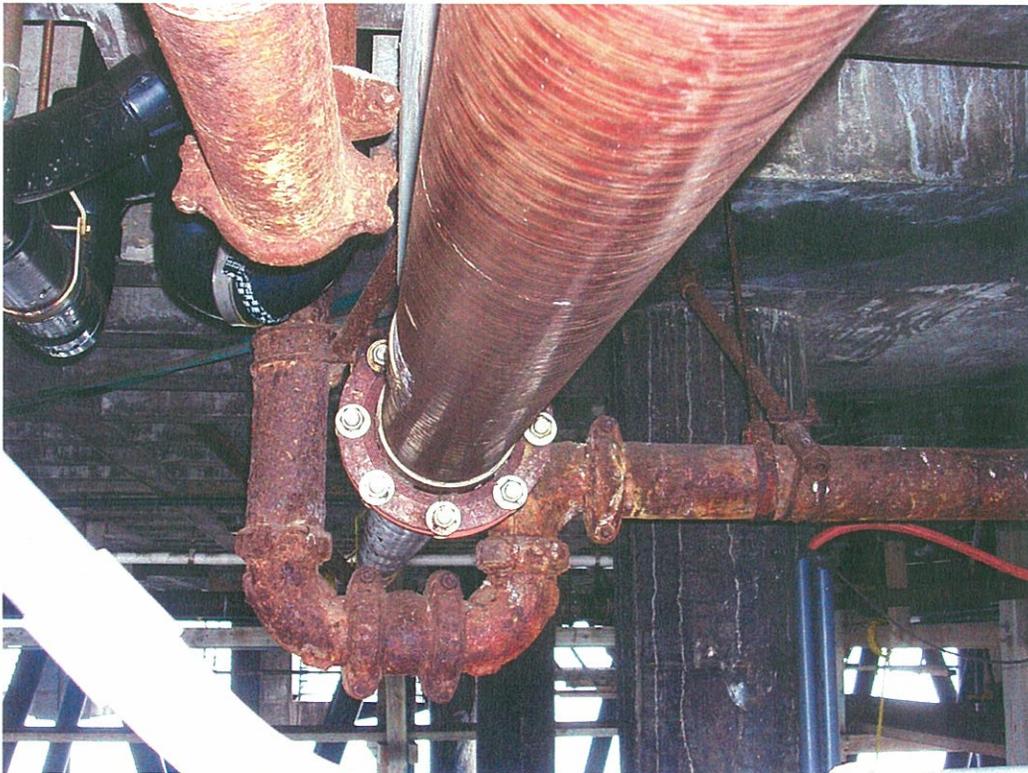


PHOTO 25

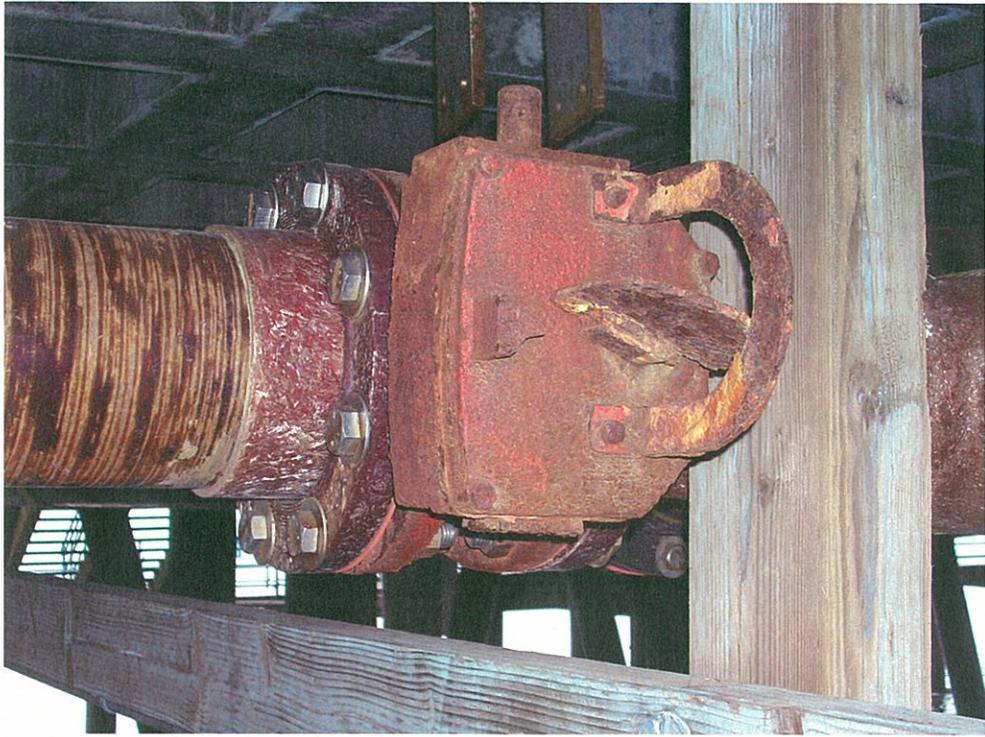


PHOTO 26

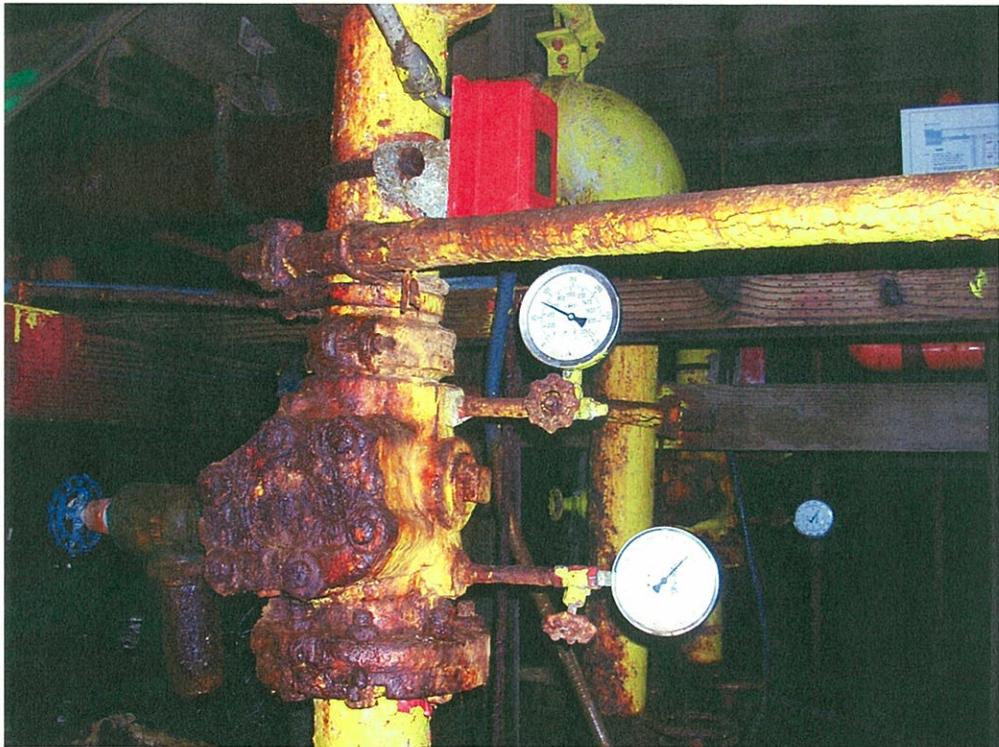


PHOTO 27

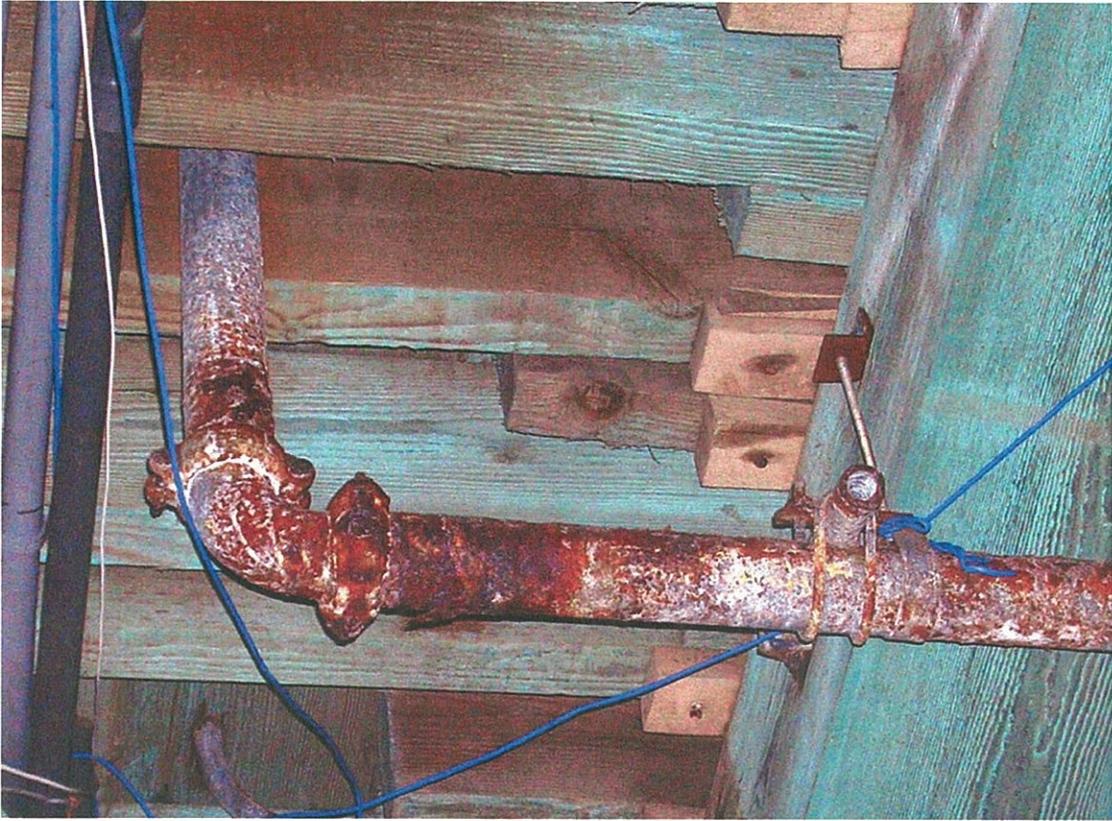


PHOTO 28



PHOTO 29



PHOTO 30



PHOTO 31



PHOTO 32



PHOTO 33



PHOTO 34



PHOTO 35



PHOTO 36



MOFFATT AND NICHOL
SANTA MONICA PIER
FIRE PROTECTION SYSTEM

REV.	DESCRIPTION	BY	DATE	REVIEWED	DATE	APPROVED	DATE
0	ISSUED TO CLIENT	PCY	10/16/07	JAD	10/25/07	JAD	10/25/07
JOB NO.: 4096							
DRAWING / CALCULATION NO.: 4096-MR-01						REV. 0	

Purpose:

The City of Santa Monica has initiated a project for assessment of the pier infrastructure. This portion of the project includes inspection of the existing fire protection system including the pipe supports and sprinklers on the pier.

Background:

Inspections of the under deck fire protection systems at the Santa Monica Pier have been performed as follows:

9/13/07: Jim DeLuca
9/18/07: Jim DeLuca, Peter Yu
9/19/07: Peter Yu

The inspection included the infrastructure of the fire protection system including the pipe supports and sprinklers.

Conclusions/Recommendations:

The overall condition of the sprinkler systems appeared very good and it appeared that the system may have been installed fairly recently. However, there were several deficiencies noted where it appeared work had been done in the area around the sprinkler system that damaged or resulted in a degradation of the sprinkler system. For instance, it was noted that some hangers and or sprinklers were damaged or missing. This could only happen due to work in the area on other pier systems and the workman not paying attention to nearby systems.

The attached "Assessment Form" and photos include a listing of the as found conditions where deficiencies are noted. None of the deficiencies identified will prevent the system from operating in the event of a fire. However, the items identified as "B" are items that are likely to affect the effectiveness of the system and should be corrected as soon as possible. Some of the sprinklers are located next to a beam that will reduce the effective coverage area of the sprinkler. These sprinklers should be modified so that they are below the beam or an additional sprinkler added on the other side of the beam so that coverage is provided to the complete area.

The items identified as "P" or "F" are repairs that include adding supports for sagging lines, reinstalling broken line supports, replacing nonstandard pipe supports, removing electrical wiring wrapped around sprinkler heads and removing the sprinkler cages which are rusted and may prevent the sprinkler from operating correctly.

Attachments: (See Appendix B)

- A. Assessment Form
- B. Field Photos

Santa Monica Pier Electrical Condition Assessment

Field Team

Eric Prater
Gary Martin

Dates Field Work performed - 2007

September 12, 13
September 17, 18, 19, 20
September 24, 25

October 3, 5

November 7

General Electrical Conditions and Observations Below Pier Deck

Distribution Equipment:

The Electrical distribution equipment, switchboard, panel boards, etc. is in need of maintenance. The equipment is generally in fair to good condition. Enclosures are showing some signs of corrosion. Equipment enclosures need to be sanded primed and painted. Equipment interiors need to be cleaned and connections torqued and tightened. Equipment lacks identification labels and updated directories. Equipment spaces and surroundings need to be cleaned and adequate lighting provided.

Lighting Systems:

There are a number of lighting systems scattered throughout the underside of the Pier deck. Most seem to be placed to provide illumination to the Pier's fire protection equipment and some appear to have been used for general maintenance illumination. All of these lighting systems are in need of repair or replacement. Areas under the Pier are dark and lack means of illumination for egress, exit identification and general maintenance.

Conduits, Boxes, Fittings, and Supports:

The majority of the conduits under the Pier deck are not supported in accordance with the National Electrical Code. As a result many conduits have become damaged at couplings and joints and have separated from pull boxes and fittings. There is no diagonal bracing

where large groups of conduits have been racked together and supported by rods and channels.

As a minimum, the National Electrical Code requires the following spacing between supports:

For PVC or Non-Metallic Rigid Conduits

½" to 1"	3' maximum spacing between supports
1 ¼" to 2"	5' maximum spacing between supports
2 ½" to 3"	6' maximum spacing between supports
3 ½" to 5"	7' maximum spacing between supports

For Rigid Galvanized Steel Conduits

½" to ¾"	10' maximum spacing between supports
1"	12' maximum spacing between supports
1 ¼" to 1 ½"	14' maximum spacing between supports
2" to 2 ½"	16' maximum spacing between supports
3" to 5"	20' maximum spacing between supports

In this corrosive environment, PVC conduit seems to be performing best (where properly supported). Galvanized steel conduits are corroding and eventually over time will require replacement. Steel conduit straps, supports and hangers are corroded and many have failed.

Similarly, steel boxes and fittings are corroded and non-metallic boxes are performing well. Many of the boxes are not supported according to NEC 314.23 and some have been made inaccessible by the installation of new stringers and structural members. Boxes are required to be accessible according to the requirements of NEC 314.29.

There are a great deal of what appears to be abandoned electrical conduits, boxes and wiring below the Pier deck. It is impossible to determine by visual inspection, which, if any are still connected and possibly live. These abandoned items should be identified and removed.

Communication Systems:

For the most part, communication systems below the Pier are not installed in raceways and are strung across the Pier structural members, conduits and piping for support. Many of the cables appear to be unused or abandoned. Abandoned communications should be identified and removed and proper protection and support provided.

Grounding:

The Pier grounding system consists of various electrical service grounds bonded together by a Pier-wide ground tap conduit and box system. All ground system components should be tested for resistance and continuity. There appear to be some cables at service points which have been disconnected. These should be checked and if no longer required, should be removed. If they are intended to be part of the ground system they need to be reconnected. We also noted several locations where connections to cold water piping have become corroded. These need to be cleaned and repaired or replaced, tightened and tested as necessary.

A number of ground tap boxes have been made inaccessible by the installation of new stringers supporting the Pier deck. These boxes will need to be repositioned so that the covers are removable.

General Lighting System Conditions and Observations Above Pier Deck

The Pier lighting is comprised of various lighting sources and styles of lighting system components. Most of the poles and luminaries are in need of maintenance. A few poles and luminaries are damaged and corroded and are in need of replacement. Lighting levels in some areas is inadequate. The lighting system should be upgraded or replaced to provide lighting levels consistent with the recommendations of the Illuminating Engineering Society (IES).

The Pier necklace lighting system is damaged and non-operational and is in need of replacement.

Elements Observed Requiring Immediate Attention

1. All broken or separated conduits with exposed live wiring need to be repaired and properly supported.
2. Disconnected grounds and damaged ground connections need to be connected, tested, and repaired or replaced.
3. Light fixtures on catwalks which have become loose from their mounting and separated from conduits where exposed wiring is present need to be reinstalled.
4. Failed conduit support racks between piles i and j from Bent 31 to 35 and need replacement. Conduits appear ready to separate and collapse.
5. Light fixture between piles s & t and Bents 35 & 36, and has fallen from supports and is being held in place by exposed live wires which have pulled out from conduits feeding the light fixture.

6. Conduit rack support rods appear undersized for load, and diagonal bracing should be provided for conduit racks located at piles, p & q and Bents 39 & 40 .
7. All steel supports and hangers at end of the concrete Pier appear to be failing and should be replaced with stainless steel.
8. Light pole at bottom of ramp at the entrance to Pier has exposed wiring within reach of pedestrians on the sidewalk.
9. Entire Pier necklace lighting system is damaged and should be disconnected and removed.

Field Notes and Photographs

Specific deficiencies related to items listed in the above General Condition Assessment Report are noted in the Electrical field notes and photographs. See Appendix C.

Santa Monica Pier Substructure Condition Assessment

Field Team

Tristan MacMillan
Kyle Landon
Lance Menzies

Dates Field Work Performed – 2007

September 3 - 7
September 10 - 14
September 17 - 21
September 24 - 28
October 1 - 5

General Substructure Conditions and Observations

Piles:

The majority of the timber piles are in fair or better condition and require no repair. There are, however, a number of exceptions that need attention.

All pile labels under the old naming systems have been painted out and the new system has been established. All field notes are based on the new numbering system.

Caps and Corbels:

Most caps and corbels are in good working condition and display only minor splitting from drying and initial installation.

Bracing:

All bracing that has been recently replaced is in good condition. Older bracing is roughly half fair working condition and half poor condition in need of replacement.

Stringers:

Most stringers are in good working condition with no visible damage. Several, however, were noted in poor condition with a need for immediate attention.

Elements Observed Requiring Immediate Attention

Several stringers on the Newcomb Pier, and one on the Municipal Pier, were observed to have severe damage and/or a lack of bearing capacity. They should be supplemented or replaced as soon as possible:

4 q+3	12 O+4 (Municipal Pier)	25 g+0 26 y+0
6 o+1	14 o+2	27 p+2
6 s+2	14 z+2	28 k+6
7.5 k+0	21 h+5 (Several in this	28 v+1
7.5 k+2	area are rotten)	28 y+4
7.5 k+4	20 t+1	29 w+4
7 r+3	20 t+2	29 y+5
7 v+0	21 x+2	36 l+1
7 y+4	23 q+0	
7 y+5	25 f+1	

While many piles, caps, corbels and braces are in need of replacement or repair, none are in a critical state that requires immediate attention.

Field Notes and Photographs

Specific deficiencies related to items listed in the above General Condition Assessment Report are noted in the Structural field notes and photographs. See appendix D.

Santa Monica Pier Offshore Pile Condition Assessment

Dates Field Work performed – 2007 and Dive Team

October 9-11	Mike Breitenstein, Tristan MacMillan, A. J. Lee
October 15-17	Mike Breitenstein, Bob Sherwood, Dimitris Pachakis
October 25-27	Rich Albert, Bill Dubbs, Bob Sherwood, Tristan MacMillan, A.J. Lee

Procedure

Near Shore Bent 43 through Bent 53:

Piles from the high tide line to the end of the Newcomb Pier were inspected from the beach at low tide. All piles were visually inspected (Type 1) and approximately 10% had marine growth removed in bands (Type 2) and the underlying pile inspected again. None of these piles were chosen for Type 3 inspection as they are not as likely candidates for marine borers as piles that are not fully exposed at low tide.

Municipal Pier Bents 50 through Bent 59:

Piles in this reach were inspected by wading and scuba diving. All piles were visually inspected (Type 1) and 12 had marine growth removed in bands (Type 2) and the underlying pile inspected again. In addition, 12 piles were tested for dissolved oxygen and three of those were cored and plugged (Type 3). None of the core samples have evidence of marine borer damage.

Municipal Pier Bent 60 through 103 (Waffle Slab):

Piles in this reach were inspected by surface supplied divers working from the Moffatt & Nichol dive boat moored next to the pier. All piles were visually inspected (Type 1) and approximately 10% had marine growth removed in bands at multiple water depths (Type 2) and the underlying pile inspected again.

Elements Observed Requiring Immediate Attention

None of the offshore piles showed damages requiring immediate attention. However, there is evidence of significant corrosion in some of the concrete piles under the Newcomb Pier especially piles at Bent 46 Pile Row y (two batter piles). While immediate attention is not required, repairs should be scheduled within the next couple of years.

Field Notes and Photographs

Specific conditions observed are noted in the attached concrete and timber pile inspection records and photographs. See Appendix E for Field Notes.



Northwest Face of West Pile at Bent 46 Pile Row y



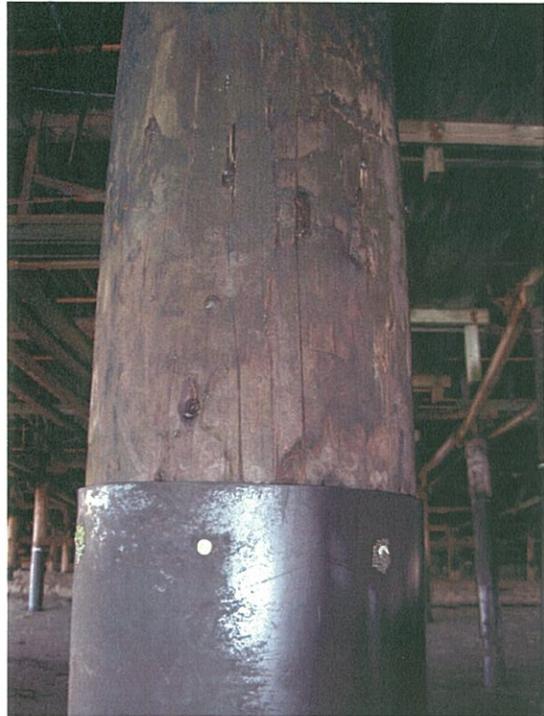
Dive Boat and Diver



Diver Checking Concrete Pile



Pile 45e Top of Wrap SW Side



Pile 45e Top of Wrap W Side



Pile 45e Level 2 at Mud Line S Side



Pile 46j Top of FRP Jacket



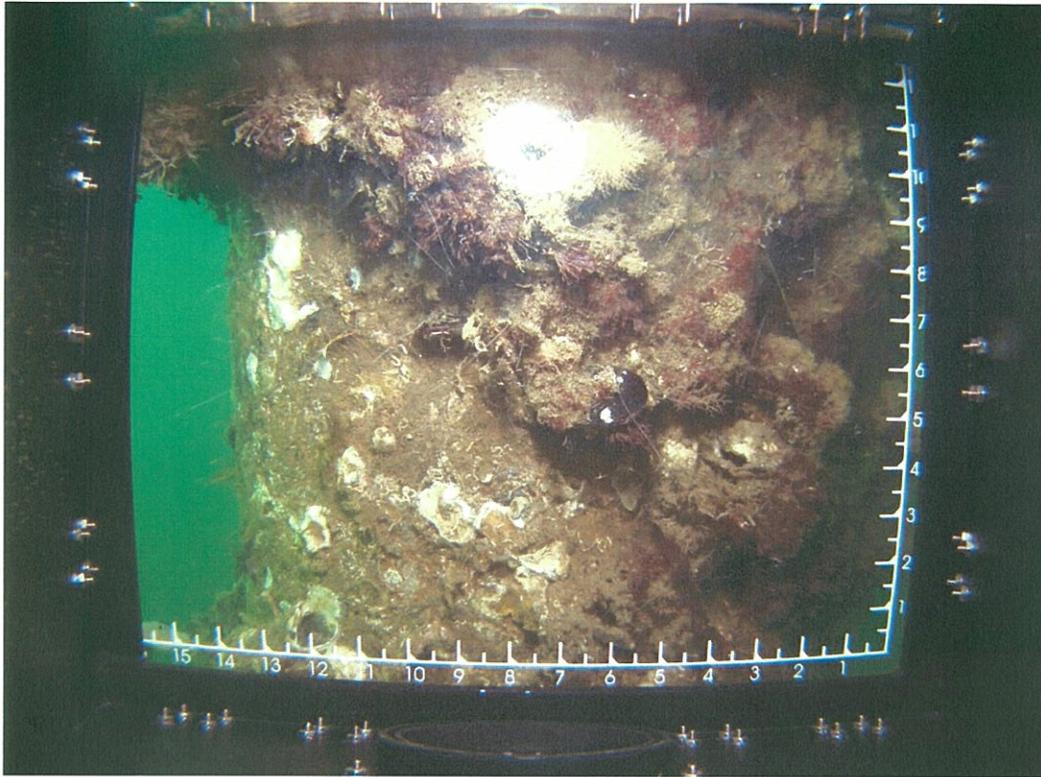
Pile 46aa Crack at Jet Inlet



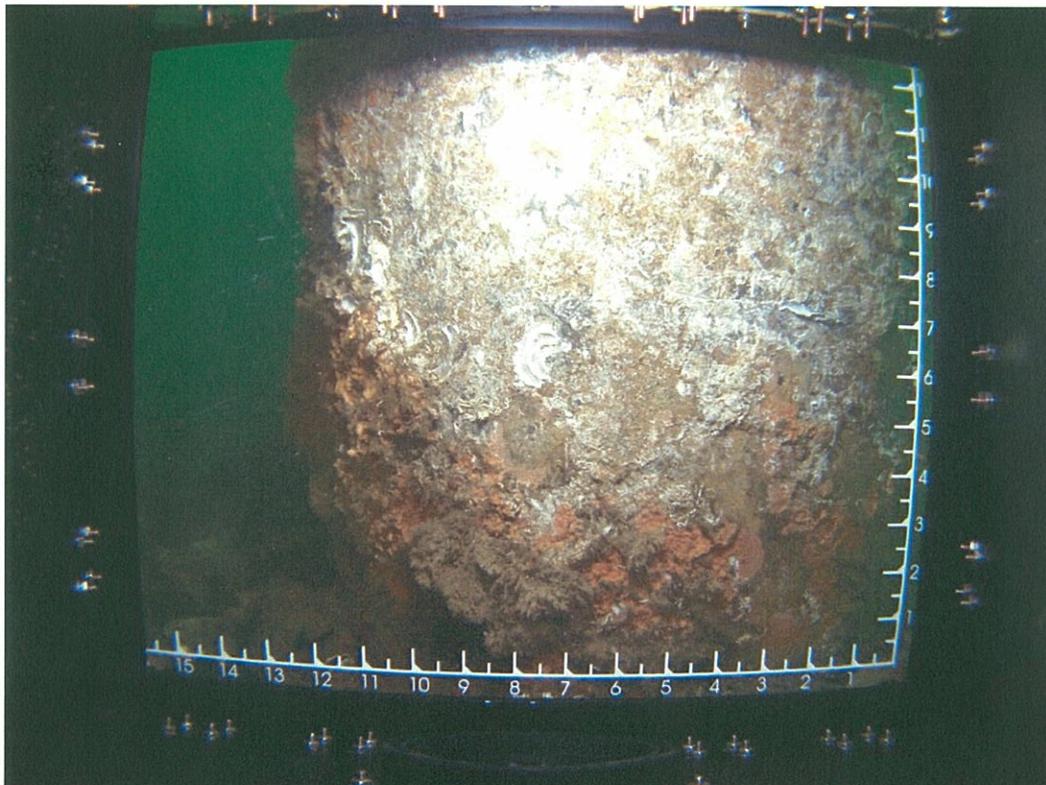
Piles 47y W & E South Side



West Pile at Bent 46 Pile Row y



Pile 90D Mid-Tide Level 2



Pile 90D Mud Line Level 2



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