CLEARWATER BEACH MARINA
ELECTRICAL DISTRIBUTION EVALUATION & FEASIBILITY STUDY
A/E #17039

25 CAUSEWAY BLVD
CLEARWATER BEACH, FLORIDA 33765

FOR THE

CITY OF CLEARWATER
CLEARWATER, FLORIDA

CLEARWATER
BRIGHT AND BEAUTIFUL · BAY TO BEACH

DRAFT REPORT
SEPTEMBER 18, 2018

PREPARED BY:

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1. Install the Main/West dock new power service equipment, service equipment platform and Main Dock power distribution system.

2. Install the West dock new power distribution system. After the new power distribution system is installed, the existing Main/West Dock old power service and power distribution system shall be removed. Option #1 is required to be done first, then Option #2.

3. Install East dock new power service equipment, service equipment platform and East Dock power distribution system. After the new service and power distribution systems are installed, the existing East Dock old service and power distribution systems shall be removed.

These options provide for new dock power services and power distribution systems to be installed in parallel to the existing dock power service and distribution systems. When the new power distribution system(s) are in place, new slip power distribution feeders and pedestals can be installed in group and the old power distribution systems can be removed. This approach minimizes boat slip downtime required to install new power distribution systems and can be phase to block-off a section of boat slips for new power distribution system upgrades as needed.

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A. INTRODUCTION

Long & Associates was retained to provide the City of Clearwater with Field Survey Drawings for the east and west marina boat dock power distribution systems, evaluate existing electrical power system issues and provide a feasibility study of options and probable costs for alternative solutions. The Marina Maintenance Staff have indicated that they are experiencing voltage drop problems in the existing electrical distribution systems serving the boat docks at the Marina. The age and capacity of the existing systems are not keeping up with the demand of modern boats. The scope of services as defined by the following descriptions of project objectives and project deliverables was established in coordination with City staff. Our team of Architectural and Engineering professionals undertook a series of site observation visits and conducted a series of Document reviews and interviews with City staff to assess the existing conditions and identify deficiencies which must be addressed to put the resolve the electrical issues at the boat docks.

PROJECT OBJECTIVES

1. Generally review and evaluate the existing Clearwater Beach Marina Boat dock power distribution systems and render a third party Professional opinion of the conditions and feasibility study with options to correct the electrical issues, including an opinion of probable costs.
2. Evaluate the possible electrical corrections of the boat dock electrical distribution system 3 possible options
    a) Install the main/west dock power service, service platform and main dock power distribution system.
    b) Install the west dock power distribution system.
    c) Install the east dock power service, service platform and power distribution system.

PROJECT DELIVERABLE

1. This Final Report includes executive summary, evaluations, and observations, field survey drawings a feasibility study. This includes the written existing conditions evaluation, a Code Review evaluation, and an Opinion of Probable costs.

PROJECT TEAM

Paul Portal, AIA, LEED AP, Architect, Principal

Paul E. Wieczorek, PE, Structural Engineer, Principal

Robert A. Race II, PE Electrical Engineer

FORMAT AND PROCESS

This Final Report is organized into an evaluation section with separate chapters for each discipline involved by floor. Following the evaluation we have included separate chapters to address and highlight specific issues requested by the owner. Conceptual options have been provided to address a staged remodeling of the facility for various tenant use and to evaluate the various portions of the facility that would have to be remodeled to make each portion function and Code compliant. Lastly we have provided an Opinion of Probable Costs based on the project area to be remodeled and average current construction costs presuming 3% inflation for each year hereafter.

The evaluation of the facility was based solely on visual observations by experienced design professionals, a review of available construction documents, and from information obtained through interviews with City personnel. Testing and analysis of materials and methods of construction and operational condition of equipment and systems was not performed within the scope of this project. Information such as dates of original construction and subsequent additions and renovations was taken from best available data from other sources provided by the owner. Recommendations for enhancements to existing facilities are described in broad terms only to establish the general scope of work required to address needs and deficiencies identified through the evaluation process outlined in this report. Detailed work plans and specific design solutions are beyond the scope of this project. The recommendations are provided to assist the City in a cost-benefit analysis of the potential upgrade of the Marina docks.

OPINION OF PROBABLE COST

Our Opinion of Probable Cost is provided to assist the City in financial planning and budgeting necessary to understand the magnitude of effort required to upgrade the existing marina power distribution systems and make them suitable for tenant, private and commercial vessel use. The opinion of probable construction cost stated for each work scope is based on our professional experience in the Tampa Bay construction market and we have provided a range of costs. These figures are expressed in 2018 dollars, and extrapolation will be required for any cost projections in future years based on inflation, market fluctuation and other factors. We have suggested a 3% increase be used for future inflation for each year thereafter.

LIMITATIONS OF USE

This report has been prepared solely for the use of the City of Clearwater as a planning and budgeting tool, and may not contain sufficient or appropriate information for other uses or for the purposes of other parties. In the event any conclusions or recommendations based upon this report are made by others, such conclusions or recommendations cannot be construed to reflect the professional opinions of Long & Associates unless we have been given the opportunity to review and concur with them in writing. We appreciate the opportunity to have provided this Professional Architectural and Engineering service for the City of Clearwater. If you have any questions concerning this report, or if we may be of further assistance, please do not hesitate to contact us at your convenience.

B. EXECUTIVE SUMMARY

Based on our visual observations of this facility, the marina dock power distribution systems need various significant repairs or replacements to correct the low voltage issues and make the systems Code compliant and usable. Many of the Marina power distribution systems components have outlived their useful life span and are in need of replacement or significant upgrades and would have to be upgraded to meet the current FBC, NEC and FEMA requirements including the power distribution equipment and related structural support platform systems for distribution equipment. In addition, the future expansion of the marina docks will need to be considered so that spare capacity can be planned for the new power distribution system design in order to accommodate the anticipated future loads for the dock expansion projects.

This report cannot be considered all inclusive for such an evaluation since the future use is not known. A choice of these systems depends largely on the intended use, longevity and future dock expansion plans.

DOCUMENTATION

The Clearwater Marina is a City Owned facility located on 25 Causeway Blvd in Clearwater Beach, Florida. The site is over 40 years old. A Phase II expansion of the Marina was complete in 1973. A new fueling dispensing system was installed in 1988.

Upon approval and notice to proceed, Long & Associates received documents from the City which were reduced copies of the original construction documents of the subject project. The documents received are listed as follows:

1973 Construction Documents (incomplete) of Clearwater Marina Phase II Expansion
1987 Construction Documents (incomplete) of Clearwater Marina New Fuel Dispensing System

The original scanned documents provided appeared to be incomplete and were largely unreadable as the copies were of poor quality. These documents have been reproduced in the Appendix C accordingly.

C. EVALUATION OF EXISTING POWER DISTRIBUTION SYSTEMS SERVING THE DOCKS

Long & Associates began the on-site field investigation process to observe and document the existing conditions of the Marina power distribution systems. Our team of professionals met with Mr. Mike Macdonald and Patrick Shackton on site for access to the marina facilities. The marina dock power distribution systems were observed by Long & Associates Representatives to document the conditions.

EXISTING CONDITIONS SURVEY

Marina Power Distribution System - West and Main Docks

The existing west docks and Crabby's Dockside restaurant are served power from an existing pad mounted 300 KVA, 208Y/120 V, thee phase, 4 wire Duke Energy Transformer. Reference Enlarged Site Plan on dwg E2.2 in Appendix C for power distribution equipment locations. The transformer has three service laterals. One lateral serves the Crabby's Dockside restaurant, another serves the 400 amp service panelboard "MSP1" and the third lateral serves the 600 amp fused service switch "MSP2". Reference West Dock Electrical Riser on dwg E3.3 in Appendix C for boat dock distribution equipment interconnections. Both services incorporate a Duke Energy meter.

A feeder circuit from service panel "MSP1" serves a feeder tap box "FT1" located on the south end of the west-center main dock. Feeder and branch circuit tap circuit breakers in tap box "FT1" serve feeders and branch circuits that distribute power to multiple vessel power pedestals and other loads on the boat docks (See feeder tap box "FT1" schedule on dwg E3.3, Appendix C, for loads served from the tap box circuit breakers). The slips on the docks consist of private, transient vessels.

A feeder circuit from service switch "MSP2" serves a feeder tap box "FT2". Feeder and branch circuit tap circuit breakers in tap box "FT2" serve feeders and branch circuits that distribute power to multiple vessel power pedestals and other loads on the boat docks (See feeder tap box "FT2" schedule on dwg E3.3, Appendix C, for loads served from the tap box circuit breakers). The slips on the docks consist of Owner metered commercial vessels.

Observations:

Based on conversations with the Staff at the Marina, there is a shore power distribution system low voltage issue. Vessel power distribution systems, in some cases, will not allow connection to shore voltage is shore power voltage is too low. Low shore power voltage conditions also create a higher risk of damage to Vessel electronic systems and can be a liability to the Marina. Some Vessel Owners provide and connect their voltage step-up transformers (see pic #1 in Appendix A) to shore power pedestals in order to increase the shore voltage to allow Vessel power system to operate and reduce potential damage to vessel electronics due to low voltage conditions. In addition, based on estimated load calculations for the existing service and feeder conductors serving the Marinas dock loads, many of the existing service and feeder circuits are overloaded. The circuit overload conditions will contribute to the voltage drop problems (the larger the load is on an undersized circuit, the higher the voltage drop). Reference NEC Article 555.12 "Marina Load Calculations for Service and Feeder Conductors" in Appendix C.

Branch circuits of the voltage class and rating corresponding to the rating of the receptacle must supply each receptacle that supplies shore power to boats per NEC Article 555.19 (A)3. The Code reference requires 240V rated power pedestals to be served supplied from a 240 Volt system. The referenced Code section also explains that supplying 120/240 V 3-wire receptacles from a 120/208V 3-wire supply may

cause overheating or malfunctioning of connected equipment per NEC.

The existing marina power distribution systems and estimated loads were modeled in a software program called Easy Power to estimate voltages at the existing power pedestals in order to evaluate the voltages at the pedestals. (See "West Dock Electrical Riser" in Appendix F). The maximum voltage drop at the power pedestals for 240 Volt connections should be 5% voltage drop or 240V x .95 = 228 Volts. The voltage calculations in the Easy Power model show existing power pedestal voltages substantially lower than 228 Volts. See clouded areas on Risers that show low voltages of 199 V and 186 V.

Part of the existing problem at the marina is that the source system serving the boat docks is 208 Volts systems and should be a 240 V systems. The existing 208V systems are starting-off as lower voltage than allowed by Code (228 Volts – 5% voltage drop max) for power serving 240 V rated vessel power pedestals.

Power distribution equipment appears to be obsolete, not in serviceable condition, located within 100 year FEMA base flood elevation and has inadequate power capacity to serve existing and future marina dock loads, based on current power demand calculation requirement per NEC Article 555 Code requirements for Marinas.

Based on conversations with the Staff at the Marina, there are existing power distribution connections serving the dock loads that are located below the Electrical Data Plane (normal highest high tide elevation) as defined in NEC 555.9 for fixed piers (reference NEC 555.9 in Appendix C). As a result, the AHJ has required two tide level markings on one of the Main Pier pilings to mark maximum tide levels, one for the east docks and one for the west docks (reference pic #6 in Addendum A). When tide level reaches the lower mark, the Marina is required to Shut-off power serving the west docks and when the tide level reaches the upper mark, the Marina is required to shut-off power to the east docks. The Marina Staff indicates that some years, these high tide levels occurs several times a year and causes major power disruptions and issues with the Marina Transient, Private and Commercial Slip Tenants. Per FEMA Requirements (Reference FEMA Construction Principles and Practices in Appendix C), Electrical utilities and equipment must be located (elevated) and designed to prevent flood waters from entering and accumulating in electrical components during flooding. In the Coastal Zone where the Clearwater Beach Marina is located, the flood water elevation height is based on the FEMA 100 year Base Flood Elevation

(BFE) for the area, which is approximately 12 feet. As a result, the new power service equipment serving the new docks will need to be mounted on a platform that is above the BFE. The existing seawall elevation at the west docks is approximate 2 feet and the main dock seawall elevation is approximately 3' . Reference back of Appendix E for SWFWMD Satellite Mapping and GIS Section of the Clearwater Beach Marina areas showing land mass elevations (yellow lines and red elevation numbers).

The existing service entrance panelboards and subpanels do not have a TVSS (transient voltage surge suppressor) or SPD (surge protective device) units. Most of the existing power distribution system equipment is in extremely poor condition and no longer serviceable. The existing power distribution service panels, panelboards, panelboard directory cards, meter centers, tap boxes, disconnects, slip power pedestals, and power distribution equipment are not labeled and Arc flash labels are not provided in accordance with NEC requirements. Electronic circuit breakers should be field tested and calibration verified. Thermography of circuit breakers and terminations is recommended. All abandoned equipment, wire and conduits shall be removed from distribution panels, tap boxes and cabinets. All feeder and branch circuit breakers in Tap boxes shall be labeled. Many panels are not rated for marine environment applications and have severe rust and are not safe. Reference pictures in Appendix A: pic #2 – Service panel "MSP1" and pic #3 – Service breaker "MSP2". Conduit Supports for many feeder conduits are missing and conduit is not adequately supported, reference pictures in Appendix A, pic #4. Feeder tap boxes had numerous taps, some illegal taps, not adequate conductor bending space and breaker labels missing, reference Appendix A, pic #5 and #6.

Marina Power Distribution System - East Docks

The existing east docks are served power from an existing pad mounted 75 KVA, 208Y/120 V, thee phase, 4 wire Duke Energy Transformer. Reference Enlarged Site Plan on dwg E2.4 in Appendix C for power distribution equipment locations. The transformer serves three service laterals; one feeds a 400 amp service panelboard "MSP3", another lateral feeds a 600 main circuit breaker "MSP4" in Meter Center "MC" and the third lateral serves the dumpster panel "DPD". Reference East Dock Electrical Riser on dwg E3.3 in Appendix C for boat dock distribution equipment interconnections. CT's are provided on the Duke transformer secondary bus and the CT's are circuited to a Duke demand meter mounted next to the transformer.

"MSP4" service disconnect serves meter center "MC" at the existing electrical service stanchion. Meter Center "MC" feeder circuit breakers serve feeders that distribute power to power pedestals/disconnect switches for Commercial Slips, bait house subpanels, admin office/bathroom subpanel and other loads on the boat docks (See Riser #2/Dwg E3.3 in Appendix C for loads served from meter center "MC"). The slips near the concrete seawalls consist of Owner metered commercial vessels.

Feeder circuits from service panelboard "MSP3" distribute power to vessel power pedestals on the docks, Starship II disconnect/loadcenter, fuel dock house subpanel and other branch circuit loads (See Riser #2/Dwg E3.3 in Appendix C for loads served from service panel "MSP4").

Observations:

Based on conversations with the Staff at the Marina, there is a shore power distribution system low voltage issue. Vessel power distribution systems, in some cases, will not allow connection to shore voltage is shore power voltage is too low. Low shore power voltage conditions also create a higher risk of damage to Vessel electronic systems and can be a liability to the Marina. Some Vessel Owners provide and connect their voltage step-up transformers (see pic #1 in Appendix A) to shore power pedestals in order to increase the shore voltage to allow Vessel power system to operate and reduce potential damage to vessel electronics due to low voltage conditions. In addition, based on estimated load calculations for the existing service and feeder conductors serving the Marinas dock loads, many of the existing service and feeder circuits are overloaded. The circuit overload conditions will contribute to the voltage drop problems (the larger the load is on an undersized circuit, the higher the voltage drop). Reference NEC Article 555.12 "Marina Load Calculations for Service and Feeder Conductors" in Appendix C.

The existing marina power distribution systems and estimated loads were modeled in a software program called Easy Power to estimate voltages at the existing power pedestals in order to evaluate the voltages at the pedestals. (See "East Dock Electrical Riser" in Appendix F). The maximum voltage drop at the power pedestals for 240 Volt connections should be 5% voltage drop or 240V x .95 = 228 Volts. The voltage calculations in the Easy Power model show existing power pedestal voltages substantially lower than 228 Volts. See clouded areas on Risers that show low voltages of 189 V and 193 V.

Part of the existing problem at the marina is that the source system serving the boat docks are 208 Volts systems and should be a 240 V systems. The existing 208V systems are starting-off as lower voltage than allowed by Code (228 Volts – 5% voltage drop max) for power serving 240 V rated vessel power pedestals.

Power distribution equipment appears to be obsolete, not in serviceable condition, located within 100 year FEMA base flood elevation and has inadequate power capacity to serve existing and future marina dock loads, based on current power demand calculation requirement per NEC Article 555 Code requirements for Marinas.

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The existing service entrance panelboards and subpanels do not have a TVSS (transient voltage surge suppressor) or SPD (surge protective device) units. Most of the existing power distribution system equipment is in extremely poor condition and no longer serviceable. The existing power distribution service panels, panelboards, panelboard directory cards, meter centers, disconnects, slip power pedestals, and power distribution equipment are not labeled and Arc flash labels are not provided in accordance with NEC requirements. Electronic circuit breakers should be field tested and calibration verified. Thermography of circuit breakers and terminations is recommended. All abandoned equipment, wire and conduits shall be removed from distribution panels, tap boxes and cabinets. All feeder and branch circuit breakers in electrical gear shall be labeled and panelboard directory cards updated with loads served.

CODE COMPLIANCE REVIEW:

The current Codes applicable at this time are:

2017 Florida Building Code

2017 Florida Energy Conservation Code

2014 National Electric Code

2013 ASHRAE 90.1

Electrical feeders exceed maximum 2% voltage drop and branch circuits exceed maximum 3% voltage drop requirements NEC Articles 210.19 (A) and 215.2(A) and ASHRAE 90.1 -8.4. Existing loads on service and feeder conductors exceed the allowable load demands per NEC 555.12.
Electrical service disconnects are not properly labeled per NEC Article 230.3 (E), power distribution equipment is not labeled per NEC 110.22 and most equipment does not have Code compliant arc flash labels per NEC 110.21. Electrical panels with exposed live buss bars that are accessible from holes in bottom of electrical panels and cabinets (some enclosures have rusted-out bottoms).

D. CONCEPTUAL OPTIONS

This report includes a visual observation of the existing marina power distribution systems to determine the feasibility of upgrading the distribution systems. Our opinion of probable costs is based construction costs anticipated for the 2018 Fiscal Year, presuming 3% inflation for each year thereafter.

The first cost option is to review the existing power distribution system serving the west marina docks and determine a relative cost to upgrade the distribution system to correct system voltage drop, power demand and Code deficiencies. This option would include leaving the existing power distribution system in place and building a new power distribution system service to serve both east and main docks. Once the new power system service is installed, new feeders and slip power pedestals and related distribution equipment can be installed, one at a time, to each slip. When the new power distribution system is in place, the existing old distribution power pedestals and related feeders/conduits can be removed back to source service panel. This phased construction approach minimizes the down time for each slip and allows the existing power distribution systems to be upgraded without shutting down the entire east and main docks for the duration of the construction.

The second cost option includes installing new feeders and power pedestals and related distribution equipment to serve slips in the main docks, one at a time, to each slip. When the new power distribution system is in place, the existing old distribution power pedestals and related feeders/conduits can be removed back to source service panel.

The third cost option is to review the existing power distribution system serving the east marina docks and determine a relative cost to upgrade the distribution system to correct system voltage drop, power demand and Code deficiencies. This option would include leaving the existing power distribution system in place and building a new power distribution system service to serve east docks and future dock expansions. Once the new power system service is installed, new feeders and slip power pedestals and related distribution equipment can be installed, one at a time, to each slip. When the new power distribution system is in place, the existing old distribution power pedestals and related feeders/conduits can be removed back to source service panel. New feeder conduits stubb-outs to serve future east dock expansion project(s) will be installed and spare space in the main distribution panel and meter centers will be provided to accommodate anticipated future slip loads.

In summary, the conceptual opens are as follows:

d) Upgrade the west dock power distribution system (phase 1)
e) Upgrade the main dock power distribution system (phase 2)
f) Upgrade the east dock power distribution system (phase 3)

OPINION OF PROBABLE COSTS

We have included an Opinion of Probable costs for the owners use in determining the order of magnitude required to upgrade the existing power distribution systems serving the docks. There are many different factors that can affect the overall cost of the distribution system upgrades. Our values are determined as a median value and we would expect a range of costs for this work depending on many different scope factors. Therefore, we recommend a 10% range both above and below the costs identified.

SEE ATTACHED ESTIMATE OF PROBABLE CONSTRUCTION COSTS IN APPENDIX.

E. CONCLUSIONS

1. Condition of Use

The Marina Maintenance Staff have been experiencing voltage drop problems in the existing electrical distribution systems serving the boat docks at the Marina due to following:

1. Inadequate 208 V service connection (should be 240V, three phase, 4 wire).
2. Overloaded feeder circuits (too many power pedestals on a circuit).
3. Undersize feeder and branch circuits for long runs (Feeder and branch circuit conductors should be increased in size of long circuit runs, so that overall voltage drop from source panel to load does not exceed 5% of 240 Volts (max 12 V voltage drop).

The existing marina power distribution systems should be replaced with a new power distribution systems to address the Code deficiencies noted in the report, fix the low voltage problem, correct the feeder and branch circuit overloading conditions, raise the main power distribution equipment above the FEMA flood plain, raise the electrical connections above the normal highest tide electrical datum line, midigate grounding system leakage currents in water (may cause accelerated corroding of boats with metallic hulls), provide reliable ground fault protected circuits and create a safe environment for the Marina Staff and Customers.

2. Opinion of Probable Costs

The Costs provided are suggested as a range of costs required to upgrade the marina electrical distribution system serving the existing east and west docks and put the docks electrical distribution system back into usable service for general marine vessel and tenant use.

APPENDICES

Appendix A	Photos
Appendix B	Bibliography of Reviewed Documents
Appendix C	Codes and Standards
Appendix D	Cost Estimate
Appendix E	Field Survey Drawings
Appendix F	Electrical Risers & Voltage Drop Calculations

APPENDIX A –

PHOTOS

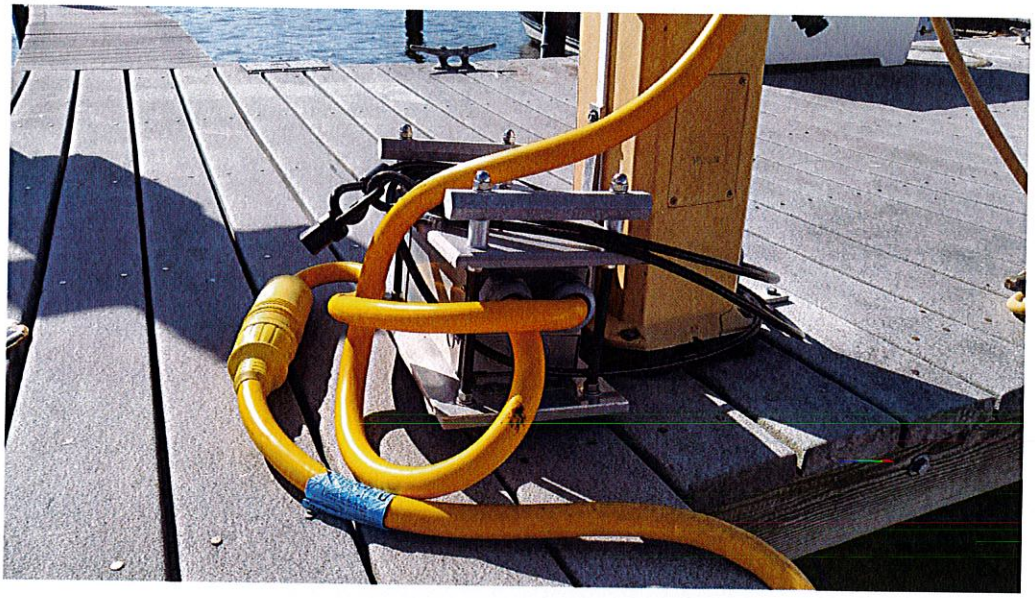


PHOTO 1- Shore Power Voltage Step-up Transformer

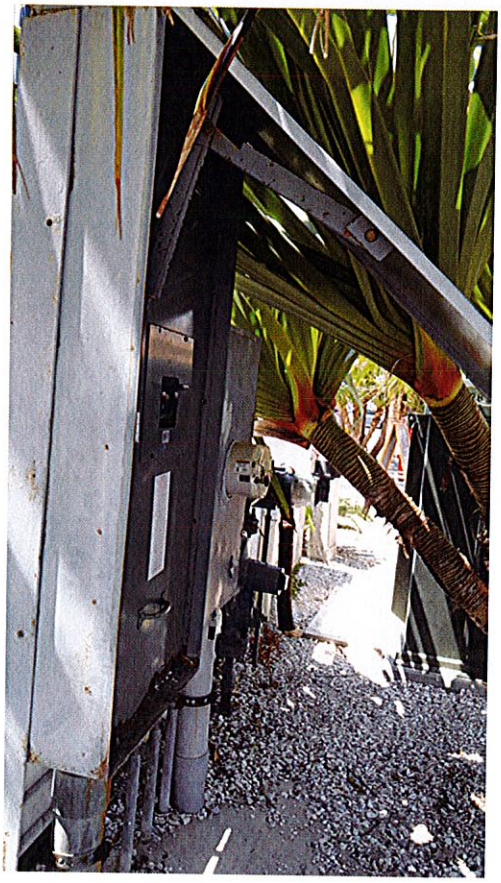


PHOTO 2- Service Panel "MSP1" with bottom of cabinet rusted-out.

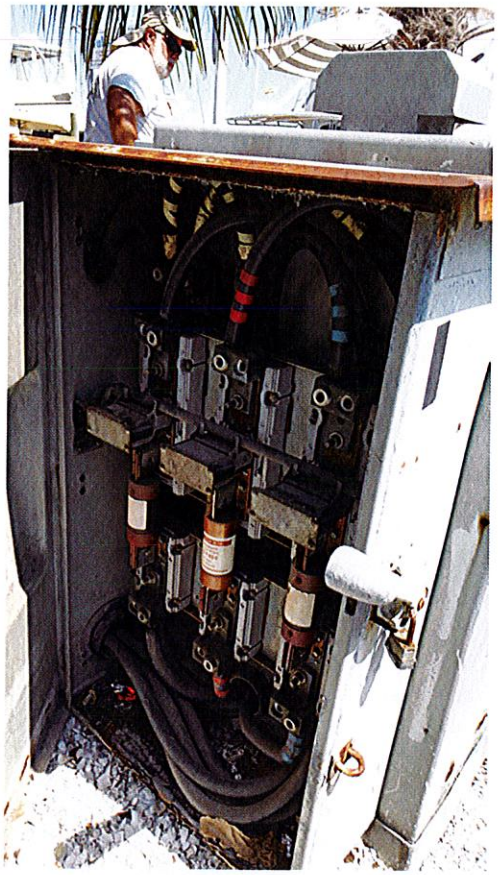


PHOTO 3- Service Switch "MSP2" with rusted-out bottom of enclosure

PHOTO 4- Feeder Conduits Not Supported

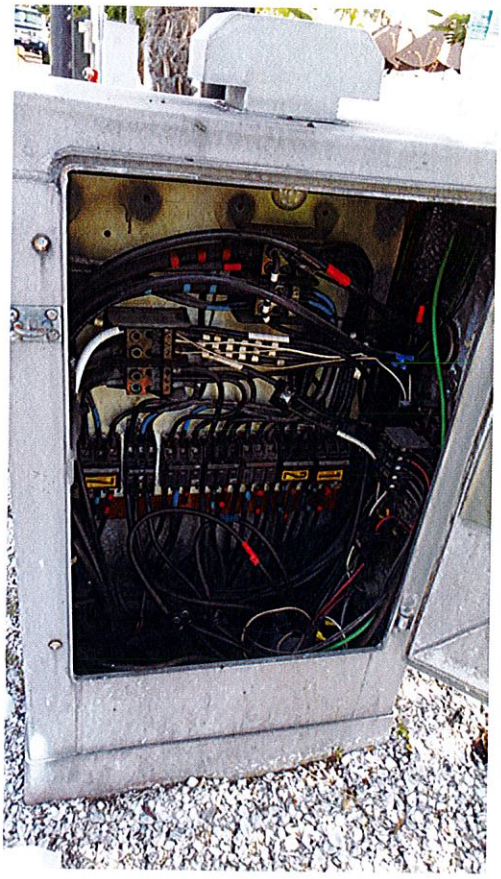


PHOTO 5- Feeder Tap Box "FT2"

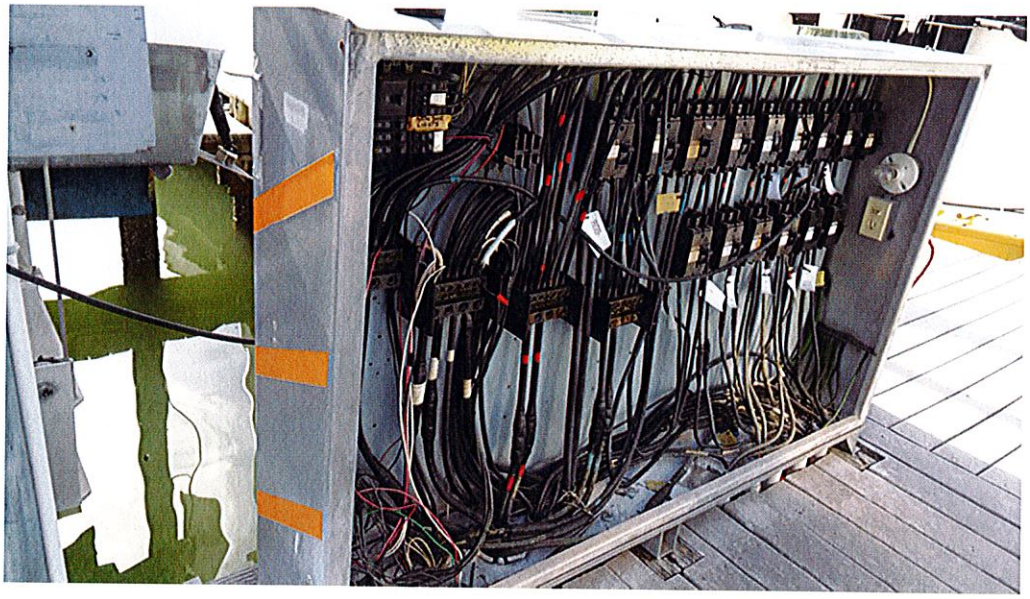


PHOTO 6- Feeder Tap Box "FT1" without feeder ground fault protection

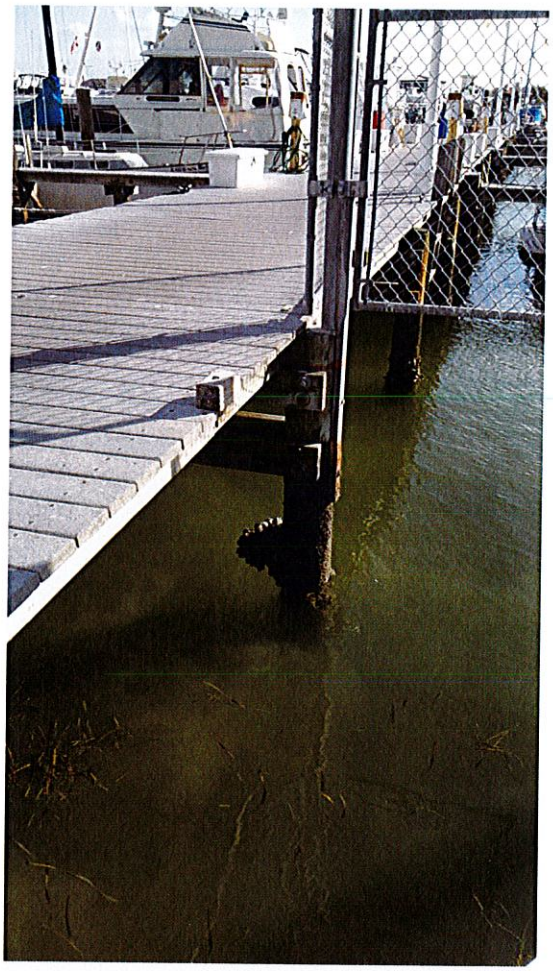


PHOTO 7- Electrical Datum Line Markings on Piling (one for west main docks and the other for east docks)

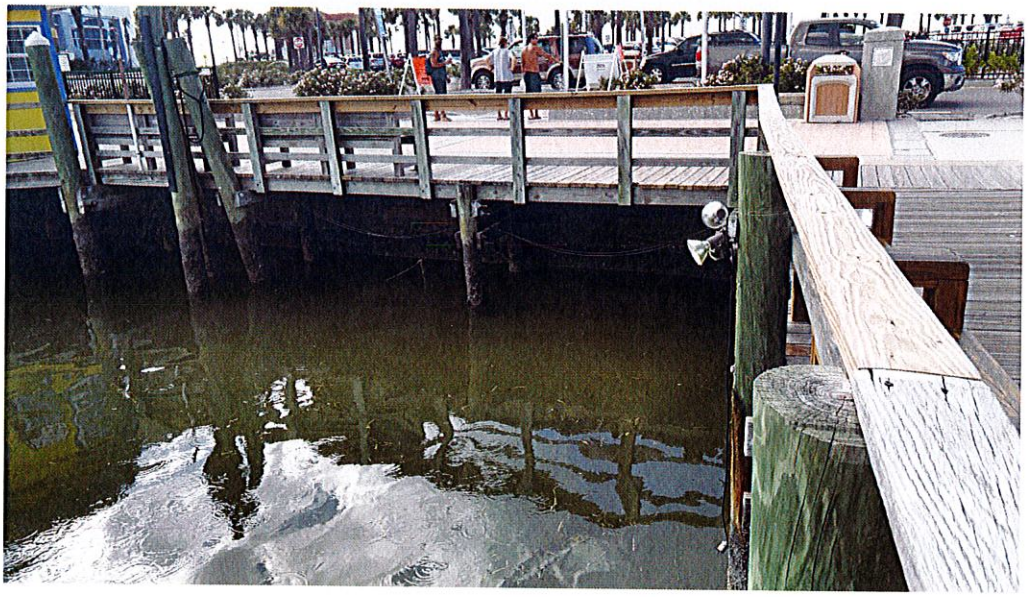


PHOTO 8- Cables not Supported

PHOTO 9- Fuel EPO Shut-Off PB Less than 20' from fuel dispenser

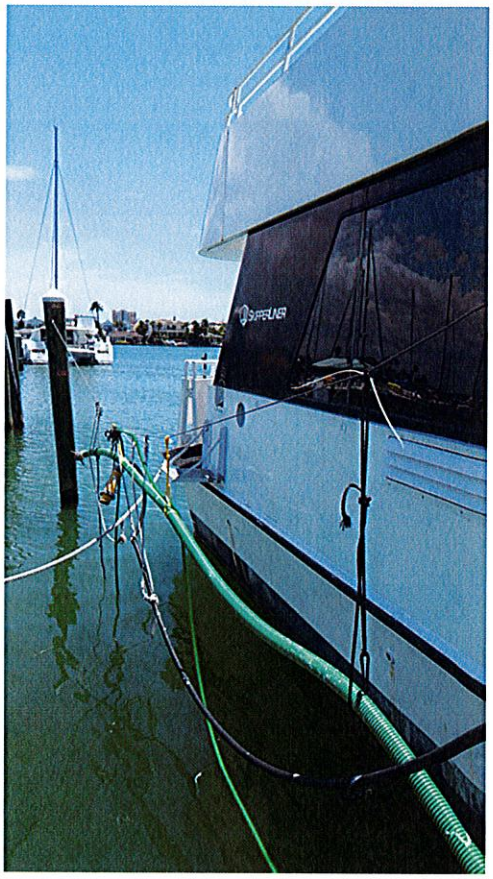


PHOTO 10- Improper Support of Power Cord

PHOTO 11- Service Panel MSP3 Rusted-Out Bottom

PHOTO 12- Service Panel "MSP3" and service switch "MSP4"

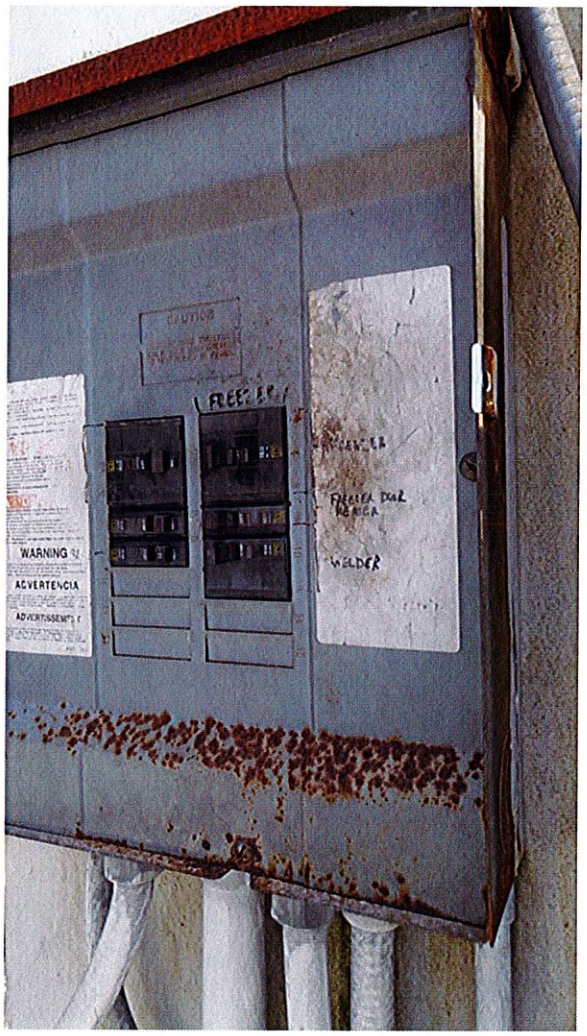


PHOTO 13- Panel With Significant Rust

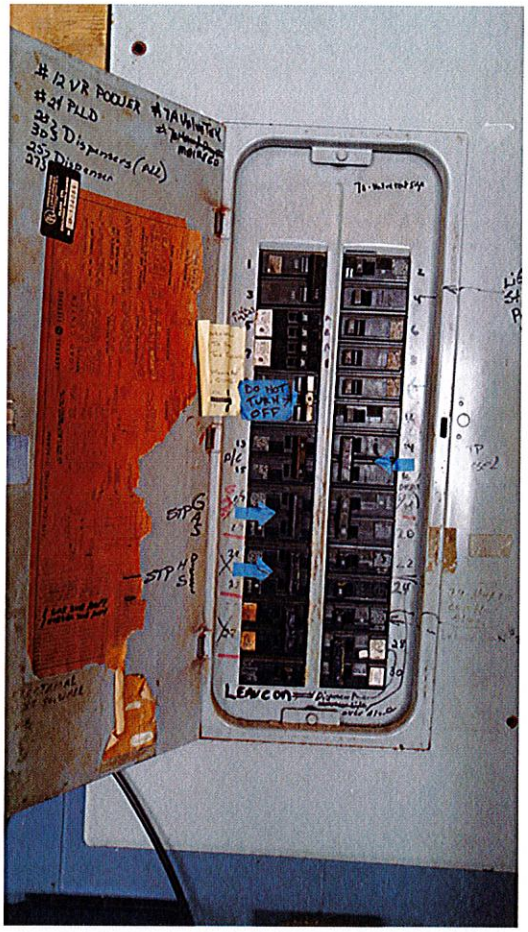


PHOTO 14- Fuel Dock House Sub-Panel- Panel and Branch Circuits Not Labeled Properly

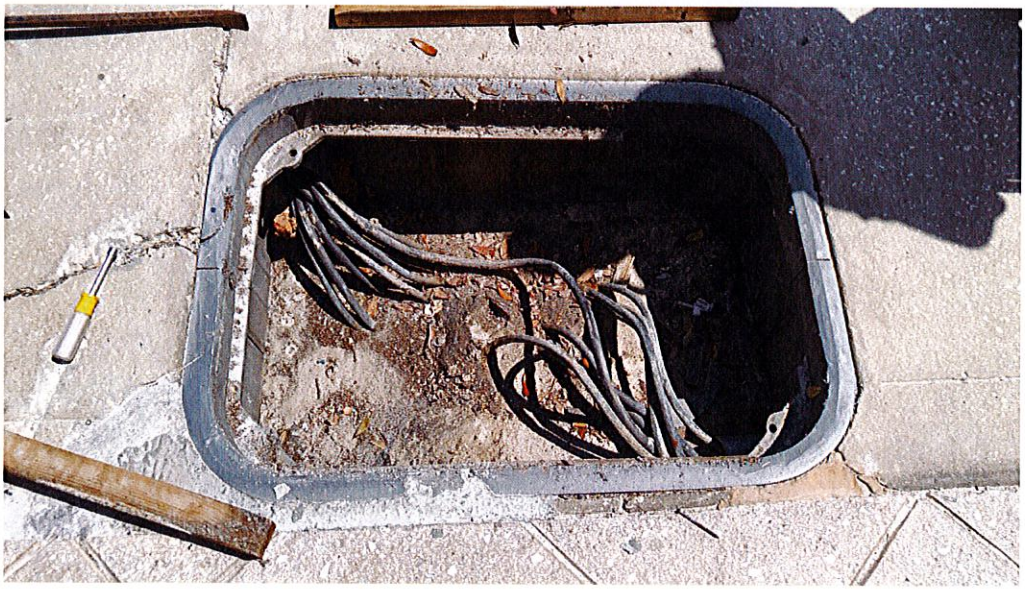


PHOTO 15- Feeder Circuit Handhole in Front of Main Dock

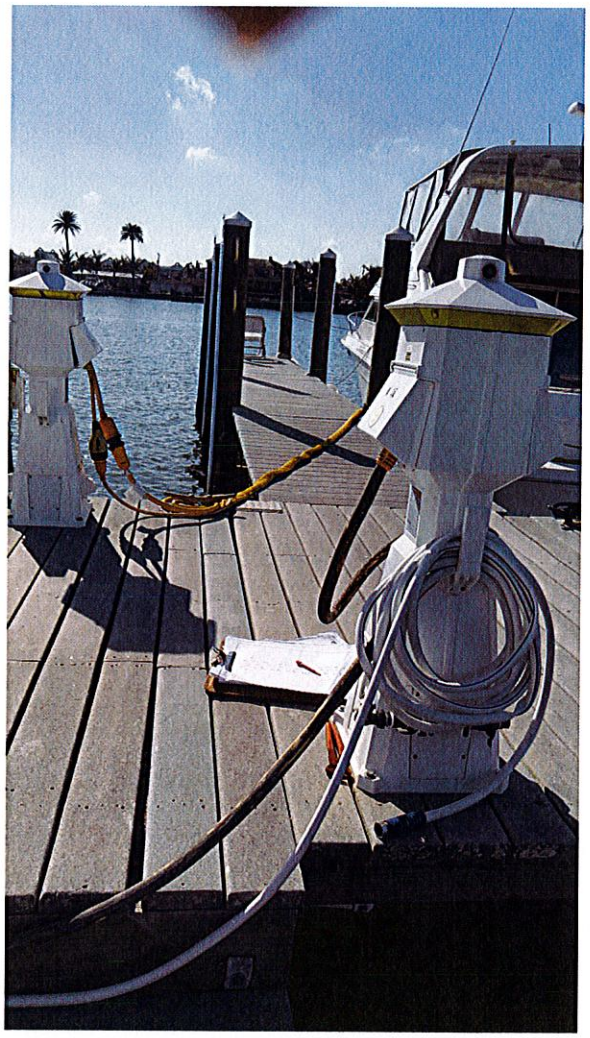


PHOTO 16- Power Cord "Y" Adapter Required For Larger Vessels With Larger Than 50A/2P Service And To Reduce Voltage Drop

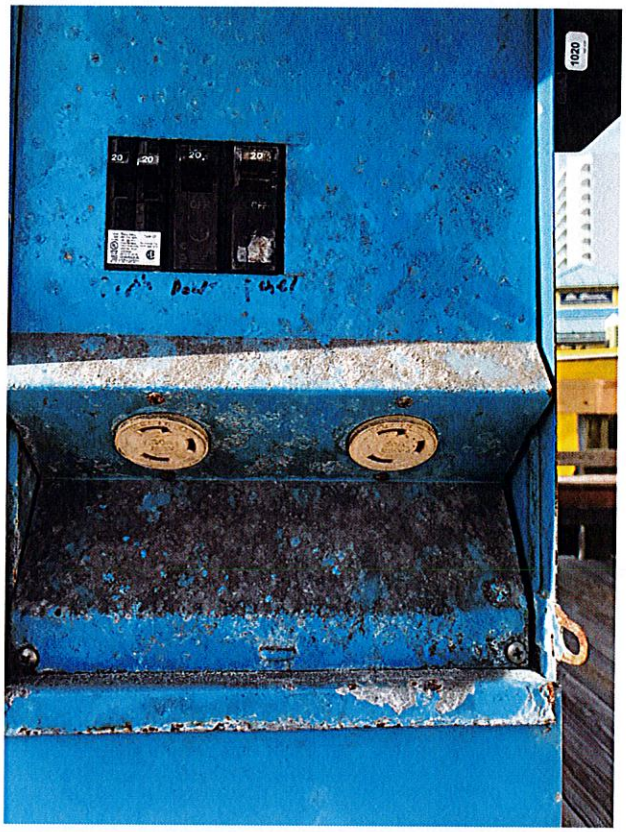


PHOTO 17- Power Pedestal with Excessive Corrosion

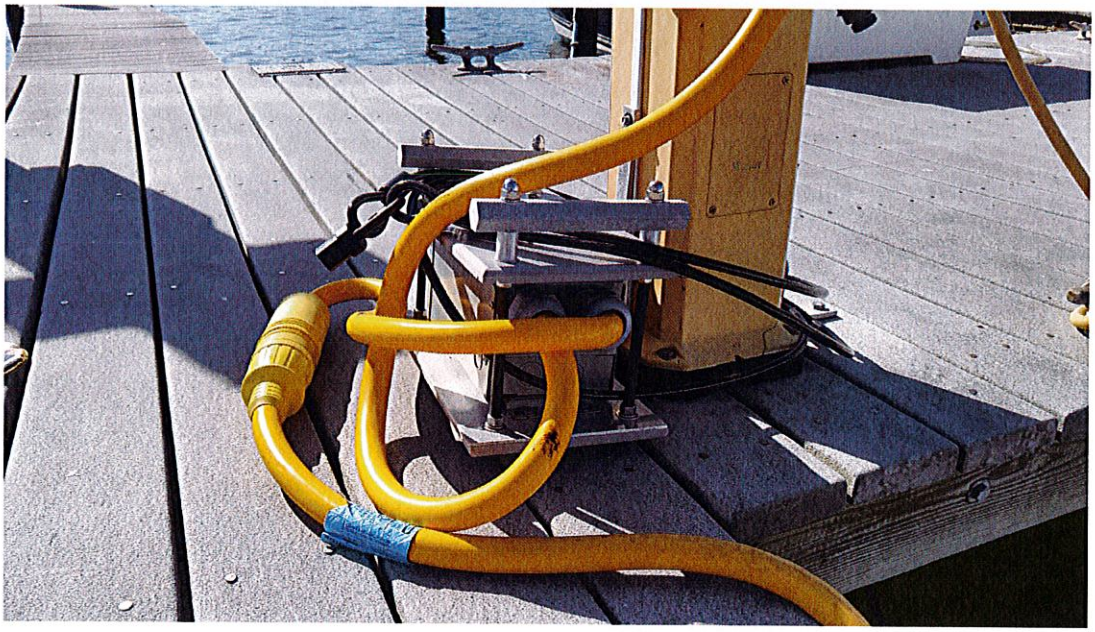


PHOTO 18- Voltage Booster Transformer

PHOTO 19- Power Pedestal with Significant Deterioration

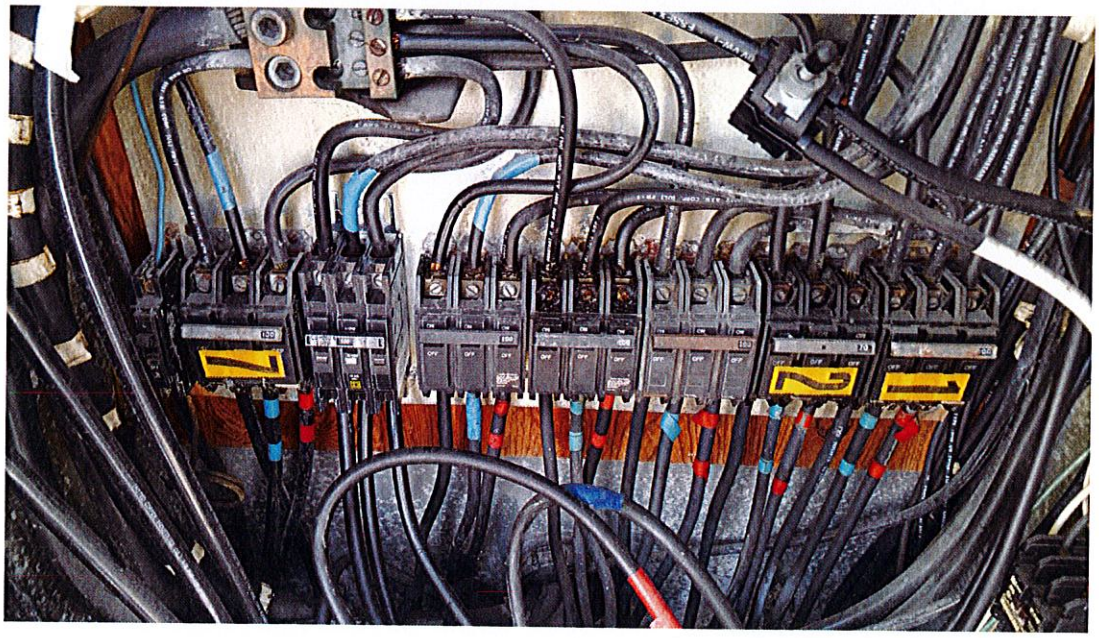


PHOTO 20- Feeder Tap Box "FT2" Without Feeder Circuit Ground Fault Protection

PHOTO 21- Starship II Rental Office Handrail Routed Over Panelboard Cover

PHOTO 22- Shore Power Pedestal

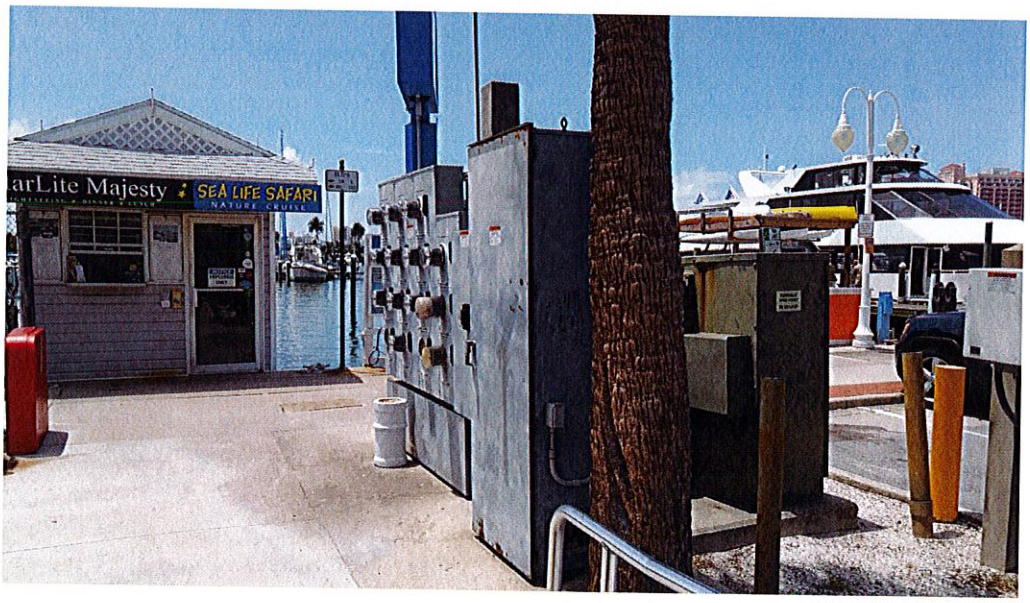


PHOTO 23- Service Panel "MSP3" and Meter Center "MC"

APPENDIX B –

BIBLIOGRAPHY OF REVIEWED DOCUMENTS

Project #: **87-37**

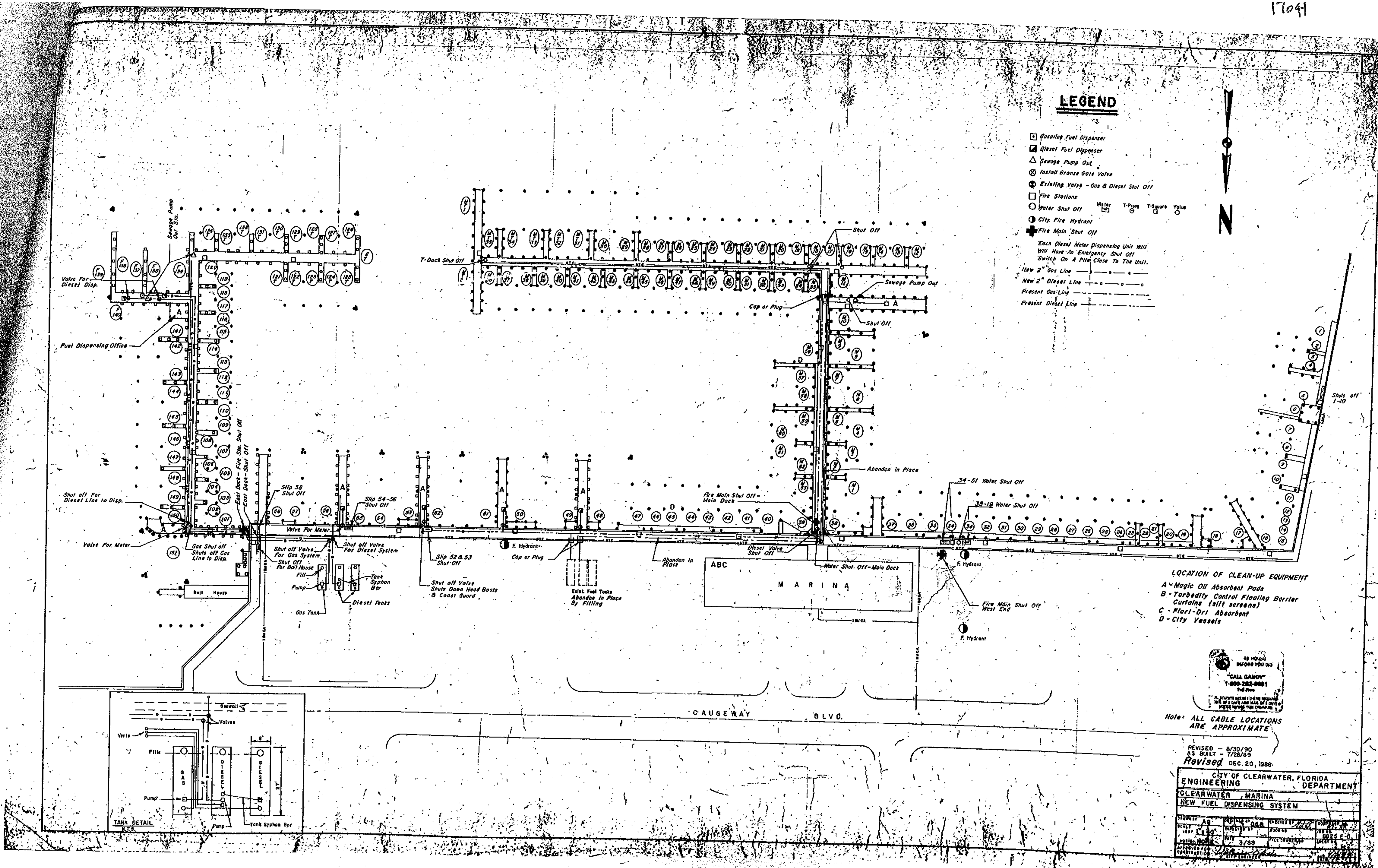
Project Name: **CLEARWATER MARINA**
NEW FUEL DISPENSING SYSTEM

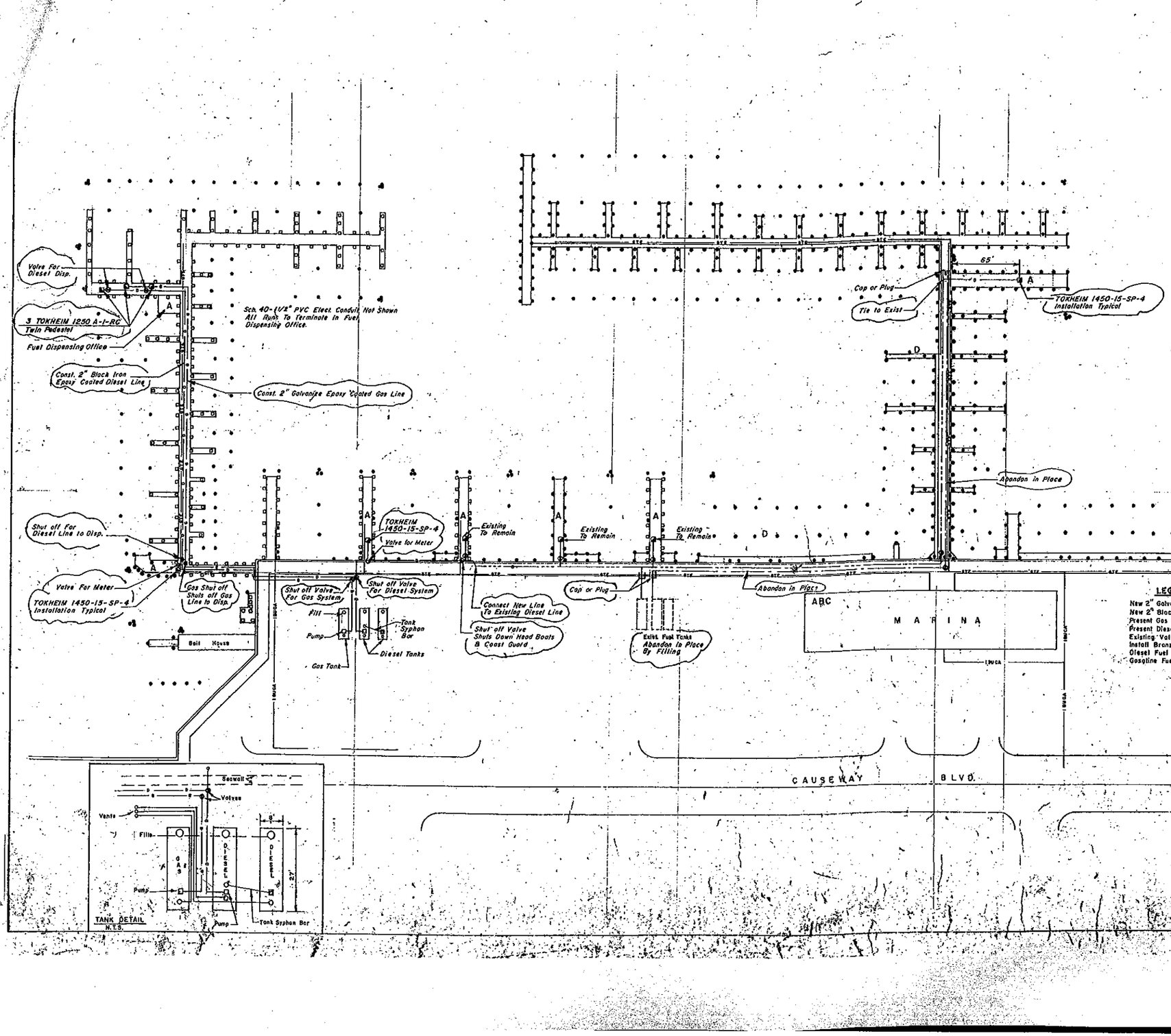
Job #: **8825 E-D**

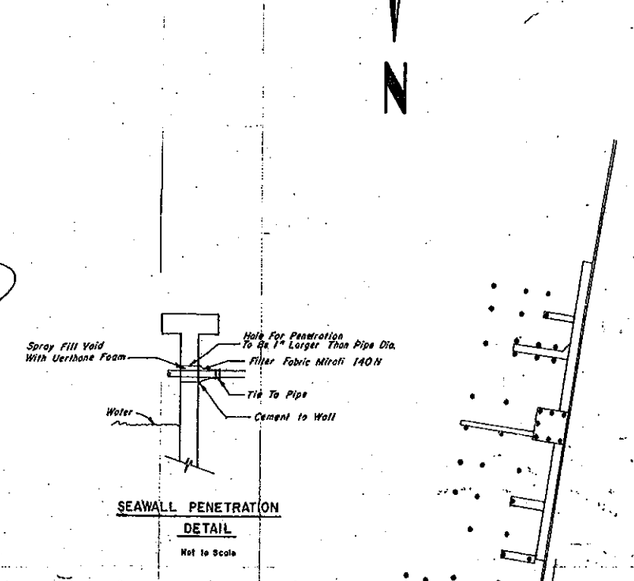
Consultant: **N/A**

Engineering: Document Name Use Job #.

17041


LEGEND
Gasoline Fuel Dispenser
Diesel Fuel Dispenser
Sewage Pump Out
Install Bronze Gate Valve
Existing Valve - Gas & Diesel Shut Off
Fire Stations
Water Shut Off
Meter
T-Prong
T-Square
Valve
City Fire Hydrant
Fire Main Shut Off
Each Diesel Meter Dispensing Unit Will Will Have An Emergency Shut Off Switch On A Pile Close To The Unit.
New 2" Gas Line
New 2" Diesel Line
Present Gas Line
Present Diesel Line
N
Valve For Diesel Disp.
Sewage Pump Out Sta.
Fuel Dispensing Office
Shut off For Diesel Line to Disp.
Valve For Meter
Gas Shut off Shuts off Gas Line to Disp.
East Dock - Fire Sta. Shut Off
East Dock - Shut Off
Slip 58 Shut Off
Slip 54-56 Shut Off
Valve For Meter
Shut off Valve For Gas System
Shut off Valve For Diesel System
Shut Off For Bait House
Slip 52 & 53 Shut Off
Shut off Valve Shuts Down Head Boats & Coast Guard
Fill
Pump
Gas Tank
Tank Syphon Bar
Diesel Tanks
Bait House
F. Hydrant
Cap or Plug
Exist. Fuel Tanks Abandon in Place By Filling
Abandon in Place
T-Dock Shut Off
Shut Off
Sewage Pump Out
Cap or Plug
Shut Off
Abandon in Place
Fire Main Shut Off - Main Dock
Diesel Valve Shut Off
Water Shut Off - Main Dock
34-51 Water Shut Off
33-19 Water Shut Off
Shuts off 1-10
F. Hydrant
Fire Main Shut Off West End
F. Hydrant
ABC
M A R I N A
LOCATION OF CLEAN-UP EQUIPMENT
A - Magic Oil Absorbent Pads
B - Turbedity Control Floating Barrier Curtains (silt screens)
C - Flori-Dri Absorbent
D - City Vessels
"CALL CANDY"
Toll Free
CAUSEWAY BLVD.
Note: ALL CABLE LOCATIONS ARE APPROXIMATE
Seawall
Valves
Vents
Fills
GAS
DIESEL
DIESEL
Pump
Pump
Tank Syphon Bar
TANK DETAIL
N.T.S.
REVISED - 8/30/90
AS BUILT - 7/28/89
Revised DEC. 20, 1988
CITY OF CLEARWATER, FLORIDA
ENGINEERING DEPARTMENT
CLEARWATER MARINA
NEW FUEL DISPENSING SYSTEM
3/88
8825 E-0, 1





SEAWALL PENETRATION DETAIL

Not to Scale

LEGEND

New 2" Galvanize Epoxy Coated Gas Line
New 2" Black Iron Epoxy Coated Diesel Line
Present Gas Line
Present Diesel Line
Existing Valve
Install Bronze Gate Valve
Diesel Fuel Dispenser
Gasoline Fuel Dispenser

LOCATION OF CLEAN-UP EQUIPMENT

A - Magic Oil Absorbent Pads
B - Torbedity Control Floating Barrier Curtains (silt screens)
C - Flori-Ori Absorbent
D - City Vessels

48 HOURS BEFORE YOU DIG "CALL SUNSHINE" 1-800-432-4770 Toll Free

Note: ALL CABLE LOCATIONS ARE APPROXIMATE

AS BUILT - 7/28/89
Revised DEC. 20, 1988

CITY OF CLEARWATER, FLORIDA
ENGINEERING DEPARTMENT
CLEARWATER MARINA
NEW FUEL DISPENSING SYSTEM

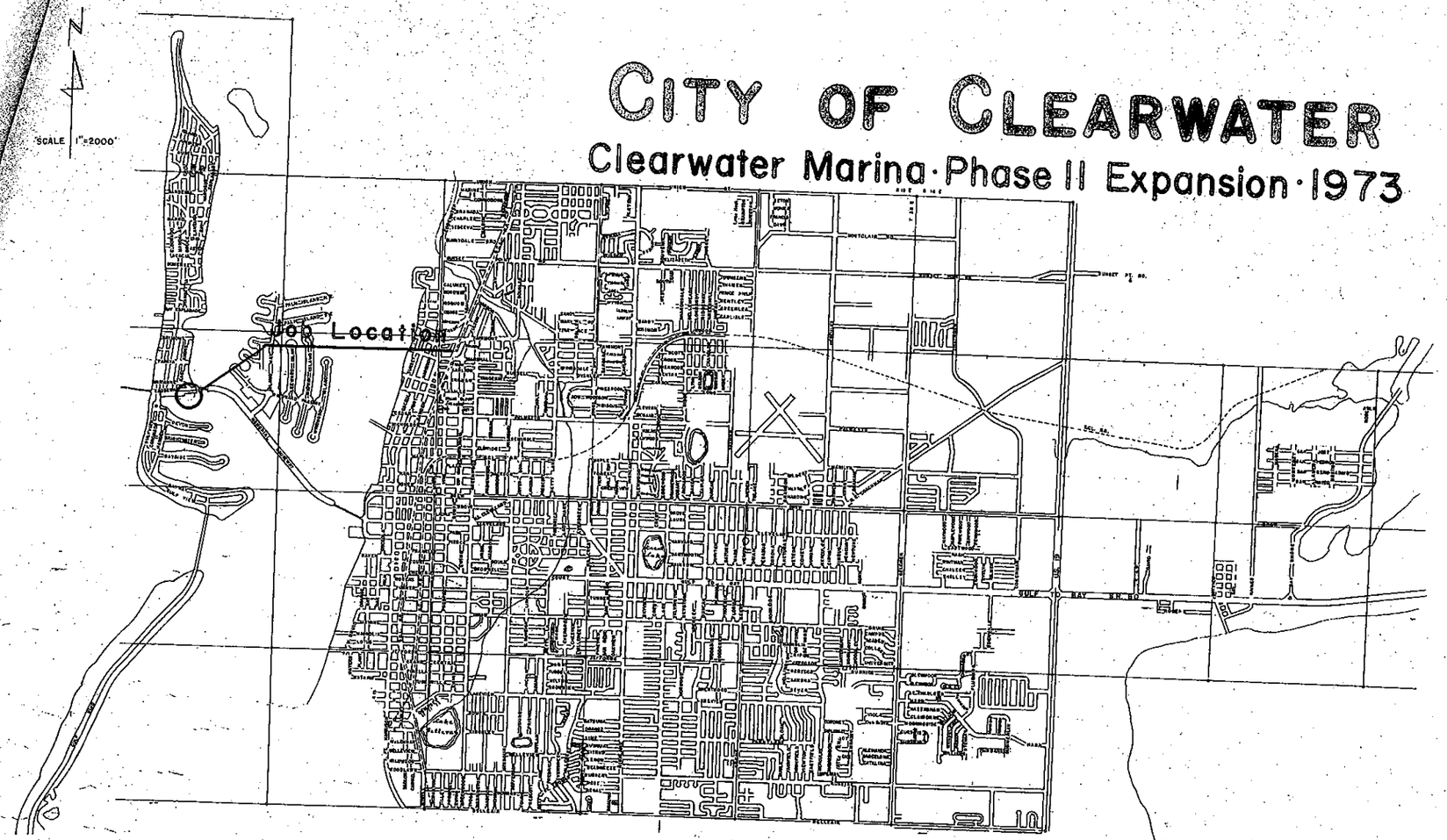
DRAWN AG	DESIGNED BY DAB	CHECKED BY [illegible]	CONTRACT NO. 87-37
SCALE 1"=10'	TRACED BY	BOOK NO.	JOB NO. 8825 E-0
VERT. NONE	DATE 3/89	FILE REFERENCE NO.	SHEET NO. 1 OF 2

APPROVED [signature] CITY ENGINEER DATE 11/8/89

CLW. MARINA
CAUSEWAY BLVD.
88025
NEW FUELING SYSTEM
P

CITY OF CLEARWATER

Clearwater Marina · Phase II Expansion · 1973



CITY OFFICIALS

H. Everett Hougen	Mayor
Donald S. Williams	Commissioner
Richard "Dick" Wachtler	Commissioner
Dr. Joseph L. Carwise	Commissioner
Rick Hall	Commissioner
Merrett R. Stierheim	City Manager

Drawing Index

1 PIER PLAN & MISC. DETAIL
2 DEMOLITION PLAN
3 CONCRETE PILE LOCATION & SEA WALL DETAILS
4 PIER DETAILS
5 WATER, POWER & LIGHTING
6 SANITARY WASTE COLLECTION

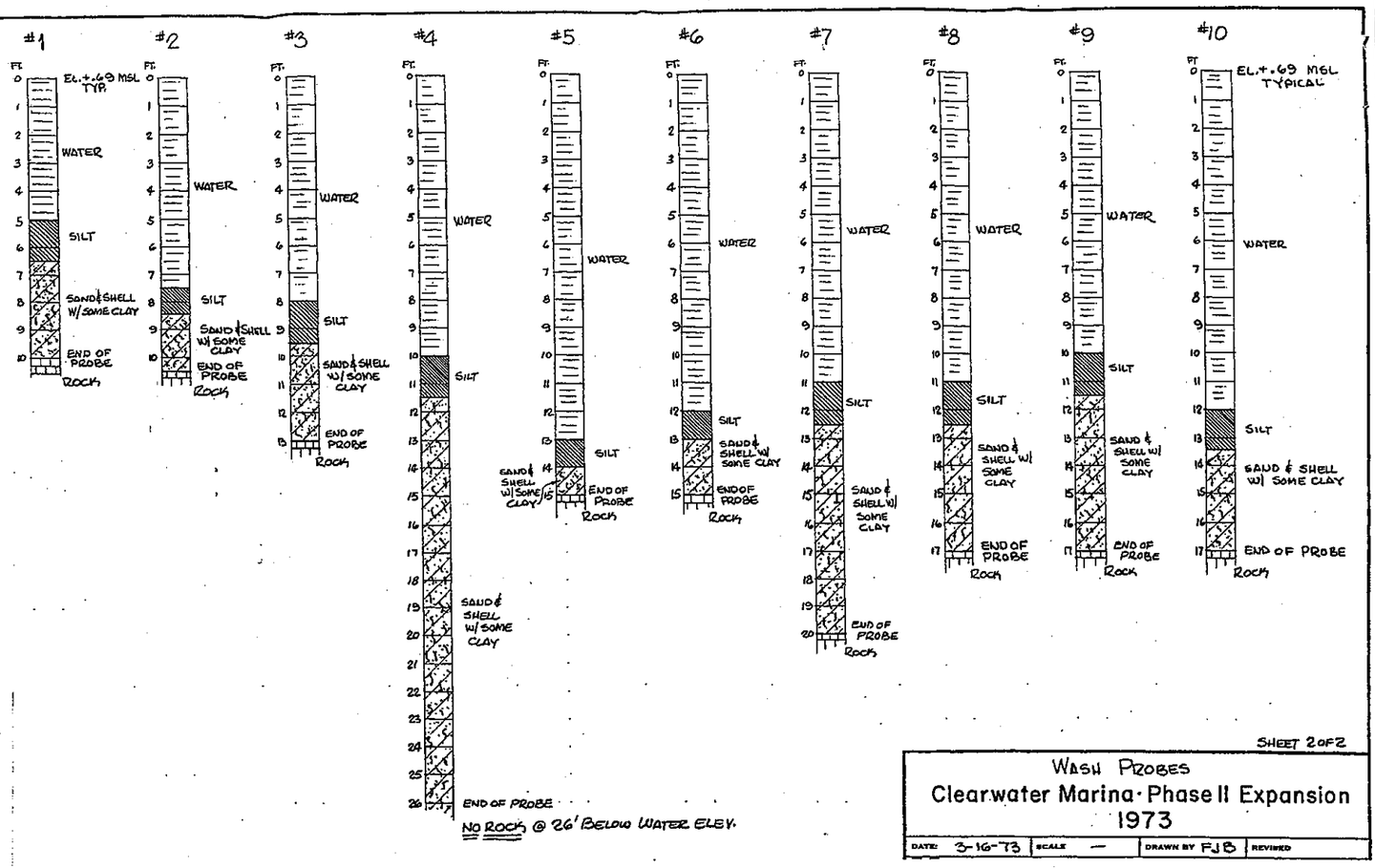
Richard Taylor
ENGR. #10085
FLA.

Job No.

Approved by Max G. Battle
Max G. Battle
City Engineer

one Doc.
13
Ed.

73101



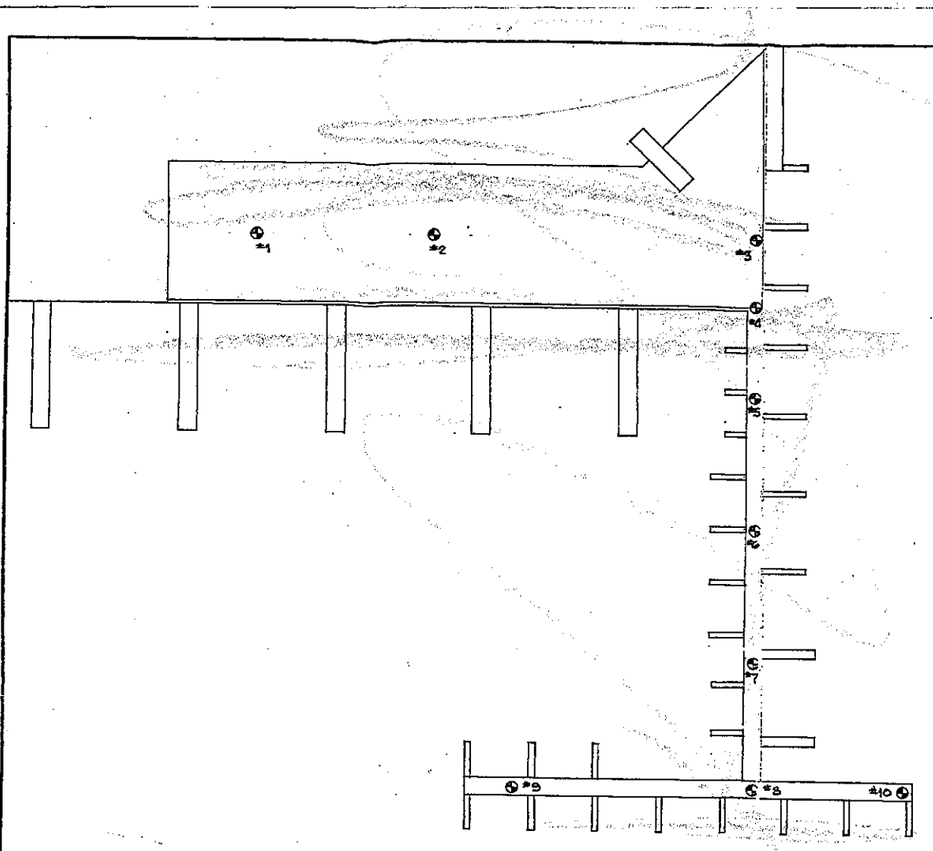
MARINA PHASE II
NA
PRINT #P0340
NA
P_____

SHEET 2 OF 2

WASH PROBES
Clearwater Marina · Phase II Expansion
1973

DATE: 3-16-73	SCALE —	DRAWN BY FJB	REVISED

73101



⊕ WASH PROBE LOCATION

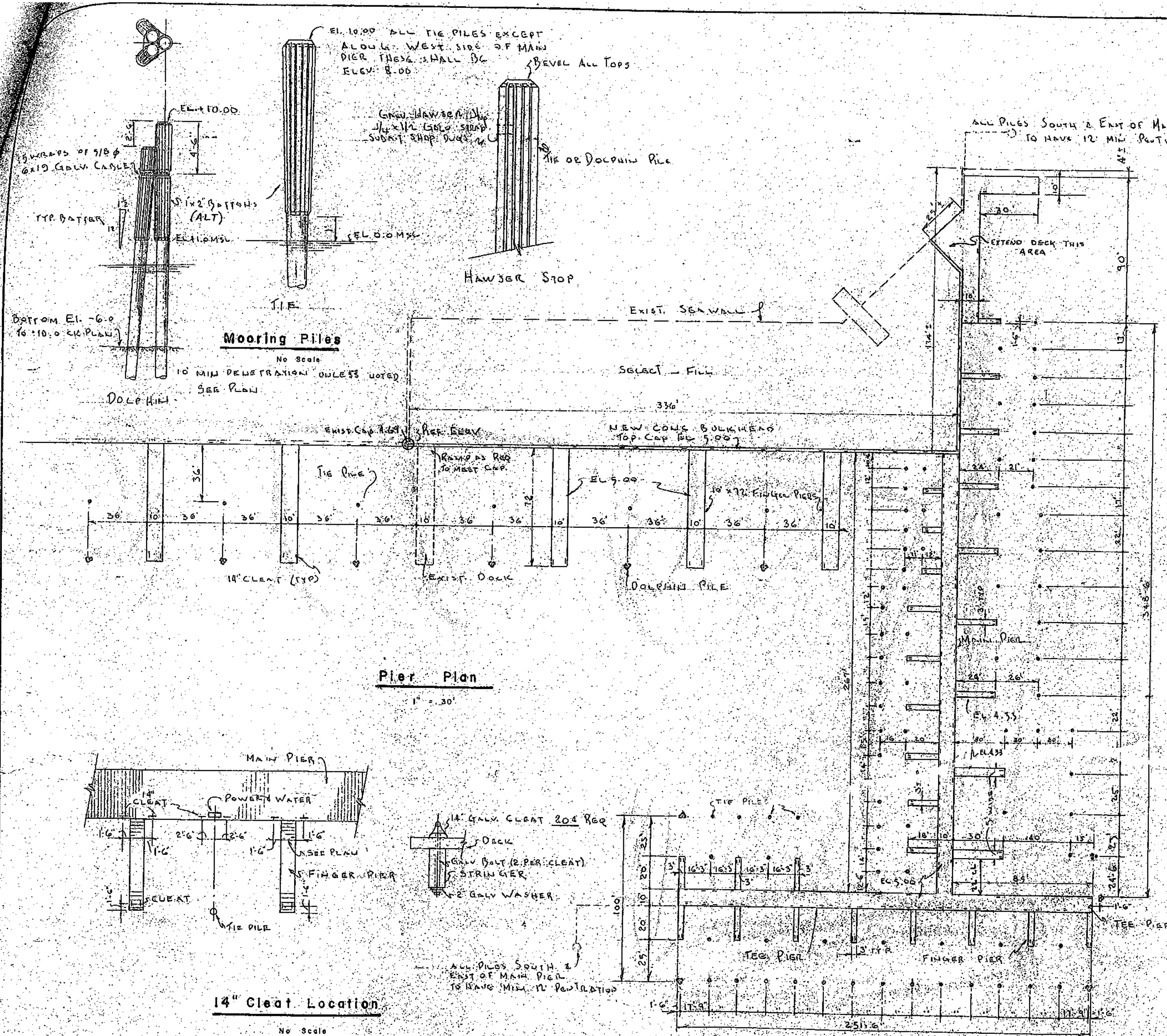
WASH PROBES TAKEN 3-13-73.
WATER AT ELEV. +0.69 MSL.

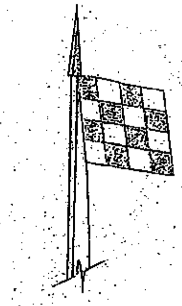
SHEET 1 OF 2

WASH PROBES
Clearwater Marina · Phase II Expansion
1973

DATE: 3-16-73	SCALE 1"=50'	DRAWN BY FJB	REVISED

73101





GENERAL NOTES:

1. ALL TIMBER MATERIAL SHALL BE SOUTHERN YELLOW PINE TREATED AS FOLLOWS:
   A. PILES - 12" MARINE PILES TREATED WITH CCA TYPE A, B or C SALTS, 2.5 FULL CELL PROCESS AWPA C3 FOR SALT [illegible]
   B. CAPS & STRINGERS TO BE STRUCTURAL GRADE TREATED AS ABOVE.
2. ALL DECKING, FENDER BOARDS & BATTENS SHALL BE #2 GRADE OR BETTER SOUTHERN PINE WITH A MINIMUM 0.51 LB WOLMANIZED SALTS RETENTION.
3. ALL HARDWARE & FASTENINGS SHALL BE HOT DOUBLE DIPPED GALVANIZED ASTM 153-65 SPEC.
4. ALL SUPPORT PILING SHALL HAVE A MINIMUM OF 10 FT. PENETRATION & 5 TON BEARING UNLESS NOTED OTHERWISE.

Clearwater Marina Phase II Expansion 1973

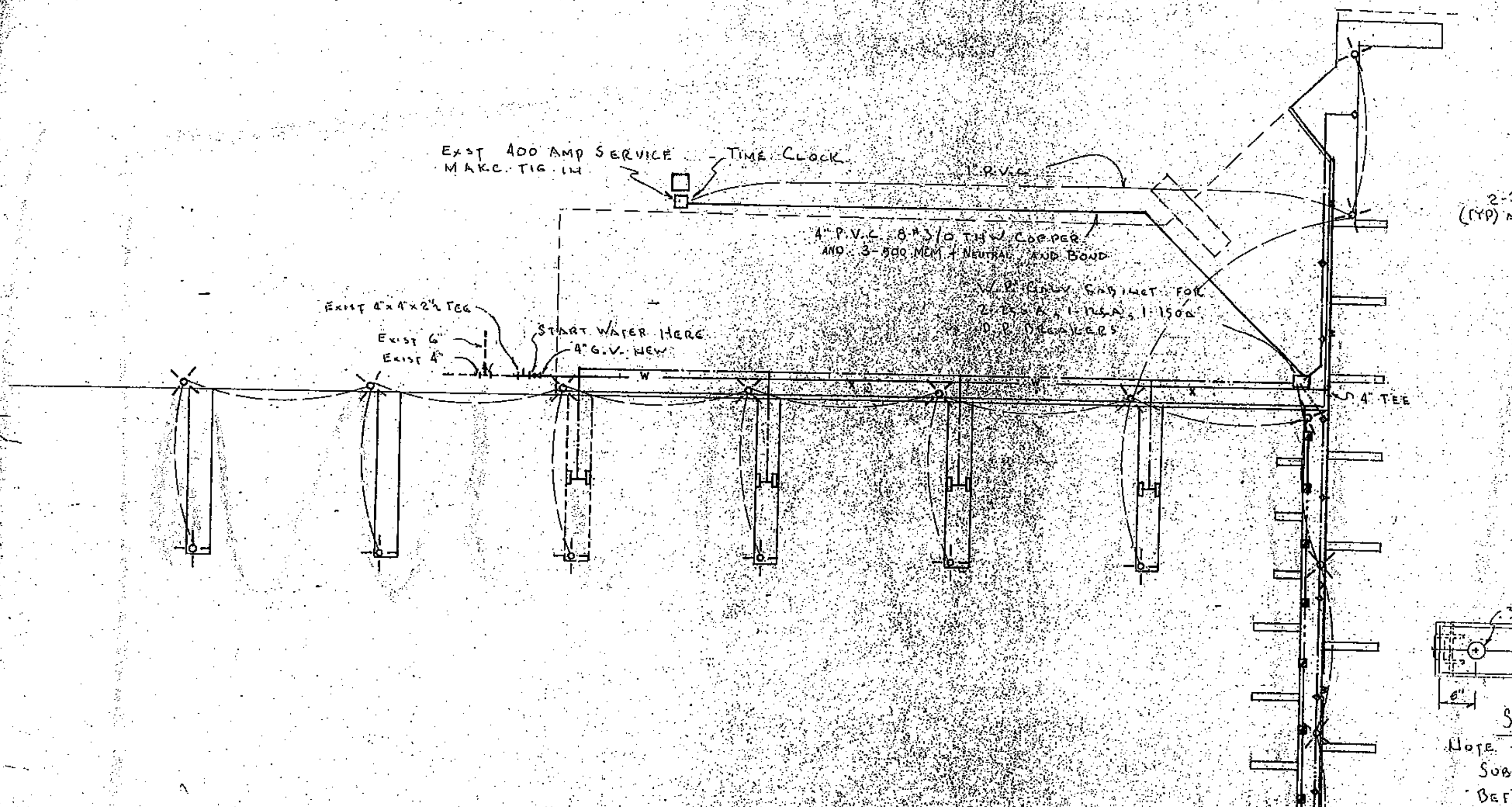
Detail

PIER PLAN & MISC. DETAIL

6

3-73

73101



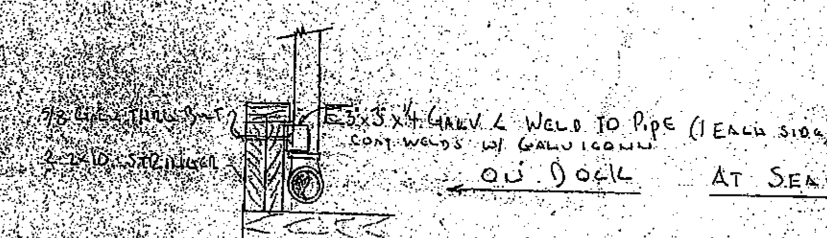
Water Service - Standpipe - Lighting - Electric Service Plan

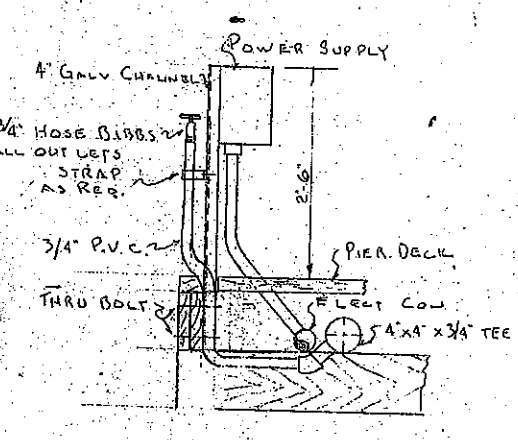
1" = 30'

Legend & Notes

- Dock Light - Lyd-Lite Cat # LC 250M, 250 Watt Mercury Lamps 15 Hinge-O-Matic Base - 22 Req - Mount Per Mfg Rec.
- Midwest WP Galv Power Outlets P-11-C 2 Duplex Recp., 2 20A S.P. Breakers - 10 Req
- Midwest WP Galv Power Outlets P-55C 1 Duplex Recp, 1-50A 4 Wire Recp. 1-50A D.P. Breaker, 1-20 A. S.P. Breaker - 8 Req
- Midwest W.P. Galv. Power Outlet P-1055C 2 50A 4 Wire Recp, 2 20A Duplex Outlet 2 50A D.P. Breakers, 2 20A S.P. Breakers - 19 Req
- 2½" P.V.C. w/ 2" 250 MCM - 1-#3/0 + Bond
- 2" PVC 2 Black, 1 White #2 THW Copper + Bond
- 2" PVC 2 1/0 Black - 1 White + Bond
- 1½ PVC 2 #2 THW Black 1 White + Bond
- X Fire Stand Pipe - 7 Req
- —W— Cast Iron Water Main (Note 3/4" Service Lines Not Shown)

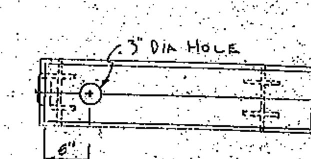
Run 1" PVC for Dock Light Circuit
74 - 3/4" Hose Bibbs Req
Provide Time Clock for Dock Lights





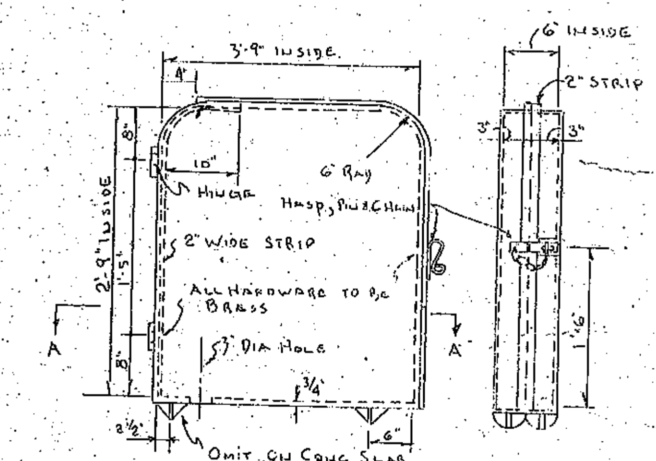
Water & Power Mounting

No Scale



Section A-A

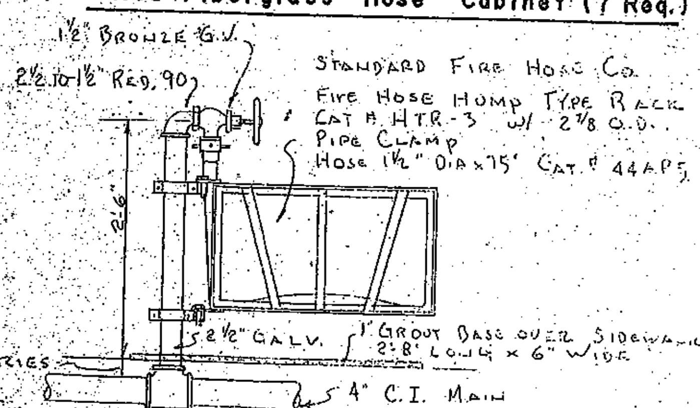
Note
Submit Shop Dwgs
Before Fabrication



Side View
No Scale

Front View

Red Fiberglass Hose Cabinet (7 Req.)



Fire Hose Rack (7 Req.)

No Scale

Clearwater Marina · Phase II Expansion · 1973

Detail
WATER, POWER & LIGHTING

6 | 5 | 3-73

73101

APPENDIX C –

CODES AND STANDARDS

ARTICLE 555 MARINAS AND BOATYARDS

Introduction to Article 555—Marinas and Boatyards

Water levels aren't constant. Ocean tides rise and fall, while lakes and rivers vary in depth in response to rain. To provide power to a marina or boatyard, you must allow for these variations in water level between the point of use and the power source. Article 555 addresses this issue.

This article begins with the concept of the electrical datum plane. You might think of it as the border of a "demilitarized zone" for electrical equipment. Or, you can think of it as a line that marks the beginning of a "no man's land" where you simply don't place electrical equipment. Once you determine where this plane is, don't locate transformers, connections, or receptacles below that line.

555.1 Scope

Article 555 covers the installation of wiring and equipment for fixed or floating piers, wharfs, docks, and other areas in marinas, boatyards, boat basins, boathouses, and similar occupancies. This article doesn't apply to docking facilities or boathouses used for the owners of single-family dwellings. Figure 555–1

Author's Comment:

- GFCI protection is required for outdoor 15A and 20A, 125V receptacles [210.8].

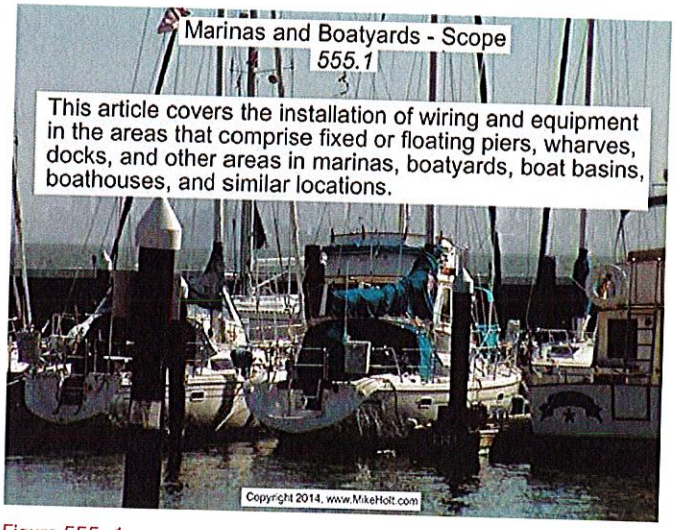


Figure 555–1

555.2 Definitions

Electrical Datum Plane.

(1) Land Area Subject to Tidal Fluctuation. The horizontal plane 2 ft above the highest high tide that occurs under normal circumstances. Figure 555–2

(2) Land Areas Not Subject to Tidal Fluctuation. The horizontal plane 2 ft above the highest water level that occurs under normal circumstances. Figure 555–3

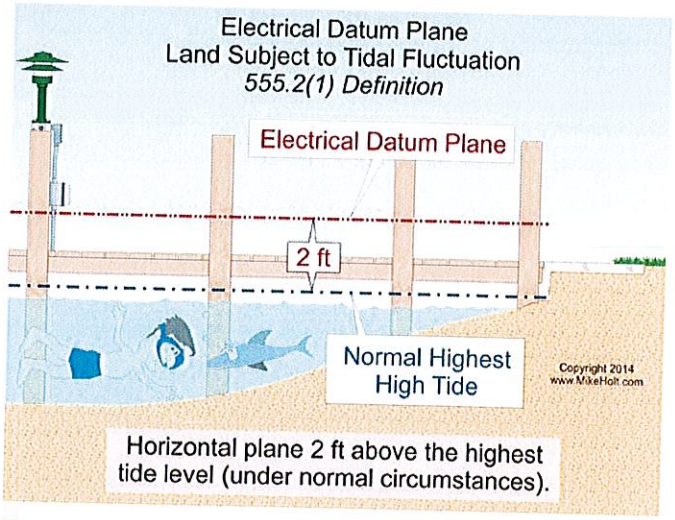


Figure 555–2

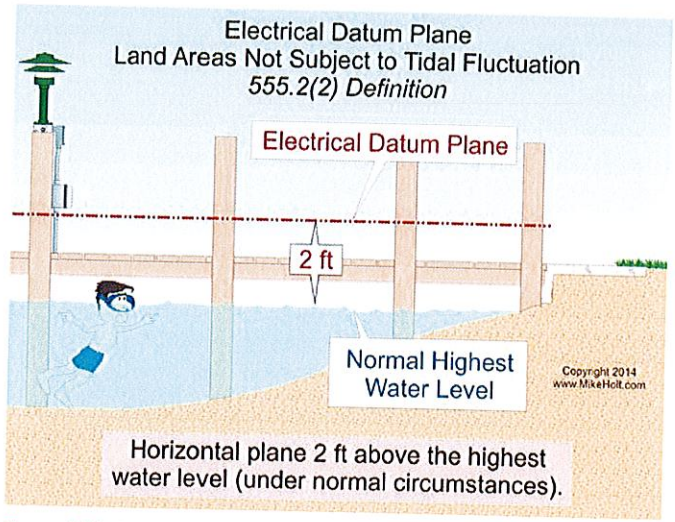


Figure 555–3

(3) Floating Piers. The horizontal plane 30 in. above the water level at the floating pier and a minimum of 12 in. above the level of the deck. Figure 555–4

Author's Comment:

- This definition is necessary for the location of transformers [555.5], electrical connections [555.9], and receptacles [555.19] near water.

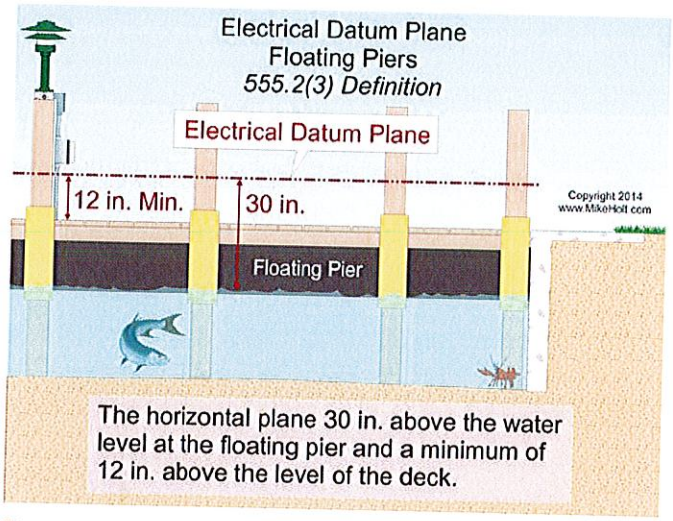


Figure 555–4

Marine Power Outlet. An enclosed assembly that can include equipment such as receptacles, circuit breakers, fused switches, fuses, watt-hour meters, panelboards, and monitoring means approved for marine use. Figure 555–5

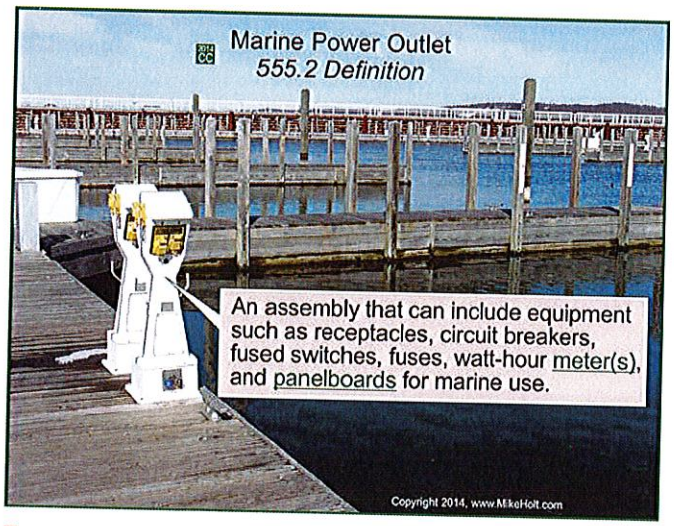


Figure 555–5

Author's Comment:

- This definition is necessary for the application of shore power receptacles [555.19(A)(1)] and disconnecting means [555.17(B)].

555.3 Ground-Fault Protection

The overcurrent device for the main marina feeder conductors must have ground-fault protection not exceeding 100 mA. If ground-fault protection is provided for each individual marina branch or feeder circuit, ground-fault protection isn't required for the main marina feeder conductors. Figure 555–6

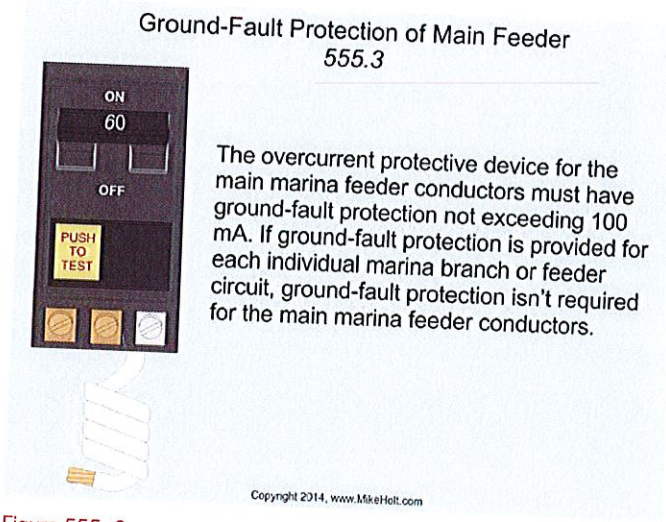


Figure 555–6

555.5 Transformers

Transformers must be approved by the authority having jurisdiction for the location, and the bottom must not be located below the electrical datum plane. Figure 555–7

555.7 Location of Service Equipment

Service equipment for floating docks or marinas isn't permitted to be located on the floating structure.

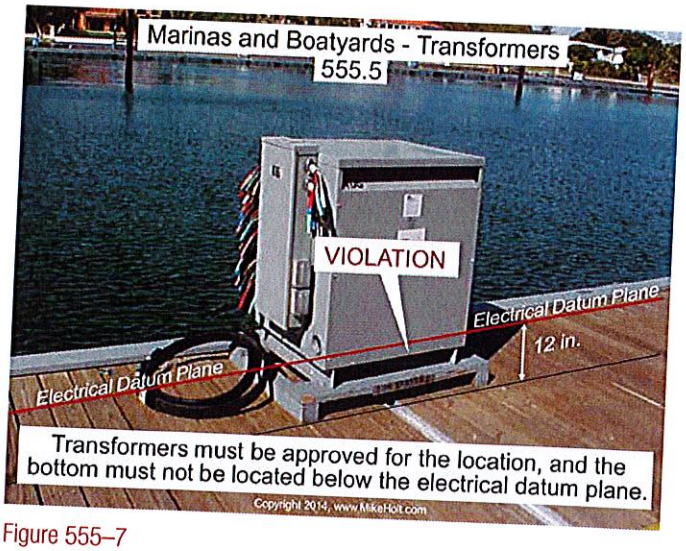


Figure 555–7

555.9 Electrical Connections

Floating Piers. Electrical connections must be located not less than 12 in. above the deck of a floating pier, unless the conductor splices are contained within approved junction boxes utilizing sealed wire connector systems listed and identified for submersion located above the waterline but below the electrical datum plane for floating piers. Figure 555–8 and Figure 555–9

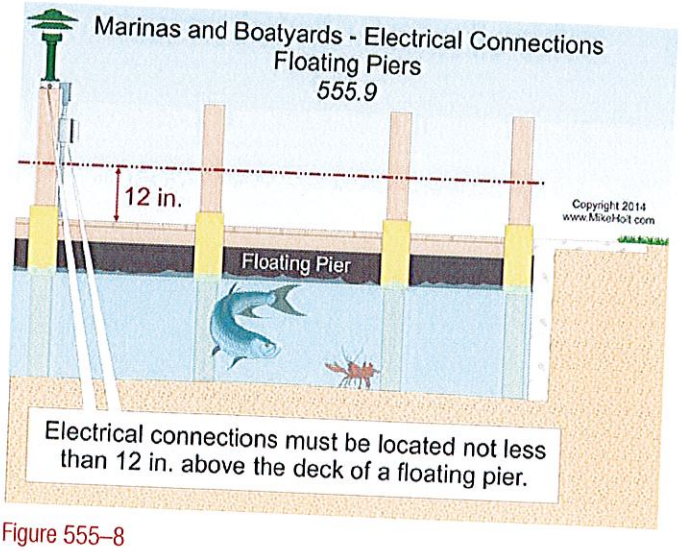


Figure 555–8

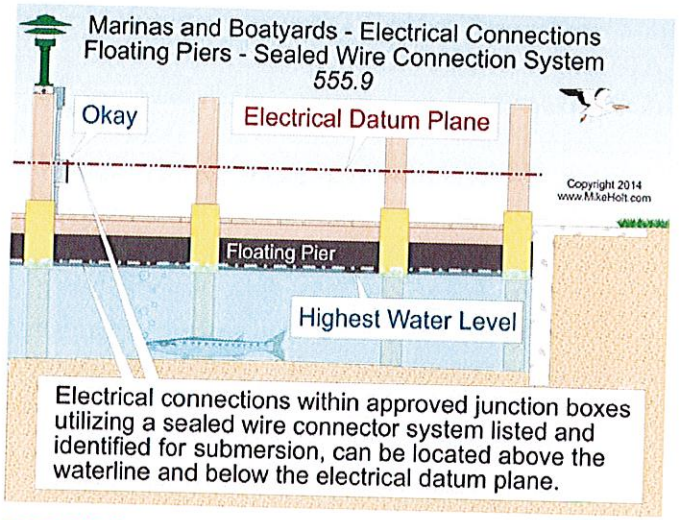


Figure 555–9

Fixed Piers. For a fixed pier, electrical connections must be located not less than 12 in. above the deck, and never below the electrical datum plane. Figure 555–10

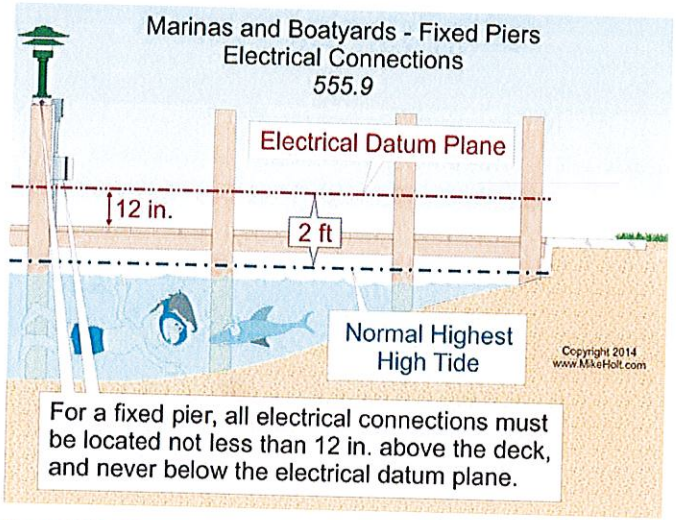


Figure 555–10

555.10 Electrical Equipment Enclosures

(A) Securing and Supporting. Electrical equipment enclosures must be securely and substantially supported by structural members, independent of any raceway connected to them.

(B) Location. Electrical equipment enclosures on piers must be located so as not to interfere with mooring lines.

555.12 Load Calculations for Service and Feeder Conductors

The calculated ungrounded and neutral service or feeder load for shore power receptacles can be calculated using the adjustment factors contained in Table 555.12.

Table 555.12 Adjustment Factors

Number of Receptacles	Sum of the Rating of the Receptacles
1–4	100%
5–8	90%
9–14	80%
15–30	70%
31–40	60%
41–50	50%
51–70	40%
Over 71	30%

Table Note 1. *If shore power provides two receptacles having different voltages for an individual boat slip, only the receptacle with the larger kilowatt demand rating is required to be included in the calculation.* Figure 555–11

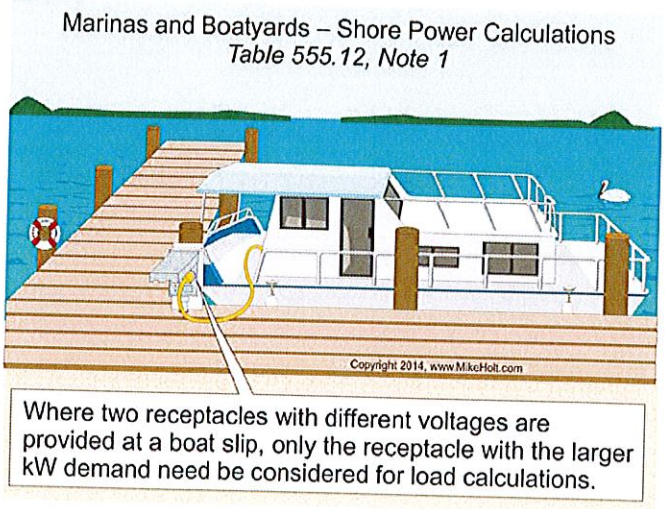


Figure 555–11

Question: *What size 120/240V, single-phase service is required for a marina with twenty 20A, 125V receptacles, and twenty 30A, 250V receptacles?* Figure 555–12

(a) 200A (b) 400A (c) 600A (d) 800A

Answer: *(c) 600A*

Step 1: *Determine the receptacle load per line.*

	Line 1	Line 2
Twenty 20A, 125V	200A	200A (ten each line)
Twenty 30A, 250V	+ 600A	+ 600A (twenty each line)
	800A	800A

Step 2: *The calculated load per line for the marina is based on the demand factors listed in Table 555.12 for 30 receptacles (per line). 800A x 0.70 = 560A*

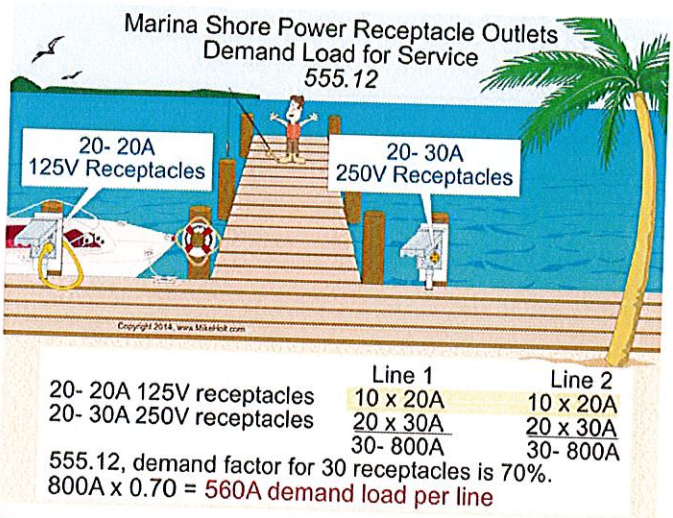


Figure 555–12

Author's Comment:

- There are 40 receptacles in this example but because the 125A are balanced between Line 1 and Line 2 the maximum receptacles connected to any one line after balancing is 30.

555.13 Wiring Methods and Installation

(A) Wiring Methods.

(1) General. Any Chapter 3 wiring method is permitted if identified for use in wet locations.

(2) Portable Power Cables. Sunlight resistant, extra-hard usage portable power cables listed for wet locations having an outer jacket resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids, and chemicals.

(B) Installation.

(4) Portable Power Cables.

(a) Portable power cables permitted by 555.13(A)(2) must be:

(1) Properly supported.

(2) Located on the underside of the pier.

(3) Securely fastened by nonmetallic clips to structural members other than the deck planking.

(4) Not be subject to physical damage.

(5) Protected against chafing by a permanently installed oversized sleeve of nonmetallic material when cables pass through structural members.

(5) Protection. Raceways must be used to protect wiring above decks of piers and landing stages.

555.15 Grounding

(B) Equipment Grounding Conductor. The equipment grounding conductor must be an insulated conductor with a continuous outer finish that's green or green with one or more yellow stripes. Figure 555–13

(C) Size of Equipment Grounding Conductor. The insulated equipment grounding conductor must be sized in accordance with 250.122, based on the rating of the overcurrent device, but not smaller than 12 AWG.

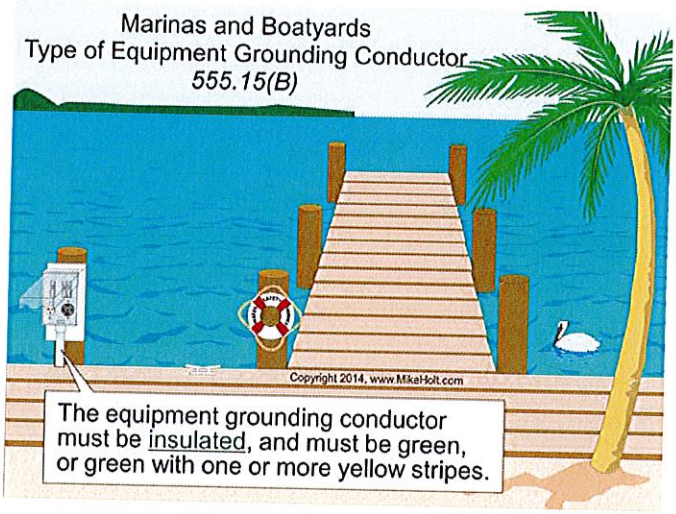


Figure 555–13

555.17 Boat Receptacle Disconnecting Means

A disconnecting means must isolate each boat from its shore power receptacle.

(A) Type of Disconnect. A circuit breaker or switch (or both) must be used to serve as the required shore power receptacle disconnecting means and it must be identified as to which receptacle it controls. Figure 555–14

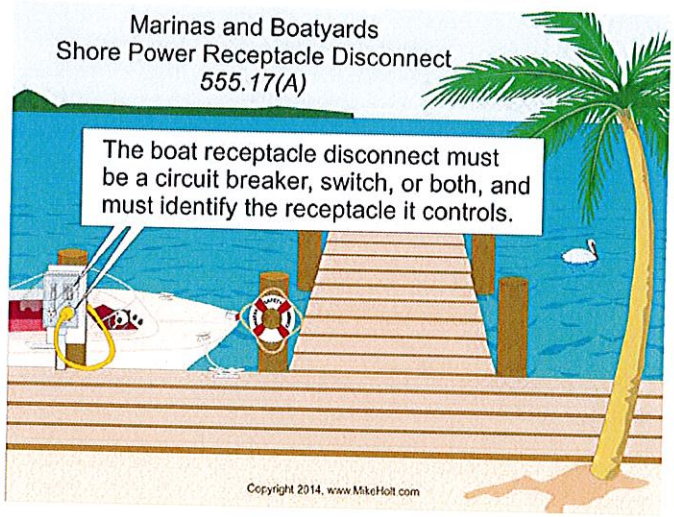


Figure 555–14

(B) Location. The disconnecting means for shore power receptacles must be readily accessible and located not more than 30 in. from the receptacle it controls. Circuit breakers or switches located in marine power outlets can be used for the boat receptacle disconnecting means. Figure 555–15

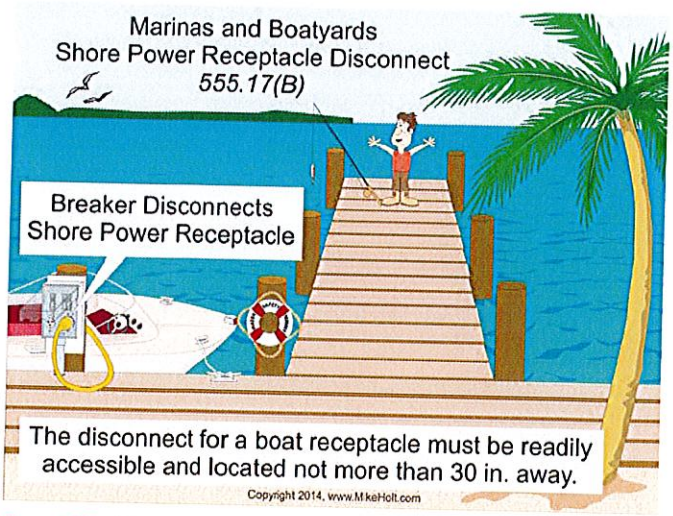


Figure 555–15

Author's Comment:

- This shore power receptacle disconnecting means is intended to eliminate the hazard of someone engaging or disengaging the boat's shore power attachment plug with wet, slippery hands, and possibly contacting energized blades. The "30-in. requirement" helps someone not familiar with the marina layout to quickly reach the disconnecting means in an emergency.

555.19 Receptacles

Receptacles must be mounted not less than 12 in. above the deck surface of the pier, and not below the electrical datum plane on a fixed pier. Figure 555–16

(A) Shore Power Receptacles.

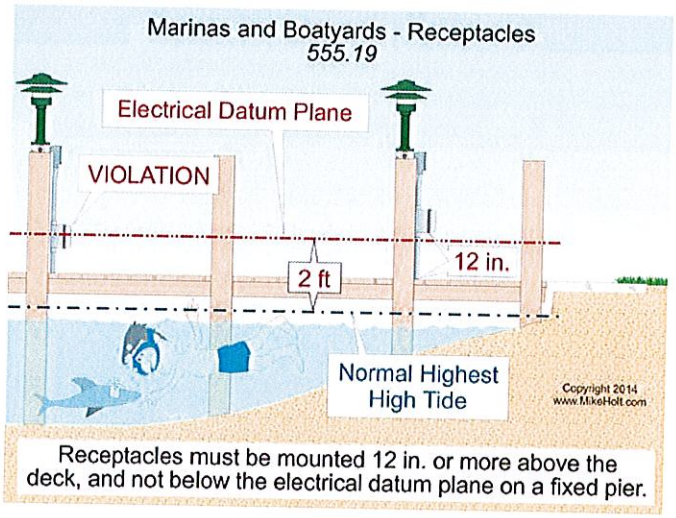


Figure 555–16

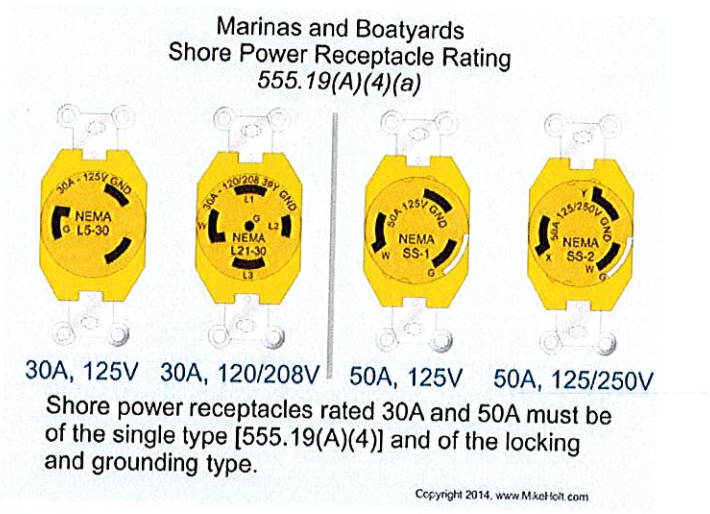


Figure 555–17

(1) Enclosures. Receptacles intended to supply shore power to boats must be part of a listed marina power outlet enclosure, be installed in listed enclosures protected from the weather, or in listed weather-proof enclosures. The integrity of the assembly must not be affected when the receptacles are in use with a booted or nonbooted attachment plug/cap inserted.

(3) Branch Circuits. An individual branch circuit of the voltage class and rating corresponding to the rating of the receptacle must supply each receptacle that supplies shore power to boats.

Note: Supplying 120/240V 3-wire receptacles from a 120/208V 3-wire supply may cause overheating or malfunctioning of connected equipment.

(4) Ratings. Single receptacles that provide shore power for boats must be rated not less than 30A.

(a) Receptacles rated 30A and 50A must be of the locking and grounding type. Figure 555–17

(b) Receptacles rated 60A or 100A must be of the pin and sleeve type.

Author's Comment:

- The rating of the shore power receptacle doesn't depend upon the length of the boat. The *Code* simply sets a minimum rating of 30A and leaves it up to the designer and/or owner to provide the receptacles they deem necessary based on the projected usage of the slips.

(B) Other Than Shore Power.

(1) GFCI Protection of Receptacles. 15A and 20A, 125V receptacles installed outdoors, in boathouses, buildings/structures used for storage, maintenance, or repair for portable electric hand tools, electrical diagnostic equipment, or portable lighting equipment must be GFCI protected. Figure 555–18

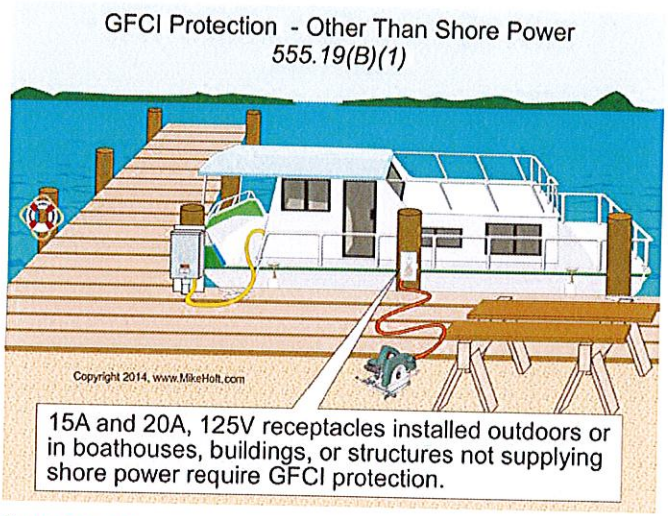


Figure 555–18

555.22 Repair Facilities

Electrical wiring and equipment at marine craft repair facilities containing flammable or combustible liquids or gases must comply with Article 511 in addition to the requirements of Article 555. Figure 555–19

Author's Comment:

- Important rules in Article 511 to consider include:
  - 511.3 Classification of Hazardous Areas
  - 511.4 Wiring and Equipment in Hazardous (Classified) Locations
  - 511.7 Wiring and Equipment Above Hazardous (Classified) Locations
  - 511.9 Explosionproof Seals
  - 511.12 GFCI-Protected Receptacles

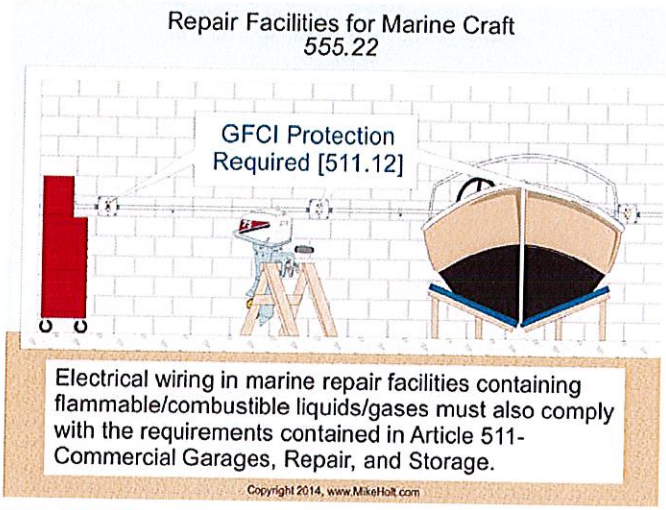


Figure 555–19

NFPA 70®

2014 HANDBOOK

Mark W. Earley
Christopher D. Coache
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This section is new in the 2014 *Code*. Feeders and services rated at 480/277 V where the disconnect is rated 1000 A or more are required to have ground-fault protection of equipment. A branch circuit supplying an industrial machine may be supplied by a feeder with a similar rating. This new section extends the ground-fault protection requirement to branch circuits. Exceptions are provided for continuous industrial processes where shutdown could introduce additional or increased hazards, and for installations where ground-fault protection is provided upstream of the branch circuit on the load side of a transformer supplying the branch circuit. For further information on ground-fault protection of equipment, see commentary following 230.95.

Informational Note: For buildings that contain health care occupancies, see the requirements of 517.17.

Exception No. 1: The provisions of this section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Exception No. 2: The provisions of this section shall not apply if ground-fault protection of equipment is provided on the supply side of the branch circuit and on the load side of any transformer supplying the branch circuit.

210.17 Electric Vehicle Branch Circuit

An outlet(s) installed for the purpose of charging electric vehicles shall be supplied by a separate branch circuit. This circuit shall have no other outlets.

This section is new for the 2014 *Code*. Electric vehicle supply equipment is a continuous load that usually operates for several hours. Most electric vehicle supply equipment for consumers is rated at 12 A at 120 V or 32 A at 240 V. On a shared branch circuit, the overcurrent protective device could trip due to overload. For these loads, the branch-circuit rating should be 125 percent of the load. In this example, the 120-V branch circuit would be supplied by a 15-A circuit, while the 240-V circuit would be supplied by a 40-A circuit.

Informational Note: See 625.2 for the definition of *Electric Vehicle*.

210.18 Guest Rooms and Guest Suites

Guest rooms and guest suites that are provided with permanent provisions for cooking shall have branch circuits installed to meet the rules for dwelling units.

Guest rooms and guest suites equipped with permanent provisions for cooking must meet all of the branch-circuit requirements for dwelling units contained in Article 210. The guest suite configuration shown in Exhibit 210.23 triggers the requirement to install the branch-circuit wiring in this unit using all of the branch-circuit provisions that apply to dwelling units.

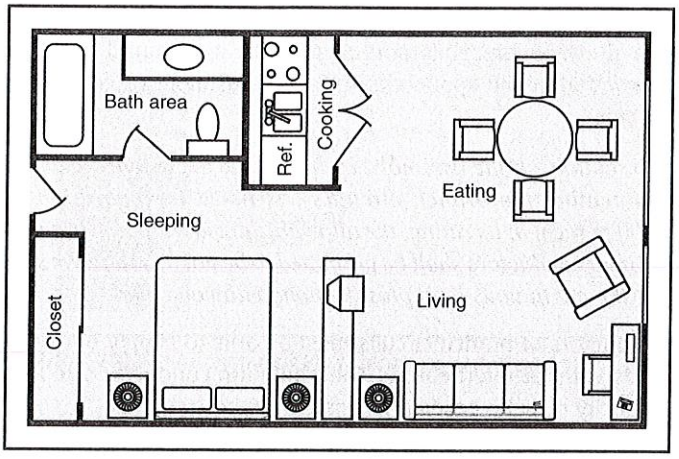

EXHIBIT 210.23 *Guest rooms or suites with permanent provisions for cooking in which the installation of branch circuit must follow all of the requirements in Article 210 covering dwelling units.*

II. Branch-Circuit Ratings

210.19 Conductors — Minimum Ampacity and Size

(A) Branch Circuits Not More Than 600 Volts.

Informational Note No. 1: See 310.15 for ampacity ratings of conductors.

Informational Note No. 2: See Part II of Article 430 for minimum rating of motor branch-circuit conductors.

Informational Note No. 3: See 310.15(A)(3) for temperature limitation of conductors.

Informational Note No. 4: Conductors for branch circuits as defined in Article 100, sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, provide reasonable efficiency of operation. See Informational Note No. 2 of 215.2(A)(1)(b) for voltage drop on feeder conductors.

Excessive voltage drop in supply conductors can cause trouble in and lead to inefficient operation of electrical equipment. Undervoltage conditions reduce the capability and reliability of motors, lighting sources, heaters, and solid-state equipment. It may be necessary to compensate for this with an installation beyond the minimum requirements. Sample voltage-drop calculations are found in the commentary following 215.2(A)(1), Informational Note No. 3, and following Table 9 in Chapter 9.

(1) General. Branch-circuit conductors shall have an ampacity not less than the maximum load to be served. Conductors shall be sized to carry not less than the larger of 210.19(A)(1)(a) or (b).

(a) Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum branch-circuit conductor size shall have an allowable ampacity not less than the noncontinuous load plus 125 percent of the continuous load.

and equipped with a manual override that allows the sensor to function as a wall switch.

(C) Other Than Dwelling Units. For attics and underfloor spaces containing equipment requiring servicing, such as heating, air-conditioning, and refrigeration equipment, at least one lighting outlet containing a switch or controlled by a wall switch shall be installed in such spaces. At least one point of control shall be at the usual point of entry to these spaces. The lighting outlet shall be provided at or near the equipment requiring servicing.

ARTICLE 215 Feeders

215.1 Scope

This article covers the installation requirements, overcurrent protection requirements, minimum size, and ampacity of conductors for feeders supplying branch-circuit loads.

Exceptions: Feeders for electrolytic cells as covered in 668.3(C)(1) and (C)(4).

215.2 Minimum Rating and Size

(A) Feeders Not More Than 600 Volts.

(1) General. Feeder conductors shall have an ampacity not less than required to supply the load as calculated in Parts III, IV, and V of Article 220. Conductors shall be sized to carry not less than the larger of 215.2(A)(1)(a) or (b).

This section was revised for the 2014 *Code*. The ampacity of the feeder conductors is required to be based on the larger of the continuous load (at 125 percent) plus the continuous load (at 100 percent) or the maximum load to be served after any adjustments or correction factors.

(a) Where a feeder supplies continuous loads or any combination of continuous and noncontinuous loads, the minimum feeder conductor size shall have an allowable ampacity not less than the noncontinuous load plus 125 percent of the continuous load.

(b) The minimum feeder conductor size shall have an allowable ampacity not less than the maximum load to be served after the application of any adjustment or correction factors.

Informational Note No. 1: See Examples D1 through D11 in Informative Annex D.

Informational Note No. 2: Conductors for feeders, as defined in Article 100, sized to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, will provide reasonable efficiency of operation.

Informational Note No. 3: See 210.19(A), Informational Note No. 4, for voltage drop for branch circuits.

Reasonable operating efficiency is achieved if the voltage drop of a feeder or a branch circuit is limited to 3 percent. However, the total voltage drop of a branch circuit plus a feeder can reach 5 percent and still achieve reasonable operating efficiency. See Article 100 for the definitions of *feeder* and *branch circuit*.

The 5 percent voltage-drop value is explanatory material and, as such, appears as an informational note. The informational notes covering voltage drop are not mandatory (see 90.5). Where circuit conductors are increased due to voltage drop, 250.122(B) requires an increase in circular mil area for the associated equipment grounding conductors.

The resistance or impedance of conductors may cause a substantial difference between voltage at service equipment and voltage at the point-of-utilization equipment. Excessive voltage drop impairs the starting and the operation of electrical equipment. Undervoltage can result in inefficient operation of heating, lighting, and motor loads. An applied voltage of 10 percent below rating can result in a decrease in efficiency of substantially more than 10 percent – for example, fluorescent light output would be reduced by 15 percent, and incandescent light output would be reduced by 30 percent. Induction motors would run hotter and produce less torque. With an applied voltage of 10 percent below rating, the running current would increase 11 percent, and the operating temperature would increase 12 percent. At the same time, torque would be reduced 19 percent.

In addition to resistance or impedance, the type of raceway or cable enclosure, the type of circuit (ac, dc, single-phase, 3-phase), and the power factor should be considered to determine voltage drop.

This basic formula can be used to determine the voltage drop in a 2-wire dc circuit, a 2-wire ac circuit, or a 3-wire ac single-phase circuit, all with a balanced load at 100 percent power factor and where reactance can be neglected:

$$VD = \frac{2 \times L \times R \times I}{1000}$$

where:

VD = voltage drop (based on conductor temperature of 75°C)
L = one-way length of circuit (ft)
R = conductor resistance in ohms (Ω) per 1000 ft (from Chapter 9, Table 8)
I = load current (amperes)

For 3-phase circuits (at 100 percent power factor), the voltage drop between any two phase conductors is 0.866 times the voltage drop calculated by the preceding formula. See the commentary following Chapter 9, Table 9, for an example of voltage-drop calculation using ac reactance and resistance. Voltage-drop tables and calculations are also available from various manufacturers.

STANDARD

ANSI/ASHRAE/IES Standard 90.1-2013
(Supersedes ANSI/ASHRAE/IES Standard 90.1-2010)
Includes ANSI/ASHRAE/IES Addenda listed in Appendix F

Energy Standard for Buildings Except Low-Rise Residential Buildings

(I-P Edition)

See Appendix F for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, the IES Board of Directors, and the American National Standards Institute.

This standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE Web site (www.ashrae.org) or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE Web site (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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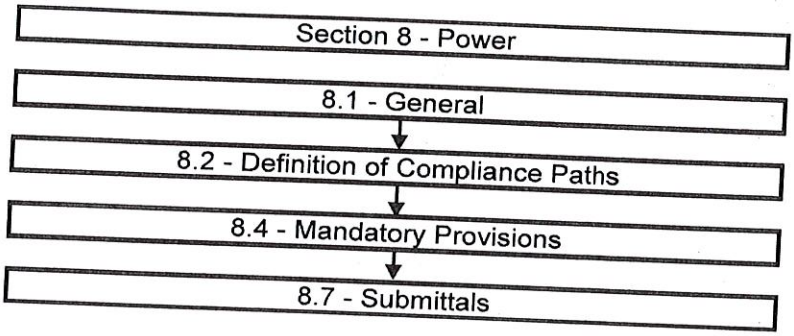


8. POWER

8.1 General

8.1.1 Scope. This section applies to all building power distribution systems and only to equipment described below.

8.1.2 New Buildings. Equipment installed in new buildings shall comply with the requirements of this section.

8.1.3 Addition to Existing Buildings. Equipment installed in addition to existing buildings shall comply with the requirements of this section.

8.1.4 Alterations to Existing Buildings

Exception: Compliance shall not be required for the relocation or reuse of existing equipment at the same site.

8.1.4.1 Alterations to building service equipment or systems shall comply with the requirements of this section applicable to those specific portions of the building and its systems that are being altered.

8.1.4.2 Any new equipment subject to the requirements of this section that is installed in conjunction with the alterations as a direct replacement of existing equipment shall comply with the specific requirements applicable to that equipment.

8.2 Compliance Paths

8.2.1 Compliance. Power distribution systems in all projects shall comply with the requirements of Section 8.1, "General"; Section 8.4, "Mandatory Provisions"; and Section 8.7, "Submittals."

8.3 Simplified/Small Building Option (Not Used)

8.4 Mandatory Provisions

8.4.1 Voltage Drop

Exception: Feeder conductors and branch circuits that are dedicated to emergency services

8.4.1.1 Feeders. Feeder conductors shall be sized for a maximum voltage drop of 2% at design load.

8.4.1.2 Branch Circuits. Branch circuit conductors shall be sized for a maximum voltage drop of 3% at design load.

8.4.2 Automatic Receptacle Control. The following shall be automatically controlled:

a. At least 50% of all 125-volt 15- and 20-amp receptacles in all private offices, conference rooms, rooms used primarily for printing and/or copying functions, break rooms, classrooms, and individual workstations
b. At least 25% of branch circuit feeders installed for modular furniture not shown on the construction documents

This control shall function on

a. a scheduled basis using a time-of-day operated control device that turns receptacles off at specific programmed times—an independent program schedule shall be provided for controlled areas of no more than 5000 ft^2 and not more than one floor (the occupant shall be able to manually override the control device for up to two hours),
b. an occupant sensor that shall turn receptacles off within 20 minutes of all occupants leaving a space, or
c. an automated signal from another control or alarm system that shall turn receptacles off within 20 minutes after determining that the area is unoccupied.

All controlled receptacles shall be permanently marked to visually differentiate them from uncontrolled receptacles and are to be uniformly distributed throughout the space.

Plug-in devices shall not be used to comply with Section 8.4.2.

Exceptions: Receptacles for the following shall not require an automatic control device:

1. Receptacles specifically designated for equipment requiring continuous operation (24 hours/day, 365 days/year)
2. Spaces where an automatic control would endanger the safety or security of the room or building occupant(s).

8.4.3 Electrical Energy Monitoring

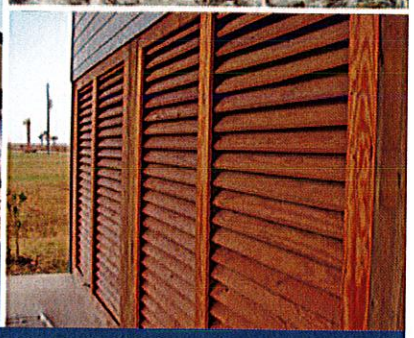
8.4.3.1 Monitoring. Measurement devices shall be installed in new buildings to monitor the electrical energy use for each of the following separately:

a. Total electrical energy
b. HVAC systems
c. Interior lighting
d. Exterior lighting
e. Receptacle circuits

For buildings with tenants, these systems shall be separately monitored for the total building and (excluding shared systems) for each individual tenant.

Exception: Up to 10% of the load for each of the categories (b) through (e) shall be allowed to be from other electrical loads.

8.4.3.2 Recording and Reporting. The electrical energy usage for all loads specified in Section 8.4.3.1 shall be recorded a minimum of every 15 minutes and reported at least hourly, daily, monthly, and annually. The data for each tenant space shall be made available to that tenant. The system shall



Coastal Construction Manual

Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas (Fourth Edition)

FEMA P-55 / Volume I / August 2011

FEMA

designations; and BFE contours throughout the SFHA. FIRMs in coastal areas may also show the LiMWA. Communities can use the information provided in FIS reports and FIRMs to manage SFHA development. At the same time, FEMA uses the FIS and FIRMs to establish insurance premiums for houses and other buildings. The information pertaining to the BFE and the flood zone at the building site are of particular importance for a coastal construction project.

5.2.3 Minimum Regulatory Requirements

The floodplain management ordinances or laws adopted by communities that participate in the NFIP must meet or exceed the minimum NFIP regulatory requirements set forth at Title 44 of the Code of Federal Regulations (CFR) Section 60.3 (44 CFR § 60.3). Community floodplain management regulations include requirements in the SFHA that apply to new construction, substantially improved buildings, and substantially damaged buildings in both Zone A and Zone V. Additional requirements apply to new subdivisions and other development in the SFHA.

WARNING

Communities participating in the NFIP are encouraged to adopt and enforce floodplain management ordinances or laws more stringent than the minimum requirements of the NFIP regulations. For example, some States and communities require that buildings be elevated above rather than simply to the BFE. The additional elevation is referred to as freeboard (see Figure 5-4). Check with local floodplain managers and building officials concerning such requirements.

The minimum NFIP requirements for new construction, substantially improved, and substantially damaged buildings affect the type of foundation that can be used, establishes the required height of the lowest floor to or above the BFE, establishes the criteria for the installation of building utility systems, requires the use of flood damage-resistant materials, and limits the use of the area below the lowest floor. In recognition of the greater hazard posed by breaking waves 3 feet high or higher, FEMA has established minimum NFIP regulatory requirements for Zone V buildings that are more stringent than the minimum requirements for Zone A buildings. Therefore, the location of a building in relation to the Zone A/Zone V boundary on a FIRM can affect the design of the building. In that regard, it is important to note that if a building or other structure has any portion of its foundation in Zone V, it must be built to comply with Zone V requirements.

WARNING

The guidance in this Manual was not specifically developed for manufactured housing. For NFIP requirements concerning manufactured housing, refer to 44 CFR Section 60.3 and FEMA P-85, *Protecting Manufactured Homes from Flood and Other Hazards, A Multi-Hazard Foundation and Installation Guide* (FEMA 2009a).

The following sections summarize the minimum NFIP requirements (for the exact wording of the regulations, refer to 44 CFR § 60.3): Section 5.2.3.1 describes the minimum requirements that apply throughout the SFHA. Sections 5.2.3.2 and 5.2.3.3 describe requirements specific to Zone A and Zone V, respectively.

5.2.3.1 Minimum Requirements in All SFHAs

The minimum NFIP floodplain management requirements for all SFHAs affect buildings, subdivisions and other new development, new and replacement water supply systems, and new and replacement sanitary sewage systems. These requirements, set forth at 44 CFR § 60.3(a) and (b), are summarized in Table 5-1.

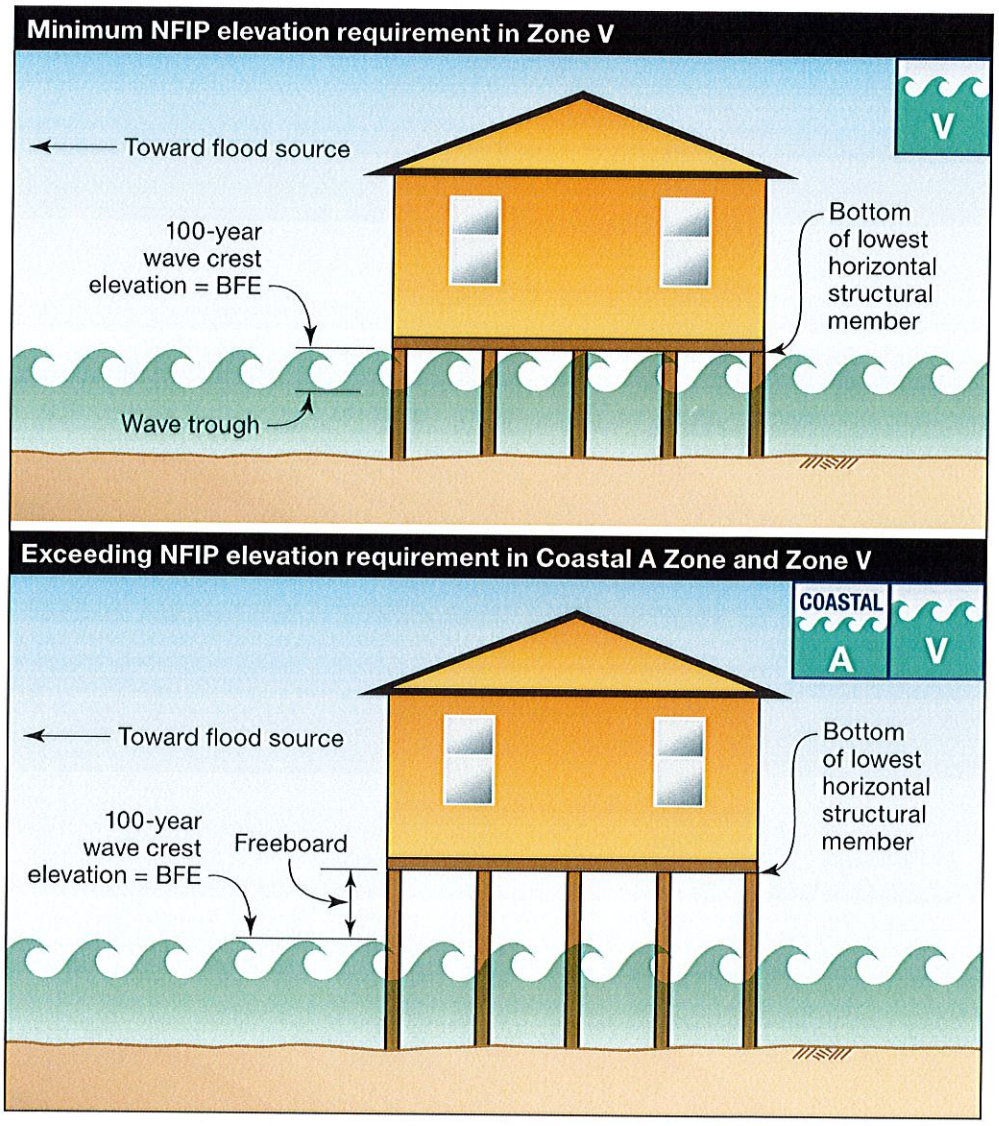


Figure 5-2.
Recommended elevation for buildings in Coastal A Zone and Zone V compared to minimum requirements

Table 5-2. Summary of NFIP Regulatory Requirements and Recommendations for Exceeding the Requirements (continued)

	Zone V		Coastal A Zone		Zone A	
	Recommendations and Requirements[a]	Cross Reference[b]	Recommendations and Requirements	Cross Reference	Recommendations and Requirements	Cross Reference
Walls of Enclosures[g] (continued)	**Requirement:** Walls must be designed to collapse (break away) under flood loads to allow free passage of floodwaters without damaging the structure or supporting foundation system. Utilities and equipment must not be mounted on or pass through breakaway walls.	**FEMA P-499:** 8.1 **Other:** FEMA TB-9		**FEMA P-499:** 3.1, 3.5, 8.1 **Other:** FEMA TB-1 and TB-9		**FEMA P-499:** 3.1, 3.5 **Other:** FEMA TB-1
UTILITIES						
Electrical, Heating, Ventilation, Plumbing and Air Conditioning Equipment	**Recommendation:** Locate equipment on the landward side of building, and/or behind structural element. **Requirement:** Utilities and equipment must be located (elevated) and designed to prevent flood waters from entering and accumulating in components during flooding.	**NFIP:** 60.3(a)(3)(iv) **IRC:** R322.1.6, RM1301.1.1, RM1401.5, RM1601.4.9, RM1701.2, RM2001.4, RM2201.6, RG2404.7, RP2601.3, RP2602.2, RP2705.1, RP2101.5 **IBC:** 1403.5, 1403.6, 1612.4 **ASCE 24:** Ch. 7 **FEMA P-55:** Ch. 12 **FEMA P-499:** 8.3 **Other:** FEMA P-348, FEMA TB-5	**Recommendation:** Follow the Zone V recommendation and requirements. **Requirement:** Utilities and equipment must be located (elevated) and designed to prevent flood waters from entering and accumulating in components during flooding.	**NFIP:** 60.3(a)(3)(iv) **IRC:** R322.1.6, RM1301.1.1, RM1401.5, RM1601.4.9, RM1701.2, RM2001.4, RM2201.6, RG2404.7, RP2601.3, RP2602.2, RP2705.1, RP2101.5 **IBC:** 1403.5, 1612.4 **ASCE 24:** Ch. 7 **FEMA P-55:** Ch. 12 **FEMA P-499:** 8.3 **Other:** FEMA P-348, FEMA TB-5	**Recommendation:** Locate equipment on the landward or downstream side of building, and/or behind structural element. **Requirement:** Utilities and equipment must be located (elevated) and designed to prevent flood waters from entering and accumulating in components during flooding.	**NFIP:** 60.3(a)(3)(iv) **IRC:** R322.1.6, RM1301.1.1, RM1401.5, RM1601.4.9, RM1701.2, RM2001.4, RM2201.6, RG2404.7, RP2601.3, RP2602.2, RP2705.1, RP2101.5 **IBC:** 1403.5, 1612.4 **ASCE 24:** Ch. 7 **FEMA P-55:** Ch. 12 **FEMA P-499:** 8.3 **Other:** FEMA P-348

APPENDIX D –

COST ESTIMATE

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CLEARWATER BEACH MARINA ELECTRICAL DISTRIBUTION EVALUATION & FEASIBILITY STUDY

A/E # 17039

25 CAUSEWAY BLVD, CLEARWATER BEACH, FL

OPINION OF PROBABLE COST - MAIN/WEST DOCK SERVICE AND MAIN DOCK DSB | **OPTION 1** | **9/14/2018**

COMPONENT DESCRIPTION	AREA		UNIT COST	SUBTOTAL	TOTAL
GENERAL REQUIREMENTS					**$ 97,338**
TEMPORARY UTILITIES & FACILITIES	6	MO	$ 2,500.00	$ 15,000	
UNDERGROUND UTILITY LOCATION	1	DAY	$ 900.00	$ 900	
CLEANING & WASTE MANAGEMENT	13250	SF	$ 0.75	$ 9,938	
SUPERVISION (FULL TIME)	6	MO	$ 7,500.00	$ 45,000	
PEDESTRIAN PROTECTION	13250	SF	$ 2.00	$ 26,500	
SELECTIVE DEMOLITION (INTERIOR)	0	SF	$ 2.50	$ -	
SITEWORK / CIVIL					**$ 18,965**
CONCRETE DEMO	1600	SF	$ 0.75	$ 1,200	
ASPHALT DEMO	0	SF	$ 0.50	$ -	
CLEAR & GRUB	0	SF	$ 0.25	$ -	
EXCAVATION	240	CY	$ 6.00	$ 1,440	
Directional Bore (HDPE conduits)	100	LF	$ 26.00	$ 2,600	
NEW CONCRETE PATCH	1600	SF	$ 7.00	$ 11,200	
GRAVEL	15	CY	$ 80.00	$ 1,200	
SOD	265	SY	$ 5.00	$ 1,325	
STRUCTURAL					**$ 97,725**
Steel	12	Tons	$ 4,500.00	$ 54,000	
Pile Caps	7	CYD	$ 800.00	$ 5,600	
1 1/2" Bar Grading	375	SF	$ 35.00	$ 13,125	
Stair w/ Grading Tread	1	EA	$ 9,000.00	$ 9,000	
2-Line Hand Rail	85	FT	$ 40.00	$ 3,400	
Concrete Piles 6 * 30 FT	180	FT	$ 70.00	$ 12,600	
ELECTRICAL					**$ 876,712**
Remove Duke Energy Power Vault and re-work primary circuits	1	LS	$ 100,000.00	$ 100,000	
New Duke Transformer/Primary Circuit	1	LS	$ 75,000.00	$ 75,000	
New Switchboards and Transformer	1	LS	$ 193,583.00	$ 193,583	
New Feeders	1	LS	$ 332,129.00	$ 332,129	
New Power Pedestals	1	LS	$ 126,000.00	$ 126,000	
Demo exisitng distribution equipment, feeders and power peds	1	LS	$ 50,000.00	$ 50,000	
SUBTOTAL HARD CONSTRUCTION COSTS					**$ 1,090,740**
BOND / INSURANCE	0.02			$ 21,815	
PHASING & OFF HOUR WORK	0.25			$ 272,685	
PERMITTING	N/A			$ -	
CONTINGENCY	0.10			$ 109,074	
CONTRACTOR OH & P	0.15			$ 163,611	
PROBABLE TOTAL PROJECT COST					**$ 1,657,924**

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CLEARWATER BEACH MARINA ELECTRICAL DISTRIBUTION EVALUATION & FEASIBILITY STUDY

A/E # 17039

25 CAUSEWAY BLVD, CLEARWATER BEACH, FL

OPINION OF PROBABLE COST - WEST DOCK POWER DISTRIBUTION SYSTEM | **OPTION 2** | **9/14/2018**

COMPONENT DESCRIPTION	AREA		UNIT COST	SUBTOTAL	TOTAL
GENERAL REQUIREMENTS					**$ 131,300**
TEMPORARY UTILITIES & FACILITIES	6	MO	$ 2,500.00	$ 15,000	
UNDERGROUND UTILITY LOCATION	1	DAY	$ 900.00	$ 900	
CLEANING & WASTE MANAGEMENT	25600	SF	$ 0.75	$ 19,200	
SUPERVISION (FULL TIME)	6	MO	$ 7,500.00	$ 45,000	
PEDESTRIAN PROTECTION	25600	SF	$ 2.00	$ 51,200	
SELECTIVE DEMOLITION (INTERIOR)	0	SF	$ 2.50	$ -	
SITEWORK / CIVIL					**$ 30,250**
CONCRETE DEMO	3200	SF	$ 0.75	$ 2,400	
ASPHALT DEMO	0	SF	$ 0.50	$ -	
CLEAR & GRUB	0	SF	$ 0.25	$ -	
EXCAVATION	475	CY	$ 6.00	$ 2,850	
Directional Bore (HDPE conduits)	100	LF	$ 26.00	$ 2,600	
NEW CONCRETE PATCH	3200	SF	$ 7.00	$ 22,400	
GRAVEL		CY	$ 80.00	$ -	
SOD		SY	$ 15.00	$ -	
STRUCTURAL					**$ -**
N/A					
ELECTRICAL					**$ 408,498**
New Switchboard	1	LS	$ 114,303.00	$ 114,303	
New Feeders	1	LS	$ 126,195.00	$ 126,195	
New Power Pedestals	1	LS	$ 68,000.00	$ 68,000	
New Power Panelboards	1	LS	$ 50,000.00	$ 50,000	
Demo exisitng distribution equipment, feeders and power peds	1	LS	$ 50,000.00	$ 50,000	
SUBTOTAL HARD CONSTRUCTION COSTS					**$ 570,048**
BOND / INSURANCE	0.02			$ 11,401	
PHASING & OFF HOUR WORK	0.25			$ 142,512	
PERMITTING	N/A			$ -	
CONTINGENCY	0.10			$ 57,005	
CONTRACTOR OH & P	0.15			$ 85,507	
PROBABLE TOTAL PROJECT COST					**$ 866,473**

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CLEARWATER BEACH MARINA ELECTRICAL DISTRIBUTION EVALUATION & FEASIBILITY STUDY

A/E # 17039

25 CAUSEWAY BLVD, CLEARWATER BEACH, FL

OPINION OF PROBABLE COST - EAST DOCK POWER SVS AND DISTR SYSTEM | OPTION 3 | 9/14/2018

COMPONENT DESCRIPTION	AREA		UNIT COST	SUBTOTAL	TOTAL
GENERAL REQUIREMENTS					$ 110,400
TEMPORARY UTILITIES & FACILITIES	6	MO	$ 2,500.00	$ 15,000	
UNDERGROUND UTILITY LOCATION	1	DAY	$ 900.00	$ 900	
CLEANING & WASTE MANAGEMENT	18000	SF	$ 0.75	$ 13,500	
SUPERVISION (FULL TIME)	6	MO	$ 7,500.00	$ 45,000	
PEDESTRIAN PROTECTION	18000	SF	$ 2.00	$ 36,000	
SELECTIVE DEMOLITION (INTERIOR)	0	SF	$ 2.50	$ -	
SITEWORK / CIVIL					$ 24,643
CONCRETE DEMO	2550	SF	$ 0.75	$ 1,913	
ASPHALT DEMO	0	SF	$ 0.50	$ -	
CLEAR & GRUB	0	SF	$ 0.25	$ -	
EXCAVATION	380	CY	$ 6.00	$ 2,280	
Directional Bore (HDPE conduits)	100	LF	$ 26.00	$ 2,600	
NEW CONCRETE PATCH	2550	SF	$ 7.00	$ 17,850	
GRAVEL		CY	$ 80.00	$ -	
SOD		SY	$ 5.00	$ -	
STRUCTURAL					$ 109,330
Steel	14	TONS	$ 4,500.00	$ 63,000	
Pile Caps	7	CYD	$ 800.00	$ 5,600	
1 1/2"Bar Grading	438	SF	$ 35.00	$ 15,330	
Stair w/ Grading Tread	1	EA	$ 9,000.00	$ 9,000	
2-Line Hand Rail	95	FT	$ 40.00	$ 3,800	
Concrete Piles 6 * 30 FT	180	FT	$ 70.00	$ 12,600	
ELECTRICAL					$ 786,669
New Duke Transformer/Primary Circuit	1	LS	$ 75,000.00	$ 75,000	
New Switchboards, Meter Center and Transformer	1	LS	$ 172,048.00	$ 172,048	
New Feeders	1	LS	$ 332,129.00	$ 332,129	
New Panelboards	1	LS	$ 41,492.00	$ 41,492	
New Power Pedestals	1	LS	$ 116,000.00	$ 116,000	
Demo exisitng distribution equipment, feeders and power peds	1	LS	$ 50,000.00	$ 50,000	
SUBTOTAL HARD CONSTRUCTION COSTS					$ 1,031,042
BOND / INSURANCE	0.02			$ 20,621	
PHASING & OFF HOUR WORK	0.25			$ 257,760	
PERMITTING	N/A			$ -	
CONTINGENCY	0.10			$ 103,104	
CONTRACTOR OH & P	0.15			$ 154,656	
PROBABLE TOTAL PROJECT COST					$ 1,567,183

APPENDIX E –

FIELD SURVEY DRAWINGS

ARCHITECTURE/ENGINEERING:
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TAMPA, FLORIDA 33611
AAC001624
EB 1828
813/839-0506

CLEARWATER BEACH MARINA
ELECTRICAL DISTRIBUTION EVALUATION
25 CAUSEWAY BLVD, CLEARWATER BEACH, FL 33767
17039

CLEARWATER
BRIGHT AND BEAUTIFUL · BAY TO BEACH

FIELD SURVEY & DRAWINGS - TASK 1

A/E PROJECT NO: 17039

MARCH 16, 2017

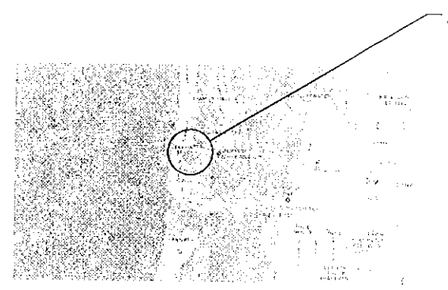
INDEX OF DRAWINGS

GENERAL

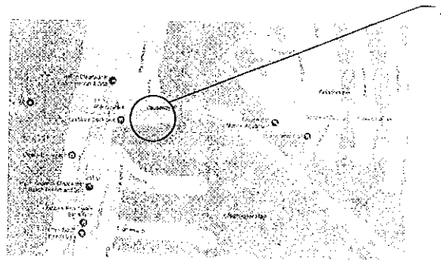
G0.1 TITLE SHEET

ELECTRICAL

E1.1 OVERALL ELECTRICAL SITE PLAN
E1.2 REFERENCE SITE PLAN
E1.3 REFERENCE SITE MAP PLAN
E2.1 ENLARGED SITE PLAN
E2.2 ENLARGED SITE PLAN
E2.3 ENLARGED SITE PLAN
E2.4 ENLARGED SITE PLAN
E2.5 ENLARGED SITE PLAN
E3.1 EXISTING POWER BOLLARD SCHEDULE
E3.2 PANELBOARD SCHEDULES
E3.3 ELECTRICAL RISERS
E3.3A PROPOSED ELECTRICAL RISERS



NORTH REGIONAL MAP



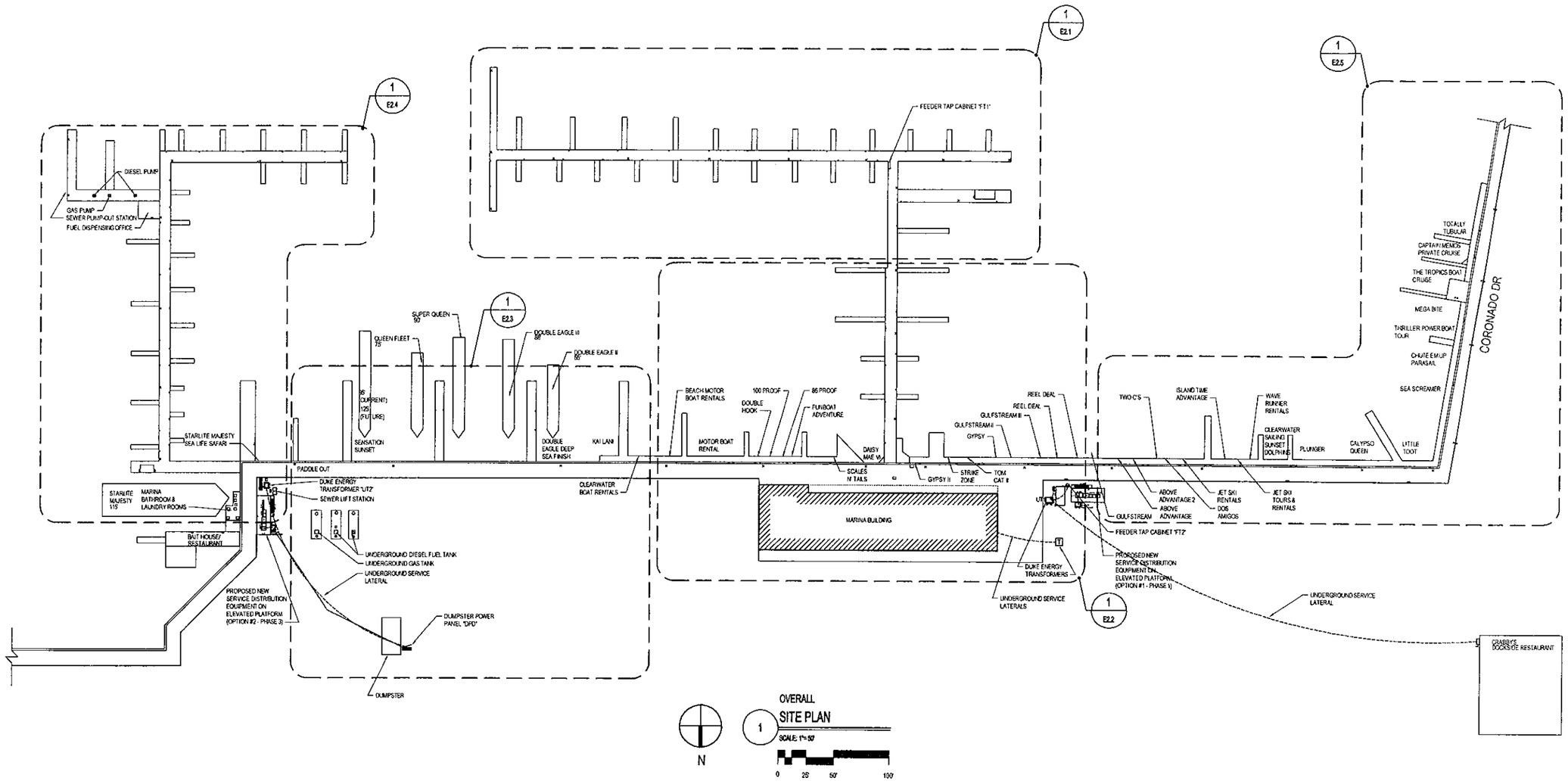
NORTH LOCAL MAP

PROJECT LOCATION:
25 CAUSEWAY BLVD
CLEARWATER BEACH, FL 33767

CLEARWATER MARINA
ELECTRICAL RENOVATION
25 CAUSEWAY BLVD, CLEARWATER BEACH, FL 33767
17039
FIELD SURVEY & DRAWINGS - TASK 1
MARCH 16, 2018

LONG & ASSOCIATES
ARCHITECTS / ENGINEERS, INC.

Shell



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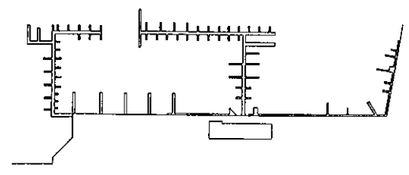

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CLEARWATER MARINA ELECTRICAL RENOVATION

FOR THE

CITY OF CLEARWATER

25 CAUSEWAY BLVD
CLEARWATER BEACH, FL 33767

Seal

NOT FOR CONSTRUCTION

No	Date	Issues & Revisions
1		
2		
3		
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5		

Phase: FIELD SURVEY & DRAWINGS
Drawn By: XG
Checked By: RAR
Job No: 17039
Date: 03-16-18

OVERALL ELECTRICAL SITE PLAN

E1.1

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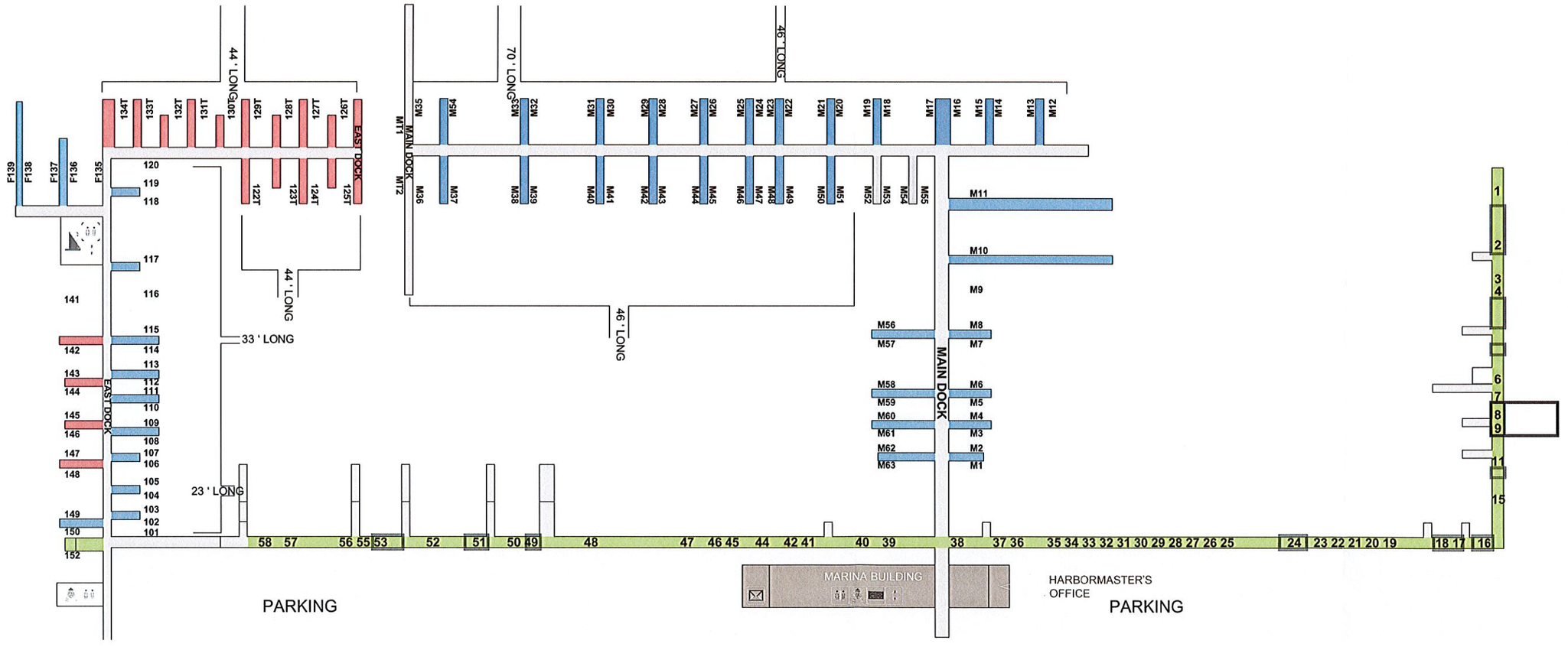
Clearwater Municipal Marina

- Transient Slips
- Private Slips
- Commercial Slips
- Booth



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REFERENCE SITE PLAN

E1.2

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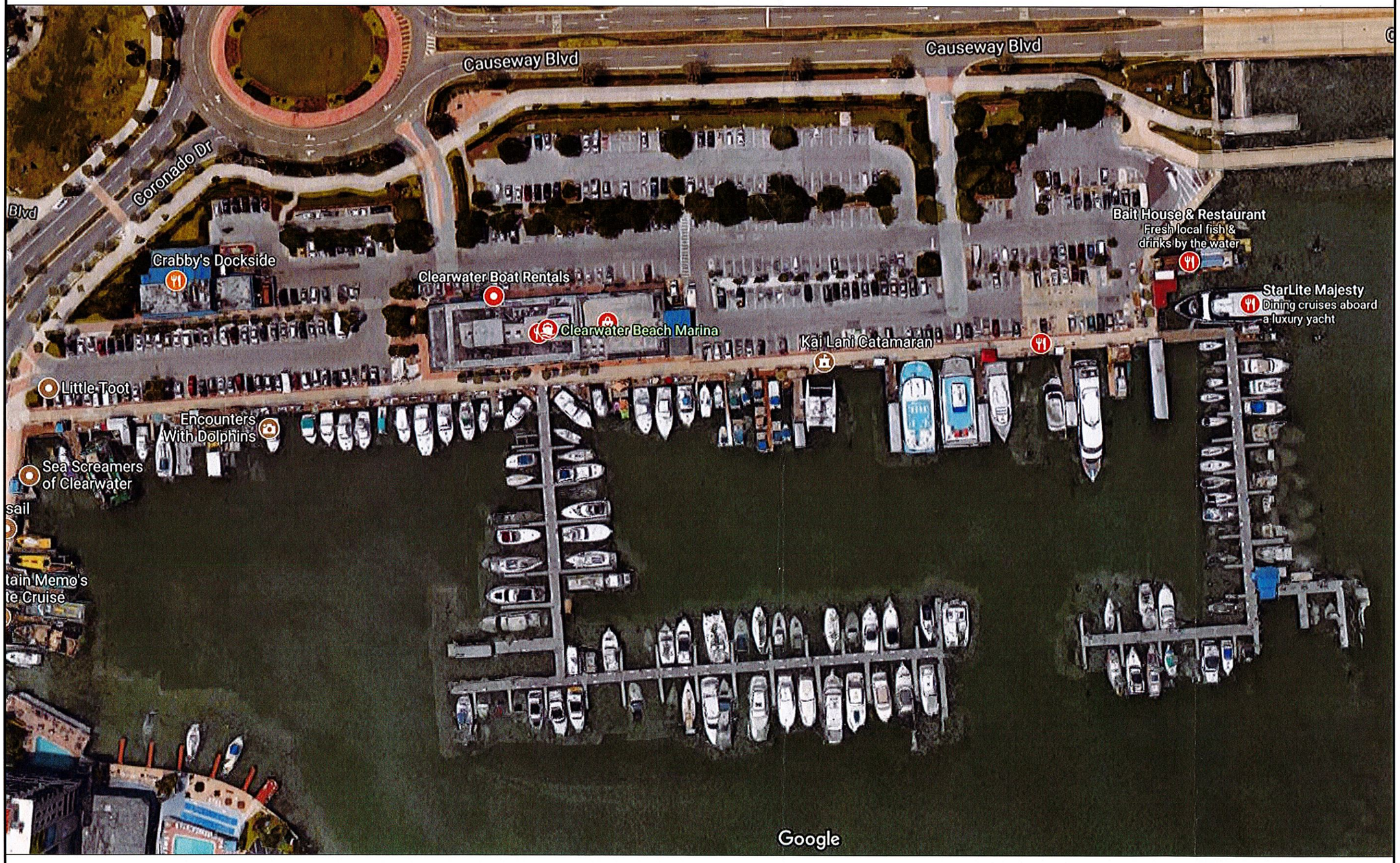

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25 CAUSEWAY BLVD
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REFERENCE SITE MAP PLAN

E1.3

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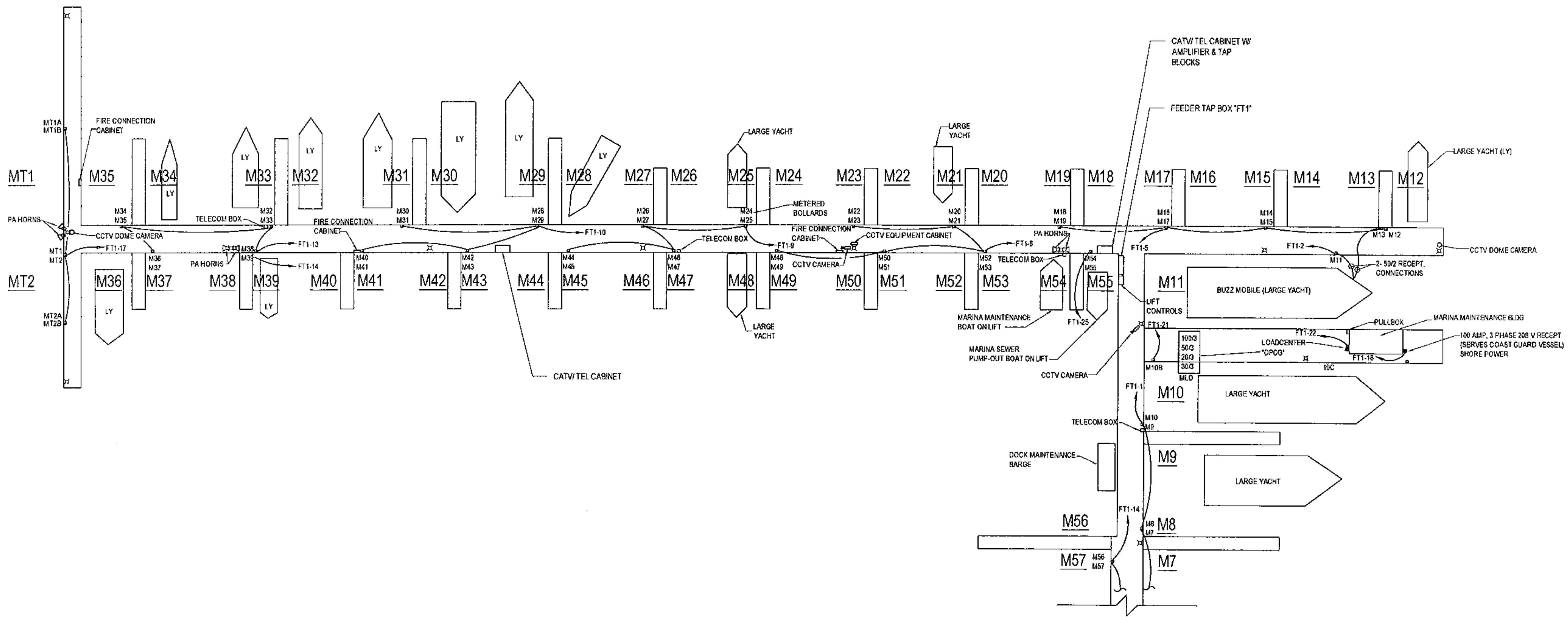


ENLARGED SITE PLAN

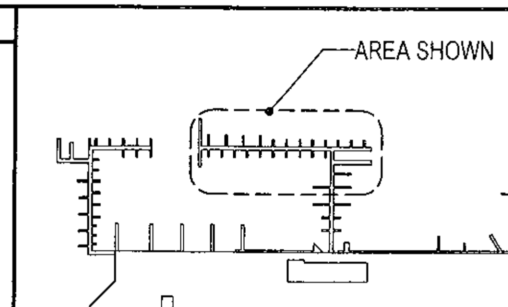
1

SCALE: 1"= 20'

0 10' 20' 40'

N

GENERAL NOTES



A KEYPLAN

SCALE: NTS

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CLEARWATER MARINA ELECTRICAL RENOVATION

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25 CAUSEWAY BLVD
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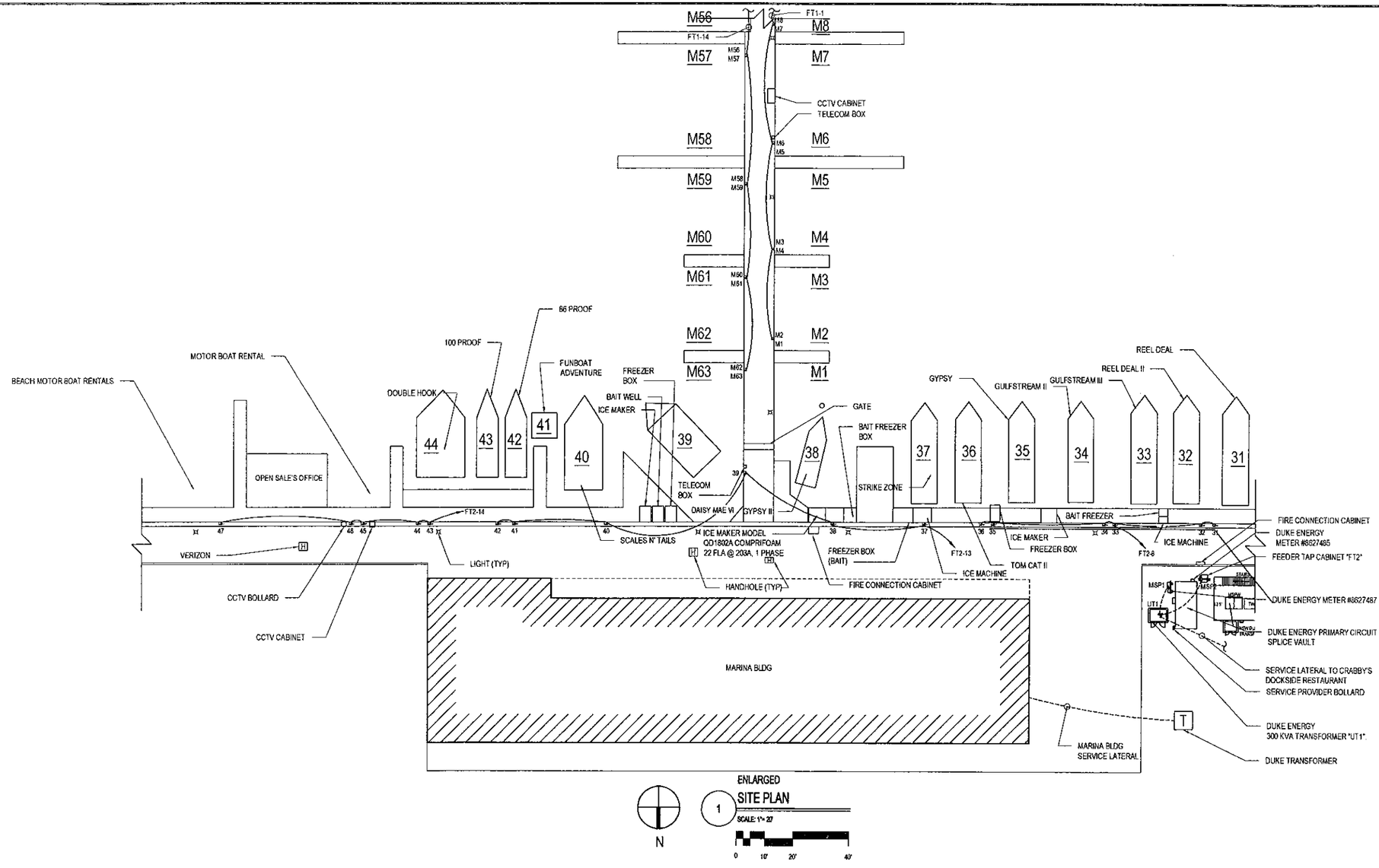
Job No: 17039
Date: 03-16-18

ENLARGED SITE PLAN

E2.1



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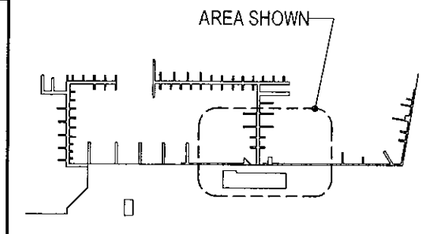

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25 CAUSEWAY BLVD
CLEARWATER BEACH, FL 33767

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Checked By: RAR
Job No: 17039
Date: 03-16-18

ENLARGED SITE PLAN

E2.2

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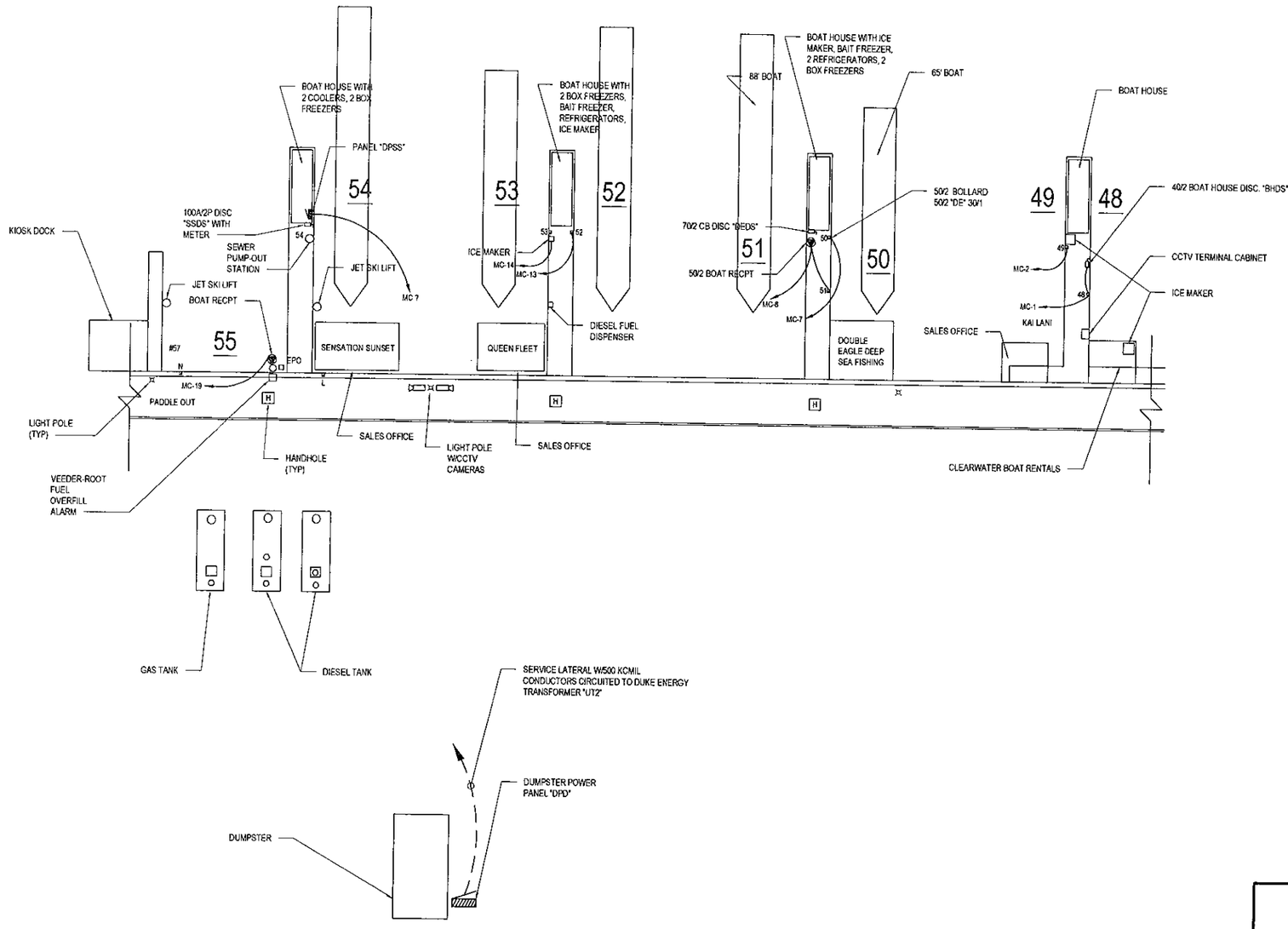

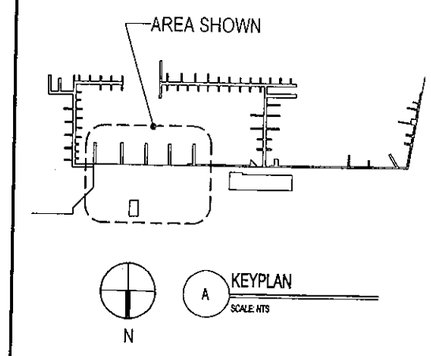

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Checked By: RAR
Job No: 17039
Date: 03-16-18

ENLARGED SITE PLAN

E2.3

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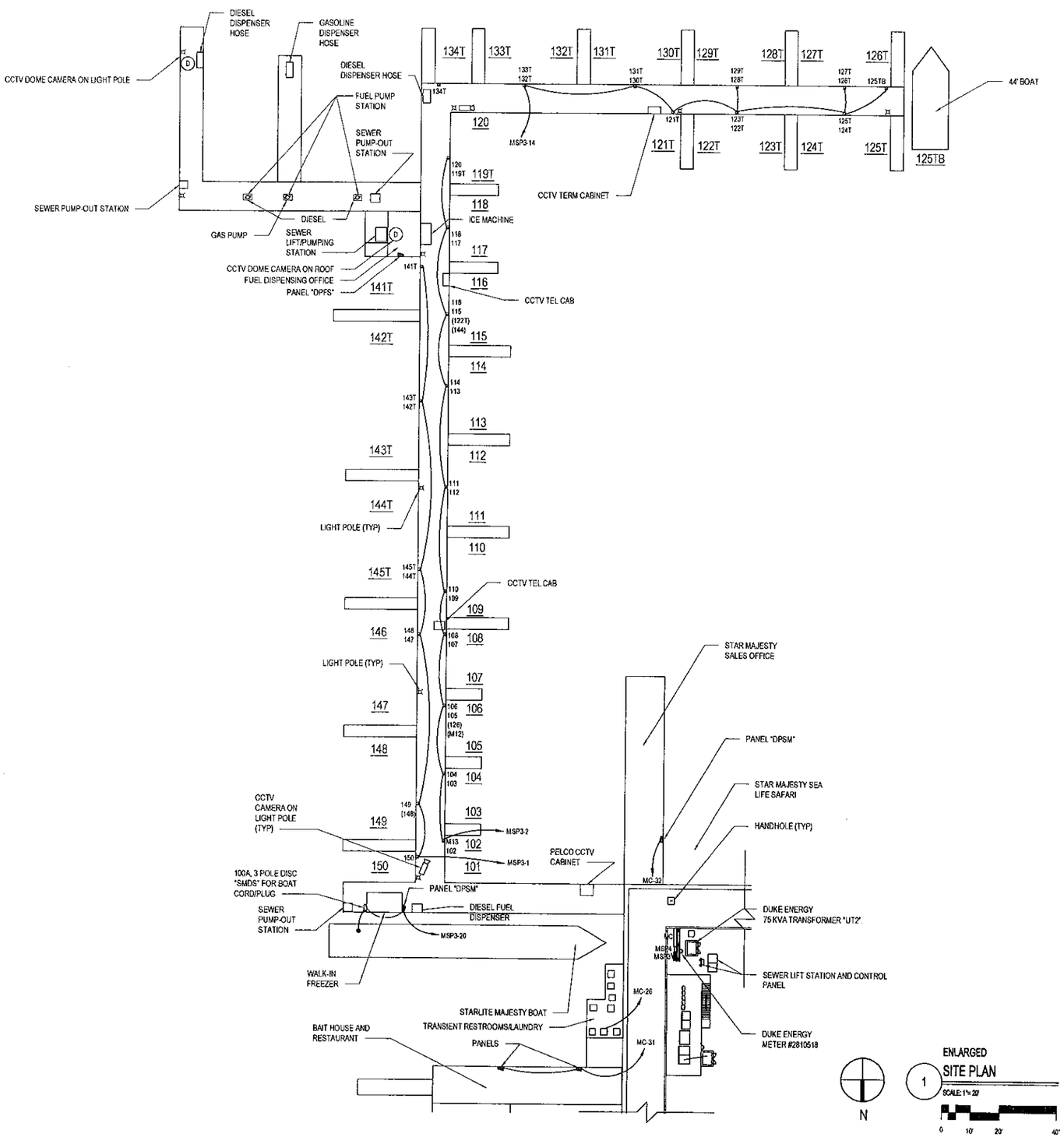
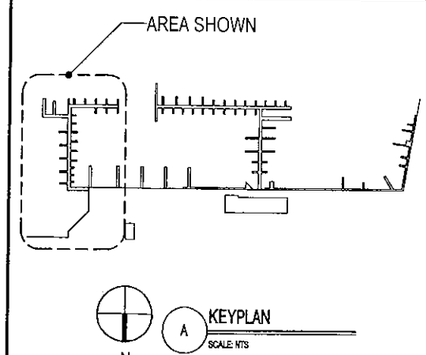


GENERAL NOTES



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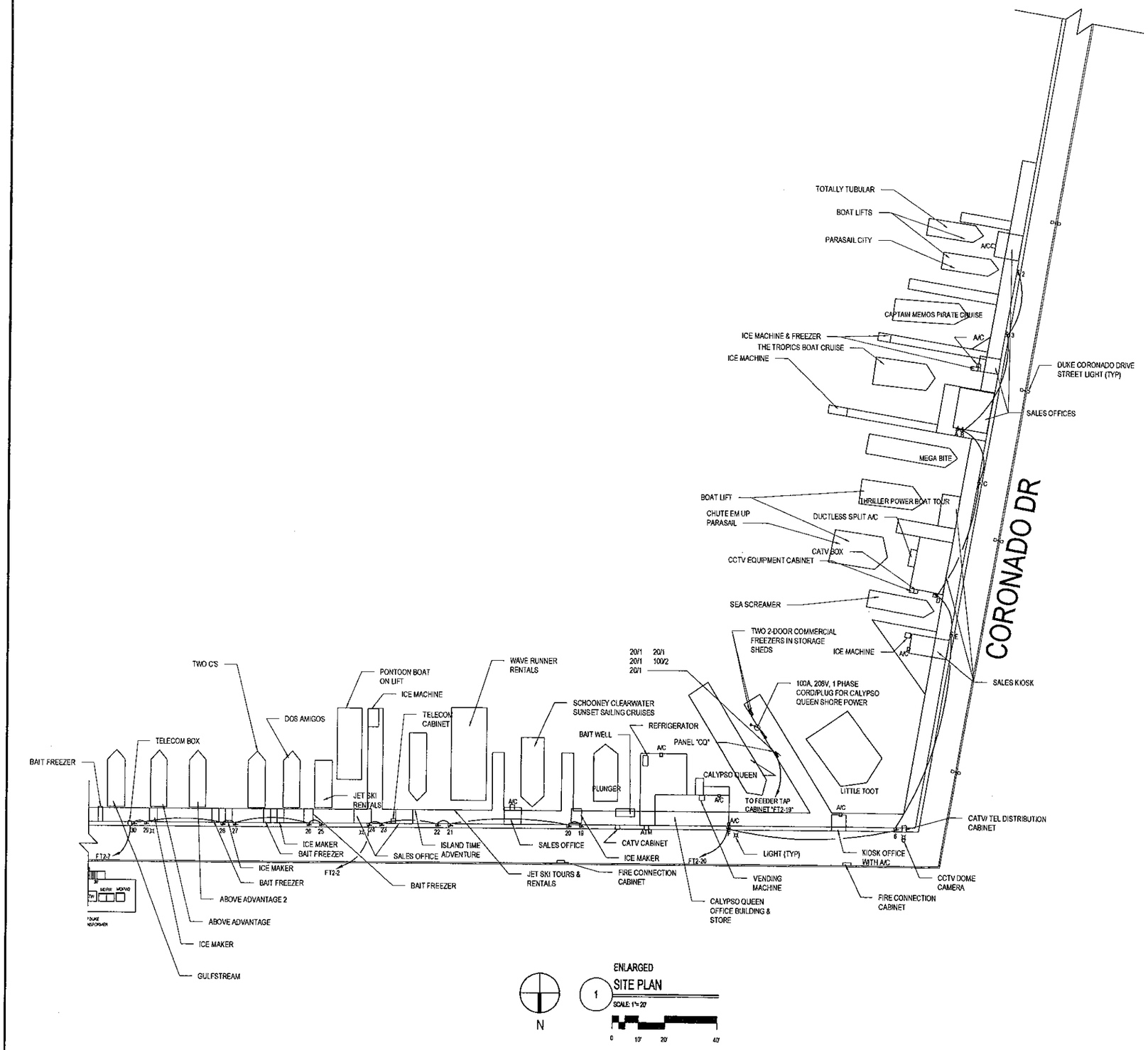
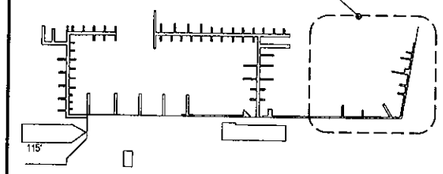
ENLARGED SITE PLAN

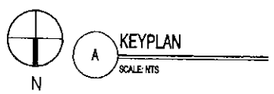
E2.4



GENERAL NOTES

AREA SHOWN





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CLEARWATER MARINA ELECTRICAL RENOVATION

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CLEARWATER BEACH, FL 33767

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Phase: FIELD SURVEY & DRAWINGS
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Job No: 17039
Date: 03-16-18

ENLARGED SITE PLAN

E2.5

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CLEARWATER BEACH MARINA BOAT SHORE DOCK POWER BOLLARD SCHEDULE

	POWER BOLLARD ID#	PLUMBING (HOSE BIBB)	SIGNAL (SERVICE PROVIDER OUTLET)	ELECTRICAL					REMARKS
				20/1 RECEPTACLE	30/1 RECEPTACLE	50/2 RECEPTACLE	METERED BOLLARD	BUILT-IN LIGHT	
COMMERCIAL	2				2		X		
	3				1		X		
	A			2		2?	X		
	B			1	2		X		
	C				2		X		
	D								MOUNTED ON WALL
	E			2	2		X		
	6			2	2		X		
	F					1	X		
	10C				1		X		
	19			2	2		X		
	20			2			X		
	21			2	2		X		
	22			2	2		X		
	23			2	2		X		
	24			2	2		X		
	25			2	2		X		
	26			2	2		X		
	27			2	2		X		
	28			2	2		X		
	29			2	2		X		
	30			2	2		X		
	31			2	2		X		
	32			4	2		X		
	33			2	2		X		
	34			2	2		X		
	35				1	1	X		
	36			2	2		X		
	37			2	2		X		
	38			2	2		X		
	39			1	1	1	X		
	40			2	2		X		
	41			2	2		X		
	42			2	2		X		
	43			2	2		X		
	44			2	2		X		
	45			3	2		X		
	46			2	2		X		
	47			2	2		X		
	48				1	2			
	G				2	1			
	I				1	1			
	H								CAN'T OPEN
	J				1	1			
	K				1	1			
	L			1	2				NO BOLLARD
	M						X		CAN'T OPEN
	N (57)			2	2		X		
	149	X	X		1	1	X	X	WITH 148
	150	X	X	2	2		X	X	
PRIVATE	M1	X		2	2		X	X	
	M2	X		2	2		X	X	
	M3	X		2	2		X	X	
	M4	X		2	2		X	X	
	M5		?TV	1	1	1	X	X	
	M6		?TV	1	1	1	X	X	
	M7		X	1	1	1	X	X	
	M8		X		1	1	X	X	
	M9	X		2	2	1	X	X	ONE SIDE IS M44
	M10	X		1	1		X	X	
	M11	X		1	1	2	X	X	ONE SIDE IS 143
	M12	?	?	2	2		?	?	IN 105 & 106
	M13	?	?	1	1	?	?	?	IN 101 & 102
	M14	X		2	2		X	X	
	M15	X		2	2		X	X	
	M16	X		1	1	1	X	X	
	M17	X		1	1	2	X	X	
	M18		X	1	1	1	X	X	
	M19		X	1	1	1	X	X	
	M20	X	X	2	2		X	X	
	M21	X	X	1	1	1	X	X	
	M22	X	X	1	1	1	X	X	
	M23		X	1	1	1?	X	X	
	M24			1	1	1	X	X	
	M25			1	1	1	X	X	
	M26		X			2	X	X	
	M27								NO PICS
	M28	X	?		1	1	X	X	
	M29	X	X		1	1	X	X	
	M30	X			1	1	X	X	
	M31	X	X		1	1	X	X	

CLEARWATER BEACH MARINA BOAT SHORE DOCK POWER BOLLARD SCHEDULE

	POWER BOLLARD ID#	PLUMBING (HOSE BIBB)	SIGNAL (SERVICE PROVIDER OUTLET)	ELECTRICAL					REMARKS
				20/1 RECEPTACLE	30/1 RECEPTACLE	50/2 RECEPTACLE	METERED BOLLARD	BUILT-IN LIGHT	
PRIVATE (CONTINUED)	M32		X		1	1	X	X	
	M33		X			2	X	X	
	M34		X			2	X	X	
	M35		X	?		2	X	X	
	M36		X	?	1	1	X	X	
	M37		X		1	1	X	X	
	M38	X	X		1	1	X	X	
	M39	X	X		1	1	X	X	
	M40	X			1	1	X	X	
	M41		X		2	2	X	X	
	M42		X	2	1	1	X	X	
	M43		X	2	2	2	X	X	
	M44			2	1	1	X	X	
	M45				1	1	X	X	
	M46	X	X		1	1	X	X	
	M47	X	X		2		X	X	
	M48	X	X		1	1	X	X	
	M49	X	X		1	1	X	X	
	M50	X	X		2		X	X	
	M51	X	X		2		X	X	
	M52	X	X		2		X	X	
	M53	X	X		2		X	X	
	M54	X			2		X	X	
	M55	X			2		X	X	
	M56	X			1	1	X	X	
	M57	X			1	1	X	X	
	M58	X			1	1	X	X	
	M59	X			1	1	X	X	
	M60		TV	1?	1	1	X	X	
	M61		TV	1?	1		X	X	
	M62	X			2		X	X	
	M63	X			2		X	X	
	MT1A		X	1?	1	1	X	X	
	MT1B		X	1?	1	1	X	X	
	MT2A		X	1?	1	1	X	X	
	MT2B		X	1?	1	1	X	X	
	NN01		X	2	2	2	X	X	
	NN02	X	X	1	2	2	X	X	
	NN03				1	4	2	2	
	101	X	X		1		X	X	WITH M13
	102	X?	X		2	?	?	?	
	103	X			2		X	X	
	104	X			2		X	X	
	105	X			2		?	?	WITH M12, T126
	106	X	X		1		X	X	
	107	X			2		X	X	
	108	X			2		X	X	
	109	X	X		2		X	X	
	110	X	X		2		X	X	
	111	X	.		2		X	X	
	112	X			2		X	X	
	113	X	X		2		X	X	
	114	X	X		2		X	X	
	115	X	X		2		X	X	WITH 122T, 144
	116	X	X		2		X	X	
	117	X	X		2		X	X	
	118	X	X		2		X	X	
	119	X	X		2		X	X	
	120	X	X		2		X	X	
TRANSIENT	T121	?	X		1	1	X	X	
	T122	X	X	1?	1	1	X	X	
	T123	X	X	1?	1	1	X	X	
	T124	?	X	1	1	1	X	X	
	T125	?	X	1?	1	1	X	X	
	T126	X	X		1	1	X	X	IN 105 &106
	T127	X	X	1?	1	1	X	X	
	T128	?	X	1?	1	1	X	X	
	T129	?	X		1	1	X	X	
	T130	X	X	1?	1	1	X	X	
	T131	X	X		1	1	X	X	
	T132	X	X	1?	1	1	X	X	
	T133	X	X		1	2	X	X	
	T134	X	X	1?	2	4	X	X	
	141	X	X	4		1	X	X	
	142		X	2	1	1	X	X	
	143		X	2	1	1	X	X	
	144		X	3?	1	1	X	X	
	145		X	3?	1	1	X	X	
	146		X	1	1	1	X	X	
	147		X	1	1	1	X	X	
	NN04	X	X	4	2	2	X	X	
	148	X	X		1	1	X	X	WITH 149

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FOR THE

CITY OF CLEARWATER

25 CAUSEWAY BLVD
CLEARWATER BEACH, FL 33767

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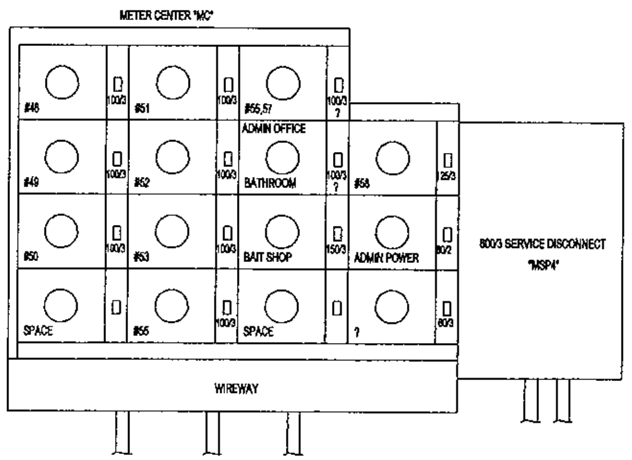
Phase: FIELD SURVEY & DRAWINGS
Drawn By: XG
Checked By: RAR
Job No: 17039
Date: 03-16-18

EXISTING SHORE POWER BOLLARD SCHEDULE

E3.1



EXISTING METER CENTER "MCC"

1 ELEVATION

NTS

EXISTING FEEDER TAP BOX "FT1"

120/208 VOLTS 3PH, 4W
SURFACE MTD

☐ MCB: — AMPS
☒ MLO: 400 AMPS

BRANCH LOAD	AMPS	CB/P	A B C		CB/P	AMPS	BRANCH LOAD
PEDESTALS #M1-M10		125/2	1	2	125/2		PEDESTALS #M11
-		-			-		-
PEDESTALS #M12-M19		125/2	5	6	125/2		PEDESTALS #M20-M23; M49-M53
-		-			-		-
PEDESTALS #M24-M27; M44-M47		125/2	9	10	125/2		PEDESTALS #M28,M29, M30,M31; M40-M43
-		-			-		-
PEDESTALS #M32-M39		125/2	13	14	125/2		PEDESTALS #M56-M63; M39
-		-			-		-
PEDESTALS #MT1-MT2		125/2	17	18	150/2		COAST GUARD BOAT SHORE RECPT
-		-			-		-
PEDESTALS #M108		200/2	21	22	200/2		MARINA MAINTENANCE BLDG SHED PANEL "DPCG"
-		-			-		-
PEDESTALS #M54, M55		100/2	25	26	20/1		BOAT LIFT
-		-		28	20/1		BOAT LIFT
MAIN DECK LIGHTS		40/2	29	30			
-		-		32			
			33	34			
			35	36			
			37	38			
			39	40			
			41	42			
			43	44			
			45	46			
			47	48			
			49	50			
			51	52			
			53	54			

TOTAL AMPS: A PH = B PH = C PH =

LOADS	CONN KVA		FACTOR		DMD KVA		DIVERSITY		DES KVA
LIGHTING	-	x	1.25	=	-	x	1.00	=	-
RECEPT		x	0.4	=		x	1.00	=	
AIRHANDLERS	-	x	1.25	=	-	x	1.00	=	-
COOLING	-	x	-	=	-	x	1.00	=	-
HEATING	-	x	1.00	=	-	x	1.00	=	-
MISC EQUIP	-	x	1.00	=	-	x	1.00	=	-
EXH FANS		x	1.25	=		x	1.00	=	
WATER HEAT	-	x	1.00	=	-	x	1.00	=	-
FUTURE	-	x	1.00	=	-	x	1.00	=	-
TOTALS	KVA				KVA				KVA

REMARKS: NEMA-3R ENCLOSURE

■ GROUND BAR

FEEDER:

* ESTIMATED LOAD PER NEC 555.12

EXISTING FEEDER TAP BOX "FT2"

120/208 VOLTS 3PH, 4W
SURFACE MTD

☐ MCB: — AMPS
☒ MLO: 600 AMPS

BRANCH LOAD	AMPS	CB/P	A B C		CB/P	AMPS	BRANCH LOAD
SLIP BOLLARD #16-18		100/2	1	2	100/3		SLIP BOLLARD #19-24
-		-			-		-
SPARE		-/1			-		-
SLIP BOLLARD #25-30		100/3	7	8	100/3		SLIP BOLLARD #31-36
-		-			-		-
-		-	11		-		-
SLIP BOLLARD #37-42		70/3		14	100/3		SLIP BOLLARD #43-47
-		-	15		-		-
-		-			-		-
CALYPSO QUEEN		200/3	19	20	100/3		CORONADO AVE
-		-			-		-
-		-	23		-		-
?		20/1	25	26	20/1		?
?		20/1	27	28	20/1		?
?		20/1	29	30			
			31	32			
			33	34			
			35	36			
			37	38			
			39	40			
			41	42			

TOTAL AMPS: A PH = B PH = C PH =

LOADS	CONN KVA		FACTOR		DMD KVA		DIVERSITY		DES KVA
LIGHTING	-	x	1.25	=	-	x	1.00	=	-
RECEPT		x	*0.6	=		x	1.00	=	
AIRHANDLERS	-	x	1.25	=	-	x	1.00	=	-
COOLING	-	x	-	=	-	x	1.00	=	-
HEATING	-	x	1.00	=	-	x	1.00	=	-
MISC EQUIP	-	x	1.00	=	-	x	1.00	=	-
EXH FANS		x	1.25	=		x	1.00	=	
WATER HEAT	-	x	1.00	=	-	x	1.00	=	-
FUTURE	-	x	1.00	=	-	x	1.00	=	-
TOTALS	KVA				KVA				KVA

REMARKS: NEMA-3R ENCLOSURE

■ GROUND BAR

FEEDER: EXISTING

* ESTIMATED LOAD PER NEC 555.12

EXISTING METER CENTER "MC"

120/208 VOLTS, 3PH, 4W
SURFACE MTD

■ MCB: 600 AMPS
☐ MLO: — AMPS

BRANCH LOAD	AMPS	CB/P	A B C		CB/P	AMPS	BRANCH LOAD
SLIP BOLLARD #48		100/3	1	2	100/3		SLIP BOLLARD #49
-		-			-		-
-		-			-		-
SLIP BOLLARD #50		100/3	7	8	100/3		SLIP BOLLARD #51
-		-			-		-
-		-			-		-
SLIP BOLLARD #52		100/3	13	14	100/3		SLIP BOLLARD #53
-		-			-		-
-		-			-		-
SLIP BOLLARD #55		100/3	19	20	100/3		SLIP BOLLARD #55, #57
-		-			-		-
-		-			-		-
SLIP BOLLARD #58		125/3	25	26	100/3		ADMIN OFFICE / BATHROOMS
-		-			-		-
-		-			-		-
BAIT SHOP		100/3	31	32	60/2		ADMIN POWER
-		-			-		-
-		-		36			
			37	38			
			39	40			
			41	42			

TOTAL AMPS: A PH = B PH = C PH =

LOADS	CONN KVA		FACTOR		DMD KVA		DIVERSITY		DES KVA
LIGHTING	-	x	1.25	=	-	x	1.00	=	-
RECEPT		x	*	=	-	x	1.00	=	-
AIRHANDLERS	-	x	1.25	=	-	x	1.00	=	-
COOLING	-	x	-	=	-	x	1.00	=	-
HEATING	-	x	1.00	=	-	x	1.00	=	-
MISC EQUIP	-	x	1.00	=	-	x	1.00	=	-
EXH FANS	-	x	1.25	=	-	x	1.00	=	-
WATER HEAT	-	x	1.00	=	-	x	1.00	=	-
FUTURE	-	x	1.00	=	-	x	1.00	=	-
TOTALS	KVA				- KVA				KVA

REMARKS: NEMA-3R ENCLOSURE

■ GROUND BAR

FEEDER: EXISTING

* ESTIMATED LOAD PER NEC 555.12

EXISTING SERVICE PANEL "MSP3"

120/208 VOLTS 3PH, 4W
SURFACE MTD

■ MCB: 400 AMPS
☐ MLO: — AMPS

BRANCH LOAD	AMPS	CB/P	A B C		CB/P	AMPS	BRANCH LOAD
FUEL DOCK PEDESTALS #141; #142-143; #144-146; #146-147; #150-151		250/3	1	2	125/3		PEDESTALS [illegible]
-		-			-		-
-		-			-		-
EAST DOCK LIGHTS		30/2	7	8	20/1		GFI SERVICE RECEPTACLE
-		-		10	20/1		PHOTOCELL
PIER LIGHTS AND EAST SEAWALL LIGHTS		30/2	11	12	20/1		SPARE
-		-		14	150/3		F-DOCK PEDESTALS ET1, ET2, [illegible]
PARKING LOT LIGHTS		30/2	15		-		-
-		-			-		-
SPARE		30/2	19	20	125/3		STARSHIP II
-		-			-		-
			23		-		-
			25	26			
			27	28			
			29	30			
			31	32			
			33	34			
			35	36			
			37	38			
			39	40			
			41	42			

TOTAL AMPS: A PH = B PH = C PH =

LOADS	CONN KVA		FACTOR		DMD KVA		DIVERSITY		DES KVA
LIGHTING		x	1.25	=		x	1.00	=	
RECEPT		x	*0.6	=		x	1.00	=	
AIRHANDLERS	-	x	1.25	=	-	x	1.00	=	-
COOLING	-	x	-	=	-	x	1.00	=	-
HEATING	-	x	1.00	=	-	x	1.00	=	-
MISC EQUIP		x	1.00	=		x	1.00	=	
EXH FANS		x	1.25	=		x	1.00	=	
WATER HEAT	-	x	1.00	=	-	x	1.00	=	-
FUTURE	-	x	1.00	=	-	x	1.00	=	-
TOTALS	598.1 KVA				- KVA				370.9 KVA

REMARKS: NEMA-3R ENCLOSURE

■ GROUND BAR

* ESTIMATED LOAD PER NEC 555.12

FEEDER: 2 SETS OF 4-350 KCMIL IN 3" CNDS.

EXISTING DPD (DUMPSTER AREA)

120/208 VOLTS 3PH, 4W
SURFACE MTD

☐ MCB: — AMPS
■ MLO: 100 AMPS

BRANCH LOAD	AMPS	CB/P	A B C		CB/P	AMPS	BRANCH LOAD
BACKFED MCB	-	100/3	1	2	100/3		DUMPSTER HYDRAULIC PUMP
-	-	-			-		-
-	-	-			-		-
SERVICE RECEPTACLE		20/1	7	8	20/1	1	PHOTOCELL/LIGHTING
SPACE	-	-/1	9	10	-/1	-	SPACE
SPACE	-	-/1	11	12	-/1	-	SPACE
SPACE	-	-/1	13	14	-/1	-	SPACE
SPACE	-	-/1	15	16	-/1	-	SPACE
SPACE	-	-/1	17	18	-/1	-	SPACE
SPACE	-	-/1	19	20	-/1	-	SPACE
SPACE	-	-/1	21	22	-/1	-	SPACE
SPACE	-	-/1	23	24	-/1	-	SPACE
SPACE	-	-/1	25	26	-/1	-	SPACE
SPACE	-	-/1	27	28	-/1	-	SPACE
SPACE	-	-/1	29	30	-/1	-	SPACE

TOTAL AMPS: A PH = B PH = C PH =

LOADS	CONN KVA		FACTOR		DMD KVA		DIVERSITY		DES KVA
LIGHTING	-	x	*	=	-	x	1.00	=	-
RECEPT	-	x	*	=	-	x	1.00	=	-
AIRHANDLERS	-	x	1.25	=	-	x	1.00	=	-
COOLING	-	x	-	=	-	x	1.00	=	-
HEATING	-	x	1.00	=	-	x	1.00	=	-
MISC EQUIP	-	x	1.00	=	-	x	1.00	=	-
EXH FANS	-	x	1.25	=	-	x	1.00	=	-
WATER HEAT	-	x	1.00	=	-	x	1.00	=	-
FUTURE	-	x	1.00	=	-	x	1.00	=	-
TOTALS	KVA				- KVA				KVA

REMARKS: NEMA-3R

■ GROUND BAR

FEEDER: EXISTING

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Phase: FIELD SURVEY & DRAWINGS
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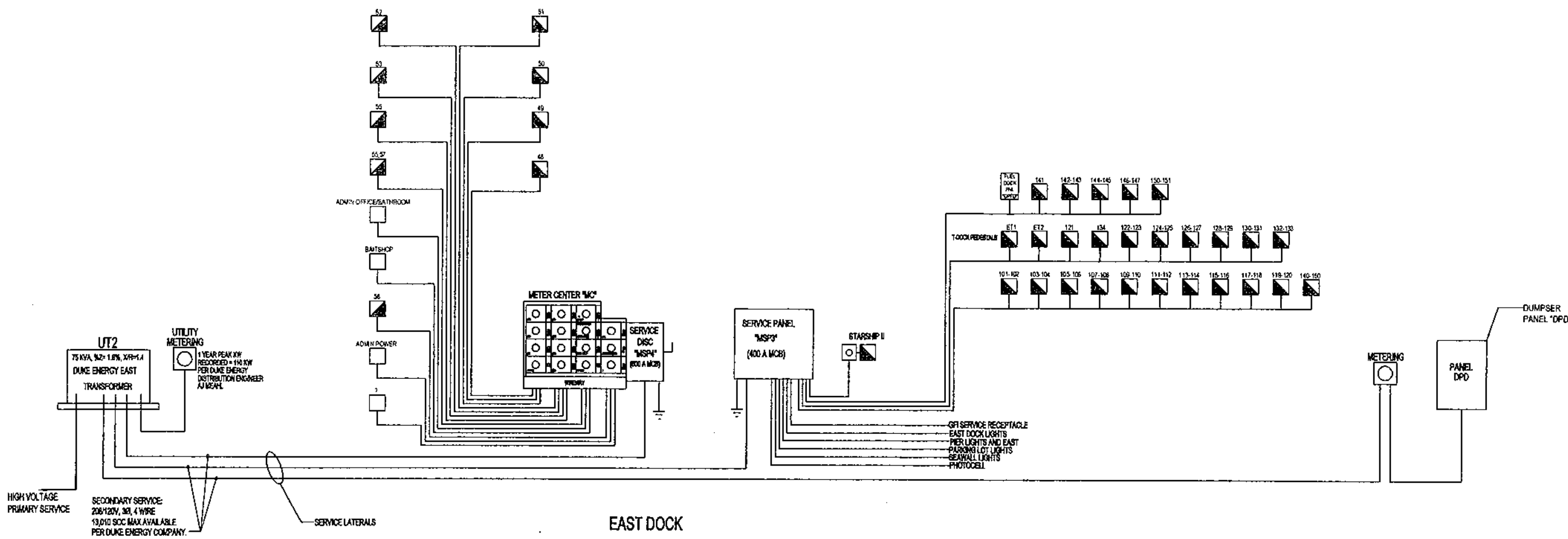
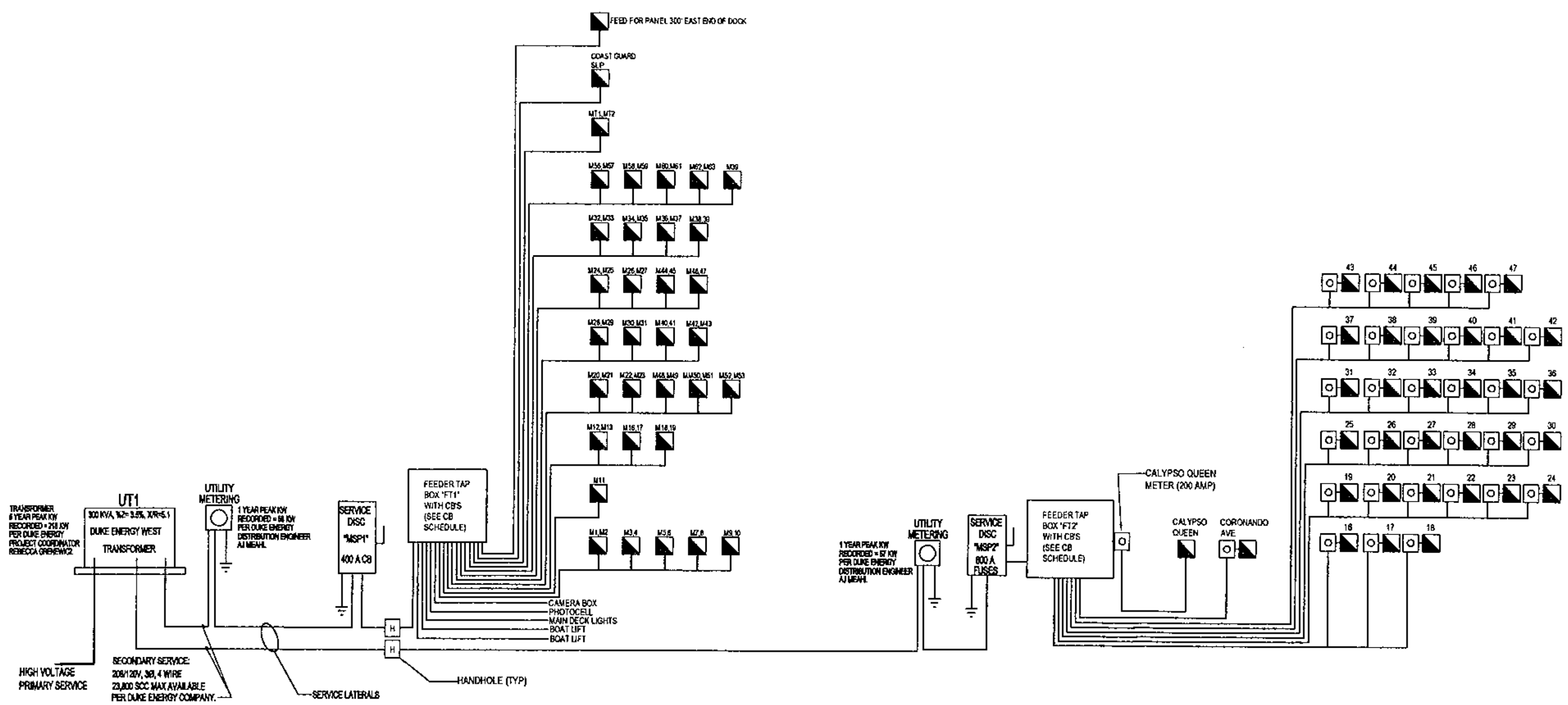
Checked By: RAR
Job No: 17039
Date: 03-16-18

PANELBORAD SCHEDULES

E3.2



2 EAST DOCK
ELECTRICAL RISER
SCALE: NTS



1 WEST DOCK
ELECTRICAL RISER
SCALE: NTS

FEEDER TAP BOX "FT1" CB SCHEDULE	
FEEDER CB SIZE (AMPS/POLES)	LOADS SERVED
60/3	?
30/1	?
30/1	?
20/1	?
20/1	CAMERA BOX
20/1	PHOTOCELL
40/2	MAIN DECK LIGHTS
20/1	BOAT LIFT
20/1	BOAT LIFT
200/2	FEED FOR PANEL 300' EAST END OF DOCK
200/2	? PEDESTALS #M108
150/2	COAST GUARD SLIP
125/2	? PEDESTALS #M54-M55
125/2	SPARE
175/2	PEDESTALS #M1-M2, #M3-M4, #M5-M6, #M7-M8, #M9-M10
125/2	PEDESTALS #M56-M57, #M58-M59, #M60-M61; #M62-M63, #M39
125/2	PEDESTALS #M11
125/2	SPARE
125/2	PEDESTALS #M20-M21; #M22-M23, #M48-M49, #M50-M51, #M52-M53
125/2	PEDESTALS #M24-M25, #M26-M27, #M44-M45; #M46-M47
125/2	PEDESTALS #MT1, #MT2
125/2	PEDESTALS #M32-M33, #M34-M35, #M36-M37, #M38-M39
125/2	PEDESTALS #M12-M13, #M16-M17, #M18-M19
125/2	PEDESTALS #M28-M29, #M30-M31, #M40-M41; M42-43

FEEDER TAP BOX "FT2" CB SCHEDULE	
FEEDER CB SIZE (AMPS/POLES)	LOADS SERVED
200/3	CALYPSO QUEEN
100/3	POWER BOLLARDS #43-47
70/3	POWER BOLLARDS #37-42
100/3	POWER BOLLARDS #31-36
100/3	POWER BOLLARDS #25-30
100/3	POWER BOLLARDS #19-24
100/2	POWER BOLLARDS #16-18
100/3	CORONANDO AVE
20/1	?
20/1	?
20/1	?
20/1	?
20/1	?

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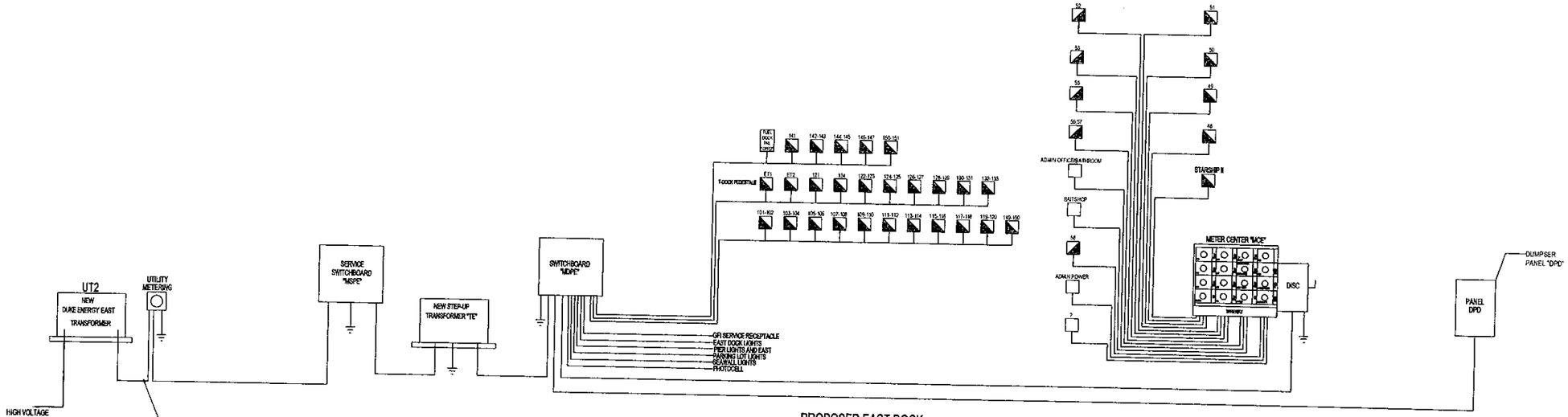
ELECTRICAL RISERS

E3.3



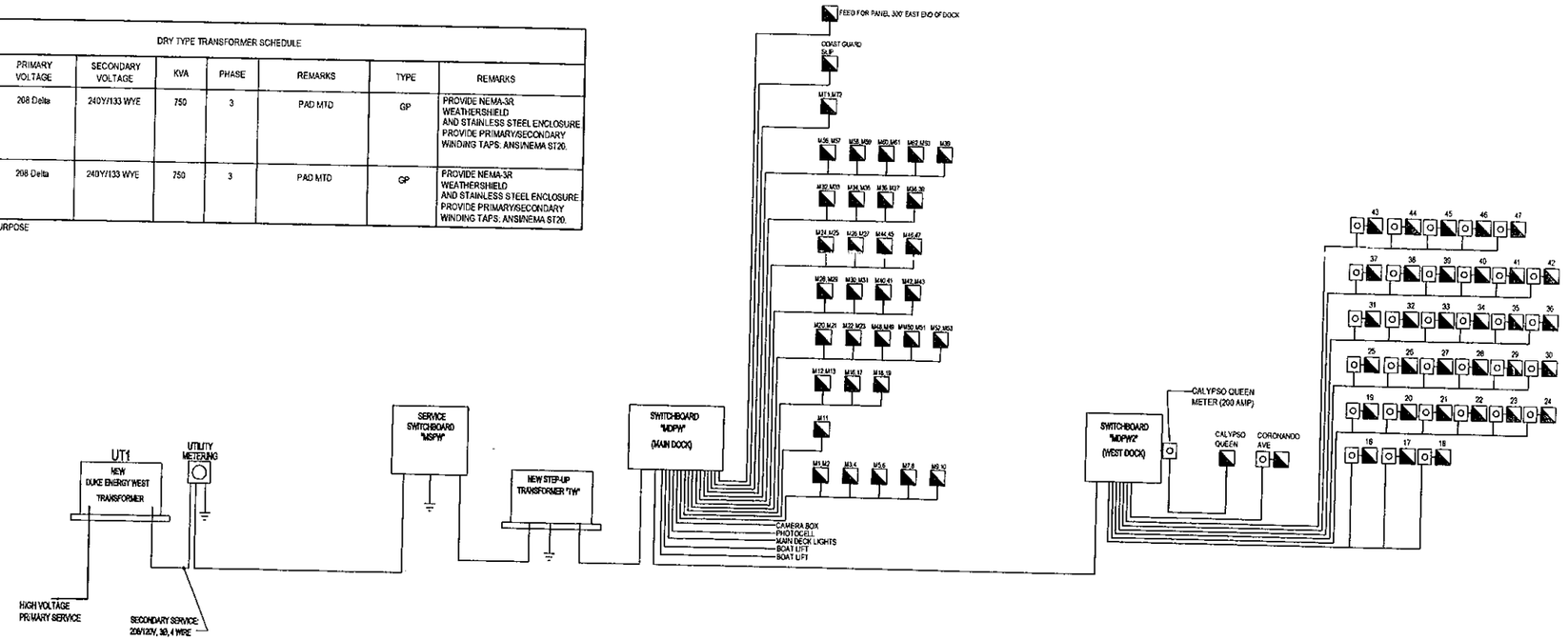
PROPOSED EAST DOCK

2 ELECTRICAL RISER

SCALE: NTS

DRY TYPE TRANSFORMER SCHEDULE							
DSGN	PRIMARY VOLTAGE	SECONDARY VOLTAGE	KVA	PHASE	REMARKS	TYPE	REMARKS
TE	208 Delta	240Y/133 WYE	750	3	PAD MTD	GP	PROVIDE NEMA-3R WEATHERSHIELD AND STAINLESS STEEL ENCLOSURE PROVIDE PRIMARY/SECONDARY WINDING TAPS: ANSI/NEMA ST20.
TW	208 Delta	240Y/133 WYE	750	3	PAD MTD	GP	PROVIDE NEMA-3R WEATHERSHIELD AND STAINLESS STEEL ENCLOSURE PROVIDE PRIMARY/SECONDARY WINDING TAPS: ANSI/NEMA ST20.

GP=GENERAL PURPOSE



PROPOSED WEST AND MAIN DOCK

1 ELECTRICAL RISER

SCALE: NTS

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Checked By: RAR
Job No: 17039
Date: 03-16-18

PROPOSED NEW ELECTRICAL RISERS

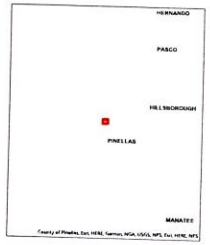
E3.3A

T:\01-Work\01_JOBS\17039\04-Auto\CAD\E3.3A.dwg Sep 17, 2018 - 3:45pm

Southwest Florida Water Management District

Produced By:
Mapping & GIS Section

Section/Township/Range (08-29-15)
1-foot Elevation Contour Lines
2017 Imagery



N
W E
S

0 200 400 800 Feet
1:2,400 Contour Interval = 1 foot

COORDINATE SYSTEM:
VERTICAL DATUM: NAVD88

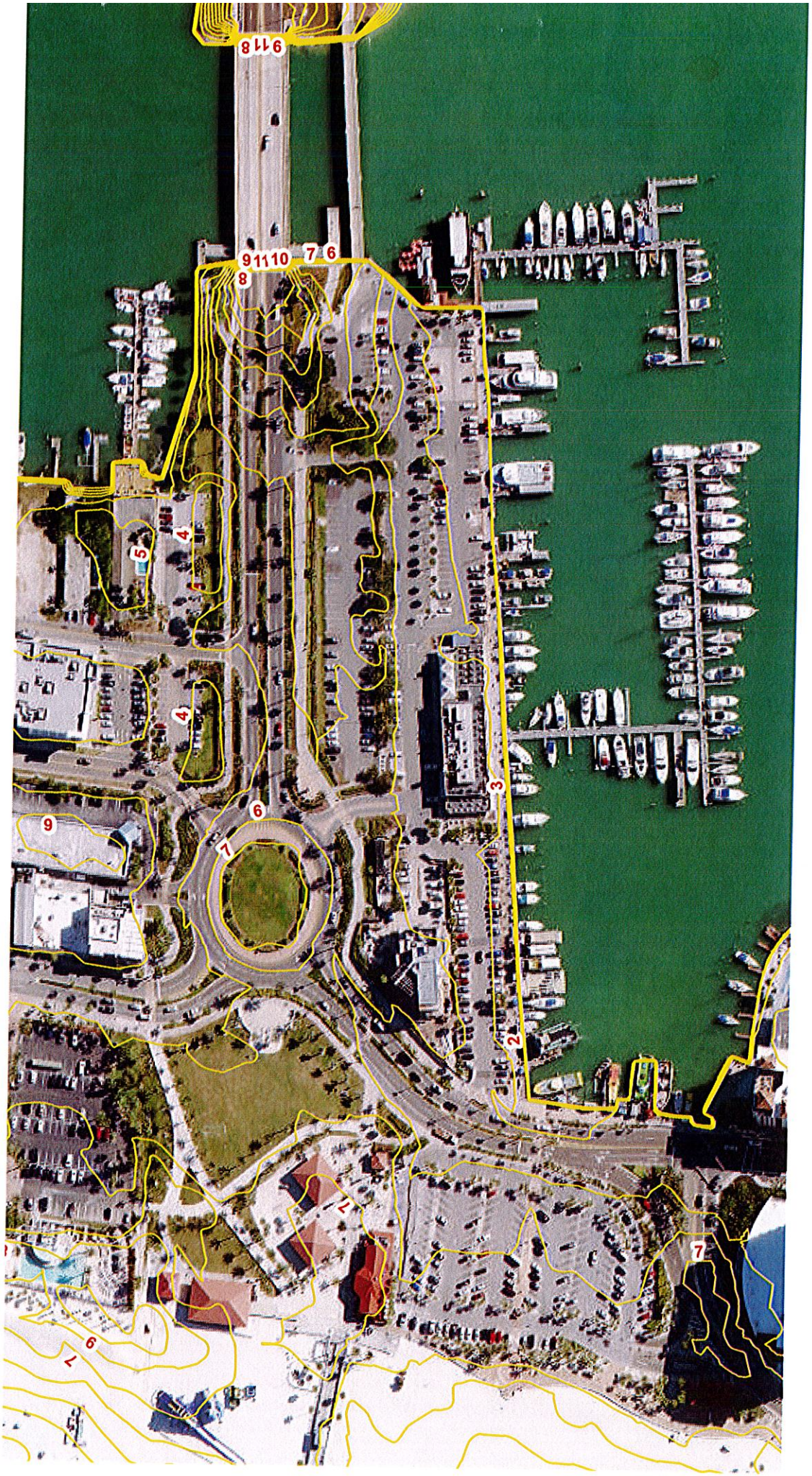
The mission of the Southwest Florida Water Management District (District) is to manage water and related natural resources to ensure their continued availability while maximizing the benefits to the public. Central to the mission is maintaining the balance between the water needs of current and future users while protecting and maintaining water and related natural resources which provide the District with its existing and future water supply.

SOUTHWEST FLORIDA
WATER MANAGEMENT DISTRICT

THIS MAP IS INTENDED FOR ILLUSTRATIVE PURPOSES ONLY. THIS IS NOT A SURVEY.

ACCURACY: IT IS INTENDED THAT THIS MAPPING COMPLY WITH U.S. NATIONAL MAP ACCURACY STANDARDS. HOWEVER, NEITHER DIRECT, OR ANY OTHER LEVEL OF ACCURACY IS NOT GUARANTEED BY THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT.

DIGITAL SOURCE DATA ARE AVAILABLE UPON REQUEST.

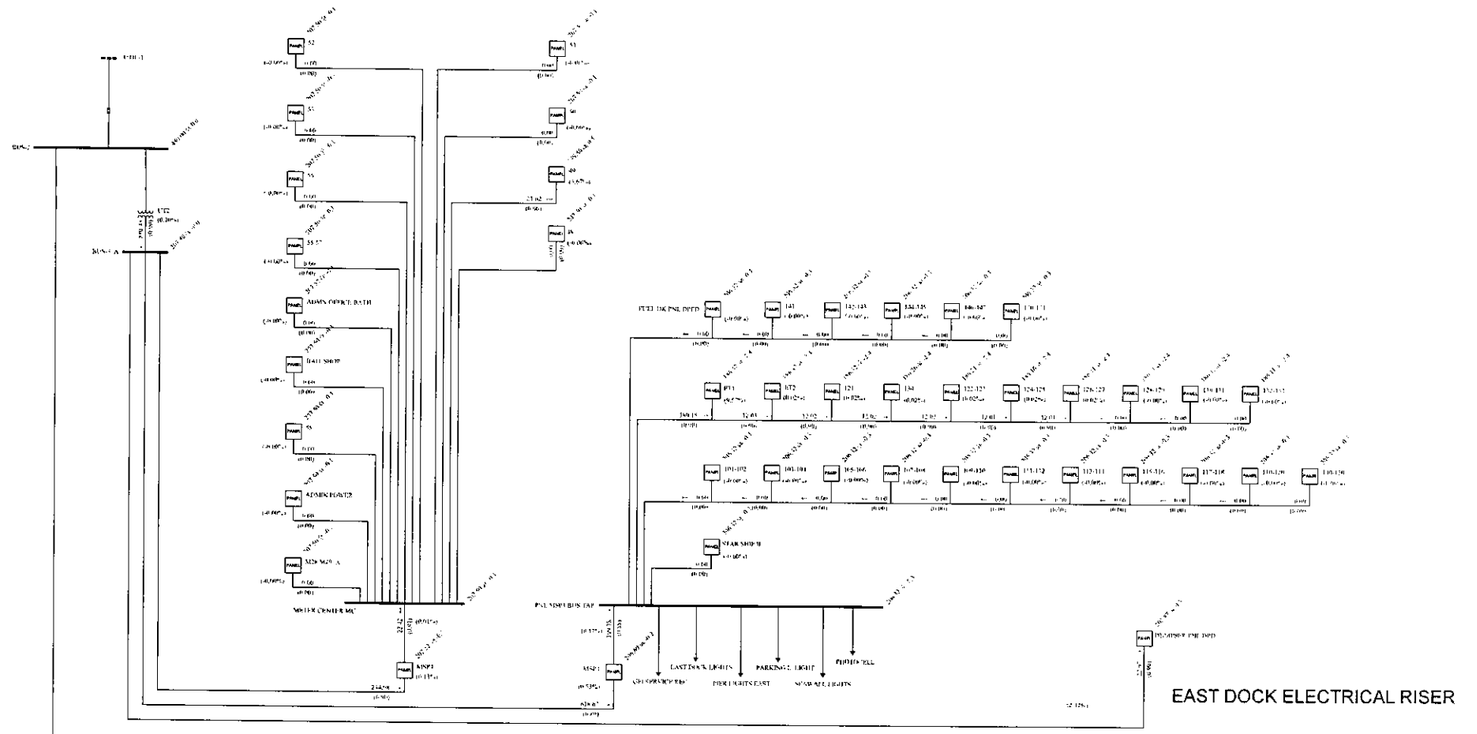

8 11 9 6
9 11 10 7 6
8
5
4
4
3
6
9
7
2
7
7
6
7

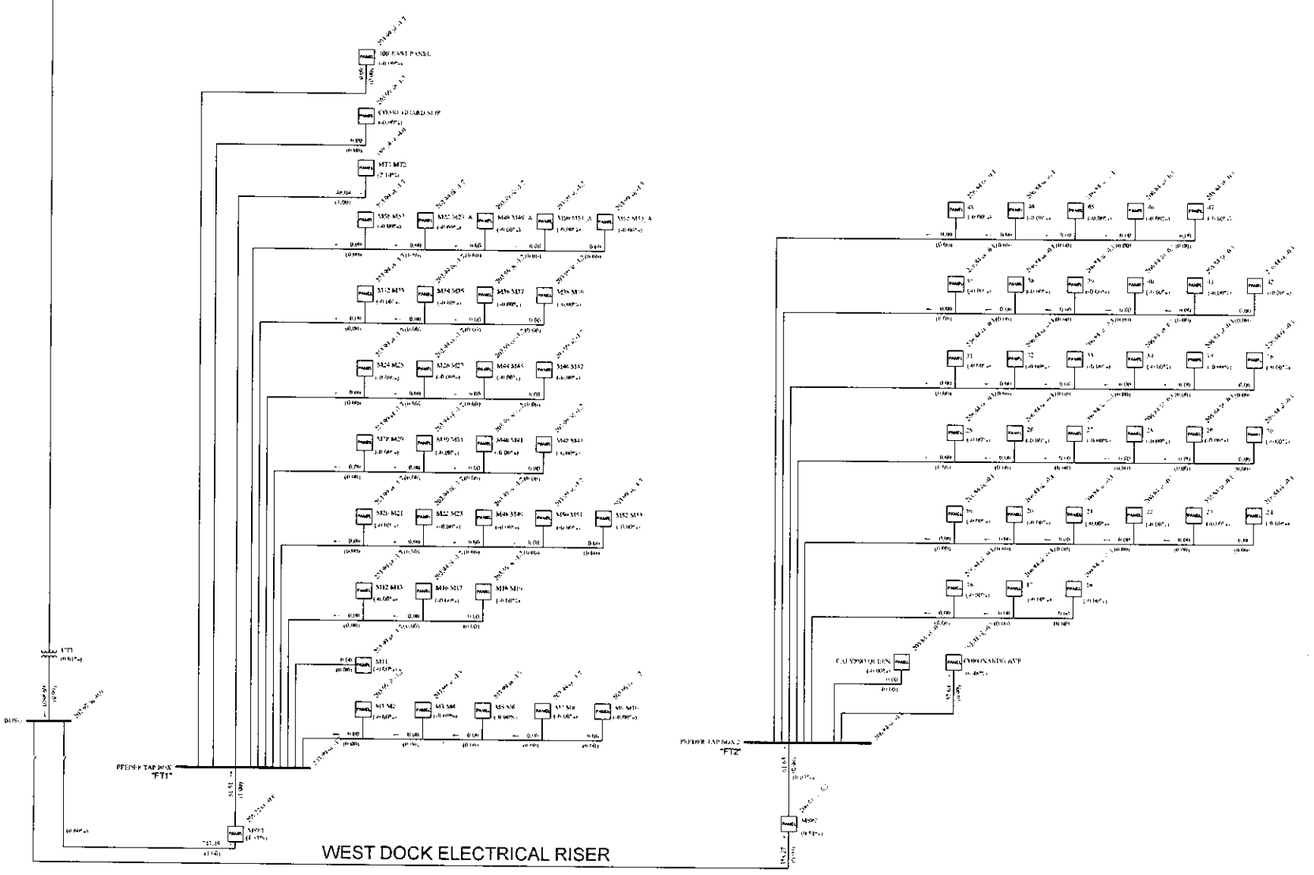
APPENDIX F –

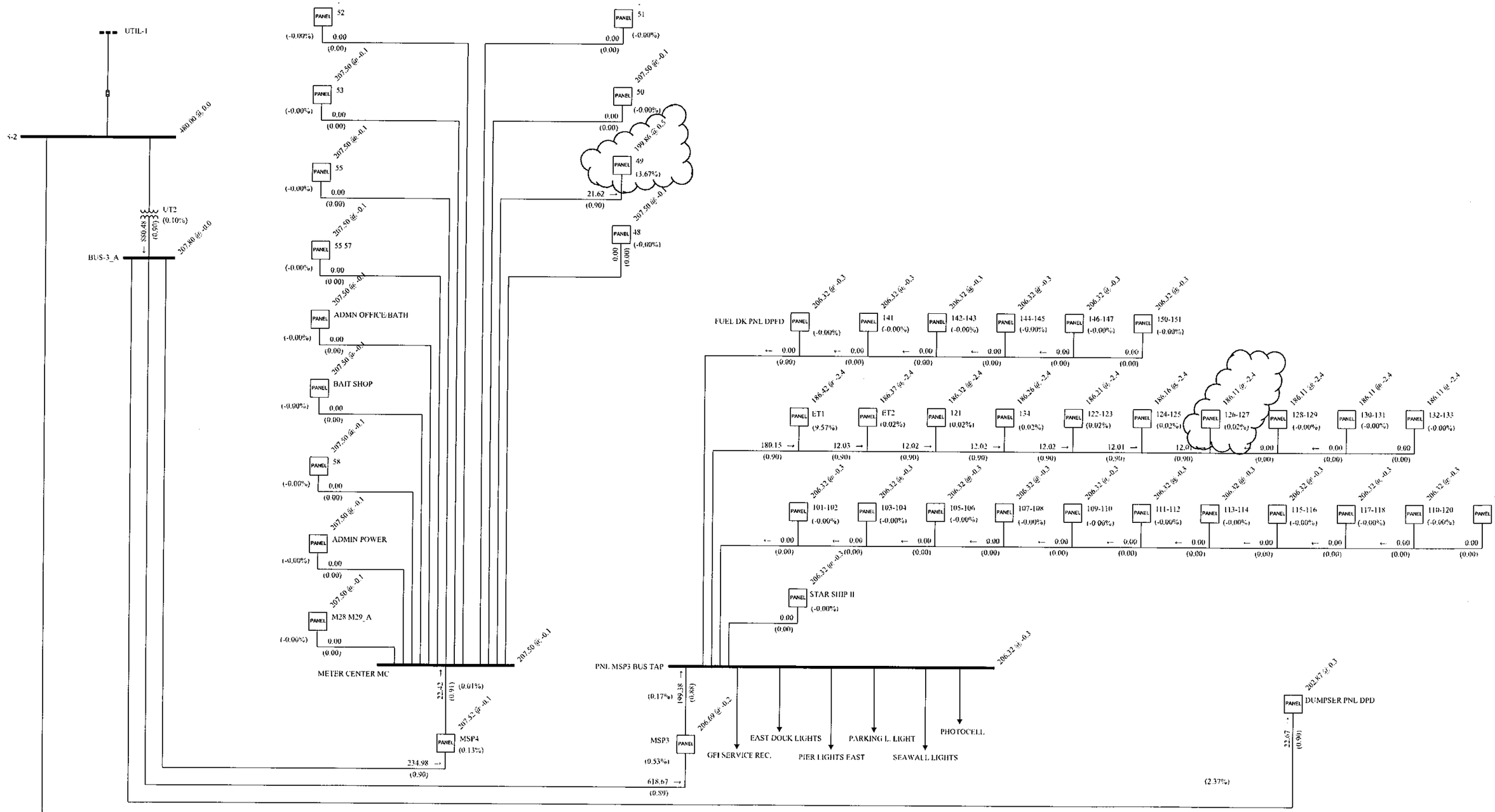
ELECTRICAL RISERS

&

VOLTAGE DROP CALCULATIONS


EAST DOCK ELECTRICAL RISER


WEST DOCK ELECTRICAL RISER



EAST DOCK ELECTRICAL RISER

WEST DOCK ELECTRICAL RISER

BUS-3
UT1
(0.01%)
1988.69
(0.99)
207.97 ∠-0.0
(0.60%)
747.49
(1.00)
FEEDER TAP BOX
"FT1"
51.81
(1.00)
206.22 ∠-0.6
MSP1
(1.31%)
48.04
(1.00)
189.14 ∠-1.0
MT1 M12
(7.14%)
PANEL
300' EAST PANEL
(-0.00%)
COAST GUARD SLIP
M56 M57
M22 M23_A
M48 M49_A
M50 M51_A
M52 M53_A
M32 M33
M34 M35
M36 M37
M38 M39
M24 M25
M26 M27
M44 M45
M46 M47
M28 M29
M30 M31
M40 M41
M42 M43
M20 M21
M22 M23
M48 M49
M50 M51
M52 M53
M12 M13
M16 M17
M18 M19
M11
M1 M2
M3 M4
M5 M6
M7 M8
M9 M10
203.99 ∠-1.7
0.00
(0.00)

FEEDER TAP BOX 2
"FT2"
61.63
(0.90)
(0.03%)
206.91 ∠-0.1
MSP2
(0.51%)
358.27
(0.90)
CALYPSO QUEEN
(-0.00%)
CORONANDO AVE
(6.46%)
57.64
(0.90)
193.41 ∠-0.5
206.84 ∠-0.1
43
44
45
46
47
37
38
39
40
41
42
31
32
33
34
35
36
25
26
27
28
29
30
19
20
21
22
23
24
16
17
18
0.00
(0.00)