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**Client: DEPARTMENT OF NATIONAL DEFENCE****Date: November 9, 2005****Project: INSPECTION AND REPAIRS OF D JETTY****Project No.: 05673****Subject: INSPECTION SUMMARY****Page 1 of 6**

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## **1 Introduction**

This project memorandum summarizes the findings of the inspection of the D Jetty carried out by Westmar Consultants Inc. (Westmar).

Inspections were conducted on September 20, 2005 and carried out by:

- Alden Evans, P.Eng.
- Mark Ramsden, P.Eng.
- Jennie Rittberg, E.I.T.
- Murray Marquardt

The purpose of the inspection was to assess the general condition of DND's D Jetty facility located on the west side of Esquimalt Harbour. Based on the inspection findings, a prioritized program of repairs will be developed.

### **1.1 Evaluation of Results**

The findings in this project memorandum reflect Westmar's assessment of the site condition at the specific time of the inspection. We have based our assessment of the condition of the structure on the following:

- Relevant published recommendations and standards relating to marine structures.
- Our engineering judgement and experience with the design, construction and maintenance requirements of similar structures.
- Our field data.
- Original construction drawings, specifications and previous engineering reports where available and applicable.

## 1.2 Scope of Investigation

The scope of the investigation work is summarized below:

- An above and underwater visual inspection of the entire structure to identify obvious mechanical damage and/or deterioration due to vessel impact, fungal decay and marine borer infestation.

## 2 Description

The general layout of the facility and associated services is consistent with the details presented on the reference drawing. Photographs of the structures are presented in *Appendix A*. The reference drawing is presented in *Appendix B*.

The structure consists of the following elements:

- Deck Planking: 76 mm by 254 mm laminated timber spanning a maximum of 1.8 m on the east face of the jetty and spanning a maximum of 3.8 m on the north face of the jetty.
- Pilecaps: 400 mm by 800 mm reinforced concrete beams spanning a maximum of 1.4 m on the east face of the jetty and a maximum of 3.25 m on the north face of the jetty.
- Piles: 400 mm hexagonal reinforced concrete piles.

The fender system is of timber construction and consists of two fender piles and a rub pole, hollow rectangular rubber fender units, a top rubbing strip and a continuous wale. Horizontal timber chocks located between each set of fender piles provide lateral restraint. Member geometry is summarized below:

- Rub Poles: Typically 355 mm diameter
- Fender Piles: Typically 355 mm diameter
- Fender Wale: 203 mm by 254 mm
- Top Rubbing Strip: 152 mm by 355 mm
- Timber Chocks: 152 mm by 355 mm
- Hollow Rubber Fenders: 254 mm by 254 mm

*Photograph Nos. 1 to 5* present general arrangement views of the facility.

### 3 Inspection Results

The D Jetty is generally in a serviceable condition and the overall condition was generally consistent with the 2004 inspection program, with some additional structural deterioration occurring in the past year. Specific observations made during the course of the structural inspection are listed in detail in the following tables.

The laminated decking is damaged in the north-east corner of the facility. Based upon the current usage of this facility, it is recommended to cordon off this area and continue to monitor the decking in this area (*Photograph No. 6*).

The abutment is undermined in several areas where the riprap slope protection has sloughed away from the underside of the abutment. This should continue to be monitored and rehabilitation considered within the next three years (*Photograph No. 5*).

Specific observations regarding the pilecaps are presented in *Table 1* below.

**TABLE 1:** Pilecap Damage

Bent No.	Pile	Description	Recommendation
35	B-C	Exposed stirrup.	Monitor.
38	E-F	Vertical crack full depth through pilecap. No corrosion staining.	Monitor.
4	D-E	Exposed stirrup.	Monitor.

*Photograph No. 8* presents a typical view of corrosion staining on the pilecaps.

The concrete piles are generally in a serviceable condition and the observed damage has not noticeably worsened since Westmar's first inspection of the facility in 1997. Specific inspection observations regarding the bearing piles are presented in *Table 2* below.

**TABLE 2:** Bearing Pile Damage

Bent No.	Pile	Description	Recommendation
17	C	Circumferential crack 450 mm below the top of the pile.	Monitor.
27	F	Vertical crack at the top of the pile 3 mm wide, 1 m long. Minor efflorescence in splash zone.	Monitor.

*Photograph No. 9* presents a typical view of spalling at the top of the piles.

*Photograph No. 10* presents a view of typical previous pile/pilecap interface spill repairs.

The fender system is in moderate condition with various components requiring replacement to restore it to a serviceable condition. Specific inspection observations regarding the fender system are presented in *Table 3* below.

**TABLE 3: Fender System Damage**

Bent	Pile	Description	Recommendation
A	Rub Pole	Fractured.	Replace.
B	Rub Pole	Fractured.	Replace.
1A	South Fender Pile	Missing top bolt.	Install new bolt.
1A	Rub Pole	Missing.	Replace.
3A	Rub Pole	Missing.	Replace.
5A	Rub Pole	Fractured.	Replace.
9A	Rub Pole	Fractured at waterline.	Replace.
13A	Rub Pole	50% cross-sectional loss (CSL) due to mechanical damage.	Replace.
13A	South Fender Pile	Not chained to pilecap.	Install restraint chain.
19A	North Fender Pile	Fractured.	Replace.
25A	Rub Pole	Missing.	Replace.
35A	Rub Pole	25% CSL due to mechanical damage.	Monitor.
41A	Rub Pole	25% CSL due to mechanical damage.	Monitor.
43A	North Fender Pile	Missing.	Replace.
45A	Rub Pole	75% CSL due to mechanical damage.	Replace.
47A	Rub Pole	55% CSL due to mechanical damage.	Replace.
53A	South Fender Pile	Open bolt hole (OBH) and fractured in the top 2 m.	Replace.

### 3.1 Horizontal Bracing

The remaining original horizontal bracing is no longer serviceable and replacement is now recommended. The recently replaced bracing is in a serviceable condition.

### 3.2 Debris Guards

At the disused ramp areas, several of the debris guards are missing (*Photograph No. 11*). Due to the modified use of this facility, this is not considered to be of significance at this time.

## 4 Summary and Recommendations

The D Jetty Facility is generally in a serviceable condition, although minor repairs/maintenance work is required in order to maintain the facility in a safe and operational condition. The items listed in *Table 4* below have been incorporated into the tender package for this years structural repair program.

**TABLE 4:** Recommended Repairs

Item No.	Description	Estimated Cost
1	Replace 10 rub poles.	\$10,000
2	Replace three fender piles.	4,500
3	Install three restraint chains.	1,500
4	Install new fender logs on east berth.	19,500
5	Replace horizontal bracing.	7,500
<b>Subtotal</b>		<b>\$43,000</b>
Contingency (25%)		11,000
<b>Total Estimated Cost</b>		<b>\$54,000</b>

In reviewing the above, it is important to note the following:

- The recommendations are based on replacing the existing structures in kind. No allowance has been made for larger vessels or an increase in berthing velocities.
- The estimate does not include contractor mobilization.
- The estimate is based on in-house experience with similar projects and on budget price quotations from local contractors and suppliers.
- The estimate is based on end 2005 cost levels and does not allow for escalation.

- The estimates do not include GST (if applicable).
- It is recommended that a contingency allowance of 25% of the total estimated cost should be included to cover undefined items. This contingency is not a reflection of the accuracy of the estimate, but covers items of work which will have to be performed, and elements of cost which will be incurred, but which are not explicitly detailed or described due to the level of engineering and estimating which has been completed to date.

*End of Project Memorandum*

*Prepared by:*

***[Original signed by Mark Ramsden]***

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Mark Ramsden, P.Eng.  
Project Engineer

*Approved by:*

***[Original signed by Alden Evans]***

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Alden J. Evans, P.Eng.  
Manager  
Port Infrastructure and Rehabilitation

MRR/tmw  
Encl. 2

PROJECT MEMORANDUM  
INSPECTION AND REPAIRS OF D JETTY  
Inspection Summary

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***APPENDIX A***

*Photographs*



**Photograph No. 1:**      Topside view of D Jetty.





**Photograph No. 2:**      Topside view of D Jetty.



**Photograph No. 3:** General arrangement of piles.



**Photograph No. 4:** Fendering on west berth face.





**Photograph No. 5:** Fender piles on north berth face.



**Photograph No. 6:** Laminated deck damage in north-east corner.



**Photograph No. 7:** Abutment undermining.





**Photograph No. 8:** Typical corrosion staining on pilecaps.



**Photograph No. 9:** Typical pile spall.



**Photograph No. 10:** Typical previous repairs to pile/pilecap interface.



**Photograph No. 11:** Disused ramp area with missing debris guards.

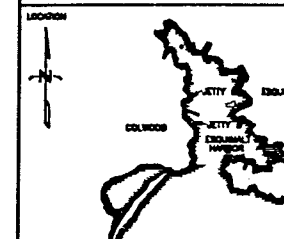
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***APPENDIX B***

*Reference Drawing*

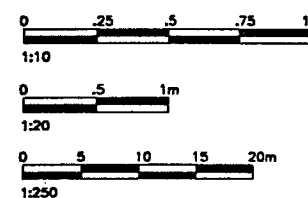


Headquarters  
Quartier général



# NOTES:

1. THE CONTRACTOR IS TO VERIFY THE SCOPE OF WORK AND ALL DIMENSIONS PRIOR TO COMMENCING WORK.
2. ALL WORK SHALL CONFORM TO THE BC BUILDING CODE 1990 AND WCB INDUSTRIAL HEALTH AND SAFETY REGULATIONS.
3. SUBMIT DETAILS OF PROPOSED WORK METHODS TO THE OWNER FOR APPROVAL PRIOR TO PROCEEDING WITH THE WORK. OBTAIN APPROVAL FROM THE OWNER PRIOR TO CUTTING, DEMOLISHING, OR REMOVAL OF ANY MATERIAL FROM THE SITE.
4. TIMBER FENDER PILES AND RUBBING POLES SHALL BE SIZE 356mm (14") COAST DOUGLAS FIR IN ACCORDANCE WITH CSA STANDARD 086. PILES SHALL BE GIVEN FULL CELL CREOSOTE OIL TREATMENT TO A NET RETENTION OF 225 KG PER CUBIC METRE (14pcf) IN ACCORDANCE WITH CSA 086.



PI	0001/01	ISSUED FOR CLIENT REVIEW	
Re	DATE	REVISION	APPROVED

**Westmar Consultants Inc.**  
Consulting Engineers - North Vancouver, B.C., Canada, Tel. (604) 965-6488

SCALE - ÉCHELLE AS NOTED

PROJECT - PROJET  
CFB ESQUIMALT DOCKYARD B.C.

'D' JETTY FENDER UPGRADE

TRACE - MÉTR STRUCTURAL DATE 96.10.28

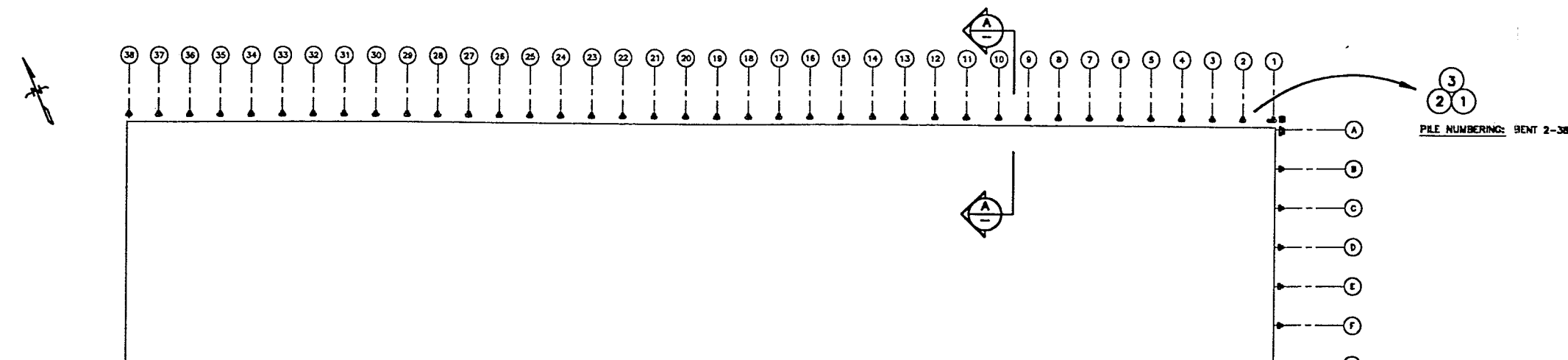
SUBJECT - SUJET

PILE PLAN AND REPAIR DETAILS

PRODUCTION	CONCURRENCE - ASSOCIATION
DESIGNED ÉTUDE	
DRAWN Dessin	
CHECKED Vérifié	
COORDINATION	APPROVED BY - APPROUVÉ PAR
	DATE

DRWG.-DESSIN NO.  
96272-00-001

Canada



FENDER PILE PLAN  
1:250

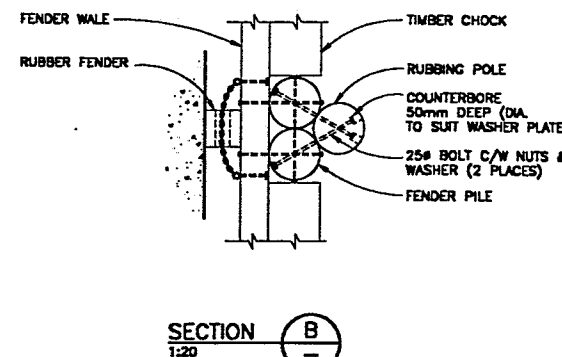
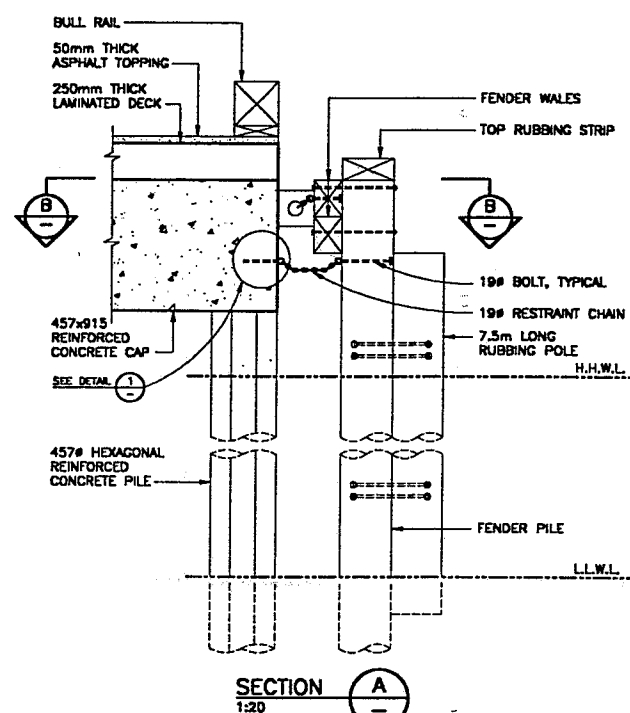


TABLE 1: FENDER PILES TO BE REPLACED (TOTAL NO. : 5)

BENT	PILE NO.	BENT	PILE NO.
1A	1	19A	1
	2	36	2

TABLE 2: RUBBING POLES TO BE REPLACED (TOTAL NO. : 6)

BENT	PILE NO.	BENT	PILE NO.
1A	3	D	3
9A	3	5	3
A	5	7	3

DETAIL 1  
1:10

REPLACEMENT EYEBOLT DETAIL  
- BENT 30

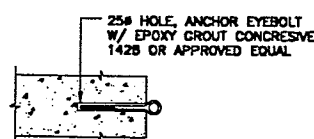
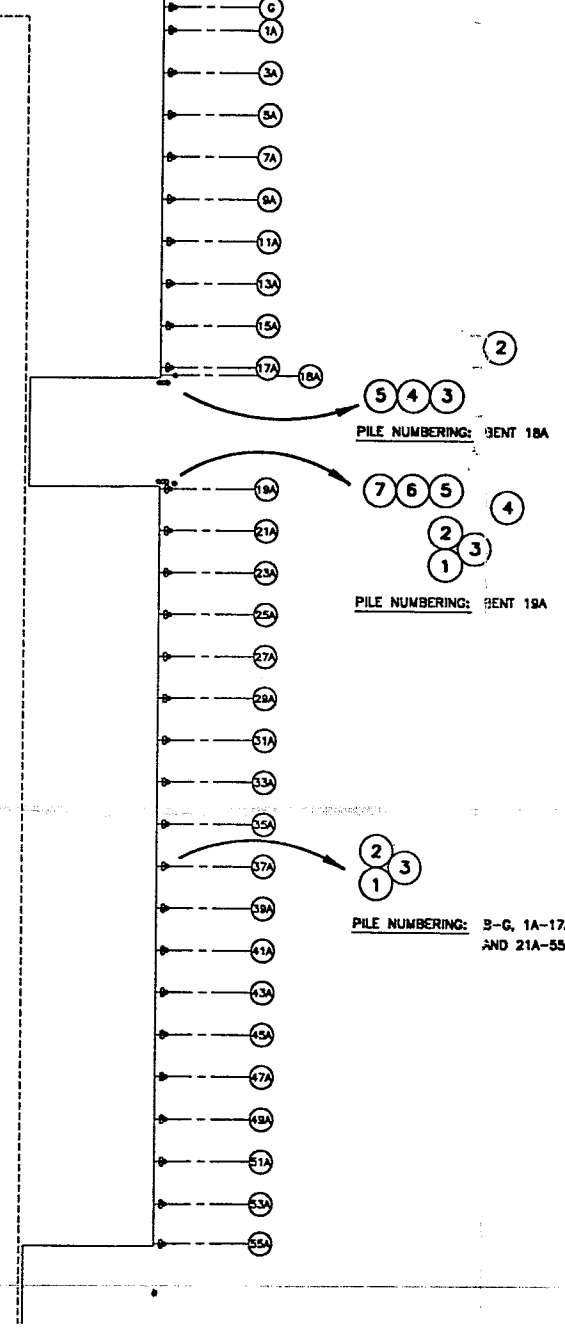


TABLE 3: MISCELLANEOUS REPAIRS

BENT	PILE NO.	RECOMMENDATION
5A	3	INSTALL LOWER CONNECTION BOLTS
18A	-	INSTALL ADDITIONAL EYEBOLTS AND RESTRAINT CHAINS
19A	3	REPLACE UPPER AND LOWER CONNECTION BOLTS
25A	3	INSTALL REPLACEMENT LOWER CONNECTION BOLTS AT DIFFERENT ELEVATION
39A-41A	-	REPLACE TOP RUBBING STRIP
39A	3	REMOVE EXISTING BOLTS; INSTALL REPLACEMENT BOLTS AT DIFFERENT ELEVATION
43A	3	INSTALL LOWER CONNECTION BOLTS
47A-55A	-	REPLACE FENDER LOG
* A	-	TIGHTENED UP RESTRAINT CHAIN
	-	REPLACE RESTRAINT CHAIN
B	2	INSTALL NEW CONNECTION BOLTS AT DIFFERENT ELEVATION
F	3	INSTALL NEW LOWER CONNECTION BOLTS AT DIFFERENT ELEVATION
2	3	INSTALL NEW LOWER CONNECTION BOLTS
8	3	INSTALL NEW LOWER CONNECTION BOLTS AT DIFFERENT ELEVATION
11-14	-	REPLACE TOP RUBBING STRIP
17	2	INSTALL TREATED DOWEL
	3	REPLACE LOWER CONNECTION BOLTS
30	-	REPLACE EYEBOLT
31	3	REPLACE LOWER CONNECTION BOLTS
32	3	INSTALL ADDITIONAL CROSS BOLT

\* INSTALL ADDITIONAL EYEBOLTS AND RESTRAINT CHAINS TO SECURE THE 4 PILE CLUSTER AT THE CORNER OF THE JETTY



PRELIMINARY  
DO NOT USE FOR CONSTRUCTION