Best Management Practices for Pile Driving and Related Operations

BC Marine and Pile Driving Contractors Association

March 2003

The B.C. Marine and Pile Driving Contractors Association and Fisheries and Oceans Canada have developed a Best Management Practices Policy for pile driving operations and related activities when working on the water within the province of British Columbia.

The Pile Driving Industry utilizes many different construction methods, equipment and materials in order to complete the contractual obligations for its client. Hammers; including drop, diesel, air, vibratory and hydraulic, vibroflot, and rotary, air and churn drills are the primary instruments in a pile driving operation. These hammers and drills are supported by a wide variety of heavy equipment, including a range of conventional cranes (truck mounted, crawler and pedestal mounted), spud scows, support barges and other water borne equipment. The piling types include treated timber (primarily creosote), concrete and steel (pipe, h-beam and sheet). Construction projects have the potential to utilize a number of different combinations of equipment and materials. It is the purpose of this document to examine the characteristics of each potential combination and develop a Best Management Practices Policy that will meet the following criteria:

-Maximize environmental protection
-Adhere to the Fisheries and Oceans regulations
-Provide construction services economically

1)- Basic Rules of Operation

When in an aquatic environment, contractors will employ the following BASIC Best Management Practices:

- All equipment will be maintained in good proper running order to prevent leaking or spilling of potentially hazardous or toxic products. This includes hydraulic fluid, diesel, gasoline and other petroleum products.
- Storage of fuels and petroleum products will comply with safe operating procedures, including containment facilities in case of a spill.
- Pile cut offs, waste or any miscellaneous unused materials will be recovered for either disposal in a designated facility or placed in storage. Under no circumstances will materials be deliberately thrown overboard.
- Contractors will have emergency spill equipment available whenever working near or on the water.
- Contractors where possible will position their water borne equipment in a manner that will minimize damage to identified fish habitat (e.g. eel grass). Where possible, alternative methods will be employed (e.g. use of anchors instead of spuds). In the event that circumstances will not allow an alternative, contractors will minimize the damage and where required restore habitat to its original state at the completion of the project.

- Prior to the commencement any work that is longer than 5 working days in duration and falls under this agreement, the contractor will complete and forward the attached "Notice of Project" to the Department of Fisheries.
- Whenever Contractors are working in areas where spawning is present, the work will be temporarily suspended and the appropriate fisheries officer contacted.
- There will be no restriction of work during closure periods (with the only exception when spawning is present) provided the contractors employ an exclusion device around the work area to restrict fish access or when required an effective method of mitigating shock waves (bubble curtain).
- Whenever shock wave monitoring (hydro phone) is performed at a marine construction site and the findings are available to the contractor, the data will be forwarded to the B.C. Marine and Pile Driving Contractors Association. It is intended to build a data base of information so that work procedures will reflect the safest and most economical approach to protecting the fish and their habitat.

2)-Timber Piling (creosote):

When driving timber piling, the following Best Management Practices will be employed to ensure minimum impact to marine fish and their habitat:

- Where possible, new timber piles will comply with the best Management Practices for the use of treated wood in aquatic environments as developed by the Canadian Institute of Treated Wood and the Western Wood Preservers Institute.
- Where the above is not possible creosote piling will stand for a minimum of 45 days prior to installation.
- These requirements are for new piling only and will not restrict the use of re-used timber piling. Reused piling will not be subject to any additional treatments.
- Timber piling is normally driven using a drop hammer, a diesel/air impact hammer or a small vibratory hammer. Because of the relative small diameter of the timber pile, and its excellent energy absorbing quality, there is little threat to fish and their habitat when driving timber piles.
- No environmental monitoring is required.
- When demolition is required on timber pile structures, the contractor will remove the piling by mechanical means and avoid breaking the piling at the mud line or below. All demolition operations should be monitored in order to control and contain the construction debris.

3)-Concrete Piles

When driving concrete piles regardless of which hammer is being used, the following Best Management Practices will be employed to minimize the impact on fish habitat:

<u>Up to 24 inch diameter concrete piling</u>

- The physical design of 24 inch concrete pile dictates that one, the energy required must be controlled in order to prevent the pile from breaking and second the concrete construction of the pile will absorb the energy. These two factors result in low level shock waves (less than 30 kPa.) being emitted and are of no danger to fish and their habitat.
- No environmental monitoring is required.

Over 24 inch diameter concrete piling

- When driving concrete piles with a diameter greater than 24 inches using an impact or hydraulic hammer, the following Best Management Practice will be employed to minimize the impact on fish habitat:
- Visual monitoring of the impact on fish by the shock waves emitted will be required. If fish kill is evident then the contractor will introduce effective means of reducing the level of the shock waves. Appropriate mitigating measures would be the deployment of a bubble curtain over the full length of the wetted pile. This should defuse the shock waves to an acceptable level.
- If after the preventive measure is introduced, and further visual monitoring reveals unacceptable conditions (excessive fish kill), then the work will stop immediately and the system reviewed and corrected.

4)-Steel Pipe Piles (less than 24 inch in diameter):

When driving steel piles of less than 24 inches in diameter regardless of the type of hammer being used, the following Best Management Practices will be employed to minimize the impact on the fish habitat:

- Because of the small diameter of the pile it is an accepted principle that the energy required to drive the pile to final point of installation would not result in shock wave in excess of 30 kPa. , and therefore would not require protective measures from the possibility of shock waves.
- If due to the ground conditions, the pile installation is causing excessive fish kill work will cease and contractors will be responsible for introducing effective means of reducing the level of shock waves or introduce measures that will protect fish from entering the potentially harmful shock wave area. Appropriate mitigating measures would be the deployment a bubble curtain over the full length of the wetted pile that would defuse the shock waves to an acceptable level.
- If after preventive measures are introduced, and visual monitoring reveals unacceptable conditions (excessive fish kill), then the work will stop immediately and the system reviewed and corrected.

5)-Steel Pipe Piles (over 24 inches in diameter)

When driving steel pipe piles with a diameter greater than 24 inches using impact or hydraulic hammers, the following Best Management Practices will be employed to minimize the impact on fish habitat:

- Visual monitoring of the effects of the shock waves on fish habitat will be required. If fish kill is evident then the contractor will introduce effective means of reducing the level of the shock wave. Appropriate mitigating measures would be the deployment of a bubble curtain over the full length of the wetted pile. If after preventive measures are introduced, and further visual monitoring reveals unacceptable conditions (excessive fish kill), then the work will stop immediately and the system reviewed and corrected.

6)-Steel Sheet Piles and H-piles

When driving steel sheet piles and H-piles with a drop hammer, an impact hammer or a vibratory hammer the following Best Management Practices will be employed to minimize the impact on fish habitat:

- It is anticipated that the driving of these types of piles will not generate shock waves in excess of 30kPa., therefore the need for mitigating measures is not required.
- If due to ground conditions, the pile installation is causing excessive fish kill, work will cease and the contractor will be responsible for introducing an effective means of reducing the level of shock wave or introduce measures that will protect fish from entering the harmful shock wave area. Appropriate mitigating measures would be the deployment of a bubble curtain over the full length of the wetted pile that would defuse the shock waves to an acceptable level.
- If after preventive measures are introduced, and visual monitoring reveals unacceptable conditions (excessive fish kill), then the work will stop immediately and the system reviewed and corrected.

7)-Stone Column Construction

When installing stone column using a vibroflot the following Best Management practices will be employed to minimize the impact on fish habitat:

- The vibrating action and air flush associated with the operation of the probe results in a high degree of turbidity. When this level exceeds the criteria as outlined in the British Columbia Approved Water Quality Guidelines, the contractor will introduce containment method that are designed to isolate the contaminated area and to prevent
  fish from entering the contaminated area. Silt curtains and netting are two methods that can provide the necessary protection.
- When supplying the aggregate to the probe, the contractor will ensure that spillage is controlled thereby providing additional protection to the fish habitat.
- An independent environmental agency will be used to monitor the levels of turbidity.

8)-Underwater Drilling and Blasting

When performing underwater drilling and blasting the following Best Management Practices will be employed to minimize the impact on fish habitat:

<u>Underwater Drilling</u>

- Drilling underwater is a process that has very little impact on the fish habitat. The procedure does not generate shock waves.
- Contractors will ensure that all attachments (hydraulic connections and couplings) are in good operating order and inspected prior to the start of every day.
- Depending on soil conditions and the potential for turbidity, drill cuttings will be deposited adjacent to the operation, contained on the sea bed or deposited into containment skiffs or scows when it is determined that the drill cuttings are unsuitable for return to the environment.

Underwater Blasting

Contractors required to perform blasting underwater will provide the following protection:

- Because of the potential for a blasted shock wave, a protection shield will surround the immediate blast area. This would be in the form of an air-induced bubble curtain, which has the primary purpose of absorbing the shock wave and a secondary purpose of keeping fish from entering the blast area.
- In order to protect against flying rock, mats (rubber) will be placed over the blasting area. The placement of the mats will also provide protection for any fish caught in the immediate area.
- Monitoring of fish movement and concentrations will be performed to determine if fish herding or scaring techniques (seal bombs) can be utilized to reduce the presence of fish in the blast area.

9)-Cleaning out Pipe Piles:

When cleaning out pipe piles (i.e. air lifting) the following Best Management Practice will be employed to minimize the impact on fish habitat:

- If the material that is to be removed inside the pipe is non-toxic, then it shall be redistributed in a manner that will minimize damage to the surrounding fish habitat. This can be achieved by the following systems:
- The excavated material is pumped through a discharge tube and allowed to settle in the immediate area.
- The excavated material is pumped through a discharge tube and contained within an enclosure (silt curtain) in order to control the sediment.
- The excavated material is pumped through a discharge tube and additional flex hosing and redirected back to the base of the pile.
- If the material to be removed from the pipe is determined to be toxic, then it will be processed through an approved containment system and the unwanted material removed and disposed of accordingly.

10) Containment of Concrete Residue and Water Run Off

When placing concrete in form work over or in water, the following Best Management Practice will be employed to minimize the impact on fish habitat:

Pouring concrete

- Spills: When pouring concrete all spills of fresh concrete must be prevented. If concrete is discharged from the transit mixer directly to the form work or placed by wheelbarrow, proper sealed chutes must be constructed to avoid spillage. If the concrete is being placed with a concrete pump, all hose and pipe connections must be sealed and locked properly to ensure the lines will not leak or uncouple. Crews will ensure that concrete forms are not filled to overflowing.
- Sealing forms: All concrete forms will be constructed in a manner which will prevent fresh concrete or cement laden water from leaking into the surrounding water.

Curing concrete

- When fresh water is used to cure concrete, the run off must be monitored for acceptable pH levels. If the pH levels are outside the allowable limits then the run off water must be contained and neutralized.

Grinding concrete

- When grinding cured concrete the dust and fines entering the water must not exceed the allowable limits for suspended solids. When grinding green or not completely cured concrete and the dust or fines are entering the water, pH monitoring will be conducted to ensure allowable ranges are maintained. In the event that the levels are outside the acceptable ranges preventative measures will be introduced. This could include introducing silt curtains to contain the solids and prevent fish from entering a contaminated area or constructing a catch basins to recover the run off and neutralizing it prior to disposal.

Patching concrete

- Spills: When patching concrete all spills must be contained and prevented from falling into the water.

Washing down hand tools, pumps and transit mixer

- All tools, pumps, pipes, hoses and trucks used for finishing, placing or transporting fresh concrete must be washed off in such a way as to prevent the wash off water from entering the marine environment. The wash water will be contained and disposed of upland in an environmentally acceptable manner.

Whenever there is the possibility of contaminates entering habitat waters, the contractor will monitor pH levels to ensure acceptable levels.

APPENDIX

Fisheries and Oceans Canada

Contact List

Name	Telephone No.	Fax. No.

NOTICE OF PROJECT

To: Fisheries and Oceans Canada

Attention:

Fax. No.:

From: “Contractor”

Telephone No.:

Fax. No.:

Representative:

Please be advised of the following marine/pile driving project:

Project Name:

Project Location:

Project Manager/Superintendent:

Project Telephone No.:

Project Fax. No.:

Project commencement date: