GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Transportation and Works
Highway Design Division

SECTION 903

CONSTRUCTION SPECIFICATION FOR PILING

INDEX

903.01 SCOPE

The scope of this specification is to cover the supply and driving of piles, sheet piles and associated work, in steel or timber. Piles to be "Supplied By The Contractor" or "Supplied By The Department".

903.02 MATERIALS

All materials shall be new and previously unused. The Contractor shall provide Mill Certificates and a Letter of Compliance for all piling and piling related materials used in the project.

903.02.01 Timber - Round Piles

Timber piles shall be clean peeled and shall comply to the standards of CSA Standard CAN3-056. Piles shall be pressure treated with creosote in conformance with CSA Standard 080 at a rate of retention of 130 to 260 kg/m^3, any cuts or breaks in the surface of treated piling shall be given three brush coats of hot creosote oil.

903.02.02 Steel Sheet Piles And H-Piles

Steel sheet piles and steel H-piles shall comply with the requirements of CSA G40.21-M 300W or ASTM A328. The straightness tolerance shall be 25mm in 20 metres.

Two copies of the mill certificates, indicating that the steel meets the requirements of the appropriate standards for Sheet and H piles shall be submitted to the Engineer prior to shipment to the job site.

Where mill test certificates originate from a mill outside of Canada or the United States of America the Contractor shall have the information on the mill certificates verified by testing by a Canadian laboratory. The laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply to comply with the requirements of ISO/IEC 17025 for the specific tests or type of tests required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian testing laboratory and appropriate wording stating that the material conforms to the specified material requirements. The stamp shall include the appropriate material specification number, the date (i.e., yyyy-mm-dd), and the signature of an authorized officer of the Canadian testing laboratory.

903.02.03 Steel Tube Piles

Steel tube piles shall be welded or seamless tube piles and shall comply with the requirements of ASTM Specification A252 Grade 2 or Grade 3. If welded, they shall be welded by the Electric Arc method in accordance with CSA Standard W59.

The straightness tolerance shall be 25mm in 20 metres.

Two copies of the mill certificates, indicating that the steel meets the requirements of the appropriate shall be submitted to the Engineer prior to shipment to the job site.

Where mill test certificates originate from a mill outside of Canada or the United States of America the Contractor shall have the information on the mill certificates verified by testing by a Canadian laboratory. The laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply to comply with the requirements of ISO/IEC 17025 for the specific tests or type of tests required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian testing laboratory and appropriate wording stating that the material

conforms to the specified material requirements. The stamp shall include the appropriate material specification number, the date (i.e., yyyy-mm-dd), and the signature of an authorized officer of the Canadian testing laboratory.

903.02.04 Pile Tips

As per contract specifications.

903.02.05 Concrete And Reinforcement For Steel Tube Piles

Concrete and reinforcement shall be in accordance with Section 904 and Section 905 respectively.

903.02.06 Storage And Handling

All piles shall be stored and handled in such a manner that damage is prevented and that design strengths will not be affected by deterioration or deformation.

903.03 PILE DRIVING

903.03.01 General Requirements And Restrictions

Piles shall not be driven until other excavation is completed to below cut-off level. Any material forced up between the piles shall be removed to the correct elevation. Any fill material shall be placed to the underside of the footing before driving piles.

Piles shall not be driven within 15m of concrete placed during the preceding seven days.
The Contractor shall not drive piles in such a manner that the piles are subjected to excessive or undue abuse. Forcing piles into their proper position by the use of excessive manipulation is prohibited.

The Contractor's driving operations shall not cause vibration sufficient to harm the construction or adjacent property.

903.03.02 Tolerances

Piles shall be driven as nearly as possible in the exact position specified on the drawings. After driving, piles at the cut-off elevation shall not be more than 75mm from the location shown on the drawings.

Deviation from the vertical or required batter shall not be more than 20mm per lineal metre of pile. Any pile so out of line or plumb as to impair its usefulness shall be pulled and redriven or an additional pile shall be driven as required by the Engineer. The piles shall not be jacked or pulled laterally to bring their tops into correct location.

903.03.03 Driving Equipment

All piles shall be driven with a hammer developing an energy per blow of not less than that shown in the contract document. The energy should be capable of remote regulation to prevent damage to the piles. The piles and hammer shall be held securely in the correct alignment by rigid leads extending down to the lowest point the hammer must reach.

The use of vibratory hammers to drive or partially drive either H-piles or pipe piles must be approved by the engineer.

903.03.04 Jetting

Jetting shall not be used unless written permission has been given by the Engineer. Appropriate special conditions will be given should jetting be authorized.

903.03.05 Helmets

Pile heads shall be protected by helmets having adequate cushioning material next to the pile head. The helmet shall distribute the blow of the hammer evenly throughout the pile cross-section.

Timber piles shall be prevented from splitting by collars.

903.03.06 Records

The Contractor shall not commence driving piles in the absence of the Engineer.

Blows per 300mm for each 300mm shall be recorded. For the final 300mm the blows per 25mm shall be recorded.

When driving is interrupted before final penetration is reached, the final record of penetration shall not be taken until, on resumption of driving, a further penetration of 300mm has been obtained.

903.03.07 Redriving

Piles pushed up by driving or loosened by jetting of adjacent piles shall be redriven to comply with the requirements of the contract. Similarly, if a pile(s) is suspected to have hung up on a boulder, the Contractor shall re-drive the pile(s) in question as well as others in the immediate vicinity.

After all piling is complete and all piles are driven to meet project criteria, the contractor shall return to each footing and re-drive at least ten (10) percent of the piles in each footing rounded to the next highest number of piles plus one. The piles selected for re-driving shall be randomly selected by the Engineer. If movement exists on one or more piles, additional piles shall be re-driven until the Engineer is satisfied that all piles have met the design criteria as established on the contract drawings or in the specifications.

The contractor is advised that piling shall not be cut-off until all re-driving is complete.

903.03.08 Driving Of Tube And H-Piles When Boulders Are Anticipated Or Driving To Bedrock

When boulders are anticipated, pile tips should be fitted. Driving shall be carried out until the pile tips make contact with rock. Driving energy shall be decreased to about a quarter and the pile shall be subjected to twenty blows. Energy can be increased with approval from the Engineer by about a quarter at twenty blows for each interval until the Engineer is satisfied that the requirements of the contract are complied with. Adjacent piles should then be redriven.

When steel tube and H-piles are to be driven to and chipped or socketed into bedrock, rock injector pile tips shall be fitted to the ends of the piles. The piles shall be chipped into the bedrock using low energy. When the piles are firmly seated, the energy shall be increased in stages or intervals and eventually driven to refusal at the rated energy as stipulated in the contract documents.

903.04 SPLICES

903.04.01 Timber Piles

No splices will be permitted for timber piles.

903.04.02 Steel Piles

No splices will be permitted for steel piles except where allowed for in the contract or as authorized by the Engineer unless the toe elevations for the pile should extend beyond those specified in the contract drawings.

Welding shall be according to CSA W59 and shall be done by a qualified welder employed by a firm certified according to CSA W47.1, Division 1 or Division 2.1.

If splices are within 5.0 meters of the pile cut off elevation specified then they shall be made with complete penetration welds as per the details on the contract plans and all welds shall receive 100% ultrasonic or radiographic inspection.

Pile splices specified as part of the design specifications which are below 5.0 meters from the pile cut off elevation shall be made with complete penetration welds as per the details on the contract plans. All piles shall receive visual Inspection with 20% of the piles rounded to the next highest number receiving

100% ultrasonic or radiographic inspection. Piles chosen for testing shall be determined by the resident engineer.

The Contractor shall employ an independent testing company with no corporate affiliation to carry out the visual inspection and non-destructive testing of welds. The independent testing company shall be certified by the Canadian Welding Bureau to the requirements of CSA W178.1 for bridge structures by radiographic or ultrasonic test methods. The welding inspector shall have documented evidence of training, professional knowledge, skill and experience in visual inspection of structural steel welds and material, and have a valid certificate showing qualification to a Level II or III according to CSA W178.2.

903.05 CONCRETE FILL IN TUBULAR STEEL PILES

After acceptance by the Engineer, the pile shells including rejected shells left in the ground shall be cut off at the required elevation and shall be filled with concrete.

Prior to filling each pile, the inside shall be inspected with an electric lamp attached to a drop cord of sufficient length to reach the bottom of the pile. Any debris and water shall be removed before placing the concrete.

Reinforcing steel shall be installed in the concrete fill at the top of all the piles as shown on the drawings.

No concrete shall be placed until all driving within a radius of 15m has been completed. If this cannot be done, driving within these limits shall be stopped until the concrete in the last pile has set for at least seven days.

Concrete shall be placed continuously until the shell is filled.

The concrete shall be worked thoroughly down into place and compacted with a vibrator to the lowest extent of the reinforcement.

After placing, the concrete shall be protected from frost for at least three days.

903.08 MEASUREMENT FOR PAYMENT

903.08.01 Sheet Piles Supplied

The measurement for sheet piles supplied will be in square metres to the nearest one decimal place. For payment purposes the measurement for sheet piles supplied will be based upon the actual quantity installed provided this quantity equals or exceeds the quantity estimated in the Structure Unit Price Table. If the actual quantity installed is less than the quantity estimated then payment will be made for supplying the quantity installed plus the total area of unused sheet piles but not exceeding the estimated quantity. Unused sheet piles will include only uncut sheet piles in lengths originally supplied to the Contractor and, if necessary, cut-off sections of sheet pile whose lengths are 3 m or longer. For payment purposes the length of cut off sections will be calculated based upon the difference between the estimated pile toe elevation as shown on the contract drawings and the actual pile toe elevation.

903.08.02 Piles Other Than Sheet Piles Supplied

The measurement for piles supplied other than sheet piles will be in linear metres to the nearest one decimal place. For payment purposes the measurement for piles supplied other than sheet piles will be based upon the actual quantity installed provided this quantity equals or exceeds the quantity estimated in the Structure Unit Price Table. If the actual quantity installed is less than the quantity estimated then payment will be made for supplying the quantity installed plus the total length of unused piles but not exceeding the estimated quantity. Unused piles will include only uncut piles in lengths originally supplied to the Contractor and, if necessary, cut-off sections of piles whose lengths are 3 m or longer. For payment purposes the length of cut off sections will be calculated based upon the difference between estimated pile toe elevation as shown on the contract drawings and the actual pile toe elevation.

903.08.03 Sheet Piles Installed

The measurement for sheet piles installed will be in square metres to the nearest one decimal place based upon the actual quantity of pile installed and left in place after cut off as approved by the engineer.

903.08.04 Piles Other Than Sheet Piles Installed

The measurement for piles other than sheet piles installed will be in linear metres to the nearest one decimal place based upon the actual quantity of pile installed and left in place after cut off as approved by the engineer.

903.08.05 Pile Tips And Splices

These will be measured according to the actual number used, authorized and accepted by the Engineer.

903.08.06 Rejection

Any piles or tips which are rejected for reasons of improper driving, positioning or damage shall not be included in the above measurements.

903.08.07 Vertical Piles

All piles shown on the plans vertically will be considered and paid for as vertical piles.

903.08.08 Battered Piles

All piles shown on the plans with a batter angle will be considered and paid for as battered piles.

903.09 BASIS OF PAYMENT

903.09.01 Sheet Piles Supplied

Payment at the contract price for sheet piles supplied shall be full compensation for all labour, materials, supplies and equipment required to complete the work associated with the supply of piling, loading and transportation to the jobsite, unloading, handling and storage of piling materials.

Unused sheet piles shall be loaded, transported and off-loaded by the Contractor to a designated area at the nearest maintenance depot as part of the demobilization item as per section 157 of the Specifications Book. When the Contractor transports the unused piles he shall present a receipt for the piles, signed by the Depot Foreman, to the Engineer.

The quantity of wastage (defined as the quantity supplied to the site less the pay quantity) shall be the Contractor's responsibility and payment will not be made for such. The Engineer shall determine the quantity of wastage.

903.09.02 Piles Other Than Sheet Piles Supplied

Payment at the contract price for piles other than sheet piles supplied shall be full compensation for all labour, materials, supplies and equipment required to complete the work associated with the supply of piling, loading and transportation to the jobsite, unloading, handling and storage of piling materials.

Unused piles shall be loaded, transported and off-loaded by the Contractor to a designated area at the nearest maintenance depot as part of the demobilization item as per section 157 of the Specifications Book. When the Contractor transports the unused piles he shall present a receipt for the piles, signed by the Depot Foreman, to the Engineer.

The quantity of wastage (defined as the quantity supplied to the site less the pay quantity) shall be the Contractor's responsibility and payment will not be made for such. The Engineer shall determine the quantity of wastage to the Engineer.

903.09.03 Piles Installed

Payment at the contract price per square meter for sheet piles installed and per linear meter for piles other than sheet piles installed shall be full compensation for positioning, driving, cleaning, painting, protecting and pile cut-off.

The re-driving of piles shall be considered incidental to the work and extra payment will not be made for the same. However, where the contractor succeeds in increasing the length of piling in the works he shall be compensated for supply and installation in accordance with the contract specifications.

Where pile capacity is established by dynamic analysis and relaxation occurs the Contractor shall have the pile capacity re-evaluated. Piles are defined to have relaxed when more than 125 mm average movement occurs in those piles subject to re-driving as defined in Section 903.03.07 above. Dynamic analysis re-evaluation shall be conducted by an agency approved by the Engineer. The cost of the dynamic analysis re-evaluation shall be paid for by the Department. All other costs including but not limited to the cost of delay shall be considered incidental to the tendered price for piles driven.

No payment will be made for falsework piling.

All costs involved in filling tube piles with concrete and reinforcing shall be included in the contract price for piles installed.

Payment for pile template(s) shall be considered incidental to the work and payment will not be made for such.

903.09.04 Pile Splices

Payment at the contract price shall be full compensation for all labour, equipment, materials and services necessary to install pile splices and provide the specified visual and non-destructive testing.

903.09.05 Pile Tips, Supply And Install

Payment at the contract price shall be full compensation for all labour, equipment and materials necessary to supply, deliver and install the pile tips.

903.09.06 Jetting

No additional payment shall be made for jetting, if authorized.