CONSTRUCTION SPECIFICATION FOR PILING

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903.01 SCOPE

This specification covers the requirements for the supply and installation of piles of wood, steel, concrete or a combination of these materials.

903.02 REFERENCES

This specification refers to the following standards, specifications or publications:

OPSS 100 The General Conditions
Ontario Provincial Standard Specifications, Construction:

OPSS 904  Concrete
OPSS 905  Steel Reinforcement
OPSS 907  Timber Structures
OPSS 909  Prestressed Concrete - Precast

Ontario Provincial Standard Specifications, Material:

OPSS 1350  Concrete (Materials and Production)
OPSS 1440  Steel Reinforcement for Concrete

Others:

CSA Standards:

CAN 3-G40.20-M81  General Requirements for Rolled or Welded Structural Quality Steel
CAN 3-G40.21-M81  Structural Quality Steels
CAN3-056-M79-080-1974  Round Wood Piles
W47.1-1973  Wood Preservation (Revised 1975/76)
W48.1-M1980  Certification of Companies for Fusion Welding of Steel Structures
W59-1977  Mild Steel Covered Arc-Welding Electrodes
W48.1-M1980  Welded Steel Construction (Metal Arc Welding)

ASTM Standards:

ASTM A252-77  Welded and Seamless Steel Pipe Piles
ASTM A328-75  Steel Sheet Piling

903.03  DEFINITIONS

For the purposes of this specification, the following definitions apply:

Bearing Pile:  Means a pile whose principal purpose is to support vertical, or near vertical, loads.

Bedrock Surface:  Means the actual surface of the bedrock, weathered or unweathered, as it exists immediately below the over-burden.

Caisson Pile:  Means a cast in place concrete pile with or without an enclosing liner, formed by placing concrete in a bored or excavated hole.

Displacement Caisson Pile:  Means a cast in place concrete pile formed by ramming fresh concrete through a liner into the ground to achieve a predetermined shape and load supporting capacity.

Driving Shoe (Pile Shoe):  Means a reinforcement attached to the bottom of the pile and designed to protect the pile during driving.

Follower:  Means an intermediate structural piece for transmitting the blow from the hammer to the pile, especially used when installing piles below water level.

Helmet (Cap Block):  Means a specially formed metal shape designed to receive the hammer blow and transmit it uniformly to the pile.
Helmet Cushion: Means material placed between the helmet and the hammer with the purpose of taking the blow and eliminating damage caused by direct impact. The material should be such that it attenuates the peak impact force and transmits the impact energy without excessive losses.

Jetting: Means the use of a jet of water at high pressure directed into the ground below the pile to assist its entry. Compressed air is sometimes used depending on soil conditions.

Pile: Means a relatively short structural element which is installed, wholly or partly in the ground by driving, drilling, augering, jetting or otherwise and derives its supporting capacity from the surrounding soil and from the soil or rock strata below its tip.

Pile Cushion: Means the material placed between the pile and the helmet to avoid damage to the head of pile as a result of direct impact from the helmet.

Rock Point: Means a specially designed steel tip, fitted to piles to enable them to be driven into hard, sound bedrock, e.g. Oslo Point.

Sheet Pile: Means a pile that is specially shaped to generally interlock with adjacent piles to form a reasonably tight wall with the principal purpose of resisting lateral pressures usually from soil or water.

903.05 MATERIALS

903.05.01 General

Materials shall be as specified in the contract.

903.05.02 Wood

903.05.02.01 Sheet Piles

Any species which will satisfactorily withstand driving may be used. Piling shall have square corners and shall be free from worm holes, loose knots, windshakes, decayed or unsound portions or other defects which might impair its strength or tightness. The piles shall be drift sharpened at their lower ends to wedge the adjacent piles tightly together.

When piles with tongues and grooves are called for, they shall be cut from solid material or made by building up piles with three planks securely fastened together.

903.05.02.02 Round Piles

Wood piles either treated or untreated, shall be clean peeled and shall comply with the requirements of CSA CAN3-056. Treated piles shall be pressure treated with creosote in conformance with CSA 080 for land and fresh water piles at the rate of retention called for in the contract.

903.05.03 Steel

903.05.03.01 Sheet Piles and H Piles

Steel sheet piles and steel H piles shall comply with the requirements of CSA CAN3G40.2 and CAN3-G40.21 or ASTM A328. H piles shall be 44 w grade.
903.05.03.02 Tube Piles

Steel tube piles shall be welded or seamless steel tubes and shall comply with the requirements of ASTM A252 Grade 2. If welded they shall be welded by the Electric Arc Method in accordance with the requirements of CSA W59.

903.05.03.03 Driving Shoes and Rock Points

Driving shoes and rock points shall comply with the requirements of the contract.

903.05.03.04 Liners

Steel liners shall comply with the requirements of ASTM A252 Grade 2.

903.05.03.05 Reinforcement

Steel reinforcement shall comply with the requirements of OPSS 1440.

903.05.03.06 Straightness Tolerance

All steel piles shall conform to a straightness tolerance of 25 mm maximum in length of 18 m.

903.05.04 Concrete

903.05.04.01 General

Concrete shall comply with the requirements of OPSS 1350.

903.05.04.02 Precast Concrete

Precast concrete shall not be twisted and shall not be cambered more than the allowable tolerances.

Each precast concrete pile shall be stamped or otherwise have the date of manufacture inscribed on it.

Precast concrete piles shall consist of concrete of 45 Mpa minimum strength. Steel reinforcing (ordinary or prestressed) shall be such that direct loading by the ram stroke will be prevented.

The manufacture of precast concrete piles shall comply with the requirements of OPSS 904, 905 and 909 except that the following tolerances shall apply:

<table>
<thead>
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<th>Tolerance</th>
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<tr>
<td>Length</td>
<td>± 9 mm per 3 m length</td>
</tr>
<tr>
<td>Straightness</td>
<td>3 mm max. in 3 m length 12 mm max. in total length</td>
</tr>
<tr>
<td>Head out</td>
<td>2 mm per 300 mm width of square</td>
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<tr>
<td>Width or Diameter</td>
<td>± 6 mm</td>
</tr>
<tr>
<td>Location of reinforcing steel, amount of cover</td>
<td>3 mm + 6 mm</td>
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<tr>
<td>Spacing of spiral</td>
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903.05.05 Protection During Storage and Handling

903.05.05.01 General

Piles shall be stored and handled in such a manner that damage is prevented and that the design strength will not be affected by deterioration or deformation.
903.05.05.02 Wood Piles

Special care shall be taken to avoid breaking the surface of treated piles. Canthooks, dog or pile pulls shall not be used. Cuts or breaks in the surface of treated piling shall be given three brush coats of hot creosote oil of approved quality. Bolt holes shall be treated with three applications of hot creosote oil applied with a bolt hole treater.

903.05.05.03 Concrete Piles

Concrete piles shall be handled only at the designated lifting points.

903.05.06 Mill Certificates for Sheet Piles, H Piles and Tube Piles

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

903.06 EQUIPMENT

903.06.01 Gravity Type Hammers

The fall of drop hammers shall be capable of regulation so that injury to the piles can be prevented.

Equipment for driving piles fitted with rock points shall also have controls to produce an height of fall between 150 mm and 2.5 m and shall be able to efficiently maintain the desired fall.

903.06.02 Steam and Diesel Hammers

Equipment for driving piles fitted with rock points shall be capable of delivering a controlled blow ranging in energy from 1/10 to full capacity.

Equipment for driving concrete piles shall have a heavy ram and a short stroke to be capable of reducing driving stresses.

903.06.03 Load Testing

The load testing apparatus for applying axial loads to piles shall be capable of maintaining constant load under increasing settlement and of applying loads such that lateral forces or impact will not occur.

The measurement of the load shall be by load cell(s) or equivalent devices(s) such that temperature effects are eliminated. The readout of the load cell or equivalent device shall be accurate to within 450 N.

Determination of absolute or relative pile movement shall be by dial indicators (gauges) which read to .025 mm. The accuracy of the measurement system is to be within .025 mm.

Calibration reports shall be furnished for all testing equipment for which calibrations required.

When loads are applied with hydraulic jack(s), the jacking system including the hydraulic ram(s), couplings, hydraulic pump, and pressure gauge shall be calibrated prior to the test so that the load applied is controllable to within 5 per cent of the total applied load.
903.07 CONSTRUCTION

903.07.01 Requirements and Restrictions

Piles shall not be driven until after excavation is completed to below cut-off level. Any material forced up between the piles shall be removed to the correct elevation and any holes or voids created shall be filled to the correct elevation with suitable material and compacted.

Material displaced, during driving, shall be removed, where it encroaches on the excavated area of the footing.

The tops of all piles shall be square to the longitudinal axis of the pile.

The use of air hammers will only be permitted for the driving of piling to specified tip elevation.

Fill material shall be placed to the underside of the footing before driving piles.

Piles shall not be driven within a radius of 7.5 m of concrete which has been in place for less than 72 hours.

Piles shall not be driven within a radius of 15 mm of concrete which has been in place for less than 72 hours without the approval of the Engineer. This provision shall not apply to the placing of concrete in displacement caisson piles.

The Contractor shall not drive piles in such a manner that he subjects them to excessive or undue abuse that would damage the pile material.

Forcing piles into their proper position by the use excessive manipulation is prohibited.

Precast concrete piles shall not be driven until they have reached their design strength but in no case shall they be driven within 2 weeks of fabrication.

The Contractor's driving operations shall not cause a degree of vibration harmful to construction operators.

903.07.01.01 Helmets

903.07.01.01.01 General

The heads of piles shall be protected by helmets having adequate and suitable cushioning material next to the pile head and fitting into a casting which in turn supports a helmet cushion. The helmet shall distribute the blow of the hammer evenly throughout the cross-section of the pile head. The helmet shall be such that the axis of the pile is held in line with the axis of the hammer.

903.07.01.01.02 Concrete Piles

The fit of the cap for concrete piles shall be loose enough to allow slight rotation without binding within the driving head in order to prevent torsional stress.

903.07.01.02 Collars

Collars, bands or other devices, as specified to protect wood piles against splitting and brooming shall be installed by the Contractor.
903.07.01.03  Splicing

903.07.01.03.01  General

Welding shall meet the requirements of CSA W59 and shall be done by a welder qualified under the provisions of CSA W47.1.

The electrode used shall be classification E6015 or E6016, in accordance with CSA W48.1.

903.07.01.03.02  Wood

Wood piles shall not be spliced.

903.07.02  Installation of Driven Piles

903.07.02.01  Leads

Pile driver leads shall be built to afford freedom of movement for the hammer, and they shall be held in position at the top and bottom by guys, stiff braces, or other approved means, to ensure support to the pile while it is being driven.

Swinging leads shall not be permitted. Batter piles shall be driven with inclined leads.

903.07.02.02  Followers

Followers shall not be used unless permitted in writing by the Engineer. When permitted they shall be of a type approved by the Engineer and of such size, shape, length and weight as to permit driving the pile in the desired location and to the required depth and resistance. The follower shall be provided with a socket or hood carefully fitted to the top of the pile to minimize loss of energy and to prevent damage to the pile, and shall have sufficient rigidity to prevent "whip" during driving. Where followers are to be used the applicable load test piles shall be driven with a similar follower.

903.07.02.03  Jetting

Jetting shall not be permitted unless permitted in writing by the Engineer. When jetting is permitted, it shall be carried out in such a manner that the carrying capacity of the piles already in place and the safety of existing adjacent structures will not be impaired. Jetting shall be stopped at least 1 m above the final expected pile-tip elevation and at least 1 m above the tip elevation of any pile previously driven within 2 m of the jet, except that where piles are to be end bearing on rock, jetting may be carried to the rock surface. Piles shall be carried down beyond the depth of jetting until the required resistance is obtained. If there is evidence that jetting has disturbed the load-bearing capacities of previously installed piles, those piles that have been disturbed shall be restored to conditions meeting the Contract requirements by redriving. Redriving, where necessary, shall be instituted after the jetting operations in the area have been completed.

The driving and jetting of concrete piles shall not be carried out simultaneously.
903.07.02.04 Redriving

Piles pushed by driving or loosened by jetting of adjacent piles or for any other reason shall be redriven to comply with the requirements of the contract. The Contractor shall check for any change in elevation before cut-off.

903.07.02.05 Steel H Piles with Rock Points

Driving with piles which are fitted with rock points shall be carried out until the rock point makes contact with rock, then stopped, and the elevation observed. Driving shall then continue commencing with a 150 mm height of drop of the ram in the case of a drop hammer, or with controlled blows of one tenth of the maximum energy in the case of a mechanical hammer. After the pile has been subjected to five series of twenty blows each series, and no further penetration is visible, the fall or energy shall be increased in steps of 300 mm for a drop hammer, or two-tenths of the maximum energy for a mechanical hammer. Driving shall continue with these stepped increases in height of fall or energy with the same series of blows as described above until no further practical penetration is observed.

The Engineer shall determine when the height of fall or the hammer energy can be increased and when the driving is complete for each pile.

903.07.02.06 Precast Concrete Piles

Suitable techniques shall be used to prevent the spalling or weakening of concrete below the cut-off elevation. For example, during easy driving conditions the stroke shall be reduced to minimize tensile stresses.

903.07.03 Installation of Caisson Piles

903.07.03.01 Construction of Holes

Holes shall be constructed in overburden and bedrock by drilling, augering or excavating methods and shall be of sufficient size to accommodate all temporary and permanent liners required for the work. Cave-in of walls shall be prevented by techniques such as bentonite slurry drilling or by installing enclosing liners where necessary. All loose earth and rock shall be removed from the bases of caisson piles at the founding level. The Engineer will determine in the field the final founding level.

903.07.03.02 Unwatering of Holes

Where the Contract calls for concrete caisson piles to be placed in the dry, holes shall be unwatered in such a manner as to prevent any disturbance to the foundation material or to the concrete when placed. Liners shall be provided and installed by the Contractor for this purpose if needed and shall be advanced to a sufficient depth below the founding level so as to completely seal the holes and prevent any water seepage into the holes after they have been pumped out.

903.07.03.03 Tremie Concrete

Where the contract calls for tremie concrete to be placed in caisson piles the Contractor shall maintain an adequate head of water within the holes to prevent the inflow of water through the bases or walls until the concrete has set.

903.07.03.04 Removal of Liners

Where the contract permits the removal of liners, they may be removed or left in place at the Contractors discretion. Liners so shall remain the property of the Contractor. When a liner is removed, the placing of concrete during removal shall be so arranged that the head of concrete will be at least equal to the hydrostatic pressure at the tip of the liner and prevent ingress of deleterious material.
903.07.04 Installation of Displacement Caisson Piles

903.07.04.01 Driving Tubes

Driving tubes shall be installed in the ground to the levels shown on the contract drawings and shall be fitted with suitable plugs at the bottoms to prevent any water entering the tubes during installation operation. Plugs so fitted may be of precast concrete or tightly rammed fresh concrete and just be capable of being rammed into the ground during formation of the concrete pile bases.

903.07.04.02 Bases

Bases shall be formed by successfully ramming concrete through the bottoms of the driving tubes by means of a drop hammer ensuring that at no time shall the level of concrete inside the tubes be less than 75 mm above the tube bottoms. The amount of concrete required to form bases will depend on the designed bearing capacity and the total energy needed to expel a specific volume of concrete. The exact requirements will be shown in the contract documents. During formation of the bases driving tubes shall be held in a fixed position.

903.07.04.03 Cased Shafts

Immediately after completion of the bases cased shafts shall be formed by initially placing the liners inside the drive tubes and embedding them firmly in the concrete bases and then placing concrete within the liners. Drive tubes shall be removed after the concrete is placed.

903.07.04.04 Uncased Shafts

Immediately after completion of the bases, uncased shafts shall be formed by placing and ramming concrete and simultaneously withdrawing the drive tubes ensuring that at all times, until the shaft is completed, the level of concrete in the tubes is not less than 75 mm above the bottom of the drive tube.

903.07.05 Cutting Off Piles

903.07.05.01 General

All driven piles shall be cut to the elevation and plane called for in the contract documents.

The length of pile shall be sufficient to permit the removal of all damaged material.

903.07.05.02 Wood Piles

Where wood piles are broomed, splintered or otherwise damaged below the cut-off elevation, the pile shall be considered defective and shall be remedied according to sub-section 903.08.04.

Wood piles shall be protected as specified in Section 907.01 of OPSS 907.

903.07.05.03 Steel Tube Piles

Steel tube piles shall be cut-off before concrete is placed in the piles.

903.07.06 Bracing for Steel Pile Bents

Structural Steel sway bracing shall be connected as shown on the plans, before the caps have been placed. Where piles are not driven in the position and to the exact alignment shown, the Engineer may require fills and shims between the bracing and the flanges of the piles. The fills and shims shall be securely connected to the adjacent members by an approved method. The proposed method and details for securing the fills
and shims shall be approved by the Engineer. All fills and shims so required to square and line up the faces of flanges for bracing shall be furnished and placed by the Contractor.

903.07.07 Painting Steel “H” and Steel Tube Piles

903.07.07.01 General

Exposed Steel “H” or steel tube piles shall be protected against corrosion from an elevation 600 mm below the low water level or finished ground surface to the top of the exposed steel.

903.07.07.02 Cleaning and Surface Preparation

The Contractor shall clean all metal surfaces by a dry blast cleaning process so that all visible rust, mill scale and other contaminants are removed.

903.07.07.03 Painting

Three coats of cold applied coal-tar paint shall be applied in accordance with the manufacturer's recommendations.

Coatings shall not be applied in damp or foggy weather or when there is a danger of rain falling on wet paint or when the temperature of the steel, coatings or surrounding air is below 5°C.

All surfaces to be painted shall be absolutely clean and dry. Each coat shall be completely dry before the application of any subsequent coat.

The paint shall be thoroughly mixed before and during application to keep all the pigments in suspension. Thinners shall only be used on the written permission of the Engineer.

All paints shall be uniformly and thoroughly applied.

Contamination from construction work after painting may require additional cleaning and painting.

903.07.08 Pile Load and Extraction Tests

The following procedure shall be applied in axial pile load and extraction tests for single piles where specified in the contract documents.

a. Four deflection gauges shall be attached to each pile, one at each quarter point of the pile circumference and shall measure deflections relative to independently supported reference beams. All reference beams or systems shall be independently supported with the supports firmly embedded in the ground at a clear distance of not less than 2.5 m from test piles or anchor piles.

b. A load deflection record shall be kept by the Contractor. Readings of time, load and movement shall be recorded before and after the application of each load increment or the removal of a load decrement, at sufficient intervals to accurately define the rate of deflection of the pile.

c. Test loads shall be applied in the increments, or removed in the decrements specified in the contract. Each load increment shall be maintained until the rate of pile settlement is less than 0.2 mm in one hour, or two hours have elapsed, whichever occurs first.

Test loads shall be applied in such a way that lateral forces or impact will not occur.
d. The total test load shall remain in place until the settlement does not exceed 0.2 mm in 48 hours.

Where the loading test is to be continued to ground failure, the ultimate load is considered to be that beyond which an increase in load produces a disproportionate increase in settlement.

e. The Contractor shall provide all necessary personnel, equipment and material to make adjustments during the tests and shall have at least one skilled workman present for the complete duration of each test.

f. The Contractor shall do all necessary grading work to ensure a level dry working area at the test location and shall erect an adequate enclosure sufficient to provide complete protection from adverse weather conditions for the complete duration of the tests. He shall also carry out all temporary work required to obtain access to the site for his personnel, equipment and materials.

g. On completion of the tests the Contractor shall clear and restore the site to the satisfaction of the Engineer. Piles that are not part of the finished work shall be cut off four feet below ground level or two feet below stream bed level. Any resulting void shall be backfilled with suitable fill material.

903.08 QUALITY ASSURANCE

903.08.01 Concrete Work

903.08.01.01 General

The placing of concrete and steel reinforcement shall comply with the requirements of OPSS 904 and 905 respectively.

903.08.01.02 Steel Tube Piles

Concrete shall not be placed until all driving within a radius of 7.5 m has been completed nor until all tubes in any one bent or footing have been driven. The concrete shall be placed continuously until the tube is filled.

903.08.02 Inspection of Caisson Pile Holes

The Contractor shall provide all facilities required for complete inspection of caisson holes by Authority personnel. Where the contract does not require unwatering or where the hole diameters are less than 750 mm, inspection may be carried out by remote methods using special purpose cameras.

903.08.03 Inspection of Steel Tubes

After the tube has been driven and cleaned, it shall be inspected and approved before any concrete is placed. The Contractor shall furnish lighting for this purpose.

903.08.04 Defective Piles

All piles damaged by improper driving, or driven out of their proper locations, or driven below the cut-off elevation and all steel piles excessively damaged at the top due to contact with the anvil, hammer or helmet shall be corrected by a method approved by the Engineer.
903.08.05  Tolerances

903.08.05.01  Piles (sheet and Bearing)

Piles shall be driven with a variation of not more than 20 mm/m from the vertical or from the barrier shown on the plans, except that piles for trestle bents shall be driven to the tolerance shown on the plans.

If a tolerance is not shown on the plans, the piles for the trestle bents shall be driven with a variation of not more than 75 mm from their proper location, measured at the underside of the pier cap. The measurement for accuracy acceptability for trestle bent piles shall be measured while the piles are free standing and not deflected to force them into position.

After driving, foundation piles shall not be out of position more than 150 mm.

903.08.05.02  Caisson Piles (Including Displacement Type)

The centre line of each caisson pile installed shall not deviate from that shown on the drawings by more than 2% of the distance between the point considered and the top of the caisson pile nor more than 75 mm at the top from the position shown on the drawings.

903.08.06  Bearing Capacity

When called for in the contract the bearing capacities of piles shall be estimated by means of the Hiley Formula according to Structural Standards SS3-10 and SS3-11 in the contract.

Other factors, however, such as the nature of the subsoil, the driving conditions, the spacing, sizes and lengths of piles and the design load per pile will be taken into account when estimating bearing capacities.

The Engineer shall determine the depth at which all piles attain the required safe bearing capacity.

The Contractor shall co-operate with the Engineer and provide the facilities for the Engineer to determine the bearing capacity.

Where the contract requires piles to be drive to bedrock the Engineer will determine the amount of penetration below the bedrock surface which is required to ensure a satisfactory foundation for each pile. For most types of bedrock a satisfactory foundation will be achieved at the bedrock surface; however, certain types of rock such as shale which may have been subjected to extensive weathering, may require a penetration in excess of one metre.

When water jets are used as a driving aid and bearing capacities are to be estimated by means of the Hiley Formula, the safe bearing capacity shall be based on the driving results after the jets have been withdrawn.

903.09  MEASUREMENT FOR PAYMENT

903.09.01  Sheet Piles

The measurement for sheet piles will be made in square metres based on the driving lines as shown on the drawings and the length of piling left in place after cut-off as approved by the Engineer.

903.09.02  Piles Other Than Sheet, Caisson and Displacement Caisson Piles

Measurement will be made in metres of the piling left in place after cut-off and required for the work, all as approved by the Engineer.
903.09.03 Driving Shoes and Rock Points

Measurement of driving shoes or rock points will be according to the actual number authorized by and accepted by the Engineer.

903.09.04 Caisson Piles

Measurement of caisson piles will be on the basis of the depth in metres along the caisson centre line between the approved bearing surface at the bottom of the caisson pile and the specified elevation at the top.

903.09.05 Displacement Caisson Piles

Measurement of displacement caisson piles will be on the basis of the depth in metres from the bottom of the driving tube and the specified elevation of the top of the pile.

903.10 BASIS OF PAYMENT

903.10.01 Supply Equipment for Installing Piles

Payment at the contract price(s) for the tender item(s) "Supply Equipment for Driving Piles", "Supply Equipment for Installing Caisson Piles" and "Supply Equipment for Installing Displacement Caisson Piles" shall be full compensation for all labour, equipment and materials required for the supply, delivery, unloadings at site, assembling and subsequent removal of the equipment from the highway right-of-way on completion of installation of the piles. All other costs relating directly or indirectly to the equipment required to advance the piles shall be included in the contract price bid for installation of the piles. Extra payment will not be made for any excavation, fill or back-fill required to accommodate the equipment.

It will be assumed, for payment purposes, that 50% of the work under this item has been completed when the satisfactory performance of the equipment has been demonstrated to the Engineer by the installation of one pile. The remaining 50% will be paid on the satisfactory completion of the installation.

903.10.02 Sheet Piles

Payment at the contract price for the tender item "Sheet Piles" shall be full compensation for all labour, equipment and materials to:

a. Supply the piles, where applicable;

b. drive and cut off the piles to the specified elevations;

c. remove and dispose surplus and extracted piling from the right-of-way;

and shall include all splicing or bracing where separate items for these are not included.

903.10.03 Bracing Sheet Piles

Payment at the contract price for the tender item "Bracing Sheet Piles" shall be full compensation for all labour, equipment and materials required to carry out the work as called for in the contract.

903.10.04 Piles Other Than Sheet, Caisson and Displacement Caisson Piles

Payment at the contract price for the tender item "(Applicable term) Piles" shall be full compensation for all labour, equipment and materials for:
a. supplying the piles, where applicable;
b. positioning, driving, splicing (including preparation), cleaning and painting piles;
c. pilehead protection;
d. furnishing and placing of any bracing;
e. cutting off tops of piles to the specified elevation, including preservative treatment of the cut-off surface of wood piles and any special treatment for concrete piles;
f. any work involved in the estimation of bearing capacities according to the requirements of 903.08.06;
g. all work required to remove any material forced up between the piles and all work for any correction involved in filling voids;
h. all welding other than that specified elsewhere;
i. all other work to advance the piles to the specified elevations;
j. the removal and disposal of surplus and extracted piling from the right-of-way.

When the supply of piles is by the Authority, payment shall include the costs of removal and disposal of surplus or extracted piling to a storage area specified by the Engineer but within 300 m of the structure.

Separate payment will not be made for falsework piling, the cost of which shall be considered as incidental to and included in the contract prices for the appropriate tendered items.

All costs involved in supplying and placing concrete in steel tube piles shall be include in the tender price for steel tube piles.

The supply and placing of all fillers and shims required for bracing steel pile bents shall be deemed to be included in the contract price for the applicable piles.

903.10.05 Driving Shoes and Rock Points

Payment at the contract price for the tender items "Driving Shoes" and "Rock Points" shall be full compensation for all labour, equipment and materials required to fabricate and install pile shoes or to fabricate and install special rock points, all in accordance with the contract.

903.10.06 Caisson Piles

Payment at the contract price for the tender item "Caisson Piles" shall be full compensation for all labour, equipment and materials required to excavate, backfill and construct the caisson piles according to the contract and including any unwatering of the piles.

903.10.07 Displacement Caisson Piles

Payment at the contract price for the tender item "Displacement Caisson Piles" shall be full compensation for all labour, equipment and materials required to install the piles as called for in the contract.

903.10.08 Redriving

Correction work carried out as in sub-section 903.07.02.04 shall be paid under "Extra Work" procedures set out in sub-section 103-3 of the General Conditions, other than work required due to the Contractor's negligence.
903.10.09  Defective Piles

Correction work carried out according to the conditions in sub-section 903.08.04 shall be deemed to be included in the Contractor's tender price for driving or installing.