Specification (Measurement)

Transport and Main Roads Specifications
MRS63 Cast-In-Place Piles

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1 Introduction

This Specification applies to the construction of cast-in-place, reinforced concrete piles contained in open-ended liners left permanently in place extending to competent rock or hard stratum (referred to as lined piles) for bridges.

This Specification shall be read in conjunction with MRS01 *Introduction to Specifications*, and other Specifications as appropriate.

This Specification forms part of the Transport and Main Roads Specifications Manual.

2 Measurement of work

2.1 Standard Work Items

In accordance with the provisions of Clause 2.1.3 of MRS01 *Introduction to Specifications*, the Standard Work Items incorporated in this Specification are listed in Table 2.1.

Table 2.1 – Standard Work Items

Standard Item No.	Description	Unit of Measurement
Cast-In-Place Piles		
70401	Steel pipe liners, supply on Site [*diameter*]	m
70402	Supply and fixing of stiffening bands	each
70403	Handling and pitching of steel liners	each
70404	Driving steel liners	m
70405P	Extension of steel liners (Provisional Quantity, as directed)	each
70409	Excavation of liners	m^3
70410	Excavation below toes of liners	m^3
70411	Excavation to form bell enlargements below liners	m^3
70412	Certification of pile capacity	each
70413	Concrete Class [*Class & compressive strength*] MPa/20 in abutment lined pile	m^3
70414	Concrete Class [*Class & compressive strength*] MPa/20 in pier lined pile	m^3
70415	Steel reinforcing bar in piles	tonne

2.2 Work Operations

Item 70401 Steel pipe liners, supply on Site, [*diameter*]

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply of liners, including any additional length to suit construction methods

c) transport of liners to Site

d) preparation of Site storage area

e) storage of liners at Site, and

f) additional length, if any, required to suit the Contractor's proposed construction method.

Item 70402 Supply and fixing of stiffening bands

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply of stiffening bands, and

c) fixing stiffening bands to liner, as per the Drawings.

Item 70403 Handling and pitching of steel liners

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) transferring liner from on Site storage to its aligned position in the driving rig

c) provision and use of driving rig

d) any preboring shown on the Drawings or approved by the Administrator, including filling the gap between liner and excavated hole with flowable fill or approved alternative, and

e) retention of liner on line for driving.

Item 70404 Driving steel liners

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) driving the liner

c) field splices made during driving

d) trimming the liner to level on completion

e) setting up to re-drive liners, where liners are driven in increments with progressive excavation

f) re-driving of liners to achieve a seal

g) repair of any damage to liner necessary to complete construction, and

h) driving of extended steel liner.

Item 70405P Extension of steel liners (Provisional Quantity, as directed)

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) preparation for welding, and

c) full penetration butt welding of liners.

Item 70409 Excavation of liners

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) excavation of material

c) disposal of excavated material

d) de-watering

e) sealing the toe of liners against entry of water or material

f) interruptions where liners are driven in increments with progressive excavation, and

g) the provision on site and use of any special equipment to safely inspect and clean pile holes.

Item 70410 Excavation below toes of liners

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) excavation of material

c) disposal of excavated material

d) de-watering, and

e) provision of safe access for inspection, including safety shield, if required.

Item 70411 Excavation to form bell enlargements below liners

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) excavation of material

c) disposal of excavated material

d) de-watering, and

e) provision of safety shield, if required.

Item 70412 Certification of pile capacity

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) assessment of information including information available to tenderers

c) undertaking additional investigations and reporting of investigations

d) provision of safe access for inspection, including safety shield, if required

e) inspection and logging of the foundation by the Contractor's Geotechnical Assessor

f) geotechnical certification of foundation capacity, and

g) provision of ‘as-constructed’ records.

Item 70413 Concrete Class [*Class & compressive strength*] MPa/20 in abutment lined pile

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply of concrete

c) transport of concrete

d) placing and compacting concrete including the provision of a tremie and all necessary equipment for placing concrete underwater, if the hole is not dry

e) finishing and curing concrete, and

f) removal of any nonconforming concrete at the top of the pile and replacement if necessary.

Item 70414 Concrete Class [*Class & compressive strength*] MPa/20 in pier lined pile

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply of concrete

c) transport of concrete

d) placing and compacting concrete including the provision of a tremie and all necessary equipment for placing concrete underwater, if the hole is not dry

e) finishing and curing concrete, and

f) removal of any nonconforming concrete at the top of the pile and replacement if necessary.

Item 70415 Steel reinforcing bar in piles

Work Operations incorporated in the above items include:

a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*

b) supply of all materials, including any additional steel required to form a pile cage that can be safely lifted and placed into the pile shaft

c) fixing reinforcing steel in place, and

d) the provision of stainless steel nibs or approved spacers to maintain minimum specified concrete cover.

2.3 Calculation of quantities

2.3.1 Natural ground surface level

The natural ground surface level shall be taken as the level determined from the contours shown on the Drawings unless agreed otherwise, in writing, by the Contractor and Administrator, prior to commencing excavation.

2.3.2 Supply of liners

Supply of liners of the nominated thickness shall be the length of liner shown on the Standard Drawings which includes an allowance for possible variations in foundation levels. Prior to ordering the liners, the Contractor shall check that the supply length is adequate for the proposed construction methods such as extending the liners above high tide level in tidal waters.

2.3.3 Sinking or driving of liners

Sinking or driving of liners shall be the length of liner, in place, measured along the pile axis from the toe of the liner to the approved top cut-off level, or to the natural ground surface level, whichever is the lower.

2.3.4 Excavation

2.3.4.1 General

The volume stated in the Schedule of Rates against any Work Item for excavation is the aggregate excavation from all areas and for all materials.

Over excavation shall not be included in the Measurement of Work under any Work Item. Over-excavation includes both increased diameter and non-approved deepening of the excavation, or deepening to suit the Contractors work methods.

2.3.4.2 Excavation of liners

Excavation of liners shall be measured as the volume calculated from the approved toe (that is, terminal level) of the liner to the natural ground surface level, or to the underside of the pile cap or headstock if that is lower, using the nominal internal diameter of liner shown on the Drawings.

2.3.4.3 Excavation below toe of liner (excluding bell enlargement)

Excavation below the toe (that is, terminal level) of the liner shall be measured as the volume of the cylinder of material whose diameter is equal to the inside diameter of the liner and whose length is measured from the base of the excavation up to the terminal level of the liner. Any additional excavation to extend the socket length, where design skin friction is downgraded due to failure to obtain a water tight seal and allow proper inspection and assessment, shall not be included in quantities for payment.

2.3.4.4 Excavation to form bell enlargement

The additional excavation required to form a bell or other enlargement outside the plan profile of the main cylindrical shaft shall be measured as the volume of material excavated outside that measured under Clause 2.3.4.3 of this Specification, as is necessary to form bells or other enlargements to the dimensions determined in accordance with MRTS63.

2.3.5 Concrete

For lined piles, the quantity of concrete shall be calculated as the sum of:

a) the volume calculated from the approved terminal level of the liner to the underside of the pile cap, headstock or other specified level shown on the Drawings using the nominal internal diameter of liner shown on the Drawings, and

b) the quantities determined in accordance with Clauses 2.3.4.3 and 2.3.4.4 of this Specification.

Deductions will not be made for the volume occupied by reinforcing steel.

No measurement will be made for concrete required to fill over-break in excavation.

2.3.6 Steel reinforcing bars

The quantity of steel reinforcing bars shall be calculated in accordance with Clause 2.3 of MRS71 *Reinforcing Steel*. The quantity shall be increased where appropriate to include additional steel reinforcing bars required by extensions to the length of piles.

2.4 Assessment of foundation information

In the schedule, where any item for foundation work is inclusive of work from a number of discrete areas (piles), the aggregate quantity shown for that item encompasses a range of constituent materials having similar physical properties and similar overall relative proportions of the different components as could be expected from information provided in the tender documents. The actual disposition and volumes of the various constituent materials within any individual pile may vary somewhat from those indicated by adjacent boreholes, but no additional compensation shall be paid where the aggregate quantities of the various components for all locations scheduled under the item are compatible with those indicated in the tender documents.

That is, where a work item encompasses a number of piles, the quantity and composition of the total excavation is what counts with regard to costs, not each individual pile.

2.5 Socket extension costs

Any socket extensions necessitated by Clauses 11.10.1 and 11.10.2 in Technical Specification MRTS63, including all consequential costs and delays, shall be at no cost to the Principal.