DIVISION 6

SPECIFICATIONS FOR PROTECTION

INDEX

SECTION 601

SUPPLY AND INSTALLATION OF GABIONS

INDEX

601.01 SCOPE

This specification covers the requirements for the supply and installation of various sizes of gabions.

601.02 MATERIALS

Gabion baskets shall be of various sizes and consist of galvanized or vinyl coated wire mesh as specified in the unit price table.

Tie-wire to secure the baskets shall be vinyl coated.

Stones used in the construction of gabions shall be clean, hard and durable, and shall be either boulder, broken rock, quarry stone, broken concrete or gravel screenings. The least dimension of any stone shall not be less than one and one-half the mesh size. The greatest dimension shall not exceed 300 millimetres.

Stones shall be of such dimensions that no less than two layers of overlapping stone are required to fill the gabion. The Contractor shall supply the stones to fill the gabion.

The Contractor shall supply gabion baskets, tie wire, and wooden or metal pegs to anchor the gabion baskets, should anchoring be necessary during construction.

The typical drawing showing various types and sizes of gabions is shown in Form 1210.

601.03 INSTALLATION

The Contractor shall load the gabion baskets and tie-wire at the point of supply and transport them to the installation site.

Gabions shall be installed to neat lines, to the lines and grades as staked by the Owner's Representative.

Should excavation be required to install the gabions at the required grade then excavation shall be carried out in accordance with Section 403. The foundation shall be excavated to an even finish and to the required grade.

The Contractor shall assemble gabions according to the manufacturer's recommendations.

The Contractor shall unfold each gabion to the open position. The four corner edges shall be wired to secure the gabion shape. The edges of the diaphragms shall be wired to the gabion walls in the correct position.

Each assembled gabion shall be securely wired to the adjacent gabions along the top and the vertical edges prior to placing of stone.

All wiring of gabions shall be carried out using the tie-wire provided, and using the following method of connection by looping. The tie-wire shall be looped around the edges to be joined. Loops shall be separated by a distance not greater than 100 millimetres. Single loops shall alternate with double loops. A single loop is one which wraps around the edges being joined once. A double loop is one which wraps around the edges being joined twice.

To achieve better alignment and finish, the Contractor shall stretch gabions before filling.

Stone on exposed areas for a minimum depth of 200 millimetres shall be carefully hand-picked and hand-placed to minimize voids and also to present an attractive and pleasing appearance as determined by the Owner's Representative.

Gabions shall be filled, keeping voids to a minimum, to a depth of 300 millimetres in each cell after which connecting wires shall be placed one in each direction, with these wires looped around two meshes at each end.

For gabions of height greater than 600 millimetres, then the operation shall be repeated and a further 200 millimetres of rock shall be placed, and then two more connecting wires shall be installed in each cell.

When filling of each gabion has been completed, the top shall be folded shut and wired to the ends, sides and diaphragms.

When placing gabions on top of each other, fill placing and compaction operations as specified in Section 204 shall be carried out behind each row of completed gabions before a successive row may be placed.

Empty gabions placed on top of a completed row of gabions shall be wired to the filled gabions at the front and at the back of a row, before filling commences.

Gabions adjacent to culverts shall be cut and fit to match the culvert to present an attractive and pleasing appearance.

601.04 MEASUREMENT FOR PAYMENT

Measurement for payment for gabions will be based on the number of each size of required gabion placed to the required alignment.

601.05 BASIS OF PAYMENT

Payment at the contract price for the size of gabion specified shall be compensation in full for all labour, materials and equipment use required to supply the gabion baskets and tie-wire, assemble and place the gabion baskets, tie together the gabion baskets, place connecting wires, complete necessary cutting and fitting together with the supply and placing of stones and also the supply and placing of anchors, if anchor pegs should be needed.

SECTION 610

RIP RAP TREATMENT

INDEX

610.01 TYPES OF RIP RAP TREATMENT

(a) Rip Rap – Hand Laid Dry Wall
(b) Rip Rap – Hand Laid With Sod
(c) Rip Rap – Grouted
(d) Rip Rap – Random

610.02 SCOPE

This specification covers the requirements for the various types of rip rap treatment listed above. The work consists of constructing a protective covering of approved stone, with or without mortar or sod as required on an earth bed; at the ends of culverts, on the sides of slopes or in the beds of channels or at other places as directed by the Owner's Representative. The work also includes such fine grading and tamping of slopes to be rip rapped and backfilling and tamping of foundation trenches, as may be required.

610.03 MATERIALS

Rip rap shall consist of clean, hard, durable rock, having a density not less than 2.6 tonnes per cubic metre. The rock material, if subjected to the Los Angeles Abrasion Test (ASTM C131), shall have a loss not greater than 35%. When tested for soundness, five cycles of magnesium sulphate, ASTM C88, the rock material shall have a loss not greater than 15%.

610.03.01 Rock

Stones for use in rip rap shall consist of clean, hard, durable rock, free of cracks. Rock subject to marked deterioration by water or weather will not be accepted. Only those stones meeting the requirements of this specification shall be used.

The largest rocks procurable shall be supplied and in no case shall any fragment measure less than 0.0035 cubic metres in volume. In hand laid dry wall rip rap, spalls shall be supplied to fill open joints. Field stones or boulders may be used when approved by the Owner's Representative.

610.03.02 Sod

Sod shall consist of a dense well-rooted growth of permanent and desirable grasses. When sod is lifted it shall be covered with grass recently mowed to a length not more than 75 millimetres. Sod shall be in widths not less than 300 millimetres nor more than 450 millimetres with a thickness not less than the depth of the fibrous roots and in no case less than 25 millimetres.

All sod shall be taken from good loamy soil. It shall be well permeated with roots; be uniform in texture and free from weeds; be in a good healthy condition with no sign of decay, and contain sufficient moisture to maintain its vitality during transportation and placing.

610.03.03 Grout

Grout shall consist of a cement mortar composed of one part Portland Cement and three parts fine aggregate.

610.04 EXCAVATION

Should the Owner's Representative require that excavation be carried out to prepare a foundation for the rip rap, then the work shall be carried out in accordance with Section 403.

a) Rip Rap - Hand Laid Dry Wall

On slopes to be rip rapped the slopes shall be fine graded to a uniform surface. Depressions shall be filled and thoroughly compacted.

b) Rip Rap - Hand Laid With Sod

Same as for (a) above.

c) Rip Rap – Grouted

Same as for (a) above.

d) Rip Rap – Random

Where required by the Owner's Representative, excavation for foundation shall be performed to provide a shelf or ledge to retain the rock so dumped as permitted under the paragraph "Placing Random Rip Rap".

610.05 PLACING

Rip rap shall be placed to the grades and within the lines staked by the Owner's Representative.

a) Rip Rap - Hand Laid Dry Wall

Unless laid to form a flat apron, the rip rap shall commence in a trench below the toe of the slope. Stones shall be placed by derrick or by hand. Stones shall be set normal to the slope, and placed so that the largest dimension is perpendicular to the face of the wall, unless such dimension is greater than the specified thickness of the wall.

The required thickness of rip rap is dependent on the proposed height and slope of the rip rap and on the expected force of the stream flow.

The Contractor shall construct the rip rap to the thickness stipulated in the contract documents or as directed by the Owner's Representative.

The largest stones shall be placed in the bottom courses and for use as headers through subsequent courses. No shaping of stones will be required; but the Contractor shall build to reasonable semblance of courses with stones laid closely and voids chinked with spalls.

Stones shall be placed in the wall in such a way that the rear of each stone shall be embedded into the slope of the embankment.

On the completion of laying of rip rap operations any open foundation trenches bordering the rip rap shall be backfilled and tamped.

b) Rip Rap - Hand Laid With Sod

The placing of stones and the backfilling and tamping of trenches shall be as required under (a) above.

However, as the placing of stones proceeds sod shall be placed so that sod separates the stones from each other, both horizontally and vertically. The sod shall be placed so that there are no voids between stones.

Sod shall not be placed upside down.

The sodding shall be trimmed so that the exposed edges of the sods are flush with the exposed face of the rip rap.

c) Rip Rap – Grouted

The placing of stones shall be as required under (a) above. Before applying mortar the surfaces of the stones shall be amply wetted. The spaces between the stones shall be filled with mortar, starting from the bottom and working to the top. The mortar shall be worked with suitable tools to completely fill all voids except that the outer faces of the stones shall be exposed. Excess mortar shall be removed with a stiff brush. Grouted rip rap shall be cured in accordance with the requirements for curing concrete sidewalk as stipulated in Section 570.

After the mortar has set any foundation trenches bordering the rip rap shall be backfilled and tamped.

d) Rip Rap – Random

Rock material may be placed by dumping it into position over the surface to be rip rapped.

The Owner’s Representative shall indicate whether the larger stones should be placed near the bottom of the slope, or near the top of the treated area to protect against scour.

The Contractor shall make a reasonable endeavour to dump the larger stones where required. Placing shall be done in such a manner that the surface of the finished rip rap shall have a uniform appearance.

610.06 MEASUREMENT FOR PAYMENT

Measurement for Payment for rip rap will only include measurement of materials which meet the specifications for the type of rip rap treatment in question. Materials placed outside of the limits as staked by the Owner's Representative will not be included in measurement for payment.

610.06.01 Measurement for Payment by Volume

For rip rap for which the contract unit price is stated in terms of the price per cubic metre, then such rip rap shall be measured for payment in terms of the net nominal volume of the rip rap structure comprising rip rap of the type in question. This net nominal volume shall be computed in cubic metres rounded to one decimal place. The net nominal volume of the rip rap structure shall be calculated as the product of: the net surface area of the rip rap structure, times the mean thickness of the rip rap structure.

The net surface area of the rip rap structure shall be defined as the net area given by mean length of the rip rap structure, times the mean width of the rip rap structure; less the area of such objects as culvert ends around which the rip rap is placed.

610.06.02 Measurement for Payment by Weight

For rip rap for which the contract unit price is stated in terms of the price per tonne, then only the stones to be used in the rip rap treatment shall be weighed on scales. The weighing of materials shall be in accordance with the requirements of Section 501. Only loads certified by the Department personnel as being placed in the works shall be included in the measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

610.07 BASIS OF PAYMENT

Payment at the Contract Unit Price per cubic metre, or per tonne, for the type of rip rap specified shall be compensation for all labour, materials and equipment-use to supply stones and sod or mortar as required, haul the materials to the site, provide such necessary dewatering as may be required, trim and tamp ground that is to receive rip rap treatment, construct the required rip rap treatment according to these specifications, cure mortar if used, backfill and tamp any open foundation trenches, together with the provision for weighing (if appropriate).

Excavation for foundation shall be paid for in accordance with Section 403, but the additional requirements for the fine grading and the tamping of depressions in slopes to be rip rapped, together with the backfilling and tamping of any foundation trenches, shall be considered compensated for in the contract price for rip rap treatment.

The occasional manual handling of rocks or stones which many occur during placing Random Rip Rap, shall in no manner be construed as transforming the classification of Random Rip Rap to that of Hand Laid Dry Wall Rip Rap.

SECTION 615

ARMOUR STONE

INDEX

615.01 SCOPE

This specification covers the requirements for the supply of armour stone of various minimum sizes and minimum weights, together with the preparation of a foundation seat for the base of the armour stone treatment and the placing of the armour stones to a thickness not less than that stated on the Unit Price Table for the type of armour stone under construction.

615.02 MATERIALS

Armour stone shall be rock that is clean, hard, sound, durable, resistant to weathering and degradation in water, free of overburden, spoil, shale and organic material and having a density of not less than 2.6 tonnes per cubic metre. The rock material if subjected to the Los Angeles Abrasion Test (ASTM C131) shall have a loss not greater than 35%. When tested for soundness, five cycles of magnesium sulphate, ASTM C88, the rock material shall have a loss not greater than 15%.

Armour stones shall be of an angular shape, and be of a uniform gradation. The greatest dimension of any stone shall not exceed two (2.0) times the least dimension.

Rock with visible planes of weakness and/or subject to marked deterioration by water or weather will not be accepted.

Individual armour stones shall be of a weight, or of a volume that is not less than that specified in the contract item in the Unit Price Table. Unless otherwise stated, the

minimum armour stone dimension in any given direction shall not be less than 0.75 metres.

The acceptability of the rock shall be determined by the Owner's Representative and/or by laboratory and/or field testing procedures carried out by qualified personnel.

The approval of some rock fragments does not convey the Owner's Representative's approval of all rock fragments to be obtained at that quarry.

Armour stones shall be supplied by the Contractor.

615.03 PLACING

Armour stones shall be placed to the satisfaction of and within the limits required by the Owner's Representative.

The Contractor shall complete any and all work required to provide access to all areas of the work site necessary to complete the preparation of foundation and placement of armour stone.

The Contractor shall prepare a foundation for the armour stone by excavating a seat in the existing ground.

Excavation shall be by means of a backhoe, or a claim as required, to carry out the excavation for the seat at the required location and to sufficient depth to provide a proper footing for the armour stone.

Excavation shall include any additional excavation required at the toe of slope to adequately prepare the armour stone footing.

The Contractor shall maintain the grades and slopes of the underlying material to ensure that the work area is cleared of all driftwood, debris, snow, ice and all other objectionable materials in the area of work.

Stones shall be placed by a crane, or similar equipment, starting at the bottom of the slope and working upwards.

The Contractor shall place the armour stone protection such that the underlying materials and any abutting Structures are not damaged. The Contractor shall be responsible at their own expense to repair any such damage to the Work.

No pushing or dumping of the stones by bulldozers or other equipment will be allowed.

The Contractor shall choose the stones and place them in such a way that the whole structure will be bound and consolidated to as great an extent as the nature of the rock will allow. Placing shall be done in such a manner that the surface of the armour stone treated slope shall have a uniform appearance. The thickness of the treated slope shall not be less than that specified in the contract item on the Unit Price Table.

Care shall be taken by the Contractor to ensure that no stones are placed outside of the lines as staked by the Owner's Representative.

If any armour stones are placed outside of the area to be treated or are washed out of place during construction, then they shall be removed or replaced by the Contractor at their own expense.

The Contractor shall be responsible for any Work or materials required to repair damage which is a result of water level variations, waves or weather conditions.

615.04 MEASUREMENT FOR PAYMENT

Stones placed outside of the limits required by the Owner's Representative will not be included in measurement for payment.

615.04.01 Measurement for Payment by Volume

For armour stone for which the contract unit price is stated in terms of the price per cubic metre, then such armour stone shall be measured for payment in terms of the net nominal volume of the armour stone treated slope comprising armour stone of the size in question. This net nominal volume shall be computed in cubic metres rounded to one decimal place.

The net nominal volume of the armour stone treated slope shall be calculated as the product of: the net surface area of the armour stone treated slope, times the nominal thickness of the armour stone treated slope, as specified in the contract item.

The net surface area of the armour stone treated slope shall be defined as the net area given by the mean length of the armour stone treated slope, times the mean width of the armour stone treated slope, measured along the face of the slope; less the area of objects around which the armour stone is placed.

615.04.02 Measurement for Payment by Weight

For armour stone for which the contract unit price is stated in terms of the price per tonne, then such armour stone shall be measured for payment by weighing the stones which are to comprise the treated slope. The weighing of materials shall be in accordance with the requirements of Section 501. Only loads certified by the Department personnel as being placed in the works shall be included in the measurement for payment. The weight shall be computed in tonnes, rounded to one decimal place.

Only armour stones certified as being placed within the limits, as staked by the Owner's Representative, will be included in measurement for payment.

615.05 BASIS OF PAYMENT

Payment at the contract unit price per cubic metre, or per tonne, for the size of armour stone specified, shall be compensation in full for all labour, materials, and equipment-use: to supply the required armour stones, to excavate a foundation seat for the bottom armour stones, to provide all haulage to transport the armour stones from the source to the place where the stones are to be placed, to complete all work required to access all areas of the work site, to place the armour stones, together with the provision for weighing (if applicable).

SECTION 620

BIN-TYPE RETAINING WALL

INDEX

620.01 SCOPE

This specification covers the requirements for the supply and installation of a bin-type retaining wall comprising bins of the design types and dimensions, and made up components of the dimensions and thickness as shown on the drawings.

620.02 MATERIALS

The materials for constructing the bin-wall shall conform to the types, dimensions and thicknesses as shown on the plans.

All elements including but not limited to the base or grade plate, horizontal stringers and spacers, vertical connectors, stiffeners, corner angles, nuts, bolts and washers shall be galvanized steel. Materials used in the fabrication of bin-type retaining walls shall conform to the applicable requirements of ASTM A653 and Designation Z600, with respect to base metal analysis and the weight of zinc coating.

All required bin-wall elements together with nuts, bolts and washers shall be supplied by the Contractor.

Bedding and backfill material shall consist of well graded, pervious, granular, other material having no more than 10% passing the number of 100 or 0.152 millimetre sieve and with a maximum particle size not exceeding 75 millimetres. However, should any part of the bedding or backfill be subjected to frequent inundation or expectation of the same, then the material used in those parts of the structure shall not have particles smaller than 3 millimetres.

The other material, other material borrow, or excavation for foundation other material used for bedding and backfill shall be measured and paid for according to the appropriate contract price for that item.

620.03 EXCAVATION FOR FOUNDATION

Excavation for Foundation for the bin-wall shall be carried out and paid for in accordance with the provisions of Section 403, however, the following additional requirements shall also apply.

Excavation shall be carried out to the lines and grades as staked by the Owner's Representative.

The use of mechanical excavation equipment will be permitted, except where, in the opinion of the Owner's Representative, their use will cause damage to structures below ground, in which case excavation by hand shall be used.

The Contractor shall proceed with caution in the excavation work so that the exact location of all buried pipes, service cables and underground structures, both known and unknown may be determined. The Contractor shall be responsible for the repair of all such pipes, services, cables and structures when broken or otherwise damaged.

Where such underground structures and pipes, etc. need to be removed in order for the bin-wall to be placed, then the removal shall be carried out according to the appropriate specification for that work and paid for according to the appropriate contract item on the Unit Price Table. Should there not be a contract item for the removal of the particular type of structure encountered, then such required removal will be paid for in accordance with the provisions of GC 19.1.

Should blasting be required to carry out the excavation, the Contractor shall ensure that any existing structures and any already assembled bin-walls are adequately protected. Any damage occurring during the carrying out of the works shall be made right by the Contractor at their own expense.

Excavation near the various grades shall be carried out by hand to ensure that no over-excavation occurs and that base plates may be placed at the correct grades and locations on undisturbed ground over their entire length.

However, where rock or other unyielding foundation occurs at base elevation, the excavation shall be deepened to 200 millimetres below base elevation to allow room for the addition of bedding.

Should the Contractor excavate deeper than required, then the excavation shall be refilled to the required unyielding foundation excavation grade with approved material and compacted to at least 95% of Standard Proctor Density (ASTM D698) all at the Contractor's expense.

The excavation at the sides and back of the bin-wall shall be of such width as to facilitate the use of hand operated compaction equipment when backfilling between the sides of the bin-wall and the sides of the excavation. This width will normally be 1 metre wide, or of such width that the Owner’s Representative may direct.

Where because of unstable soil conditions the excavation cannot be carried out to a trench steep batter, the Contractor shall not excavate a more gentle slope. In these conditions, the excavation shall be carried out in a series of steps with surfaces vertical and horizontal.

Excavation material conforming to the requirements of bedding material and backfill as stipulated in Section 620.02 shall be used as either bedding or backfill for the bin-walls. Such material may be placed straight away into partly erected bins or stockpiled for later placing.

Excavation material not suitable for use with bin-walls but nevertheless suitable for fill construction shall be incorporated in full construction in accordance with Section 204.

Excavation material which is unsuitable for fill construction shall be placed and trimmed along fill slopes or elsewhere, as directed by the Owner’s Representative.

620.04 SHEATHING AND SHORING

Protection of the works and all work done under this section shall comply with the relevant requirements of the “Occupation Health and Safety Act” for the Province of Newfoundland and Labrador.

Where, due to the nature of the work, the Contractor sheathes, shores, or braces the excavation, then such sheathing, shoring or bracing shall be supplied, installed, maintained and removed before backfill is placed, all at the Contractor's expense.

All works behind the sheathing shall be filled with native backfill or other material, as the Owner's Representative directs, and compacted as the sheathing is placed.

620.05 PROVISIONS FOR TRAFFIC AND PEDESTRIANS

The Contractor shall make provisions for the accommodation and protection of traffic and pedestrians and the owners and occupants of adjacent houses and premises, during the carrying out of the works. Such required temporary stairs, bridgeways, guards and fences shall be provided by the Contractor at their own expense.

The Contractor shall provide, place and maintain until the work is completed such barricades, construction signs, torches, red lanterns and guards as are required to protect persons from injury and to avoid property damage.

Excavated material when stockpiled shall be piled so as to avoid obstructing sidewalks, driveways or the road.

620.06 PROVISION OF UNDERDRAIN

Where the Owner's Representative requires that perforated pipe be placed to provide an underdrain for the bin-wall, then such work shall be carried out and paid for under separate contract items.

Should additional excavation be required to position the underdrain, after excavation for foundation operations for the bin-wall have been completed, then such excavation shall be carried out and paid for in accordance with Section 404.

The perforated pipe shall be installed and paid for in accordance with Section 420

Select bedding for the perforated pipe shall be supplied, placed and paid for in accordance with Section 410.

620.07 PREPARATION OF BED

Where rock or unyielding soils have been excavated to a compacted grade of not more than 200 millimetres below the proposed base elevations then bedding material, comprising material conforming to the requirements of Section 620.02, shall be used to provide a bed for the base plates.

The Contractor shall place and lightly compact the bedding so as to provide the required grades for the base plates, as staked by the Owner's Representative.

The Contractor shall exercise care in the preparation of the bed to ensure a smooth trim bed, only lightly compacted, so that the entire wall may adjust to small differential settlements and avoid the concentration of loads on any individual members of the wall.

620.08 ASSEMBLY OF BIN-WALL

The manufacturer or supplier shall provide shop drawings to both the Contractor and Department which outline all steps necessary for the proper assembly of the bin-wall.

The bin-wall shall be installed to the lines, grades and batter as staked by the Owner's Representative.

The assembly of the bin-wall shall comply with the manufacturer's specifications for bin-wall assembly.

Drilling, punching or drifting to correct defects in manufacture, settlement or improper backfill and bedding shall not be permitted. Any parts having holes improperly punched shall be promptly replaced by the manufacturer.

The Contractor shall ensure that components of the various dimensions and gauge thicknesses are installed at the appropriate locations in the structure, as shown on the plans.

Bin-wall members shall be handled carefully and any which are damaged shall be removed and new members substituted at the Contractor's expense.

All the required nuts and bolts shall be firmly secured in place before acceptance.

The bin-wall shall be assembled so that when installation is complete, the structure presents a neat and uniform appearance.

The Contractor shall co-ordinate the installation of the bin-wall with any work of relocating or installing any other structures which may occur at the same location as the bin-wall.

620.09 BACKFILLING AND COMPACTION

Other material consisting of suitable Excavation for Foundation other material, other material, or other material borrow conforming to the requirements of Section 620.02 shall be used to provide backfill for both inside and around the outside edges of the bins.

Backfill shall be placed in layers of loose thickness not greater than 200 millimetres and then compacted.

Each layer of backfill shall be compacted to at least 95% of Standard Proctor Density (ASTM D698) before a further layer is placed on top.

Compaction in areas more than 300 millimetres away from stringers and spacers shall be provided by means of a hand held mechanical type compactor.

The corrugations of the stringers and spacers including vertical connectors and corner angles, shall be filled with backfill material conforming to Section 620.02. The maximum thickness of each lift shall be 100 millimetres. Mechanical tampers shall not operate closer than 300 millimetres from the stringers and spacers. Compaction within this area shall be achieved by means of hand operated timber rams.

The Contractor shall exercise care in placing backfill to avoid segregation.

Filling the bins shall follow closely the assembly of the structure to avoid storm damage or displacement of the bins by earth movement.

Backfilling should proceed keeping the level of fill in the bins above the level of fill behind the retaining wall, but if restricted working conditions render this impractical, then the fill may be placed behind the wall concurrently with backfilling the bin wall. The backfill shall not be placed behind the wall before the backfill is placed in the bin.

Backfilling operations shall proceed to an elevation 300 millimetres above the top of the bin wall, or to such lower grade as may be staked by the Owner’s Representative. Should fill be required above this limit for backfilling, then such fill shall be in accordance with Section 204.

The Contractor shall be liable for any damage arising from default or neglect in backfilling operations.

620.10 MEASUREMENT FOR PAYMENT

Measurement for payment for bin-type retaining wall of a particular design type, shall be the sum given by the addition of the individual bin front nominal areas for all the bins placed of that particular design type. This measurement shall be computed in square metres rounded to two decimal places.

Bin front nominal area being defined as the product given by a nominal width of the bin (typically 3.05 metres) times the slope height of the bin measured from the bottom of the bottom stringer to the top of the top stringer.

620.11 BASIS OF PAYMENT

Payment at the contract price for bin type retaining wall, of a particular design type and thickness, shall be full compensation for all materials, labour and equipment use to supply and install the bin-wall of that design type to the requirements as stated in this specification, including the provisions of shop drawings.

Excavation for foundation for the bin-wall shall be carried out and paid for in accordance with Section 403. However, the additional hand work and care required to carry out the excavation in accordance with this specification shall be considered compensated for in the contract price for the bin-type retaining wall.

The preparation of a bed, backfilling and compaction shall be paid for in accordance with Section 403, Section 206 or Section 207, as the case may be, but the additional requirements for placing and compaction in accordance with this specification shall be considered compensated for in the contract price for bin-type retaining wall.

SECTION 625

DESIGN, SUPPLY AND INSTALLATION OF WELDED WIRE WALL

INDEX

625.01 SCOPE

This work shall consist of Welded Wire Retaining Wall constructed in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or established by the Owner's Representative. The wall shall be a Hilfiker Retaining Wall or an approved equal. The design life for the wall must be a minimum of 75 years.

625.02 MATERIALS

625.02.01 Wire Reinforcement and Cap Mesh

Welded wire fabric for facing shall be formed by a 90 degree bend of the soil wire reinforcement mesh and a prong to interlock with the soil reinforcing mesh above. The reinforcing mesh shall be shop fabricated of cold drawn steel wire and shall be welded into the finished mesh fabric conforming to the minimum requirements of ASTM A1064, with a yield strength minimum of 450 MPa [65 ksi]. Welded Wire Mesh for the welded wire wall shall be as per project specifications, and will be hot dip galvanized (2.0 oz./SF, ASTM A123; 605 g/m2). Any damage done to the mesh galvanization prior to installation shall be repaired in an acceptable manner and in a galvanized coating comparable to that provided.

625.02.02 Backing Materials

625.02.02.01 Backing Mats

Where required, as shown on the plans, steel backing mat shall be W5 vertical x W2.5 horizontal minimum (.2582” [6.6 mm] x .178" [4.5 mm] nom. dia.) welded wire fabric meeting ASTM A1064 and hot dip galvanized (2.0 oz./SF, ASTM A123; 605 g/m2) in accordance with paragraph 2.1.

625.02.02.02 Hardware Cloth

Where required, as shown on the plans, 20-Gauge metallic hardware cloth screen, or 23-Gauge PVC coated (Brown or Green) hardware cloth screen with openings not exceeding ¼ inch (6.4 mm) and a roll width of 660 millimetres. The hardware cloth screen shall be in accordance with ASTM A740 and shall be placed between the backfill and steel backing mat. A minimum vertical lap of 50 millimetres and horizontal lap of 25 millimetres must be maintained to retain the wall backfill.

625.02.02.03 Filter Fabric

Where required, as shown on the plans, geotextile filter cloth shall be utilized to retain the soil as required by the welded wire wall designer.

625.03 SELECT GRANULAR BACKFILL MATERIALS

625.03.01 Select Backfill Material Requirements

As shown on the plans, select granular backfill materials for the welded wire wall structure shall be reasonably free from organic and otherwise deleterious materials and shall conform to the following gradation limits as determined by ASTM D6913:

SIEVE SIZE	PERCENT PASSING
152.4 mm	100
76.1 mm	100 – 75
75 µm (0.075 mm)	0 – 25

The backfill shall conform to all of the following additional requirements:

1. The Plasticity Index (P.I.), as determined by ASTM D4318 (AASHTO T90), shall not exceed 6.

2. The fraction finer than 15 microns (0.015 mm), as determined by ASTM D7928 (AASHTO T88) shall not exceed 15 percent.

3. The material shall exhibit an angle of internal friction of not less than 34 degrees, as determined by the standard direct shear test ASTM D-3080-72 (AASHTO T236), utilizing a sample of the material compacted to 90% percent of ASTM D1557-92. No testing is required for backfill where 80 percent of the material is greater than ¾ inch (19mm). Before construction begins, the borrow selected shall be subject to show conformance with this frictional requirement.

ELECTRO-CHEMICAL PARAMETER	ELECTRO-CHEMICAL REQUIREMENT	TEST METHOD	
Resistivity	> 3000 ohm-cm (Min)	G187	T 288
pH	5 - 10	D4972	T289
Chlorides (Cl^-)	<100 mg/kg (ppm)	D4327	T 291
Sulphates (SO_4^{2-})	< 200 mg/kg (ppm)	D4327	T 290
Max Organic Content	< 1%		

If the resistivity is greater than or equal to 5,000 ohm-cm, the chlorides and sulfates requirements may be waived.

625.03.02 Acceptance of Select Backfill Material

The Contractor shall furnish to the Owner's Representative a Certificate of Compliance certifying that the select granular backfill material complies with this section of the specifications. A copy of all test results performed by the Contractor, which are necessary to assure compliance with the specifications, shall also be furnished to the Owner's Representative and the welded wire wall designer.

The frequency of sampling of Select Granular Backfill necessary to assure the above-mentioned requirements shall be directed by the Owner's Representative.

Backfill not conforming to this specification shall not be used without written consent of the Owner's Representative.

625.04 CONSTRUCTION REQUIREMENTS

625.04.01 Wall Excavation

Wall excavation shall be in accordance with the requirements of general specifications and in reasonably close conformity with the limits and construction stages shown on the plans.

625.04.02 Foundation Preparation

The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcement mat or as shown on the plans. Prior to wall construction, the foundation, if not in rock, shall be compacted, as directed by the Owner's Representative.

Any foundation soils found to be unsuitable shall be removed and replaced, as directed by the Owner's Representative.

The maximum calculated applied bearing pressure at the foundation level is as shown on the elevation view for each wall. It is the responsibility of the Owner's Representative to determine that this calculated applied bearing pressure is allowable for that location.

625.04.03 Welded Wire Retaining Wall Erection

Standard wire mesh reinforcement mats, and applicable facing materials, shall be placed in 600 millimetres successive horizontal lifts in the sequence shown on the shop drawings as backfill placement proceeds. Each standard lift must have the ability to compress a minimum of 50 millimetres without creating any outward bulge of the facing elements. Vertical tolerance (plumbness) and horizontal alignment tolerance shall not exceed 51 millimetres when measured at the junction of the wire facing and soil reinforcement along a 3 metre straight edge.

The overall vertical tolerance of the wall (top and bottom) after construction shall not exceed 25 millimetres per 3 metres of wall height, unless the wall design requires a battered facing. For battered facing structures, the overall tolerance from the theoretical battered locations shall not exceed 13 millimetres per 3 metres of battered wall height.

625.04.04 Backfill Placement

Backfill placement shall closely follow erection of each course of reinforcement mats. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing. Any wall materials, which become damaged or disturbed during backfill placement, shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Owner's Representative. The Contractor, at their expense, shall correct any misalignment or distortion of the wall facing due to placement of backfill outside the limits of this specification.

Backfill shall be compacted to 95 percent of the maximum density as determined by ASTM D1557 (AASHTO T99 method C or D), with oversize correction, at optimum moisture content (±2%).

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill material shall have a placement moisture content equal to or within two percentage points of optimum moisture content (Wopt ±2%). Backfill material with placement moisture content in excess or less than Wopt ±2% shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift. The Contractor shall decrease the percentage of deviation from optimum moisture, if necessary, to obtain the specified density. The optimum moisture content shall be determined in accordance with AASHTO T99 Standard Proctor Method A, with coarse particle correction according to ASTM D4719.

Backfill shall be placed in complete horizontal lifts. The maximum lift thickness after compaction shall not exceed 305 millimetres. The Contractor shall decrease this lift thickness, if necessary, to obtain the desired density.

Compaction within 1 metre of the backface of the wall facing shall be achieved by at least three passes of a lightweight mechanical tamper, roller or vibratory system. Soil density tests are not generally required within this area.

At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to rapidly direct run-off of rainwater away from the wall face. In addition, the Contractor shall not allow surface run-off from adjacent areas to enter the wall construction.

625.05 MEASUREMENT FOR PAYMENT

The unit of measurement for wall erection will be the square metres, rounded to one decimal place, of wall surface area complete and in place.

625.06 BASIS OF PAYMENT

Payment shall include compensation for all labour and materials and equipment use required to prepare the wall foundation, place the reinforcement mats, position the backing mats and screens as shown on the plans. Backfill material shall be paid for in accordance with Section 206, 207 or 403, as appropriate, but any additional requirements for backfilling, including materials testing and compaction, shall be considered compensated for in the contract price for the welded wire wall. Excavation required to provide a level surface for the wall shall be paid for in accordance with Section 403.

SECTION 631

SEEDING

INDEX

631.01 SCOPE

This specification covers the requirements for surface preparation, the supply and spreading of topsoil and the supply and application of lime, fertilizer and grass seed, together with the provision of maintenance of the seeded areas for a period of two months.

631.02 MATERIALS

The following materials shall be supplied by the Contractor and shall conform to the requirements as stated.

631.02.01 Topsoil

Topsoil shall be fertile loamy material of a quantity acceptable to the Owner's Representative. It shall be free from roots, vegetation or other debris of such size and quantity as would, in the opinion of the Owner's Representative, prevent proper

application of the topsoil, and free from stones and clods over 50 millimetres in greatest diameter. Topsoil badly infested by seeds and noxious weeds will not be accepted.

The topsoil may only be taken from a source of supply approved by the Owner's Representative.
Soil removed as part of the grubbing operations may be used if the material meets the requirements of this section.

Contractors should note that legislation prohibits the removal of topsoil from areas zoned by Government for agricultural use. Information regarding the location of these agricultural zones may be obtained from the appropriate Government Department.

631.02.02 Lime

Lime shall be agricultural quality lime free from lumps.

631.02.03 Fertilizer

Fertilizer shall be free from lumps and have the plant food ratio of 10 nitrogen to 20 phosphorus to 20 potash plus 2% F.T.E.

631.02.04 Grass Seed

Grass seed shall consist of a mixture 45% Kentucky Blue, 10% Wild White Clover, 10% Italian Rye Grasses, and 35% Creeping Red Fescue.

631.02.05 Water

Water used in the work shall be free of any impurities which would inhibit germination or otherwise adversely affect growth.

631.03 PREPARATION OF SURFACE

Seeding shall be carried out only within the limits as staked by the Owner's Representative.

Surfaces that are to be treated with seeding shall first be trimmed to restore the ground to the condition it was in prior to any erosion which may have taken place. This work shall consist of such dozer and hand work that is necessary to restore the ground to the lines and slopes as existed on completion of grading operations.

At the edges of the area to be treated with seeding, the ground shall be hand excavated to such depth that will allow for the placing of 70 millimetres of topsoil, such that after the

topsoil is placed the ground will be flush over the joint so as to allow the free flow of water across the joint, and also so as to present a neat appearance.

All areas to be seeded shall be fine graded to a uniform surface and the surface materials shall be loosened to a depth of 25 millimetres. These areas shall be so maintained until the topsoil is placed.

631.04 PLACING TOPSOIL

After completion of preparation of surface operations, topsoil shall be uniformly spread over the entire area to be seeded. The topsoil shall be placed to a depth not less than 70 millimetres. All clods or lumps shall be pulverized and any roots or foreign matter shall be raked up and removed from the site.

631.05 APPLICATION OF LIME, FERTILIZER AND GRASS SEEDS

On completion of placing topsoil operations; lime, fertilizer and grass seed shall be evenly spread over the surface to be seeded using approved spreaders. They shall not be mixed before application. Lime and fertilizer shall not be spread after the sowing.

Spreading shall only be carried out on calm days so as to avoid uneven application of the materials and segregation of the grass seed mixture.

It is preferable to seed in early summer or the last two weeks of August.

Should rainfall be insufficient, during the period of sowing and initial grass growth, water shall be applied immediately before and after seeding and subsequently thereafter during the maintenance period. Watering when carried out shall be done in such a manner as not to cause any erosion.

No seeding shall take place after the 20th of September.

Lime shall be applied in such quantities as to obtain a pH value of 6.5 for the topsoil. This will often be obtained by applying the lime at the rate of 4500 kilograms per hectare.

Fertilizer shall be applied at the rate of 1100 kilograms per hectare.

The grass seed mixture shall be applied at the rate of 85 kilograms per hectare.

The surface shall be lightly raked to a depth of 10 millimetres immediately after seeding.

631.06 MAINTENANCE

The Contractor shall be responsible for maintaining seeded areas to ensure proper and adequate growth of the grass during a period of two months following sowing.

Should the treated area require watering in the Owners Representative's opinion, then the Contractor shall thoroughly water the seeded area taking care not to cause any erosion.

During the maintenance period, any defect caused by defects in materials, workmanship or damages caused by watering or the weather shall be re-seeded with grass seed at the Contractor's expense.

631.07 MEASUREMENT FOR PAYMENT

The slope area actually seeded, from within the limits as staked by the Owner's Representative, will be measured in square metres, rounded to the nearest whole number.

631.08 BASIS OF PAYMENT

Payment at the contract price for seeding shall be compensation for all labour, materials and equipment use for: the preparation of the ground to be treated with seeding, the supply and placing of topsoil, lime, fertilizer and grass seed and the raking of the freshly seeded ground, together with such watering and maintenance as may be required over the two month maintenance period.

SECTION 632

HYDROSEEDING

INDEX

632.01 SCOPE

This section covers the requirements for the supply and application of fertilizer, grass seed and mulch by hydroseeding and hydromulching, together with the provision of maintenance during a one year warranty period provided by the Contractor.

The supply and placement of soil for hydroseeding is covered separately in Section 634.

The supply and application of lime is covered separately in Section 635

632.02 MATERIALS

The following materials shall be supplied by the Contractor and shall conform to the requirements as stated:

632.02.01 Grass Seed

Grass seed shall meet the requirements of the Seeds Act for Canada No. 1 seed, and shall be of the following varieties and respective percentages for standard applications:

BIRDSFOOT TREFOIL, VARIETY LEO	45%
WILD WHITE CLOVER	30%
CREEPING RED FESCUE, VARIETY	10%
BOREAL	15%
ANNUAL RYE GRASS	

The White Clover and Birdsfoot Trefoil seed must be inoculated with the following bacterial cultures at the specified rates in order to produce nodules. The inoculum is added to the hydroseed tank with the seed.

WHITE CLOVER INOCULUM	RATE: 100 GRAMS PER KG. OF WHITE
BIRDSFOOT TREFOIL INOCULUM:	CLOVER SEED BIRDSFOOT TREFOIL INOCULUM:

For late summer applications of hydroseeding the following seed mixture shall be used for slope treatment with this late condition of application:

BIRDSFOOT TREFOIL, VARIETY LEO	25%
WILD WHITE CLOVER	10%
CREEPING RED FESCUE, VARIETY	20%
BOREAL	15%
ANNUAL RYE GRASS	10%
CANADA BLUEGRASS	10%
TIMOTHY	10%
HARD FESCUE	

632.02.02 Fertilizer

Fertilizer shall be granular, non-burning, free flowing and free of lumps.

The fertilizer to be placed in the hydroseeding mixture shall have a plant food ratio of 10 nitrogen, 20 phosphorus and 20 potash plus 2% Fritted Trace Elements or 12 nitrogen, 24 phosphorus, 24 potash plus 2% Fritted Trace Elements. The fertilizer mixture shall be applied at the rate of 400 kilograms per hectare. The fertilizer to be spread the following spring during the maintenance period shall be 5-10-30, applied at the rate of 300 kilograms per hectare, or approved equivalent.

632.02.03 Mulch

The mulch shall be of a type consisting of natural sundried straw or wood fibres.

Straw fibres shall include; oat, barley, alfalfa or wheat fibres and shall be free from any weeds or other foreign matter which may be detrimental to plant life. Any straw fibre combination shall be maintained in a dry condition to allow even distribution when processed through a blower. The addition of other vegetative material consisting of hay, chopped corn stalks or other similar substances may be used with prior approval of the Owner's Representative.

Wood fibres shall include any wood or wood cellulose fibres and shall be free from any germination or growth inhibiting components.

Any fibres to be included in a mulch mixture shall be processed in lengths of 20 - 40 millimetres and supplied air dry in packages not exceeding 50 kilograms in weight for proper storage and handling.

The mulch shall be capable of dispersing in water to form a homogeneous slurry and remain in such a state when agitated or mixed with other additives.

When applied, the mulch shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil.

632.02.04 Binder

The binder must be capable of joining seeds, mulch and soil particles together on slopes and erodible surfaces until plant growth has been established. The binder must not form an impervious seal which would prevent the penetration of moisture to the underlying soil.

The binder shall be supplied as a water-soluble powder composed of polymerised and organic substances and must be absolutely non-toxic.

632.02.05 Water

Water used in hydroseeding and hydromulching shall be free of any impurities which would inhibit germination or otherwise adversely affect growth.

632.03 HYDROSEEDING OPERATIONS

The Owner's Representative shall designate the boundaries of areas for hydroseeding and mulching treatment. These areas will usually include a 300 millimetres wide overlap over adjoining vegetation so as to eventually provide a continuous cover of vegetation.

No area shall be hydroseeded until surface preparation has been completed to the satisfaction of the Owner's Representative and the lime applied.

Hydroseeding shall be carried out as soon as possible after completion of the surface preparation, in order to prevent erosion by wind and water.

Contractor should wait for several days after the application of lime before hydroseeding.

The hydroseeding procedure to be applied to designated areas shall be undertaken in one operation. The operation shall consist of the distribution of a slurry composed of: the required seed mixture, the fertilizer, mulch, and binder.

The rate of application of the ingredients of hydroseeding slurry shall be as follows for standard applications:

SEED MIXTURE	80 kg/ha
FERTILIZER	400 kg/ha
BINDER	20kg/ha
MULCH	1600kg/ha
INOCULUM	IN ACCORDANCE WITH SECTION 632.02.01

For late summer applications of hydroseeding the following seed mixture shall be used for slope treatment with this late condition of application:

SEED MIXTURE	150 kg/ha
FERTILIZER	600 kg/ha
BINDER	20kg/ha
MULCH	1250kg/ha
INOCULUM	IN ACCORDANCE WITH SECTION 632.02.01

The Contractor shall measure the quantities of each of the materials to be charged into the seeder, either by mass or by a system of mass-calibrated volume measurements that is to the satisfaction of the Owner's Representative and the Contractor shall provide all equipment required for this purpose.

The ingredients required for the hydroseeding operation shall be thoroughly mixed with water in a hydroseeding tank.

In order to prevent all of one type of seed being planted on one part of the job, and all of another type of seed being planted on another part of the job, it is imperative that the hydroseeding slurry be continuously agitated during the hydroseeding operation to ensure that a homogeneous slurry is spread.

The distribution of the slurry shall be by means of an approved hydroseeder and shall be applied uniformly and in such a manner as to prevent puddling and movement of the soil surface.

Work shall proceed only in calm weather and on ground free of frost, snow, ice or standing water and when, in the opinion of the Owner's Representative, weather and seasonal conditions are suitable. Hydroseeding shall not be carried out during periods of rainfall.

632.04 PROTECTION OF ENVIRONMENT

The Contractor shall take all reasonable care to prevent the contamination by their operations, of structures, signs, guide rails, fences, utilities and all such installations and, where such contamination occurs, shall remove it to the satisfaction of the Owner's Representative.

The Contractor shall take whatever precautions may be necessary and shall ensure that fertilizer in solution shall not come in contact with the foliage of any trees, shrubs or other susceptible vegetation.

Should the Contractor fail to meet this requirement, they shall immediately spray the affected vegetation with water, to the satisfaction of the Owner's Representative, to remove such contamination.

Mechanical damage to trees and shrubs shall, at the Contractor's expense, be repaired by trimming and painting or replacement, as required.

Such action as is herein required shall not relieve the Contractor of further responsibility should it not effectively remedy the damage, or of their liability as set out elsewhere within the contract.

632.05 MAINTENANCE

The Contractor shall be responsible for maintaining hydroseeded areas to ensure proper and adequate growth of the vegetation during the warranty period. The Contractor shall

also be responsible for an additional application of fertilizer the following spring. This application shall be by a method approved by the Department. The fertilizer shall be 5-10-30 and shall be applied at a rate of 300 kilograms per hectare. No additional payment will be made for maintenance or the extra application of fertilizer.

632.06 CONTRACTOR'S WARRANTY PERIOD

All areas hydroseeded under this contract shall have a warranty period of one year starting from the date of initial acceptance. This warranty shall cover any defects in materials and workmanship, and damages caused by the elements of weather. During this period, any defect brought to the attention of the Contractor by the Owner's Representative shall be fixed, repaired or made good to the satisfaction of the Owner's Representative and at no additional cost to the Department.

632.07 MEASUREMENT FOR PAYMENT

The slope area actually hydroseeded, from within the limits as staked by the Owner's Representative, will be measured in square metres, rounded to the nearest whole number.

632.08 BASIS OF PAYMENT

Payment of the contract price for hydroseeding shall be compensation in full for all labour, materials and equipment use for: supplying the inoculated seed mixture as specified; supplying the fertilizer, binder and mulch; carrying-out the hydroseeding operation; and supplying and placing the fertilizer in the following spring; together with a one year warranty period, during which time the Contractor shall be responsible for making good any defect to the growth of the vegetation.

Full payment shall not be made until the final acceptance of the work on satisfactory completion at the end of the warranty period. A holdback in the amount of 25% of the total payment for hydroseeding shall be retained for the warranty period and until additional application of fertilizer the following spring, as per Section 632.05.

SECTION 633

SODDING

INDEX

633.01 SCOPE

This specification covers the requirements for surface preparation, supply, and spreading of topsoil, and the supply and placing of sod over areas to be treated with sodding, together with the provision of maintenance for the placed sodding over a period of one month.

633.02 MATERIALS

The following materials shall be supplied by the Contractor and shall conform to the requirements as stated.

633.02.01 Sod

Sod shall consist of a dense well rooted growth of permanent and desirable grasses, uniform in texture and free from weeds. It shall be in good healthy condition with no sign of decay and contain sufficient moisture to maintain its vitality during transportation and placing.

Grass on the sod shall be of a length not longer than 75 millimetres. If necessary the grass may be mowed prior to lifting the sod so as to cut the grass to within the tolerance.

All sod shall be cut in rectangular sections of uniform width and thickness and may be cut in varying lengths. The sod shall be in widths not less than 300 millimetres nor more than 500 millimetres, in thickness not less than the depth of the fibrous roots and in no case less than 50 millimetres.

Contractors should note that legislation prohibits the removal of sod from areas zoned by Government for agricultural use.

Information regarding the location of these agricultural zones may be obtained from the appropriate Government Department.

633.02.02 Topsoil

Topsoil shall be fertile loamy material of a quality deemed satisfactory to the Owner's Representative. It shall be free from roots, vegetation or other debris of such size and quantity as would, in the opinion of the Owner's Representative, prevent proper application of the topsoil and free from stones and clods over 50 millimetres in greatest diameter. Topsoil badly infested by seeds and noxious weeds will not be accepted.

The topsoil may only be taken from a source of supply approved by the Owner's Representative.

Soil removed as part of the grubbing operations may be used if the material meets the requirements of this section.

Contractors should note that legislation prohibits the removal of topsoil from areas zoned by Government for agricultural use.

633.02.03 Pegs

Pegs shall be made from good quality wood. They shall be pointed at one end and be approximately 300 millimetres long and have an approximate diameter of about 25 millimetres.

633.03 PREPARATION OF GROUND

Sodding shall be carried out only within the limits as staked by the Owner's Representative.

Surfaces that are to be treated with sodding shall first be trimmed to restore the ground to the condition it was in prior to any erosion which may have taken place. This work shall consist of such dozer and hand work that is necessary to restore the ground to the lines and slopes as existed on completion of grading operations.

At the edge of shoulders and ditches and adjacent to other vegetation, the ground shall be hand excavated to such depth that will allow for the placing of topsoil and sod such that at the joint the top of the sod is flush with the top of the adjacent ground so as to allow the free flow of water across the joint and also so as to present a neat appearance.

All areas to be sodded shall be fine graded to a uniform surface and the surface materials shall be loosened to a depth of 25 millimetres. These areas shall be so maintained until the topsoil is placed.

633.04 PLACING TOPSOIL

After completion of preparation of ground operations, topsoil shall be uniformly spread over the entire area to be sodded.

The topsoil shall be placed to a depth not less than 50 millimetres. All clods or lumps shall be pulverized and any roots or foreign matter shall be raked up and removed from the site.

633.05 PLACING SOD

Sod shall be laid lengthwise across the face of the slope with ends close together. Sod shall be countersunk to the existing grade level at the edges of shoulders, ditches, and existing vegetation to allow the free flow of water across the joint between the existing grade and the new sodding and also to provide for a neat finish. Joints in adjacent rows shall be staggered. Joints and broken sod shall be pounded to a uniform surface.

Where sod is placed on slopes 3:1 and steeper, sodding shall be pegged as follows:

On slopes steeper than 1 3/4:1 each and every row of sod shall be pegged; on slopes from 1 3/4:1 to 3:1 each of the bottom three rows and each third row above shall be pegged.

In a pegged row of sod, the pegs shall be uniformly spaced across the face of the slope at uniform intervals of not greater than 0.5 metres such that when the sods therein are:

(a) 0.5 metres or less in length, there shall be a peg in each sod;

(b) greater than 0.5 metres but not greater than 1.0 metre there shall be two pegs in each sod.

(c) greater than 1.0 metre but not greater than 2.0 metres there shall be three pegs in each sod. The pegs shall be driven flush with the sod.

The entire work shall be done in a thoroughly workmanlike manner so that the appearance on completion shall be as nearly as possible that of a good natural growth in place.

No sod shall be laid when in a frozen condition, nor upon frozen ground, nor under any other condition not favourable to transplanting or growth of the sod.

633.06 MAINTENANCE

The Contractor shall be responsible for the care of all completed sodding for a period of one month following the completion of placing.

During this period any break, which may occur through slipping of sod, shall be repaired and any sod which is dead shall be removed and replaced by the Contractor, with fresh, live sod, without charge. Should the sodding become wilted during the maintenance period, the Contractor shall thoroughly water the sodding taking care not to cause any erosion.

633.07 MEASUREMENT FOR PAYMENT

The slope area actually treated with sodding, from within the limits as staked by the Owner's Representative, will be measured in square metres, rounded to the nearest whole number.

633.08 BASIS OF PAYMENT

Payment at the Contract price for sodding shall be compensation for all labour, materials and equipment use for: the preparation of the ground to be treated with sodding, the supply and placing of topsoil, sod and pegs, together with any necessary maintenance work, materials, and watering required during the one month maintenance period.

SECTION 634

SOIL FOR HYDROSEEDING

INDEX

634.01 SCOPE

This section covers the requirements for the supply and application of soil to areas to be hydroseeded. Included in the work is the preparation of the surface by the removal of rocks and debris.

It should be noted that some areas to be hydroseeded will not require the application of soil for hydroseeding.

634.02 MATERIALS

Soil for hydroseeding shall be supplied by the Contractor. The soil for hydroseeding shall consist of either Organic Loam or alternatively a Silty Other Material and Peat Mixture.

634.02.01 Organic Loam

Organic Loam shall be free from weeds, large stones and debris. The Organic Loam shall meet the following gradation: maximum size of particles 100 millimetres, max of 10% by weight larger than 50 millimetres. To meet this gradation it may be necessary that the material be screened.

Only organic loam approved by the Owner’s Representative shall be used in the work.

634.02.02 Silty Other Material and Peat Mixture

Silty Other Material shall consist of very poorly drained granular material having a high silt content. The maximum size of particles shall be no greater than 100 millimetres, and no more than 10% by weight shall be larger than 50 millimetres. To meet this gradation, it may be necessary that the material be screened. Only Silty Other Material deemed acceptable by the=Owner's Representative shall be used in the work.

Peat shall be bog material free of pieces of wood, roots and any deleterious material. Only peat deemed acceptable by the Owner's Representative shall be used in the work.

The silty Other Material and peat shall be thoroughly mixed together. The mixture shall contain no less than 25% peat and no more than 50% peat. Mixing may be by either; placing the silty O.M. and peat in layers and mixing in place by the use of equipment, or by pre-mixing.

634.03 PREPARATION OF SURFACE

The Contractor shall grade and clean-up areas over which soil for hydroseeding is to be placed prior to placing the soil for hydroseeding. Materials such as; rock, boulders, debris and other material, which it is necessary to remove in order to prepare the ground, shall be removed and disposed of. This shall apply to all areas to be treated with soil for hydroseeding regardless as to the source of the materials. The Contractor may elect to bury this waste on site if this meets with the approval of the Owner's Representative.

634.04 TRANSPORTATION

The Contractor shall transport the materials from the source to the job site, where they shall be applied to the designated areas.

634.05 PLACEMENT

The area requiring the soil will be designated by the Owner's Representative. Prior to spreading the soil, the Contractor is to grade the area to neat and sightly contours and to provide positive drainage.

The soil is to be spread over the designated areas to the depth of 100 millimetres.

The Contractor shall ensure that soil does not contaminate streams or water bodies.

634.06 MEASUREMENT FOR PAYMENT

Measurement for payment will be the product of the length by width of the area treated with a nominal 100 millimetres of topsoil placed inside the limits staked by the Owner's

Representative. The area of topsoil will be computed in square metres to the nearest whole number.

634.07 BASIS OF PAYMENT

Payment at the contract price for soil for hydroseeding shall be compensation in full for all labour, materials, equipment use and any other expenses to: collect debris and rocks from areas to be treated with soil, provide all haulage expenses to transport the debris and rocks to a disposal site provided by the Contractor at their own expense, dispose of the debris and rocks, provide sources of the required materials, obtain all required permits and approvals, provide and transport samples to the Department's Materials Engineering Division in St. John's, screen materials if required, construct and maintain access road to the sources of materials, provide all haulage of materials from the source to where the material is to be placed, mix the silty other material and peat mixture as appropriate, place the soil for hydroseeding to the required thickness of 100 millimetres, pay any royalties for the materials, clean up and provide such other restoration to the sources of the materials as may be required, together with any other work necessary to complete the contract item

SECTION 635

LIME FOR HYDROSEEDING

INDEX

635.01 SCOPE

This section deals with the supply and application of lime prior to hydroseeding operations, including the work of preparing the surface to be limed. Preparing the surface involves grading and trimming the surface together with the removal of rocks and debris.

635.02 MATERIALS

Lime shall be agricultural quality lime. The lime shall be free flowing and free of lumps. The Contractor shall supply the lime.

635.03 PREPARATION OF SURFACE

Surfaces that are to be treated with lime shall first be shaped up and graded to prepare the surface for hydroseeding. This work shall consist of such dozer and hand work necessary to restore the ground to the smooth grades that existed prior to erosion, and to remove and dispose of all: other material, rock, boulders and debris that it is necessary to remove in order to prepare the surface for hydroseeding.

This shall apply to all areas to be hydroseeded regardless as to the source of the material. The Contractor may elect to bury this waste on site where feasible and with the Owner's Representative's approval.

For areas over which Soil for hydroseeding is required, the placing and trimming of the Soil for hydroseeding shall be completed before the application of lime may begin.

635.04 LIMING OPERATIONS

The Owner's Representative shall designate the boundaries of areas for lime treatment. These areas will usually include a 300 millimetre wide overlap over adjoining vegetation so as to eventually provide a continuous cover of vegetation.

No area shall be limed until surface preparation has been completed to the satisfaction of the Owner's Representative.

The lime shall be applied at the even rate of 0.7 kilograms per square metre (7.0 tonnes per hectare), or at such other rate, or rates, as the Owner's Representative may designate. The lime shall be applied using the hydroseeding equipment. Spreading by hand will not be allowed.

The lime shall be applied before hydroseeding, in a separate operation from the hydroseeding application.

635.05 PROTECTION OF ENVIRONMENT

The Contractor shall ensure that lime does not contaminate streams or brooks.

Lime has been found to cause corrosion of galvanized metal in guide rail. The Contractor shall take all reasonable care to prevent the contamination of: structures, signs, guide rails, fences, utilities and all such installations. Should contamination by lime occur, then the Contractor shall remove the contaminating lime, to the satisfaction of, and by means approved of by the Owner's Representative

635.06 MEASUREMENT FOR PAYMENT

Measurement for payment shall be by means of the weight of lime used measured in tonnes rounded to one decimal place.

Where the lime arrives in pre-weighed bags, the weight shall be determined by counting the bags of lime used.

Where the lime arrives in loose form, then the lime shall be weighed at the Contractor's expense.

635.07 BASIS OF PAYMENT

Payment at the contract price for Lime for Hydroseeding shall be compensation in full for all labour, materials and use of equipment to: trim and prepare the surface to be limed, collect debris and rocks, provide all haulage expenses to transport the debris and rocks

to a disposal site provided by the Contractor at their own expense, dispose of the debris and rocks, supply the lime, weigh the lime if in loose form, and apply the lime in conformity with this specification.

SECTION 636

SOIL EROSION BLANKET

INDEX

636.01 SCOPE

Contractors are advised that this item includes the supply and installation of the erosion control blanket, application of lime and hydroseeding.

636.02 MATERIALS

The Erosion Control Blanket shall be Bonded Fibre Matrix or equivalent. Any blanket must be approved by the Owner's Representative. Installation shall be in accordance with the manufacturer's recommendations.

636.03 APPLICATION

The Bonded Fibre Matrix, (BFM), shall be hydraulically applied and upon drying, adhere to the soil in the form of a continuous, 100% coverage biodegradable erosion control blanket.

The Bonded Fibre Matrix shall be comprised of long strand, thermally defibrated wood fibres, (>88% of total volume by weight), held together by organic tackifiers, (10%), and mineral bonding agents, (>2%), which upon drying, become insoluble and non-dispersible.

The matrix which forms shall be designed, tested and proven to perform in a manner equal or superior to biodegradable erosion control blankets, (ECB's). Documentation of testing at an industry recognized laboratory shall be provided which demonstrates superior performance as measured by reduced water runoff, reduced soil loss, and better plant germination, as compared to erosion control blankets. The formed matrix shall meet the following performance requirements:

1. The material, when mixed into a liquid slurry, shall pass a free liquid quality control test, (liquids separate from fibrous solids, no greater than 25 millimetres in 1 minute's time), as measured on a standard test board.
2. The matrix, when dry shall not dissolve or disperse upon re-wetting.
3. The matrix, shall have no holes > 1 millimetre in size.
4. The matrix shall have no gaps between the product and the soil.
5. The matrix shall have a minimum water holding capacity of 1000g/100g, (1.2gal/LB matrix).
6. The matrix shall have no germination or growth inhibiting components, and shall not form a crust which inhibits water infiltration.
7. The matrix shall be comprised of material which are 100% biodegradable and 100% beneficial to plant growth.

The Bonded Fibre Matrix, (BFM), shall be installed by a contractor certified by the manufacturer and trained in the proper procedures for mixing and application of the product. The BFM shall be mixed according to manufacturer's recommendations, and contractor shall demonstrate "free liquid" test to inspector upon request. Bonded Fibre Matrix shall be spray applied at a minimum rate of 660 kilograms per hectare, utilizing standard hydraulically seeding equipment, in successive layers as to achieve 100% coverage of all exposed soil. The BFM shall not be applied over standing water, nor immediately before, during, or immediately after rainfall. The matrix shall have opportunity to dry for 24 hours after installation, with exceptions approved by the Owner’s Representative.

636.04 BASIS OF PAYMENT

Payment at the contract price for this item shall be compensation in full for all labour, materials and equipment use required to supply and install the erosion control blanket including all anchoring, application of lime for hydroseeding as per Section 635 and hydroseeding as per Section 632. Measurement for payment shall be by means of the total surface area protected within the limits as staked by the Owner’s Representative measured in square metres rounded to one decimal place.

SECTION 640

SUPPLY AND INSTALLATION OF GUIDE RAIL

INDEX

640.01 SCOPE

This specification covers the requirements for the supply and installation of various guide rail installation types together with the accompanying posts.

Unless the type of guide rail installation is specified otherwise in the contract documents, the type of guide rail shall be the standard type shown on Form 1280.

“Guide Rail with Additional Posts” shall be as shown on Form 1282-1. The extent of “Guide Rail with Additional Posts” will be as per the extent shown in the contract documents.

“Guide Rail – Structures” shall be as shown on Form 1282-2. The extent of “Guide Rail - Structures” will be within 11527 millimetres of the structure approach and 7717 millimetres of the structure exit. Any guide rail past these limits will be considered "Guide Rail

Standard Installation" unless noted otherwise in the contract documents. If there is no guide rail shown past these limits there shall be a ‘buried guide rail section’ as shown on Form 1280-1 or a terminal fin as shown on the contract documents.

The supply, installation, measurement for and basis of payment for modified special end shoes is considered incidental.

Standard hazard markers, 2 each of WE-1 and WE-2, shall be supplied by the Department to the Contractor at no expense. The Contractor is responsible for posts, mounting hardware and the erection of hazard makers as per contract drawings. Posts for mounting the hazard markers shall be treated timber, a nominal 100 millimetres x100 millimetres, length as required.

640.02 ENVIRONMENTAL REQUIREMENTS

Guide rail posts located in Protected Water Supply areas shall only be chromated copper arsenate (CCA) treated type.

640.03 MATERIALS

Guide rail parts furnished under these specifications shall be interchangeable with similar parts, regardless of their source of manufacture.

640.03.01 Rail Sections

The rail elements shall consist of a corrugated steel W-beam with corrugations symmetrical about the horizontal axis and such that the edges and centre of the rail element may contact each post.

For “Guide Rail Standard Installation” and “Guide Rail with Additional Posts”, the individual rail elements shall be of the Standard Type (W-beam) consisting of 2.75 millimetre thick rail. The length shall not be less than 4125 millimetres, having post bolt slots 3810 millimetres apart centre to centre for “Guiderail Standard Installation”; and 1905 millimetres apart centre to centre for “Guide Rail with Additional Posts”.

For “Guide Rail – Structures” the individual rail elements shall be of the Standard Type (W-beam) consisting of 3.5 millimetre thick for one length of rail not less than 4125 millimetre at structure approach and exit and attached to each end block with the modified special end shoes. It shall have post bolt slots for each post as shown on Form 1282-2.

The rail metal shall be open hearth oxygen furnace or electric furnace steel having an elongation of not less than 12 per cent in 50 millimetre and shall withstand a cold bend,

without cracking, of 180° around a mandrel of a diameter equal to 2½ times the thickness of the plate.

The rail elements shall be hot-dip galvanized before or after fabrication. In accordance with the specifications of ASTM A123 or CSA G164M. Rail element joints shall be capable of withstanding a tensile load of not less then 350 kN without failure. The rail element shall not deflect more than 140 millimetres when tested as a simple beam with the traffic face up and with an 8.9 kN load applied at the centre of a 3650 millimetre span through a 76 millimetre wide flat bearing.

Workmanship shall be equivalent to good commercial practice and all edges, boltholes and surfaces shall be free of torn metal, burns, sharp edges and protrusions.

Rail sections shall be supplied by the Contractor.

2 certified copies of mill test reports of each batch from which the rail element is formed, shall be furnished to the Owner's Representative, if requested by the Department Representative

640.03.02 Buried End Sections

Buried end sections shall be manufactured to meet the dimensions as shown on Form 1279 and Form 1280. The sections shall be shop fabricated from rail sections conforming to the requirements of Section 640.03.01. No punching, cutting or welding will be permitted in the field.

The weld shall be cleaned, pre-treated and coated with cold galvanizing compound as outlined.

Where corrugated steel beam is cut with a saw, drilled, or welded, the beam shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, etc. and wiped clean. The cleaned surface shall receive at least one application of metal conditioner to de-oxidize, de-grease and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid-zinc compound shall be applied to the prepared, clean, dry metal surface. The cold-galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold-galvanizing compound shall have a minimum 50 millimetre overlap of the surrounding undamaged galvanized metal.

Both metal conditioner and cold-galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings-organic and meet or exceed

ASTM A780 requirements All materials must be applied in accordance with the manufacturer's instructions.

The Contractor shall supply the angled sections.

640.03.03 Rail Terminal Sections

Rail terminal sections shall be of the standard type, as illustrated on Form 1279 and Form 1280. The metal and galvanizing shall be of the same thickness and quality as is stipulated for the rail sections in Section 640.02.01. The Contractor shall supply the terminal sections.

640.03.04 Bolts, Nuts, Washers and Spikes

All bolts, nuts and washers shall conform to the specifications of ASTM A307 or F3125M, except that rail splice bolts shall be button headed.

Post bolts and splice bolts shall have shoulders of such shape and size that they fit into the bolt slots in the rails and thus prevent the bolt from turning.

Post bolts shall be 16 millimetre diameter and 200 millimetres long for use with standard 150 millimetre x 150 millimetre posts, or 16 millimetre diameter and 250 millimetre long for use with 200 millimetre x 200 millimetre posts. The Contractor shall pay particular attention that post bolts be of sufficient length to accommodate the offset blocks as required.

Post bolt washers for the back of posts shall be 45 millimetres in diameter and 4 millimetres thick.

Bolts for anchors shall be 16 millimetre diameter and 350 millimetres long for use with standard 150 millimetre x 150 millimetre posts and anchors, or 16 millimetre diameter and 450 millimetres long for use with 200 millimetre x 200 millimetre posts and anchors. Washers shall be 45 millimetres round and 4 millimetres thick.

Spikes for anchors shall be 125 millimetre galvanized spikes.

Bolts, nuts, washers and other fittings shall be hot-dip galvanized in accordance with ASTM A153 “Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.”

The Contractor shall supply the bolts, nuts, washers and spikes.

640.03.05 Signal Reflectors

Silver signal reflectors and yellow signal reflectors shall be of size 75 millimetre x 100 millimetre. The Department will supply both types of signal reflector free to the Contractor at the following district depots: White Hills in St. John's, Clarenville, Grand Falls, Deer Lake, and Goose Bay.

Nails for securing signal reflectors shall be supplied by the Contractor and shall consist of 30 millimetre galvanized flat head nails.

640.03.06 Standard Hazard Markers

Standard hazard markers, 2 each of WE-1 and WE-2, shall be supplied by the Department to the Contractor at no expense. The Contractor is responsible for posts, mounting hardware and the erection of hazard makers as per contract drawings. Posts for mounting the hazard markers shall be a nominal 100 millimetre x100 millimetre, length as required.

Connections for the hazard markers shall be supplied by the Contractor and shall consist of two 80 millimetre long, 10 millimetre diameter galvanized lag bolts with a galvanised washer.

640.03.07 Posts and Anchors

Timber for posts and anchors shall be sound, well-seasoned structural grade lumber. Only birch wood will be acceptable for 150 millimetre x 150 millimetre guide rail posts. Hemlock or other approved species will be acceptable for 200 millimetre x 200 millimetre guide rail posts.

Posts shall have minimum dimensions of 150 millimetre x 150 millimetre x 2400 millimetre for “Guide Rail Standard Installation”, and for "Guide Rail with Additional Posts.”

“Guide Rail – Structures” posts shall have minimum dimensions of 200 millimetre x 200 millimetre x 2400 millimetre.

"Guide Rail with Additional Posts" and “Guide Rail – Structures” shall have offset blocks on all posts.

Anchors shall consist of either one piece of guide rail post cut 450 millimetres long, or two pieces of 38 millimetre x 140 millimetre x 450 millimetre lumber.

Posts and anchors shall be pressure treated with an acceptable wood preservative.

The minimum required depth of penetration of wood preservative shall be 13 millimetres. To determine penetration, a borer core shall be taken from 20 pieces in each charge. If 80% of the borings meet the penetration requirements, the charge shall be accepted.

The minimum retention of preservative shall be as follows:

PRESERVATIVE	MINIMUM RETENTION	METHOD OF DETERMINATION
PENTACHOROPHENOL	6.4 kg/m3	BY ASSAY
CHROMATED COPPER ARSENATE	6.4 kg/m3	BY ASSAY
OTHER	IN ACCORDANCE WITH CSA 080M	

Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.

If requested by the Owner's Representative, the Contractor shall provide penetration and retention test reports for the guide posts and guide rail posts supplied for the project.

The Contractor shall supply all the required wood preservative treated posts and anchors.

640.03.08 Wood Preservative

Wood preservative for use in treating field cut ends of posts shall be of the same type and chemical composition as that used in the original treatment.

The Contractor shall supply the wood preservative.

640.04 INSTALLATION

Galvanized materials shall be loaded, hauled and handled in such manner that galvanizing will not be damaged. All bare, abraded, and damaged surfaces shall be cleaned, pre-treated if required and coated with cold galvanizing compound as outlined above.

Guide rail shall be placed to the lengths, lines and grades set by the Owner's Representative. Except where directed otherwise by the Owner's Representative, the guide rail shall be installed in accordance with the requirement of Forms 1279, 1280, 1282-1, or 1282-2, as the case may be.

A buried end section shall be placed at each end of a run of guide rail unless directed otherwise by the Owner's Representative.

On divided highways, a buried end section shall be placed at the approach end of a run of guide rail and a terminal section shall be placed at the other end unless directed otherwise by the Owner's Representative.

The end post of a buried end section shall have an anchor secured to the bottom of the post.

Where a 150 millimetre x 150 millimetre x 450 millimetre timber anchor is used, it shall be secured to the post by means of a galvanized nut and 16 millimetre diameter bolt 350 millimetre long together with two 45 millimetre round, 4 millimetre thick galvanized washers.

Where a double 38 millimetre x 140 millimetre x 450 millimetre lumber anchor is used, it shall be secured to the post by means of four 125 millimetre galvanized spikes.

Field boring and cutting to length of anchors will be permitted, provided that the hole is treated with two coats of wood preservative before driving the bolts and provided that the cut end is treated with two coats of wood preservative before burying.

The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1500 millimetres below the ground surface.

Posts shall be set plumb and to the established lines and grades and shall be placed at 3810 millimetre intervals, unless directed by the Owner's Representative.

The posts shall be firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 100 millimetres. Each layer shall be thoroughly compacted before the next layer is placed. Should the backfill be dry then each layer shall be moistened before tamping.

All backfill shall be compacted to 95% of Standard Proctor Density (ASTM D698).

All surplus excavated material shall be disposed of along the sides of fill, or in other locations as directed by the Owner's Representative.

The rails shall be secured to even lines such that the centre of the rail is 635 millimetres above the edge of pavement.

The Contractor shall bore holes in the posts for the post bolts and treat the holes with two coats of wood preservative before driving the bolts.

Rail elements and terminal sections shall be lapped so that the exposed ends will not face approaching traffic.

The bolted connections of the rail element to the post shall be capable of withstanding a 22.5 kN pull at right angles to the lines of the railing.

When the attachment of the rail elements to the posts has been completed, the tops of the posts shall be cut to a point 75 millimetres above the top of the rail as shown by Form 1279 and Form 1280. The tops of the posts shall be treated with two coats of wood preservative after cutting.

Signal reflectors shall be attached to posts at terminal sections, posts at the buried end sections, and to every fourth post in a length of guide rail. Silver reflectors shall be placed facing oncoming traffic and yellow reflectors shall be placed on the opposite side of the post except for divided highway. On divided highways, silver reflectors shall be placed facing oncoming traffic on the outside shoulder and yellow reflectors shall be placed facing oncoming traffic on the median shoulder.

The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and secure the reflectors with 30 millimetre galvanized flat head nails as shown as shown on Form 1281.

640.05 MEASUREMENT FOR PAYMENT

Measurement for payment for the supply and installation of Standard Type Guide Rail, “Guide Rail with Additional Posts”, “Guide Rail – Structures”, or Type "A" Guide Rail, as the case may be, shall be the length of that type of guide rail placed within the limits designated by the Owner’s Representative, measured in metres, rounded to one decimal place, measured end to end along the face of the railing and terminal sections regardless of the type and kind of installation excluding the modified special end shoes.

Measurement for payment for the supply and installation of Type "B" Guide Rail shall be the length of rail and terminal sections placed within the limits designated by the Owner’s Representative, measured in metres, rounded to one decimal place, measured end to end along one side only.

Where the guide rail structure is a composite of more than one type of guide rail installation, then measurement for payment shall be by the length of each type of guide rail installation making up the composite.

Measurement for payment for buried end sections will be by means of the number of buried end sections placed as directed by the Owner's Representative.

640.06 BASIS OF PAYMENT

Payment at the contract price for the Supply and Installation of Guide Rail of a particular type shall be compensation in full for all labour, materials, and equipment to: excavate post holes, supply and install all posts, anchors, rail sections, rail terminal sections, modified end shoes, standard hazard markers, bolts, nuts, washers, spikes and nails, bend rail sections where required to a uniform radius, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative, install reflectors, clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, all in accordance with this specification.

Payment at the contract price for the Supply and Installation of buried end sections shall be compensation in full for all labour, materials, and equipment to: excavate post holes, supply and install posts, anchors, buried end sections, bolts, nuts, washers, spikes and nails, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative, install reflectors, clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, all in accordance with this specification.

SECTION 643

SALVAGE AND SALVAGE AND REINSTALLATION OF GUIDE RAIL

INDEX

643.01 SCOPE

This specification covers the requirements for the salvage of existing guide rail, including buried ends, terminal ends and hardware, and posts from one location, and where stipulated, the reinstallation of the guide rail at another location using either the salvaged

rail, including buried ends, terminal ends and hardware and salvaged posts, or the salvaged rail including buried ends, terminal ends and hardware, and new posts.

643.02 ENVIRONMENTAL REQUIREMENTS

Guiderail posts located in Protected Water Supply areas shall only be chromated copper arsenate treated type.

643.03 MATERIALS

643.03.01 Rail Sections and Rail Terminal Sections

Only salvaged rail sections, angled rail sections and rail terminal sections deemed acceptable by the Owner's Representative shall be used in the re-assembly.

643.03.02 Bolts, Nuts, Washers and Spikes

All bolts, nuts and washers shall conform to the specifications of ASTM F3125M, except that rail splice bolts shall be button headed.

Post bolts and splice bolts shall have shoulders of such shape and size that they fit into the bolt slots in the rails and thus prevent the bolt from turning.

Post bolts shall be 16 millimetres in diameter and 200 millimetres long unless otherwise required. Post bolt washers for the back of the post shall be 45 millimetres round and 4 millimetres thick.

Bolts for anchors shall be 16 millimetres in diameter and 350 millimetres long unless otherwise required and washers shall be 45 millimetres round and 4 millimetres thick.

Spikes for anchors shall be 125 millimetre galvanized spikes.

Bolts, nuts washers and other fittings shall be hot-dip galvanized in accordance with the specification of ASTM Designation A-153.

The Contractor shall supply the bolts, nuts washers and spikes.

However, should any of the salvaged bolts, nuts and washers be suitable for re-use, as deemed by the Owner's Representative, then the Contractor may use these components.

643.03.03 Signal Reflectors

Silver signal reflectors and yellow signal reflectors shall be of size 75 millimetres x 100 millimetres. The Department will supply both types of signal reflector free to the

Contractor at the following district depots: White Hills in St. John's, Clarenville, Grand Falls, Deer Lake and Goose Bay.

643.03.04 Nails for Reflectors

Nails for securing signal reflectors, shall be supplied by the Contractor and shall consist of 30 millimetre galvanized flat head nails.

643.03.05 New Posts and Anchors

Timber for new posts and anchors shall be sound, well seasoned structural grade lumber.

Only birch wood will be acceptable for new 150 millimetres x 150 millimetres guide rail posts. Hemlock or other approved species will be acceptable for 200 millimetres x 200 millimetres guide rail posts.

Posts shall have minimum dimensions of 150 millimetres x 150 millimetres x 2400 millimetres, except in the particular case of posts to be used in Tender Items worded “Guided Rail with Additional Posts”, as shown in Form 1282, in which case posts shall have minimum dimensions of 200 millimetres x 200 millimetres x 2400 millimetres.

Anchors shall consist of either one piece of 150 millimetres x 150 millimetres x 450 millimetres timber, or two pieces of 38 millimetres x 140 millimetres x 450 millimetres lumber.

Posts and anchors shall be pressure treated with an acceptable wood preservative.

The minimum required depth of penetration of wood preservative shall be 13 millimetres. To determine penetration, a borer core shall be taken from 20 pieces in each charge. If 80% of the borings meet the penetration requirements, the charge shall be accepted.

The minimum retention of preservative shall be as follows:

PRESERVATIVE	MINIMUM RETENTION	METHOD OF DETERMINATION
PENTACHOROPHENOL	6.4 kg/m3	BY ASSAY
CHROMATED COPPER ARSENATE	6.4 kg/m3	BY ASSAY
OTHER	IN ACCORDANCE WITH CSA 080M	

Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.

If requested by the Owner's Representative, the Contractor shall provide penetration and retention test reports for the guide posts and guide rail posts supplied for the project.

Where the contract item is given as "Salvage and Reinstallation of Guide Rail with New Posts" then, the Contractor shall supply all the required wood preservative treated new posts and anchors.

643.03.06 Re-usable Posts and Anchors

Only salvaged posts and anchors deemed acceptable by the Owner's Representative shall be used in the re-assembly, and then only if the contract item is given as, "Salvage and Reinstallation of Guide Rail with Salvaged Posts". Where the contract item is given as, "Salvage and Reinstallation of Guide Rail with New Posts" then, salvaged posts shall not be used.

643.03.07 Wood Preservative

Wood preservative for use in treating field cut ends of posts shall be of the same type and chemical composition as that used in the original treatment.

The Contractor shall supply the wood preservative.

643.04 DISMANTLING OF EXISTING GUIDE RAIL

The Contractor shall exercise care in dismantling and removing rails and terminal sections so that they are not damaged and remain suitable for re-use. The rails and terminal sections shall be transported to, and stored at, a secure storage site provided by the Contractor at their own expense, pending their re-assembly at a new location.

Where the contract item is given as "Salvage of Guiderail" then the salvaged guide rail sections and all suitable hardware shall be transported to, and stored at, the nearest Department Depot. All salvaged guide rail hardware, including: bolts, nuts, and washers shall be separated, crated and labelled by the Contractor upon return. Guide rail sections shall be neatly stockpiled as directed by the Depot Supervisor.

Should any material, designated for salvage and reinstallation or just salvage, be damaged or lost by the Contractor, then the Contractor shall be charged with the costs of replacement with equivalent new material. Damaged material shall become the property of the Contractor and shall be disposed of.

643.05 REMOVAL AND SALVAGE OF EXISTING POSTS

The Contractor shall exercise care in excavating posts so that they are not damaged and remain suitable for re-use.

Where the contract item is given as, "Salvage and Reinstallation of Guide Rail with New Posts" or “Salvage Existing Guide Rail” then, the salvaged posts shall be transported to, and stored at, the nearest Department Depot.

However, should the contract item be given as, "Salvage and Reinstallation of Guide Rail with Salvaged Posts" then, the posts shall be transported to and stored at, a secure storage site provided by the Contractor at their own expense pending their re-use at a new location.

Should any post designated for salvage, be damaged or lost by the Contractor, then the Contractor shall be charged with the cost of replacement. Damaged posts shall become the property of the Contractor and shall be disposed of.

643.06 BACKFILLING POST HOLES

The Contractor shall backfill to the required grade using the excavated materials if suitable. Should the excavated material be unsuitable, or should there be insufficient suitable backfill material from the excavation, then the Owner’s Representative will direct that material from a cut or from a borrow area will be used to complete the backfilling.

Backfilling shall be placed in layers not exceeding 200 millimetres in thickness loose measurement. Each layer shall then be compacted to the required compaction before a further layer is placed.

Backfill consisting of other material or other material borrow shall be compacted to not less than 95% of the Standard Proctor Density (ASTM D698).

In rock backfill material where Standard Proctor tests cannot be carried out, compaction shall be continued until a compaction is achieved that is equivalent to that obtained in a fill when there is no visible movement of fill under a vibrating vibratory compactor with vibratory roller of length not less than one decimal five metres.

The backfilled hole or trench shall be levelled and trimmed to provide sightly contours and adequate drainage.

643.07 INSTALLATION

For reinstallation, the rail sections, buried end sections, terminal sections and posts shall be transported to the location where they are required.

Guide rail shall be placed to the lengths, lines and grades set by the Owner's Representative. The guide rail shall be installed in accordance with the requirements of Forms 1279 and 1280 except where directed otherwise by the Owner's Representative.

An angled rail section shall be placed at each end of a run of guide rail unless directed otherwise by the Owner's Representative.

The end post at an angled rail section shall have an anchor secured to the bottom of the post.

Where a 150 millimetres x 150 millimetres x 450 millimetres timber anchor is used it shall be secured to the post by means of a galvanized nut and 16 millimetre diameter bolt x 350 millimetres long together with two 45 millimetres round 4 millimetres thick galvanized washers.

Where a double 38 millimetres x 140 millimetres x 450 millimetres lumber anchor is used it shall be secured to the post by means of four 125 millimetre galvanized spikes.
Field boring and cutting to length of anchors will be permitted, provided that the hole is treated with two coats of wood preservative before driving the bolts and provided that the cut end is treated with two coats of wood preservative before burying.

Where the contract item is given as, "Salvage and Reinstallation of Guide Rail with Salvaged Posts" then, posts with the original anchors may be used provided that the anchor is sound. Should the anchor have been damaged during salvage then the Contractor shall replace the anchor on the post using new materials.

The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1500 millimetres below the ground surface.

Posts shall be set plumb and to the established lines and grades and shall be placed at 3810 millimetre intervals, unless directed otherwise by the Owner's Representative.

The posts shall be firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 100 millimetres. Each layer shall be thoroughly compacted before the next layer is placed. Should the backfill be dry then each layer shall be moistened before tamping.

All backfill shall be compacted to 95% of Standard Proctor Density (ASTM D698).

All surplus excavated material shall be disposed of along the sides of fill, or in other locations as directed by the Owner's Representative.

The rails shall be secured to even lines such that the centre of the rail is 635 millimetres above the edge of pavement.

The Contractor shall bore holes in the posts for the post bolts and treat the holes with two coats of wood preservative before driving the bolts.

Rail elements and terminal sections shall be lapped so that the exposed ends will not face approaching traffic.

The bolted connections of the rail element to the post shall be capable of withstanding a 22.5 kilo newton pull at right angles to the lines of the railing.

When the attachment of the rail elements to the posts has been completed, the tops of the posts shall be cut to a point 75 millimetres above the top of the rail as shown on Form 1279 and Form 1280. The tops of the posts shall be treated with two coats of wood preservative after cutting.

Signal reflectors shall be attached to posts at terminal sections, posts at the buried end sections, and to every fourth post in a length of guide rail. Silver reflectors shall be placed facing oncoming traffic and yellow reflectors shall be placed on the opposite side except for divided highway. On divided highways, silver reflectors will be placed facing oncoming traffic on the outside shoulder and yellow reflectors will be placed facing traffic on the median shoulder.

The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and secure the reflectors with 30 millimetre galvanized flat head nails as shown on Form 1281.

When reinstalling salvaged posts, the original reflectors shall be removed and new reflectors shall be attached.

643.08 MEASUREMENT FOR PAYMENT

Measurement for payment for the Salvage and Reinstallation of Guide Rail shall be the length of the reinstalled guide rail placed within the limits designated by the Owner's Representative, measured in metres, rounded to one decimal place, measured end to end along the face of the railing and terminal sections.

Measurement for payment for the Salvage of Guiderail shall be the length of the existing guiderail to be salvaged within the limits designated by the Owner's representative, measured in metres, rounded to one decimal place, measured end to end along the face of the railing and terminal sections.

643.09 BASIS OF PAYMENT

643.09.01 Basis of Payment for Salvage and Reinstallation of Guide Rail with New Posts

Payment at the contract price for Salvage and Reinstallation of Guide Rail with New Posts, shall be compensation in full for all labour, materials and use of equipment to: dismantle the rail sections, transport the rail sections and terminal sections to a secure storage site provided by the Contractor at their own expense, store the rail sections, excavate and salvage the guide rail posts and transport them to the nearest Department Depot, backfill and compact the excavation, excavate holes for posts at the required new location, supply new preserved wood posts and anchors, transport the stored rail sections and rail terminal sections from the storage site to the place of installation, supply the bolts, nuts, washers and spikes, assemble and secure the anchors to the posts, assemble the guide rail to the required lines and grade, bend rail sections where required to a uniform radius, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative to cut ends and drill holes, and install reflectors.

643.09.02 Basis of Payment for Salvage and Reinstallation of Guide Rail with Salvaged Posts

Payment at the contract price for Salvage and Reinstallation of Guide Rail with Salvaged Posts, shall be compensation in full for all labour, materials and use of equipment to: dismantle the rail sections, excavate and salvage the guide rail posts, transport the rail parts and posts to a secure storage site provided by the Contractor at their own expense, store the rail parts and posts, backfill and compact the excavation, excavate holes for posts at the required new location, transport the stored rail parts and posts from the storage site to the place of installation, supply the bolts, nuts, washers and spikes, supply assemble, and secure new anchors where the original anchors are damaged, assemble the guide rail to the required lines and grade, bend rail sections where required to a

uniform radius, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative to cut ends and drill holes, remove original reflectors, and install new reflectors.

643.09.03 Basis of Payment for Salvage of Guide Rail

Payment at the contract price for Salvage of Guide Rail, shall be compensation in full for all labour, materials and use of equipment to: dismantle the rail sections, salvage all suitable hardware, excavate and salvage the guiderail posts and transport the rail sections, hardware and posts to the nearest Department Depot and stockpile the salvaged materials as directed

SECTION 645

SUPPLY AND INSTALLATION OF WOODEN GUIDE POSTS

INDEX

645.01 SCOPE

This specification covers the requirements for the supply and installation of wooden guide posts.

645.02 ENVIRONMENTAL REQUIREMENTS

Guide posts located in Protected Water Supply areas shall only be chromated copper arsenate treated type.

645.03 MATERIALS

Wooden guide posts shall consist of a post with an anchor attached to the base as shown on the drawing Section 1285.

Lumber for posts and anchors shall be sound, well seasoned structural grade lumber free from cracks and warp.

Only birch wood will be acceptable for the guide posts.

Posts shall be of 150 millimetres x 150 millimetres lumber. The length shall be approximately 2700 millimetres.

Anchors shall consist of two pieces of 38 millimetres x 89 millimetres lumber each of length 450 millimetres.

Posts and anchors shall be pressure treated with an acceptable wood preservative.

The minimum required depth of penetration of wood preservative shall be 13 millimetres. To determine penetration, a borer core shall be taken from 20 pieces in each charge. If 80% of the borings meet the penetration requirements, the charge shall be accepted. The minimum retention of preservative shall be as follows:

PRESERVATIVE	MINIMUM RETENTION	METHOD OF DETERMINATION
PENTACHOROPHENOL	6.4 kg/m3	BY ASSAY
CHROMATED COPPER ARSENATE	6.4 kg/m3	BY ASSAY
OTHER	IN ACCORDANCE WITH CSA 080M	

Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.

If requested by the Owner's Representative, the Contractor shall provide penetration and retention test reports for the guide posts and guide rail posts supplied for the project.

Nails for attaching anchor pieces to the post shall consist of 100 millimetre galvanized nails.

Nails to secure Department supplied reflectors, shall be 30 millimetre galvanized flat head nails.

All materials, with the exception of the reflectors, shall be supplied by the Contractor. The Department will supply the silver signal reflectors and the yellow signal reflectors which will both be of size 75 millimetres x 100 millimetres.

645.04 ASSEMBLY AND INSTALLATION

Anchors shall be attached to the posts as shown on drawing Section 1285. Each piece of 28 millimetres x 89 millimetres x 450 millimetres lumber shall be nailed near its centre to the post so that the lower edge of the anchor is 30 millimetres above the bottom of the post. Each piece shall be secured by means of two galvanized nails of length 100 millimetres.

Should any piece of lumber become split or cracked during nailing, then the Contractor shall, at their own expense, replace the damaged piece with sound lumber.

Guide posts shall be placed at the locations as set by the Owner's Representative. The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1500 millimetres below the ground surface.

The posts shall be set plumb, and firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 150 millimetres. Each layer shall be thoroughly compacted before the next layer is placed. Should the backfill material be dry, then each layer shall be moistened before tamping.

All surplus excavated material shall be disposed of along the sides of fill, or in other locations as directed by the Owner's Representative.

The tops of the posts shall be cut to a point 1200 millimetres above the edge of the pavement, as shown on drawing Section 1285 "Wooden Guide Post", or cut otherwise as directed by the Owner's Representative.

The tops of the posts shall be treated with 2 applications of wood preservative as in Section 590, "Wood Preservation".

Signal reflectors shall be attached to the top of the guide posts, as shown on drawing Section 1285.

The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and then secure the reflectors with 30 millimetre galvanized flat head nails so that silver reflectors are placed facing on-coming traffic and yellow reflectors are placed on the opposite side except on divided highway. On divided highways, silver reflectors are to be placed facing oncoming traffic on the outside shoulder and yellow reflectors are to be placed facing oncoming traffic on the median shoulder.

645.05 MEASUREMENT FOR PAYMENT

Measurement for Payment will be by means of the number of completed new wooden guide posts placed at the required locations.

645.06 BASIS OF PAYMENT

Payment at the contract price for the Supply and Installation of Wooden Guide Posts shall be compensation in full for all labour, materials and equipment-use to: supply the posts, anchors, nails, and wood preservative, assemble the guide posts, excavate the post hole, install the post, backfill the hole, tamp the backfill, dispose of all surplus materials, trim the post, apply wood preservative to top of post and install the reflectors all in accordance with this specification.

SECTION 660

SUPPLY AND INSTALLATION OF CHAIN LINK FENCE

INDEX

660.01 SCOPE

This specification covers the requirements for the construction of chain link fence of the fabric full height type, with no barbed wire on top. See Form 1213 and Form 1214 for details.

660.02 DEFINITIONS

For the purpose of this specification, the following definitions shall apply:

Fence Post - An upright tubular or fabricated steel member for supporting fencing material.

Line Posts - Fence posts spaced at regular intervals between terminal posts throughout each stretch of fence.

Terminal Posts - Fence posts which include end, gate, corner and straining posts.

End Posts - Fence posts positioned at the ends of a stretch of fence.

Gate Posts - The two fence posts forming a gateway.

Corner Posts - Fence posts positioned at corners, and changes of direction greater than ten degrees.

Straining Posts - Fence posts positioned at changes in grade greater than thirty degrees.

Top Rail - A tubular or fabricated steel section continuously joined by means of sleeves or couplings throughout each stretch of fence extending between terminal posts.

Brace Rail - A tubular or fabricated steel section used for bracing terminal posts.

Bottom Wire - Wire installed at the bottom of the fence and extending through each stretch of fence between terminal posts.

Fittings - Mechanical connections of various designs, shapes and metals to join fence components into an integral structure.

Wire Ties - Wire that is used to tie chain link fence fabric to the line posts, bottom wires and top rails or top wires.

Knuckled - The type of selvage obtained by interlocking adjacent wire ends, in pairs, and then bending the wire ends back into a closed loop.

660.03 MATERIALS

660.03.01 Fence Fabric

The steel wire for chain link fence fabric shall conform to Canadian General Standards Board CAN/CGSB-138.1.

The fabric shall be of the width as specified in the drawings, or as specified in the unit price table. Typical widths are 1200 millimetres and 1800 millimetres.

The chain link fence fabric shall be industrial quality, Type 1 Steel Fabric 9 gauge with galvanized wire mesh. The mesh shall be a uniform 50 millimetre diamond pattern.

660.03.02 Line Posts

Line posts shall be 60.3 millimetre O.D., standard continuous weld schedule 40 galvanized steel pipe, and shall conform to Canadian General Standards Board CAN/CGSB-138.2. The minimum weight per metre shall be not less than 5.45 kilograms. The length shall be 838 millimetres longer than the height of the fabric.

660.03.03 End, Corner and Straining Posts

End and Straining posts shall be 88.9 millimetre O.D., standard continuous weld schedule 40 galvanized steel pipe, and shall conform to Canadian General Standards Board CAN/CGSB-138.2. The minimum weight per metre shall be not less than 11.22 kilograms. The length shall be 1067 millimetres longer than the height of the fabric.

660.03.04 Gate Posts

For gates of up to 2.4 metres in height, the following shall apply for the posts. The length shall be 1067 millimetres longer than the height of the fabric.

Gate posts shall comprise standard continuous weld schedule 40 galvanized steel pipe conforming to Canadian General Standards Board CAN/CGSB-138.2. The length shall be 1067 millimetres longer than the height of the fabric.

For gate posts for use with single gates of span up to 3.6 metres, and double gates of span up to 7.3 metres. The post O.D. shall be 88.9 millimetres. The minimum weight per metre shall be not less than 11.22 kilograms.

For gate posts for use with single gates of span of over 3.6 metres and to up to 4.6 metres, and double gates of span of over 7.3 metres and to up to 9.1 metres, the post O.D. shall be 114.9 millimetres. The minimum weight per metre shall be not less than 15.92 kilograms.

For gate posts for use with single gates of span of over 4.6 metres and to up to 7.6 metres, and double gates of span of over 9.1 metres and to up to 15.2 metres, the post O.D. shall be 168.3 millimetres. The minimum weight per metre shall be not less than 28.3 kilograms.

660.03.05 Top Rails and Brace Rails

Top Rails and Brace Rails shall comprise standard continuous weld schedule 40 galvanized steel pipe of 42.9 millimetre O.D. with plain ends, conforming to CAN/CGSB-138.2. The lengths shall be random lengths.

660.03.06 Bottom Wire

The diameter of the wire shall be 5.0 millimetres. The wire shall be zinc-coated with not less than 610 grams per square metre. The mass per unit area of zinc coating shall conform to CSA G162.1.

660.03.07 Gates

Gates shall be in sizes defined as the distance between the inside faces of the gate posts.

For gates of up to 2.4 metres in height, the gate frames shall be made from 42.9 millimetre O.D. galvanized pipe. Gates shall be constructed from galvanized steel pipe frames and braces, conforming to CAN/CGSB-138.4. All joints shall be electrically welded and hot-dip galvanized after welding.

All gates shall be supplied with galvanized malleable iron hinges, latch and latch catch, and shall be capable of opening approximately 180 degrees. Gate latches shall be

suitable for the use of padlocks, which may be attached and operated from either side of the gate.

Gates shall be supplied completely assembled, including the fabric. Gate fabrics shall be similar to adjacent fence fabric.

Double gates shall have a centre rest with iron foot for closed position and chain hold open when open. The double gates shall have braces comprising 33.3 millimetre O.D. galvanized steel pipe.

660.03.08 Fittings and Accessories

All required fittings, accessories, and galvanizing of such material shall conform to CAN/CGSB-138.4.

All posts shall be fitted with waterproof galvanized metal caps designed to fit and fasten securely over the posts and carry the top rail in a horizontal position.

Fasteners for attaching fence fabric to posts, bottom wire, and top rail shall be 3.5 millimetre aluminum or galvanized steel wire.

Stretch bars shall consist of 5 millimetre x 20 millimetre galvanized steel.

Stretch bar fastening bands shall be fabricated from 3 millimetre x 20 millimetre galvanized steel or 5 millimetre x 20 millimetre aluminum.

Top rail sleeve couplers shall be galvanized, be of the outside sleeve type, and be at least 178 millimetres in length.

Touch-up paint shall be zinc pigmented paint conforming to CGSB 1-GP-178Ma.

660.03.09 Concrete

Concrete for post holes shall have a compressive strength of at least 15 MPa at 28 days.

660.04 CONSTRUCTION

The fence shall be installed at the location indicated in the drawing, and to the lines designated by the Owner’s Representative.

The work shall be carried out in accordance with CAN/CGSB-138.3.

660.04.01 Site Preparation

Prior to the installation of the fence, the Contractor shall remove any debris, and trim and contour the ground to correct ground undulations, so as to obtain a smooth uniform gradient for the fence.

The Contractor shall cut off at ground level, such trees, stumps and brush and remove and dispose of such logs, debris and overhanging branches that would interfere with the installation of the fence.

660.04.02 Post Installation

Post spacing shall be equal horizontal distances. The spacing shall not be greater than 2400 millimetres. All posts shall be placed in a vertical position and set accurately in line and position, as required by the Owner's Representative.

All posts shall be cut to the required height above the ground so as to present a smooth and uniform profile.

Straining posts shall be installed at equal intervals not exceeding 150 metres. Additional straining posts shall be installed where changes in vertical alignment exceed 30 degrees.

Horizontal deflections in the fence alignment of 10 degrees or more shall be considered as corners, and corner posts shall be installed.

End posts shall be installed at each end.

All posts set in Other Material, or loose rock, or where overburden to solid rock is 450 millimetres or greater, shall be set in concrete footings. The concrete footings shall be domed above ground to shed water.

Concrete footings for line posts shall be at least 250 millimetres wide and at least 1067millimetres deep.

Concrete footings for terminal posts shall be at least 300 millimetres wide and at least 1220 millimetres deep.

Where the size of the hole exceeds the minimum dimensions of the footings, the Contractor shall; place the footing against undisturbed ground, or shall backfill the hole with suitable Other Material in layers, compact each layer to 95% of Proctor Density, and then excavate the hole to the required minimum dimensions.

For posts in solid rock or where overburden is less than 450 millimetres, holes for the posts shall be drilled in the rock to a minimum depth of 380 millimetres with a diameter 25 millimetres greater than the outside diameter of the post. The annular space around the post shall be filled with non shrink cement grout.

Posts shall be set in the ground so as to give the required height above ground.

Concrete placing, curing and protection from the elements shall conform to the requirements of Section 904

660.04.03 Rail, Brace and Gate Installation

Rails, braces, gates, or fence fabric shall not be placed until the footings have cured a minimum of 5 days.

Top rails shall be fastened securely to line post tops using waterproof line post caps. In sag locations, it may be necessary to drill the post and cap, and fasten with a bolt, to ensure a secure fit.

Install brace rails between all terminal posts and the nearest line post on each side. The brace rails shall be placed in the centre of the panel and parallel to the ground.

Gates shall be installed with the fabric on the side farthest from the roadway, and with the barbed edge at the top. Double gates shall have a steel gate centre rest installed.

Gates shall be installed such that when closed, the bottom of the gates are 40 millimetres above the finished grade.

The Contractor shall perform such grading as may be necessary to ensure that the surface grade, within the required gate sweep area, shall be low enough to permit free movement of the gate.

660.04.04 Tension Wire and Fence Fabric Installation

Install bottom tension wire, stretch tightly to the tension recommended by the manufacturer and fasten securely to terminal posts with turnbuckles and tension bar bands. The fence fabric shall be stretched tight and fastened with tension bars secured to terminal posts. Tension bars shall be secured to terminal posts at 300 millimetre intervals. The fabric shall be installed on the side of the post nearest the roadway, with the barbed edge at the top.

The fabric shall be securely fastened to the line posts, bottom wire and top rail with tie wires. The tie wires shall be placed at 250 millimetre intervals. The tie wires shall be secured with a minimum of two twists.

660.04.05 Paint Touch-up

Damaged parts shall not be used in the work. However, surface scratches may be painted.

Surfaces to be treated with paint shall be thoroughly cleaned with a wire brush to remove loose and cracked coatings. The scratched area shall be painted with two coats of zinc pigmented paint.

660.04.06 Clean-up

After fence installation, the Contractor shall clean and trim the site, and restore the ground to a neat condition.

660.05 MEASUREMENT FOR PAYMENT

660.05.01 Total Composite Fence Structure Measurement

Measurement for payment will be made in units of each; for each completed chain link fencing structure comprising all specified fence fabric, posts and gates, all as specified in the drawings.

660.05.02 Fence Item Measurement

660.05.02.01 Chain link Fence

Measurement will be made of the actual length of the fence fabric installed, following the contour of the ground. Gate openings will not be included in this measurement.

The measurement shall be calculated in metres, rounded to one decimal place.

660.05.02.02 Terminal Posts for Chain Link Fence

Measurement will be made in units for each end post, gate post, corner post, and straining post installed, as required by the Owner’s Representative.

660.05.02.03 Gate for Chain Link Fence

Measurement will be made in units for each type and size of gate installed, as required by the Owner’s Representative. The two gates comprising a set of double gates shall be counted as one double gate.

660.06 BASIS OF PAYMENT

660.06.01 Basis of Payment for Composite Fence Structure

Payment at the lump sum contract price for the supply and installation of the chain link fence specified in the drawings, shall be compensation in full for all materials, labour and use of equipment: to prepare the fence line for fence installation, to supply all fence posts, fence fabric, rails, wire, gates, fittings and accessories, together with concrete and grout for the footings, to excavate post holes, to install the posts, fence, gates, and fittings according to the drawings, to provide paint touch-up to minor scratches, and to clean up the site on completion of the fence installation.

660.06.02 Basis of Payment for Fence Items

660.06.02.01 Basis of Payment for Chain Link Fence

Payment at the contract price for the supply and installation of the chain link fence of the specified height, shall be compensation in full for all materials, labour and use of equipment: to prepare the fence line for fence installation, to supply all line posts, fence fabric, rails, wire, fittings and accessories, together with concrete and grout for the footings, to excavate the line post holes, to install the line posts, fence, and fittings according to the Owner's Representatives requirements, to provide paint touch-up to minor scratches, and to clean up the site on completion of the fence installation.

Payment for the end, straining, corner and gate posts, shall be compensated for separately under terminal posts for chain link fence.

Payment for the supply and installation of gates, if any, will be compensated for separately, under an item for the gates.

660.06.02.02 Basis of Payment for Terminal Posts

Payment at the contract price for the supply and installation of the required terminal posts, shall be compensation in full for all materials, labour and use of equipment: to supply the terminal posts of the required height for the fabric, and to supply post caps, and concrete and grout for the footings, to excavate post holes, to install the posts and post caps according to the Owner's Representatives requirements, to provide paint touch-up to minor scratches, and to clean up the site on completion of the post installation.

660.06.02.03 Basis of Payment for Gate for Chain Link Fence

Payment at the contract price for the supply and installation of a chain link fence gate of the specified type, height and gate opening width, shall be compensation in full for all

materials, labour and use of equipment: to prepare the gate opening for the gate, to supply the completed gate, hinges, latch, latch catch, and fittings, to install the gate according to the Owner's Representatives requirements, to provide paint touch-up to minor scratches, and to clean up the site on completion of the gate installation.

In the case of a double gate, payment at the contract price for the supply and installation of the gate, shall also include compensation in full for all materials, labour, and use of materials: to supply a centre rest together with concrete and grout for the centre rest footing, to excavate the hole for the centre rest, and to install the centre rest.

Payment for the gate posts, shall be compensated for separately under terminal posts for chain link fence.