.5 In-filtration Testing: The ground water table around the manhole must be at least 1 foot above the highest fabrication weld elevation of the section being examined. The joints may be examined visually for leaks. **No leaks should be observed.** If a leak is observed, it will be necessary to lower the water table below the area of the leak, and to completely dry and clean the area prior to undertaking a repair weld.

.6 Ex-filtration Testing: Establish a water level within the manhole that is at least 1 foot above the highest fabrication weld. Allow to stand for a minimum of 12 hours. *(The profile wall PE pipe will 'relax' due to the imposed internal pressure by minor deflection of the inside surface of the profile wall, increasing the volume inside the pipe.)* Add additional water as required to return the height of water to the original level. Let stand for 1 hour and measure the amount of water required to return the standing head to the initial level. Repeat three (3) times. The volume of 'make-up' water required in each subsequent step should be less than the preceding step. The values of 'make-up' water over time should trend to zero (0).

END OF SECTION

.....1999-12-16

PART 1 GENERAL

1.1 Related Sections

.1 Section 02315 - Excavating, Trenching and Backfilling.

.2 Section 02317 - Roadway Excavation, Embankment and Compaction.

.3 Section 02701- Aggregates: General

.4 Section 01330 - Submittal Procedures

.5 Section 01355 - Waste Management and Disposal

.6 Section 01610 - Basic Product Requirements

1.2 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C 117-95, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 698-91(1998), Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m3).

.4 ASTM D 1248-98, Standard Specification for Polyethylene Plastics Molding and Extrusion Materials for Wire and Cable.

.5 ASTM F 667-97, Standard Specification for 8, 10, 12, and 15 inch Corrugated Polyethylene Tubing and Fittings.

.2 Canadian Standards Association (CSA)

.1 CAN3-G401-93, Corrugated Steel Pipe Products.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire.

.2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

1.3 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Inform Engineer at least four (4) weeks prior to commencing work, of proposed source of bedding materials and provide access for sampling.

1.4 Material Certification

.1 Submit manufacturer's test data and certification at least four (4) weeks prior to commencing work.

.2 Certification to be marked on pipe.

1.5 Delivery, Storage and Handling

.1 Deliver, store and handle materials in accordance with Section 01610 - Basic Product Requirements.

PART 2 PRODUCTS

2.1 Corrugated Steel Pipe

.1 Corrugated steel pipe: to CAN3-G401.

.2 Water-tight cut-off collars: as indicated.

.3 Prefabricated end sections: as indicated.

.4 Corrugated fluming: to CAN3-G401.

2.2 Granular Bedding and Backfill

.1 Granular bedding and backfill material to Section 02701- Aggregates: General and following requirements:

.1 Crushed pit run or screened stone, gravel or sand.

PART 3 EXECUTION

3.1 Trenching

.1 Do trenching work in accordance with Section 02315- Excavating Trenching and Backfilling.

.2 Obtain Engineer's approval of trench line and depth prior to placing bedding material or pipe.

3.2 Bedding

.1 Dewater excavation, as necessary, to allow placement of culvert bedding in the dry.

.2 Place minimum thickness of 200 mm of approved granular material on bottom of excavation and compact to minimum 95% maximum density to ASTM D 698.

.3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by Engineer, free from sags or high points.

.4 Place bedding in unfrozen condition.

3.3 Laying Corrugated Steel Pipe Culverts

.1 Commence pipe placing at downstream end.

.2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.

.3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.

.4 Lay paved invert or partially lined pipe with longitudinal centre line of paved segment coinciding with flow line.

.5 Do not allow water to flow through pipes during construction except as permitted by Engineer.

3.4 Joints: Corrugated Steel Culverts

.1 Corrugated steel pipe:

.1 Match corrugations or indentations of coupler with pipe sections before tightening.

.2 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.

.3 Insert and tighten bolts.

.4 Repair spots where damage has occurred to spelter coating by applying two coats of asphalt paint approved by Engineer or two coats of zinc rich epoxy paint.

.2 Structural plate:

.1 Erect in final position by connecting plates with bolts at longitudinal and circumferential seams.

.2 Drift pins may be used to facilitate matching of holes.

.3 Place plates in sequence recommended by manufacturer with joints staggered so that not more than three plates come together at any one point.

.4 Draw bolts up tight, without overstress, before beginning backfill.

.5 Repair spots where damage has occurred to spelter coating by applying two coats of asphalt paint or two coats of zinc rich epoxy paint approved by Engineer.

3.5 Backfilling

.1 Backfill around and over culverts as indicated or as directed by Engineer.

.2 Place granular backfill material, in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.

.3 Compact each layer to 95% maximum density to ASTM D 698 taking special care to obtain required density under haunches.

.4 Protect installed culvert with minimum 500 mm cover of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 1:2.

.5 Place backfill in unfrozen condition.

3.6 Fluming

.1 Assemble and install fluming as indicated.

.2 Set top edges of fluming flush with side slope.

END OF SECTION

.....1996-06-30

PART 1 GENERAL

1.1 Related Work

.1 Section 01330 - Submittal Procedures

.2 Section 02231- Clearing and Grubbing

.3 Section 02371- Rip-Rap

.4 Section 02631- Manholes and Catch Basins.

.5 Section 02701- Aggregates: General

1.2 References

.1 ASTMC117-90, Test Method for Material Finer Than 0.075mm Sieve in Mineral Aggregates by Washing.

.2 ASTMC136-84a, Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTMD698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m3).

.4 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire.

.5 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

1.3 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Submit to Engineer for testing, samples of following materials at least four (4) weeks prior to commencing work:

.1 Two samples 3600mm square of flexible lining including joint or intersecting joints if included in work.

.2 Two samples 600mm long of flexible lining including joint or intersecting joints if included in work.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures.

.2 Indicate following items:

.1 Liner panels, details of anchoring panels, material, thickness and reinforcement.

.2 Projections through liner and method of sealing.

.3 Piping.

.4 Sluice or slide gates.

.5 Valves.

1.5 Classification of Excavation

.1 General: excavation of rock, common and unclassified materials shall include placing of suitable excavated materials in embankment fills or dikes, and disposal of unsuitable material.

.2 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of]m^3.

.3 Common excavation: excavation of all materials of whatever nature, which are not included under definition of rock excavation, including dense tills, hardpan and frozen materials.

.4 Unclassified excavation: excavation of deposits of whatever character encountered in work.

1.6 Measurement for Payment

.1 Construction of sewage lagoon: lump sum payment.

PART 2 PRODUCTS

2.1 Materials

.1 Rip-rap: to Section 02371- Rip-Rap.

.2 Granular material to Section 02701- Aggregates: General and following requirements:

.1 Stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTMC136 and ASTMC117. Sieve sizes to CAN/CGSB-8.1.

.3 Table

PART 3 EXECUTION

3.1 Stripping of Topsoil

.1 Commence topsoil stripping of area as directed by Engineer after area has been cleared and grubbed.

.2 Strip topsoil to depths as directed by Engineer. Avoid mixing topsoil with subsoil.

.3 Stockpile in locations as directed by Engineer.

.4 Dispose of unused topsoil as directed by Engineer.

3.2 Excavation

.1 Excavate effluent ditches, by-pass ditches or re-routed surface drainage ditches as indicated.

.2 Remove unsuitable materials from dike foundation to depth as indicated.

.3 Excavate basin for lagoon to lines and elevations indicated.

3.3 Dike Construction

.1 Construct dikes as indicated.

.2 Place dike material in unfrozen condition.

.3 Place dike materials in layers of 150mm compacted thickness. Compact each layer to 95% maximum density to ASTM D 698.

.4 Hand finish or grade slopes and top of completed dike to remove stones over 25 mm in size and other debris.

.5 Finish slopes and top of dike as indicated.

.6 Rip-rap areas indicated in accordance with Section 02454- Rip-Rap.

3.4 Installation of Sewers

.1 Construct and install required manholes in accordance with Section 02631- Manholes and Catch Basins.

.2 Install valves, sluice gates, and slide gates in accordance with manufacturer's recommendations.

3.5 Flexible Lining

.1 Place compacted layer of granular material in unfrozen condition on bottom and sides of lagoon as indicated.

.2 Check surface on which flexible liner is to be placed and remove projections that may puncture lining.

.3 Place liner panels as directed by Engineer or as indicated. Anchor panels temporarily using sand bags or other weights that will not damage liner.

.4 Excavate anchor trenches at locations as indicated.

.5 Place and secure liner in anchor trenches.

.6 Backfill and compact anchor trenches.

.7 Clean edges of panels to be spliced and join as outlined in manufacturer's recommendations.

.8 Complete anchoring of panels at base of slope.

.9 Cut liner sheets to fit accurately around inlets, outlets, sleeves, concrete structures and other projections through lining.

.10 Complete flashing and sealing of penetrations as indicated.

.11 Place cover blanket as indicated.

3.6 Rip-Rap

.1 Place rip-rap in accordance with Section 02371- Rip-Rap and as indicated.

3.7 Clean Up

.1 Remove surplus material and debris from site.

END OF SECTION

Part 1 GENERAL

1.1 Related Sections

.1 Section 02315 – Excavating, Trenching and Backfilling

.2 Section 03302 – Cast-In-Place Concrete.

.3 Section 01330 - Submittal Procedures.

1.2 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Allow continual sampling by Engineer during production.

.3 Provide Engineer with access to source and processed material for sampling.

.4 Install sampling facilities at discharge end of production conveyor, to allow Engineer to obtain representative samples of items being produced.

.5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

Part 2 PRODUCTS

2.1 Materials

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.

.2 Flat and elongated particles of coarse aggregate: to ASTM D4791.

.1 Greatest dimension to exceed five times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Natural sand.

.2 Manufactured sand.

.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:

.1 Crushed rock.

.2 Gravel and crushed gravel composed of naturally formed particles of stone.

.3 Light weight aggregate, including slag and expanded shale.

2.2 Source Quality Control

.1 Inform Engineer of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.

.2 If, in opinion of Engineer, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.3 Advise Engineer 4 weeks in advance of proposed change of material source.

.4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 EXECUTION

3.1 Preparation

.1 Aggregate source preparation

.1 Prior to excavating materials for aggregate production, clear area to be worked, and strip unsuitable surface materials. Dispose of cleared and unsuitable materials as directed by Engineer.

.2 When excavation is completed dress sides of excavation to nominal [1.5:1] slope, and provide drains or ditches as required to prevent surface standing water.

.3 Trim off and dress slopes of waste material piles and leave site in neat condition.

.2 Processing

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Engineer.

.3 Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer.

.4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

.3 Handling

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.4 Stockpiling

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Engineer.

.2 Stockpile aggregates in sufficient quantities to meet Project schedules.

.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.

.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Engineer within 48 h of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:

.1 Max 1.5 m for coarse aggregate and base course materials.

.2 Max 1.5 m for fine aggregate and sub-base materials.

.3 Max 1.5 m for other materials.

.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.9 Do not cone piles or spill material over edges of piles.

.10 Do not use conveying stackers.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in neat compact stockpiles as directed by Engineer.

.3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

END OF SECTION

.....1996-06-30

PART 1 GENERAL

1.1 Related Sections

.1 Section 02317 - Roadway Excavation, Embankment and Compaction.

.2 Section 02701- Aggregates General

.3 Section 02722- Granular Sub-base

1.2 References

.1 ASTMC117-90, Test Method for Material Finer Than 0.075mm Sieve in Mineral Aggregates by Washing.

.2 ASTMC131-89, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTMC136-92, Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTMD698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft3) (600kN-m/m3).

.5 ASTMD1557-91, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft3) (2,700kN-m/m3).

.6 ASTMD1883-92, Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.

.7 ASTMD4318-84, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.8 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.

.9 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

1.3 Delivery, Storage, and Handling

.1 Deliver and stockpile aggregates in accordance with Section 02701- Aggregates General. Stockpile minimum 50% of total aggregate required prior to commencing operation.

.2 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

PART 2 PRODUCTS

2.1 Materials

.1 Granular base: material to Section 02701- Aggregates: General and following requirements:

.1 Crushed stone or gravel.

.2 Gradations to be within limits specified when tested to ASTMC136. Sieve sizes to CAN/CGSB-8.1.

.1 Gradation to:

Sieve Designation	% Passing		
	1	2	3
100 mm	-	-	-
75 mm	-	-	-
50 mm	100	-	-
37.5 mm	70-100	-	-
25 mm	-	100	-
19 mm	50-75	-	100
12.5 mm	-	65-100	70-100
9.5 mm	40-65	-	-
4.75 mm	30-50	35-60	40-70
2.00 mm	-	22-45	23-50
0.425 mm	10-30	10-25	7-25
0.180 mm	-	-	-
0.075 mm	3-8	3-8	3-8

.2 Material to level surface depressions to meet gradation (2) limits in accordance with 2.1.1.2.1.

.3 Liquid limit: to ASTMD4318, maximum25

.4 Plasticity index: to ASTMD4318, maximum6

.5 Los Angeles degradation: to ASTMC131. Max. % loss by weight: 45

.6 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTMC136.

Passing		Retained on
50 mm	to	25 mm
25 mm	to	19.0 mm
19.0 mm	to	4.75 mm

.7 Soaked CBR: to ASTMD1883, min 80, when compacted to 100% of ASTMD1557.

PART 3 EXECUTION

3.1 Sequence of Operation

.1 Place granular base after sub-base surface is inspected and approved by Engineer.

.2 Placing

.1 Construct granular base to depth and grade in areas indicated.

.2 Ensure no frozen material is placed.

.3 Place material only on clean unfrozen surface, free from snow and ice.

.4 Begin spreading base material on crown line or on high side of one-way slope.

.5 Place material using methods which do not lead to segregation or degradation of aggregate.

.6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.7 Place material to full width in uniform layers not exceeding 150mm compacted thickness. Engineer may authorize thicker lifts (layers) if specified compaction can be achieved.

.8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.9 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Engineer before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compacting

.1 Compact to density not less than 100% maximum dry density in accordance with ASTMD1557.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.

.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.5 Proof rolling

.1 For proof rolling use standard roller of 45400kg gross mass with four pneumatic tires each carrying 11350kg and inflated to 620kPa. Four tires arranged abreast with centre to centre spacing of 730mm.

.2 Obtain approval from Engineer to use non standard proof rolling equipment.

.3 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, Engineer to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by Engineer.

.2 Backfill excavated subgrade with common material and compact in accordance with Section 02317 - Roadway Excavation, Embankment and Compaction.

.3 Replace sub-base material and compact in accordance with Section 02317 - Roadway Excavation, Embankment and Compaction.

.4 Replace base material and compact in accordance with this section.

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Engineer and replace with new materials in accordance with Section 02722- Granular Sub-base and this section at no extra cost.

3.2 Site Tolerances

.1 Finished base surface to be within plus or minus 10mm of established grade and cross section but not uniformly high or low.

3.3 Protection

.1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by Engineer.

END OF SECTION

Approved: 2002-12-04

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01355 - Waste Management and Disposal.

.2 Section 02701 - Aggregates: General.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C117-95, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D422-63(1998), Standard Test Method for Particle-Size Analysis of Soils.

.4 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.5 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft^3) (2,700kN-m/m^3).

.6 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

Part 2 Products

2.1 MATERIALS

.1 Granular sub-base material: in accordance with Section 02701 - Aggregates: General and following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.2.

.3 Table

Sieve Designation	% Passing			
100 mm	-	-	-	-
75 mm	100	100	100	-
50 mm	-	-	-	100
37.5 mm	-	-	-	-
25 mm	55-100	-	-	60-100

Sieve Designation	% Passing			
19 mm	-	-	-	-
12.5 mm	-	-	-	38-70
9.5 mm	-	-	-	-
4.75 mm	25-100	25-85	-	22-55
2.00 mm	15-80	-	-	13-42
0.425 mm	4-50	5-30	0-30	5-28
0.180 mm	-	-	-	-
0.075 mm	0-8	0-10	0-8	2-10

.4 Other Properties as follows:

.1 Liquid Limit: to ASTM D4318, Maximum 25.

.2 Plasticity Index: to ASTM D4318, Maximum 6.

.3 Particles smaller than 0.02 mm: to ASTM D422, Maximum 3%.

.4 Soaked CBR: to ASTM D1883, Min 40 when compacted to 100% of ASTM D1557.

Part 3 Execution

3.1 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Engineer.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Begin spreading sub-base material on crown line or high side of one-way slope.

.6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Engineer may authorize thicker lifts (layers) if specified compaction can be achieved.

.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.10 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density of not less than 98% maximum dry density in accordance with ASTM D698.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compaction to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.4 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Engineer.

END OF SECTION

.....2000-12-05

PART 1 GENERAL

1.1 Related Sections

.1 Section 01330 - Submittal Procedures.

1.2 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM B209-96, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 62-GP-11M-78, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing.

.3 Manual of Uniform Traffic Control Devices for Canada

1.3 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Submit to Engineer at least four (4) weeks prior to commencing work, following samples of materials proposed for use:

.1 Reflective markers.

.2 Galvanized steel posts.

PART 2 PRODUCTS

2.1 Reflective Markers

.1 200 x 100 mm with 20 mm radius corners aluminum base panel with permanently attached reflective sheeting:

.1 Aluminum base panel: to ASTM B209M, 1.6 mm thick, degreased and etched or treated with light amorphous chromate type coating.

.2 Reflective sheeting: to CGSB62-GP-11M, type I, class I, reflectivity level I. Colour: yellow.

2.2 Steel Posts

.1 Steel posts: galvanized steel sign standards 3.2 m long, flanged, "U" shaped in cross section, measuring 65 mm wide by 30 mm deep. Metal thickness: 4.5 mm. Pre-drill bolt holes in locations as indicated.

.2 Bolts: 65 mm long galvanized steel, 9 mm minimum diameter. Each bolt to be complete with two nylon washers, cast block spacer and galvanized steel nut.

PART 3 EXECUTION

3.1 Assembly

.1 Fasten reflective markers to steel posts using bolts, washers, spacers and nuts. Use two bolts for each delineator unit, centered and spaced at 150 mm.

.2 Fasten two reflective markers back to back to each steel post for delineator units installed on two-way roads. Attach single reflective marker to each post for delineator units installed on one-way roads.

3.2 Installation

.1 Do work in accordance with "Manual of Uniform Traffic Control Devices for Canada", (MUTCDC) except where specified otherwise.

.2 Install posts vertically and as indicated and in no case more than 4.0 m nor less than 1.2 m from edge of pavement.

.3 Locate centre of reflective marker 2.4 m above elevation of outside edge of adjacent lane in accordance with MUTCDC and at right angles to road centreline.

.4 On straight alignment, space delineator units at 60 m.

.5 On curves, space delineator units as follows:

Radius of Curve in Metres	Spacing in Metres on Curve	Spacing in Metres in Advance and Beyond		
		First Space	Second Space	Third Space
1500	42	60	60	60
1000	35	60	60	60
500	24	45	60	60
350	20	38	60	60
250	17	32	52	60
200	15	29	46	60
150	13	25	40	60
100	11	20	33	60
75	9	18	28	57
60	8	16	25	51
40	7	13	21	42

.6 Five markers to be always visible to the right of the road on approaches to and throughout horizontal curves.

END OF SECTION

.....1996-06-30

PART 1 GENERAL

1.1 Related Work

.1 Section 01330 - Submittal Procedures

1.2 References

.1 ASTMA307-91, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.

.2 CAN/CSA-O80 Series-M89, Wood Preservation.

.3 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 CAN/CGSB-1.40-M89, Primer, Structural Steel, Oil Alkyd Type.

.5 CAN/CGSB-1.181-92, Ready Mixed Organic Zinc-RichCoating.

.6 CGSB31-GP-107Ma-90, Non-inhibited, PhosphoricAcid Base Metal Conditioner and Rust Remover.

.7 AASHTOM180-79, Corrugated Sheet Steel Beams forHighway Guardrails.

1.3 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Inform Engineer at least four (4) weeks prior to commencing work, of proposed sources of guide rail and components.

PART 2 PRODUCTS

2.1 Materials

.1 Steel W-beam guide rail as indicated and to following requirements:

.1 Steel rail and terminal sections: to AASHTOM180, classA Type1 zinc coated.

.2 Bolts, nuts and washers: to ASTMA307, hot dip galvanized to CSAG164.

.2 Organic zinc-rich coating: to CAN/CGSB-1.181.

.3 Metal conditioner, and paints:

.1 Metal conditioner: to CGSB31-GP-107Ma.

.2 Primer paint for galvanized steel: to CAN/CGSB-1.40.

.4 Sawn timber posts and offset blocks:

.1 Species: SPF

.2 Type: pressure treated in accordance withCAN/CSA-O80 Series.

.3 Grade: 1.

.4 Dimensions: as indicated.

PART 3 EXECUTION

3.1 Erection

.1 Set posts by instrument for alignment, and locations as indicated and as directed by Engineer.

.2 Excavate post holes to depths as indicated and to diameter of 360mm plus or minus 20mm. Compact bottom to provide firm foundation. Set post plumb and square in hole.

.3 Backfill around posts using excavated material and compact in uniform layers not exceeding 150mm compacted thickness.

.4 Leave or make depression approximately 150mm deep around posts until painting is completed, then fill and compact to ground elevation.

.5 Cut off tops of posts as indicated, with tops parallel to grade of pavement edge.

.6 Treat cut tops with two coats of wood preservative.

.7 Construct anchorages to details as indicated. Place and compact backfill for anchors as directed by Engineer.

.8 Erect steel W-beam components to details as indicated. Lap joints in direction of traffic. Tighten nuts to 100N.m torque. Maximum protrusion of bolt 12mm beyond nut.

3.2 Painting Touch up

.1 Galvanized steel-touch up:

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

END OF SECTION