Town of OLDS

CONTRACT SPECIFICATIONS-2018 EDITION

DIVISION 01	GENERAL REQUIREMENTS
DIVISION 02	EXISTING CONDITIONS
DIVISION 03	CONCRETE
DIVISION 05	METAL
DIVISION 10	SPECIALTIES
DIVISION 31	EARTHWORK
DIVISION 32	EXTERIOR IMPROVEMENTS
DIVISION 33	UTILITIES
DIVISION 34	TRANSPORTATION
DIVISION 50	SPECIFICATION DRAWINGS

Town of Olds

TOWN OF OLDS ENGINEERING SERVICES

REQUEST FOR CHANGES TO PUBLICATIONS

Please use this form when making requests for changes or a reference or spelling error is noticed to or in a Town of Olds publication. Please indicate which publication(s) is affected. Please use multiple Change Request forms for multiple requests.

Requests forms to be returned to the Town of Olds Engineering Services or e-mailed to operations@olds.ca.

☐ - CONTRACT SPECIFICATION

☐ - UNIT PRICE CONTRACT DOCUMENT

☐ - DEVELOPMENT AGREEMENT

☐ - DESIGN GUIDELINES

CHANGE REQUESTED:

SECTION NUMBER_____ ☐- SEE ATTACHMENT
SECTION NAME _____

DETAILS OF REQUESTED CHANGE:

BACKGROUND ON WHY CHANGE HAS BEEN REQUESTED:

REQUESTED BY _____ PHONE NUMBER _____

DEPARTMENT _____ DATE _____

REVIEWED BY _____ DATE REVIEWED_____

☐ REQUEST APPROVED. ☐ REQUEST DENIED. ☐ POSTPONED TILL NEXT YEAR

☐ MORE INFORMATION REQUIRED FROM APPLICANT

INTRODUCTION

DIVISION 01 GENERAL REQUIREMENTS

DIVISION 02 EXISTING CONDITIONS

DIVISION 03 CONCRETE

DIVISION 05 METAL

DIVISION 10 SPECIALTIES

DIVISION 31 EARTHWORK

DIVISION 32 EXTERIOR IMPROVEMENTS

DIVISION 33 UTILITIES

DIVISION 34 TRANSPORTATION

DIVISION 50 SPECIFICATION DRAWINGS

This document is part of three publications produced by The Town of Olds Engineering Services: The Development Agreement; Design Guidelines; and Contract Specifications.

The Contract Specifications provides:

- A basic method for the execution of constructing Town infrastructure,
- The Town's expectations of safety, site conditions, workmanship etc.,
- Technical information of products acceptable to meet Town standards.

The bases for these specifications originates from the National Master Specifications (NMS - primarily) and the Canadian Master Specifications (CMS). The City of Edmonton (Edm), City of Calgary (Cal) and Alberta Transportation (AT) construction specifications have also been used as reference sources. The footer of each Section indicates the primary source of information used for that Section and may also contain a listing of *secondary* sources used. Where a significant amount of the information has been modified for The Town of Olds requirements, T.O.O. will be noted.

The following Specifications have been created specifically for The Town of Olds and do not have an equivalent in the NMS or CMS:

- 01 61 10 New Product Approval
- 32 31 27 Wildlife Fencing
- 33 45 00 Sewer Cleaning
- 33 45 10 Inspection of Sewers
- 33 71 16 Horizontal Directional Drilling

The Section numbers have been chosen to fit within the Division where they are located.

Section 01 14 00	Work Restrictions
Section 01 21 00	Allowances
Section 01 23 00	Alternatives
Section 01 29 00	Payment Procedures
Section 01 31 00	Project Coordination
Section 01 32 00	Construction Progress Documentation
Section 01 33 00	Submittal Procedures
Section 01 35 29	Health and Safety Requirements
Section 01 35 43	Environmental Procedures
Section 01 41 00	Regulatory Requirements
Section 01 42 00	References
Section 01 45 00	Quality Control
Section 01 51 00	Temporary Utilities
Section 01 52 00	Temporary Construction
Section 01 53 40	Hauling and Haul Roads
Section 01 55 26	Traffic Control
Section 01 57 13	Temporary Erosion & Sediment Control
Section 01 58 99	Temporary Construction Signing
Section 01 61 00	Common Product Requirements
Section 01 61 10	New Product Approval
Section 01 74 11	Site Cleaning
Section 01 77 00	Closeout Procedures

Section 01 78 00 Closeout Submittals

1. GENERAL

This Section provides common work restrictions that may affect a construction project. The contact information provided is for general reference however it does not negate the Engineer or Contractor from contacting Alberta One Call before proceeding to work.

1.1 RELATED WORK

This section describes requirements applicable to all Sections within Divisions 02 to 34.

1.2 GENERAL

.1 For locations of underground utilities and pipelines:

Alberta One-Call
1-800-242-3447

.2 The Contractor shall be responsible for notifying the appropriate Town Departments and private utility companies prior to carrying out operations in the vicinity of any existing Town infrastructure or natural feature, at least one week in advance of any such operations being carried out. The Contractor shall arrange a site meeting with the Consultant and one representative of the appropriate Town Departments or private utility companies.

1.3 WORKING AROUND EXISTING UTILITIES

.1 In the case of water, sanitary, and storm sewer lines:

Town of Olds
Operational Services
Phone: 403-507-4822

.2 In the case of overhead or underground electrical power lines, street lighting, and traffic signals:

Fortis Alberta Inc. (Calgary Office)
Phone: 403-514-400

.3 In the case of overhead or underground electrical power lines and street lighting within the rural areas of the Town boundary:

Fortis Alberta Inc. (Calgary Office)
Phone: 1.403-514-4000

.4 In the case of overhead or underground electrical power lines and street lighting along Highway 2A and 27 Right-of-Way.

Alberta Transportation
Phone: 403-340-4964

.5 In the case of overhead or underground electrical power transmission lines:

AltaLink Management Ltd. (Calgary Office)
Phone: 1-866-451-7817

.6 In the case of underground natural gas distribution pipelines within the Town:

ATCO Gas (Town of Olds Office)
Phone: 403-556-3798

.7 In the case of underground natural gas transmission pipelines:

ATCO Pipelines (Calgary Office)
Phone: 403-245-7060

.8 In the case of overhead or underground telecommunication lines (including fibre-optic):

Shaw CableSystems Ltd. (Red Deer Office)
Phone: 403-346-6633

Telus Communication Inc.
Phone: 1-800-317-3363

MTS Allstream (Formerly A.T. & T Communications Inc.)
Phone: 1-866-282-0111 (Manitoba Office)

O-Net
Phone: 1-403-556-6638

1.4 WORKING AROUND EXISTING SURFACE INFRASTRUCTURE

.1 In the case of road and sidewalk:

Town of Olds
Engineering Services Department
Phone: 403-556-6981

.2 In the case of trees and/or natural features:

Town of Olds
Operation Services
Phone: 403-556-6981

1.5 CONNECTIONS TO EXISTING MAINS

1. A contractor may not connect a new water pipe (main or service) or appurtenance to the existing, operational water main system without contacting Operations Services and obtaining a utility excavation permit.

2. In new developments, where an existing phase of that development has water mains that have been commissioned, but have not had a Final Acceptance Certificate (FAC) issued, the Consultant and/or Contractor will require the approval of Engineering Services to connect the “under construction” water mains to the existing but non-FAC’d main.

1.6 NOISE GENERATING WORK

Carry out noise generating work in accordance with The Town of Olds Community Standards Bylaws 2015-08, which states, in part, as follows:

“With the exception of the activities referred to in section 6 herein, unless permission from the Development Authority is first obtained, no person shall use, operate or allow to be used or operated any tools, machinery or equipment so as to create a noise, or disturbance which may be heard in a residential building between the hours of ten o’clock in the evening and seven o’clock in the morning of any day.”

1.7 MEASURE OF PAYMENT

.1 The Contractor, at their expense, is to conduct operations in accordance with the requirements of the authority having jurisdiction.

.2 This item has no payment clause.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes information regarding the following:

- Cash Allowances
- Contingency Allowances

1.1 RELATED SECTIONS

.1 Instruction to Bidders — Section 00 21 13

.2 General Conditions — Section 00 71 00

1.2 CASH ALLOWANCES – STIPULATED PRICE AND COST PLUS CONTRACTS

.1 Cash allowances, unless otherwise specified, cover the Contractor's net cost of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation and other authorized expenses incurred in performing Work.

.2 Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.

.3 Contract Price will be adjusted by written order to provide for an excess or deficit to each cash allowance.

.4 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in Contract Documents.

.5 Progress payments on accounts of work authorized under cash allowances shall be included in Consultant's monthly certificate for payment.

.6 Schedule shall be prepared jointly by Consultant and Contractor to show when items called for under cash allowances must be authorized by Consultant for ordering purposes so that progress of Work will not be delayed.

1.3 CONTINGENCY ALLOWANCE – UNIT PRICE CONTRACTS

.1 The disposition of Contingency Allowances is detailed in Section 00 71 00 - General Conditions, Article 49.

.2 Do not include in the Contract Price, additional sums for products, installation, overhead, or profit.

.3 Expenditures under the contingency allowance will be authorized in accordance with the procedures provided in Section 00 71 00 - General Conditions, Article 46 (Changes in Work) and evaluated as detailed in Article 47 (Valuation of Changes).

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes information regarding the procedures applicable to Alternatives.

1.1 RELATED SECTIONS

.1	Instruction to Bidders	Section 00 21 13
.2	General Conditions	Section 00 71 00
.3	Common Product Requirements	Section 01 61 00
.4	New Product approval	Section 01 61 10

1.2 ALTERNATIVES

.1 General

a. The Contract is based on the materials, equipment, and methods described in the Contract Documents.

b. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution per Section 01 61 10.

c. The contractor shall allow enough time (minimally 2 weeks up to 6 weeks) for the Engineer to evaluate the alternative; no extension to the contract completion date will be made due to this proposal.

.2 Approval of Alternatives

a. The Engineer shall be the sole judge as to the merits of proposed alternatives and their acceptance.

b. Do not substitute materials, equipment, or methods unless the Engineer has specifically approved such substitution for this work.

c. Alternatives will be considered on the basis of the following:

i. Savings in long term maintenance costs,

ii. Improvement in quality,

iii. Compatibility with other components,

iv. Environmental considerations for both product (recyclable material content or recyclability after use / life span) and construction method,

v. Aesthetics, and

vi. Constructability.

.3 "Or Equal"

Wherever the terms "or equivalent", "or equal", "or approved equal" appears after specific types of materials and items shown on the drawings or specified, they shall be construed to mean as being equal in the opinion of the Engineer, in material content, workmanship, and quality to that designated as being the minimum acceptable standard. The Engineer's written approval must be obtained for proposed alternatives.

.4 Use of Alternatives

If the Contractor elects to supply and/or install an alternative material to that specified or shown on the drawings, the Contractor shall be responsible for making all consequent adjustments, at his own cost, to make the alternative fit into the work as specified and these consequent costs shall be deemed to be included in the price bid for the alternate. The Contractor shall be responsible for any costs incurred by the Engineer for changes to the drawings or specifications as a result of any substitution.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes information regarding the following:

- Metric Standards
- Mobilization and Demobilization
- Traffic Accommodation Payment Clause
- Progress Payments
- Interim (Seasonal) Performance of Work
- Substantial Performance of Work
- Release of Holdback Procedures

1.1 RELATED SECTIONS

.1	Instruction to Bidders	Section 00 21 13
.2	General Conditions	Section 00 71 00
.3	Closeout Procedures	Section 01 77 00

1.2 METRIC STANDARDS

These specifications are metric and metric usage is based upon SI units in accordance with CSA Standard CAN3 Z234 - Canadian Metric Practice Guide.

1.3 MOBILIZATION AND DEMOBILIZATION

.1 Bonding and Insurance Costs

.a Where Mobilization and Demobilization is included as a bid item, any costs associated with the provision of bonding and insurance shall be included in the lump sum price bid for mobilization.

.b No direct payment will be made for the recovery of bonding and insurance costs if there is no bid item for Mobilization and Demobilization.

.2 Payment Clause

.a Where Mobilization and Demobilization is included as a bid item, it shall consist of the necessary work and operations including, but not limited to, the movement of personnel, equipment, supplies and incidentals to the work, the establishment of offices and other facilities necessary to undertake the work. It will also be

compensation for expenses incurred for other work and operations that must be performed prior to the commencement of the work.

.b The Owner will pay for Mobilization and Demobilization at the lump sum price bid for “Mobilization and Demobilization” which payment shall be compensation in full for all costs associated with tender submission, tender, and mobilization and demobilization.

.c The initial payment by the Owner will be as follows:

i. Where the Lump Sum tender amount for Mobilization and Demobilization is less than or equal to 10% of the original Total Tender Amount, the Owner will pay 80% of the Lump Sum bid for Mobilization and Demobilization.

ii. Where the Lump Sum tender amount for Mobilization and Demobilization exceeds 10% of the original Total Tender Amount, the Owner will pay 80% of an amount equal to 10% of the Total Tender Amount.

iii. This payment will be included with the initial progress payment.

.d The Owner will pay the balance upon approved Substantial Completion Certificate issuance.

.e Initial payment for Mobilization and Demobilization will not be made until the value of the work completed on bid items, excluding Mobilization and Demobilization, Traffic Control, and Erosion Control, exceeds 10% of the Total Tender Amount.

.f Mobilization and Demobilization will be paid only once, regardless of the number of times the Contractor mobilizes.

.g No direct payment will be made for Mobilization and Demobilization if there is no bid item for it.

1.4 TRAFFIC ACCOMMODATION PAYMENT CLAUSE

.1 Where Traffic Accommodation is included as a bid item, it shall consist of the necessary work and operation, including but not limited to controlling the movement of traffic and pedestrians, supply and maintenance of temporary signing, and other incidentals necessary for the Work.

.2 The Owner will pay for traffic accommodation at the lump sum price bid for "Traffic Accommodation"; which payment shall be full compensation for all costs associated with traffic accommodation.

.3 The initial payment by the Owner will be as follows:

.a Where the Lump Sum tender amount for Traffic Accommodation is less than or equal to 10% of the original Total Tender Amount, the Owner will pay 80% of the Lump Sum bid for Traffic Accommodation.

.b Where the Lump Sum tender amount for Traffic Accommodation exceeds 10% of the original Total Tender Amount, the Owner will pay 80% of an amount equal to 10% of the Total Tender Amount.

.c This payment will be included with the initial progress payment.

.4 The Owner will pay the balance upon approved Substantial Completion Certificate issuance.

.5 Initial payment for Traffic Accommodation will not be made until the value of the work completed on bid items, excluding Mobilization and Demobilization, Traffic Control, and Erosion Control, exceeds 10% of the Total Tender Amount.

.6 Traffic Accommodation will be paid only once, regardless of the number of times the Contractor adjusts the traffic accommodation.

.7 No direct payment will be made for Traffic Accommodation if there is no bid item for it.

1.5 PROGRESS PAYMENTS

The Contractor may make monthly applications for payment pursuant to Division 00, Section 00 71 00, Article 50.

1.6 SEASONAL OR SUBSTANTIAL COMPLETION CERTIFICATE

The Contractor shall make application for Substantial Certificate pursuant to Division 00, Section 00 71 00, Article 54.

1.7 PAYMENT OF HOLDBACK

The Contractor shall make application for Holdback pursuant to Division 00, Section 00 71 00, Article 51.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This section provides general guidance and procedures for managing and coordinating the Work under the administration of a Consultant or Project Manager as designated in a Development Agreement, Unit Price Contract, or Development Permit Development Agreement.

1.1 RELATED SECTIONS

.1 Submittal Procedures — Section 01 33 00

Note: This section describes requirements applicable to all Sections within Divisions 02 to 34. Some of the following Sections may have additional requirements or more specific requirements. Some Sections may have requirements for advance notifications.

1.2 MEETINGS

.1 Pre-construction Meeting

.a A pre-construction meeting will be arranged by the Consultant after the Contract is awarded.

.b Meetings will be held at the Consultant's office or at an alternate location at or near the site.

.2 Progress Meetings

.a Progress meetings will be held on a regular biweekly basis or more frequently if requested by the Consultant.

.b Accommodation for progress meeting shall be provided by the Contractor at or near the site.

.c The Consultant will give to all parties advance notice of meeting dates, times, and locations.

.d The Contractor shall have in attendance the Superintendent and, if requested by the Consultant, representatives of the Subcontractors.

.e The Consultant will have the Project Consultant and/or the Resident Consultant in attendance.

.f The Owner may have a representative in attendance.

.g Minutes will be taken by the Consultant and copies will be distributed to attendees.

1.3 COORDINATION OF WORK

.1 General

.a Although the specifications set forth the work of various trades under separate divisions, it is not intended that the work of that trade is necessarily limited to, nor is inclusive of all work set forth in that particular division. The Contractor shall delegate the extent of the work of various trades and shall coordinate the work of all trades.

.b Although the specifications are separated into titled divisions, the Consultant will not be an arbitrator to establish limits of any contracts between the Contractor and its Subcontractors.

.2 Work by Others

.a The Contractor shall coordinate the work of this Contract with the work of all other contractors, utility companies, and work forces.

.3 Work of Subcontractors

.a Ensure cooperation of Subcontractors in laying out Work. Maintain efficient and continuous supervision.

1.4 FIELD ENGINEERING SERVICES

.1 General

.a The Consultant will establish survey bench marks and monuments and be responsible for their accuracy.

.b The Contractor shall safeguard all survey control marks, statutory iron posts, and lot corner posts, and shall re-establish, at their expense, all survey control marks, statutory iron posts and lot corner posts, removed without authorization from the Consultant.

.2 Datum Planes

.a Elevations indicated or specified refer to Geodetic datum unless otherwise stated.

.3 Setting Out

.a The Contractor shall remove physical obstructions as necessary for the survey crew operation, and arrange a survey work schedule with Consultant 48 hours prior to requiring completion of survey work.

.b The Consultant will establish base lines, control points, lines and grades for work, and may check points, lines, or grades established by Contractor.

.c The Contractor shall be responsible for the accuracy of his work in relation to the Consultant's bench marks and monuments.

.4 Assistance to Resident Consultant

.a The Consultant may require temporary assistance in performing surveys periodically throughout the duration of the Project. The Contractor shall make available, upon request of the Consultant, a temporary assistant at no additional cost.

1.5 PROGRESS PHOTOGRAPHS / VIDEO

Note: For purposes of this specification "photograph" shall be considered either as a hard copy picture produced from film or digitally or full motion video.

.1 Prior to work commencement the Contractor shall take photographs of protected and sensitive land areas and existing infrastructure (e.g. fences, buildings) adjacent to the work area for reference to possible damage claims.

.2 Throughout the Work schedule the Contractor shall take photographs to record progress.

.3 When unique, specialized or difficult conditions arise, photographs of the site, materials and installation should be taken and a hard copy submitted to the owner.

.4 Submit photographs, relevant to the work, to the consultant, on a monthly bases, with the regular progress payment submissions.

.5 Identify the photograph (or series of) by project name, date / time of exposure and provide a direction of view for each photograph.

.6 Unmanned Aerial Vehicle (UAV)

.i The operation of the UAV will be governed under Transport Canada regulations and Alberta's Freedom of Information and Protection of Privacy Act.

.ii The use of an UAV shall be incidental to the contract.

.iii The Contractor shall be responsible for all costs associated with Permits, maintenance, training, etc. required for the safe operation of the UAV.

.iv The Contractor indemnifies the Owner and Consultant of any claims which may be brought forward by a third party in the event of an accident resulting in property damage, injury or death.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section details the Contractor's responsibilities in the preparation and submission of construction schedules with the form and requirements for periodic revisions.

1.1 RELATED SECTIONS

.1 Submittal ProceduresSection 01 33 00

.2 Closeout ProceduresSection 01 77 00

.3 Closeout SubmittalsSection 01 78 00

.4 This section describes requirements applicable to all Sections within Divisions 02 to 34.

1.2 REQUIRED SCHEDULES

.1 Construction Progress Schedule

.2 Shop Drawings and Product Data Schedule

.3 Samples and Mix Design Schedules

1.3 SCHEDULE'S FORMAT

.1 Prepare schedule in the form of a horizontal bar chart.

.2 Provide a separate bar for each sub-contractor or major task.

.3 Provide a horizontal time scale identifying the first workday of each week.

.4 Tasks shall be listed, in chronological order, of the start date.

.5 Sub-listings of major tasks shall be identified by Specification subjects.

Note: If the contractor proposes changes to the materials, products, mix designs, etc. from that which is noted within the Tender, the schedule shall include the time line these changes will affect the contract, if they have not been finalized prior to Award of Contract. The contractor may not claim a time delay, per Section 00 71 00, Article 45, due to this change unless the Engineer states otherwise in writing.

1.4 SUBMISSION

.1 Initial schedule submission shall be per Section 00 71 00, Article 44 of the Unit Price Contract.

.2 Submit an electronic copy (e.g. PDF) to be retained by the Engineer.

.3 The Engineer will review schedule and return review copy within 10 days after receipt.

.4 Resubmit finalized schedule within 7 days after return of review copy.

.5 Submit revised progress schedule with each application for payment.

.6 Distribute copies of the revised schedule to:

.a Job site office,

.b Subcontractors, and

.c Other concerned parties, as requested.

.7 Instruct recipients to report to the Contractor within 10 days any problems anticipated by the timetable shown in the schedule.

1.5 CONSTRUCTION PROGRESS SCHEDULE

.1 Include the complete sequence of construction activities include time allowance for additional reviews due to proposed specification changes.

.2 Include the dates for the commencement and completion of each major element of construction.

.3 Show projected percentage of completion of each item as of the first day of the month.

.4 Indicate progress of each activity to date of submission schedule.

.5 Show changes occurring since previous submission of schedule:

.a Major changes in scope,

.b Activities modified since previous submission,

.c Revised projections of progress and completion, and

.d Other identifiable changes.

.6 Provide a narrative report to define:

.a Problem areas, anticipated delays, and the impact on the schedule,

.b Corrective action recommended and its effect,

.c The effect of changes on schedules of other prime contractors.

1.6 MISCELLANEOUS SCHEDULES

.1 Shop Drawings, Product Data Schedule, Samples, Mix Design Schedules, Mock-up, etc. shall have separate schedules provided with the start and end dates. These dates shall be recorded on the Construction Progress Schedule.

.2 A miscellaneous schedule shall include timeline (dates) for review, resubmission, float, and last date for meeting the fabrication schedule, commencing from the date of initial review submission. The fabrication may be included if applicable to a critical path time line.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This section identifies submissions of data or products to confirm conformance to Contract Documents.

1.1 RELATED SECTIONS

.1 Project Managing and Coordination — Section 01 31 00

.2 Construction Progress Documentation — Section 01 32 00

.3 Quality Control — Section 01 45 00

.4 Closeout Procedures — Section 01 77 00

.5 Closeout Submittals — Section 01 78 00

.6 This section describes requirements applicable to all Sections within Divisions 02 to 34.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Submit to Consultant the submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Work affected by submittal shall not proceed until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

.6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work is coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of the Contract Documents is not relieved by Consultant's review.

.10 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer to Section 00 71 00 – General Conditions, Articles 3 through 6.

.2 The term "Shop Drawings" is defined in Section 00 71 00, Article 6.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 14 days for Consultant's review of each submission.

.5 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.6 Make changes in shop drawings as Consultant may require; consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.

.7 Accompany submissions with transmittal letter containing:

.a Date,

.b Project title and number,

.c Contractor's name and address,

.d Identification and quantity of each shop drawing, product data and sample, and

.e Other pertinent data.

.8 Submissions shall include:

.a Date and revision dates,

.b Project title and number, and

.c Name and address of:

.i Subcontractor,

.ii Supplier, and

.iii Manufacturer.

.d Contractor's stamp, signed by Contractor’s authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

.e Details of appropriate portions of Work, as applicable:

.i Fabrication,

.ii Layout, showing dimensions, including identified field dimensions, and clearances,

.iii Setting or erection details,

.iv Capacities,

.v Performance characteristics,

.vi Standards,

.vii Operating weight,

.viii Wiring diagrams,

.ix Single line and schematic diagrams, and

.x Relationship to adjacent work.

.f After Consultant's review, distribute copies.

.g Submit a set of shop drawings in PDF format and AutoCAD DWG format for each requirement requested in specification Sections and as the consultant may reasonably request. The electronic files shall be presented on a CD, DVD, or USB device.

.h Submit product data sheets or brochures, in PDF format on a CD, DVD, or USB device, for requirements requested in specification Sections and as requested by the Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.i Delete information not applicable to project.

.j Supplement standard information to provide details applicable to project.

.k If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, one signed copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.l The review of shop drawings by the Owner is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Owner approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.4 SAMPLES

.1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Engineer's business address.

.3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.6 Make changes in samples which Consultant may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 MOCK-UPS

Mock-ups shall be erected in accordance with Section 01 45 00.

1.6 PROGRESS PHOTOGRAPHS

Photographs may be provided. For information regarding photography requirements refer to Section 01 31 00.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes and clarifies the Health and Safety considerations required to ensure that the Contractor shows due diligence towards health and safety on the construction sites.

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.3 Material Safety Data Sheets (MSDS).

.4 Province of Alberta - Occupational Health and Safety Act, Regulations and Code.

1.2 CONSTRUCTION SAFETY

.1 The Contractor shall be solely responsible for construction safety on the Work site and shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Work.

Note: refer to Unit Price Contract, Section 00 71 00, Article 60, for Prime Contractor definition.

.2 The Contractor shall ensure compliance, on its part, and on the part of all its Subcontractors, with safety measures of the National Building Code, Alberta Occupational Health and Safety Act, Worker's Compensation Board, and the Municipal Authority, provided that in case of conflict or discrepancy, the more stringent requirements shall apply.

.3 The Contractor shall appoint a representative to be responsible for communication with the Owner, Engineer, Workers, and Alberta Occupational Health and Safety, with respect to health and safety issues. Such representative shall be familiar with the health and safety rules, regulations, and procedures applicable to the Work, and shall ensure that all workers comply with such rules, regulations, and procedures.

.4 The Contractor shall ensure the health and safety of all persons on the Work site, including workers in his employ, Subcontractors, Engineer and Owner representatives, and members of the general public.

.5 When working in or immediately adjacent to areas where public traffic access is permitted (roadways, lanes, parking lots, etc.), all workers shall wear a traffic safety vest acceptable under the Occupational Health and Safety regulations.

.6 The consumption of restricted drugs or alcohol will not be permitted at the Work site. Anyone in possession of or under the influence of restricted drugs or alcohol shall be dismissed from the Work site.

1.3 SAFETY BRIEFING

.1 Prior to commencing the Work, the Contractor's Safety Officer shall provide the Engineer with a copy of their health, safety and security policies, rules, and procedures, as well as a list of employees trained in First Aid.

1.4 HAZARDOUS WORK

.1 Hazardous work situations include, but are not limited to:

.a Use of flame producing equipment,

.b Use of power actuated tools,

.c Work inside any enclosure or area that may contain toxic vapour, dust or be oxygen deficient (confined space).

.d Work in an excavation,

.e Work on or near live electrical lines or equipment,

.f Use of or exposure to hazardous chemicals.

.2 The Contractor shall comply with the requirements of the Transportation of Hazardous Goods Act and the Workplace Hazardous Materials Information System (WHMIS) regarding the transportation, use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of safety material data sheets acceptable to Labour Canada and Health and Welfare Canada.

.3 Hazardous work shall not commence until all workers have been informed of the hazards involved in the Work they are about to perform, are adequately trained in the performance of the hazardous work, are provided with appropriate personal protection equipment, and trained in the use of said equipment.

.4 The Contractor shall train workers and have available all equipment necessary to perform a rescue from a hazardous work area.

1.5 ACCIDENTS AND FIRST AID

.1 Maintain on site, adequate equipment and medical facilities, as required by Alberta Occupational Health and Safety, to supply first aid service to anyone injured in connection with the Work.

.2 Post local emergency numbers near telephones.

.3 The contractor to report any accidents, injuries, or emergencies to Alberta Occupational Health and Safety and Workers' Compensation Board, the consulting engineer and / or project manager including the incident report.

1.6 SECURITY

.1 Provide all necessary lighting, fencing, hoarding, signage, and security personnel to adequately protect the Work and the public.

1.7 EXPLOSIVES

.1 Handle, store, and transport explosives in accordance with local by-laws, the provisions of the Explosives Act (Canada), and the Explosive Safety Regulations contained in Alberta Regulations made under the Occupational Health and Safety Act.

.2 Explosives are not to be used or stored on-site without Engineer's approval.

1.8 CONTAMINATED / HAZARDOUS AREA

.1 Unless under separate contract for the purposes of removal and disposal of contaminated / hazardous waste, the Contractor will not disturb any area designated as contaminated / hazardous until given written (signed and sealed) notification by an environmental professional assigned to the site, or the regulatory authority, stating:

.a the area is clear of the contamination / hazard, or

.b is contained and restrictions apply, or

.c covered under a Risk Management Plan.

.2 Disposal of contaminated or hazardous waste shall be to Section 01 35 43.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes general environmental protection requirements to the Contract Specifications. Some of the other Sections may contain additional or more specific environmental protection requirements.

1.1 RELATED SECTIONS

.1	Temporary Erosion & Sediment Control	Section 01 57 13
.2	Site Cleaning	Section 01 74 11
.3	Clearing and Grubbing	Section 31 11 00
.4	Tree and Shrub Preservation	Section 32 93 50

Note: This section describes requirements applicable to all Sections within Divisions 02 to 34.

1.2 PROTECTION

.1 Fires and Burning

.a Fires and burning of waste, as described within The Town of Olds Fire Permit Bylaw, is not permitted.

.b Although not a preferred method of disposal, the contractor may apply for a fire permit, under the conditions of the Town's Fire Permit Bylaw, where large volumes of vegetative material (e.g. clearing a tree stand for new development) has been collected.

.c Where fires or burning are permitted, prevent staining or smoke damage to structures, materials, or vegetation which is to be preserved. Restore, clean and return to new condition stained or damaged work.

.d Provide supervision, attendance and fire protection measures as directed.

.e Do not commence burning when winds will direct smoke towards existing buildings and roadways.

.2 Waste Management and Disposal

.a Dispose of material designated for salvage, recycle, or re-use in the Work, becomes the property of the Owner and shall be disposed of per the direction of the Owner, or the Owner's designate, in accordance with these Specifications and other Regulatory Authorities.

.b Dispose of soils shall be to Section 31 22 13.

.c Dispose of material designated as rubbish and waste shall be to the Town's Waste Management Facility unless the disposal material is not licensed to be handled by the Town's facility.

.d Disposal of contaminated or hazardous materials shall be off-site to a Facility designated to handle such material.

.e If disposal is at a site other than a Town Facility a copy of the site's permit or license to accept the waste material shall be submitted to the Engineer, upon request.

.f Do not bury rubbish and waste materials on site.

.g Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm sewers, or sanitary sewers.

.3 Drainage

Note: Handling of surface water drainage or ground water infiltration shall be within the guidelines of the Alberta Water Act and as amended within these Contract Specifications.

.a Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.b Do not pump water containing suspended materials into waterways, sewer, or drainage systems. Refer to Section 01 57 13 regarding a Dewatering Permit.

.c Control disposal or run-off of water containing suspended materials or other harmful substances as required per Section 01 57 13.

.4 Site Clearing and Plant Protection

Note: Prior to clearing or vegetation removal the Contractor to confirm that the work is not in contravention of the Migratory Birds Convention Act and the Wildlife Act.

.a Protect trees and plants on site and adjacent properties where indicated in accordance with Section 32 93 50.

.b Restrict tree removal to areas indicated or designated by Engineer.

.c Where specified, clearing to take place outside of the nestling/fledgling time.

.d Where specified, preserve all top soil/root material to be placed back on the site for a viable seed source.

.e Top soil from these areas must be laid down within one season of original excavation.

.f Site clearance shall not negatively affect treed area to be preserved. A minimum of 10 meters setback to be measured from the closest tree trunk is required.

.g Any preserved areas must be fenced and absolutely no equipment may be operated or parked within the fenced area.

.h Refer to Section 31 11 00 for further requirements.

.5 Work Adjacent to Waterways and Preserved Wetlands

Note: Prior to work commencing adjacent to waterways and wetlands ensure the work is not in contravention of the Alberta Water Act.

.a Do not operate construction equipment in waterways.

.b Do not use waterway beds for borrow material without Engineer's approval.

.c Do not dump excavated fill, waste material, or debris in waterways.

.d Design and construct temporary crossings to minimize erosion to waterways.

.e Do not skid logs or construction materials across waterways.

.f Avoid indicated spawning beds when constructing temporary crossings of waterways.

.g Do not blast under water or within 100 m of indicated spawning beds.

.h Where specified, work to take place outside of the nestling/fledgling time.

.i Refer to Section 01 57 13 for further requirements.

.6 Pollution Control

.a Maintain temporary erosion and pollution control features installed under this Contract to Section 01 57 13 requirements.

.b Control emissions from equipment and plants to Local Authority emission requirements.

.c Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.d Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

.7 Historical / Archaeological Control

.a For historical, archaeological, cultural resources, and / or palaeontological resources discovered on-site during construction, the Contractor shall:

.i Notify Alberta Culture and Tourism and the Engineer,

.ii Treat the area similar to a contaminated site or Environmental Reserve land,

.iii Shall not continue work on the area in question until notified by the governing authority to proceed.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes and clarifies regulatory requirements common to all the Specifications in this document.

1.1 REGULATORY REQUIREMENTS

.1 General

.a The Laws and Regulations of the place where the Work is performed shall govern, in accordance with the General Conditions.

.b The Contractor shall ensure compliance on its part and on the part of all of its Subcontractors, with the Occupational Health and Safety Act and Regulations thereunder.

.c Work shall conform to or exceed the minimum standards of the Canadian General Standards Board, the Canadian Standards Association, and the Alberta Building Code or as specified in the documents.

.d When specified standards are not dated, conform to the latest issues, as of the date of receipt of Tender.

.2 Waterworks and Sewerage

.a The Contractor shall comply with all regulations and recommended standards of Alberta Environment with respect to public health, public water supplies, and sewerage systems.

.3 Regulations, Standards, and Codes

.a Codes, standards, and regulations are specified in other sections of the Specifications and the Work shall be done in accordance with those codes, standards, and regulations where applicable.

.4 Fees, Permits, and Certificates

.a The Contractor shall obtain all permits, licences, and certificates required for execution of the Work. They shall provide inspection authorities with such plans and information as may be required.

.5 Holidays

.a The Contractor shall not work on any Statutory Holiday without the Engineer's approval.

.6 Weight Regulations

.a The Contractor shall comply with all requirements of the Alberta Safety Act (T-6 RSA 2000).

2. PRODUCTS

2.1 NOT APLLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section provides reference to acronyms for Standards, Organizations and Trade Associations used throughout this document. All notations here have been verified as having a website (March, 2016).

AASHTO - American Association of State Highway and Transportation Officials

ACI - American Concrete Institute

ANSI - American National Standards Institute

ASTM - American Society for Testing and Materials

AWWA - American Water Works Association

CAN/CSA - National Standard of Canada/Canadian Standards Association

CAN2 - National Standard of Canada/Canadian General Standards Board

CAN3 - National Standard of Canada/Canadian Standards Association

CGSB - Canadian General Standards Board

CSA - Canadian Standards Association

ISA - International Society of Aboriculture

MUTCD - Manual on Uniform Traffic Control Devices (U.S.)

MUTCDC – Manual of Uniform Traffic Control Devices (Canada)

RDG – Roadside Design Guide, Alberta Transportation

Conform to these standards, in whole or in part as specifically requested in the Specifications.

If there is question as to whether any product or system is in conformance with applicable standards, the Engineer reserves the right to have such products or systems tested to prove or disprove conformance.

The cost for such testing will be bore by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.

Conform to the latest date of issue of referenced standards in effect on the date of submission of bids, except where a specific date or issue is noted.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes and clarifies the common administrative and financial requirements for testing, inspection, and report writing.

1.1 RELATED SECTIONS

.1 Submittal Procedures Section 01 33 00

.2 This section describes requirements applicable to all Sections within Divisions 02 to 34.

1.2 GENERAL TESTING REQUIREMENTS

.1 During the progress of the Work, a sufficient quantity of tests will be performed to determine that materials and installation meet the specified requirements. The minimum required testing frequency is provided in the Design Guidelines, Section 3 - Engineering Services Guidelines.

Note: Front Serviced areas have modified testing requirements; refer to the Design Guidelines, Section 13.

.2 Testing will be in accordance with pertinent codes and regulations.

.3 Requirements for specific tests and criteria are described under various Sections through-out the Specifications document.

.4 Product testing, mill tests, and laboratory reports, to demonstrate that materials supplied meet the specifications required, are noted under the applicable Sections throughout the Specifications document.

1.3 INDEPENDENT TESTING AGENCY

.1 An Independent Testing Agency will be engaged for the purpose of testing portions of the Work. The cost of such services will be borne as described in this Section.

.2 The Independent Testing Agency shall provide certified inspectors for the product being tested and the equipment required for executing the testing.

.3 The Independent Testing Agency shall provide a signed and sealed electronic copy (e.g. PDF) of the test results, including a cover letter indicating time, date, location, and test(s) performed etc. Results shall be provided to the Contractor, Consultant and the Engineer. Hard copies are to be provided upon request.

.4 Test Result reports shall follow the submission requirements in Section 01 33 00.

1.4 ACCESS TO WORK

.1 The Owner and the Engineer shall have access to the Work. If part of the Work is prepared at a location(s) other than the place of the Work, access shall be given to such work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer instructions, or the law of the place of the Work.

.3 If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections, or approvals before such is made, uncover such Work, have the inspections or tests satisfactorily completed and make good such Work.

.4 The Engineer may order any part of the Work to be examined if the Work is suspected to not be in accordance with the Contract Documents. If, upon examination, such Work is found not in accordance with the Contract Documents, correct such Work and pay the cost of examination and correction. If such Work is found in accordance with the Contract Documents, the Owner shall pay the cost of examination and replacement.

1.5 TESTING SERVICES BY THE CONTRACTOR

.1 The Contractor shall retain the services of an approved independent testing agency and pay the costs of testing services as follows:

.a Standard Proctor Maximum Dry Density tests for borrow materials,

.b Sieve Analysis of sands and aggregates supplied,

.c Quality Control tests for precast concrete,

.d Quality control tests for hot-mix asphaltic concrete pavement,

.e Mix Designs, and

.f Product testing that is required and / or is specified under various Sections throughout the Specifications document.

.2 The testing agency shall supply copies of all test results related to The Contract directly to the Engineer.

.3 The Contractor shall supply all labour, materials, and equipment, and shall perform tests for linings, coatings, pressure tests, leakage tests, infiltration tests, camera testing, and all other tests specified under various sections of the Specifications document.

1.6 TESTING SERVICES BY THE OWNER

.1 The Owner will retain and pay for the services of an independent testing agency for sample testing during construction to check quality of the Work. This may include the following and other tests:

.a Standard Proctor, sample density, and moisture content tests for trench backfill, fill material, embankment, road subgrade, and granular materials.

.b Quality assurance testing for concrete pursuant to Section 03 05 13.

.c Quality assurance testing for asphaltic concrete pursuant to Section 32 12 16.

.d The Owner may order and pay for testing of any material or installation in addition to the tests by the Contractor. The Owner's testing will be performed by an independent testing agency.

.e The Owner may provide the results of his testing to the Contractor. However, the Contractor should not rely on testing undertaken by the Owner to control his operations.

.f Tests conducted by the Owner or his agent are based on random sampling and shall not be deemed to relieve the Contractor of the responsibility for the quality and maintenance of the Work.

.g The Owner may void any testing results if the Tester is not certified to perform the test in question.

1.7 CONTRACTOR'S RESPONSIBILITY FOR TESTING

.1 The Contractor shall provide facilities for access to the Work in order that testing laboratories may properly perform tests.

.2 Coordinate with the Engineer, the scheduling of the testing laboratory to enable testing to be carried out as necessary, without undue delays.

.3 The testing laboratory will take all samples and specimens, and will provide the necessary equipment and personnel to deliver specimens and samples to the laboratory.

.4 The Contractor shall make good Work disturbed by inspection and testing.

.5 Pay costs for uncovering and making good Work that is covered before the required inspection or testing is completed and approved by the Engineer.

1.8 CODE COMPLIANCE TESTING

.1 Inspections and tests required by codes or ordinances, or by a plan approval authority, shall be the responsibility of, and shall be paid for by the Contractor.

1.9 CONTRACTOR'S CONVENIENCE TESTING

.1 Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.10 RETESTING

.1 When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting because of the non-compliance shall be performed by the same testing laboratory and the costs will be deducted from the Contractor's payments.

1.11 MOCK-UPS

For purposes of these Specifications a Mock-up relates to Town owned structures (e.g. building, bridge: materials / finishes, etc.) or an Enhanced Amenity (see Design Guidelines - Section 13), typically used with landscape finishing. A Mock-up may entail, minimally, supplying samples of products or materials, and / or creating a scaled section of the structure to provide a representation of the finished structure. An architectural rendering is not considered a Mock-up.

.1 If the Contract does not contain a Supplementary Condition to address the time frame for preparing mock-ups or the potential effect of such work on the Contract duration, this issue will be negotiated with the Owner.

.2 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.3 All costs to supply, prepare, erect, dismantle, dispose of, recycle, change, etc. of a Mock-up will be considered incidental to the Contract unless a payment item has been included in the Contract; payment will be Lump Sum.

.4 If Mock-up is a constructed object, remove or dispose of Mock-up at the conclusion of the Work. If the Mock-up is located on-site, repair any damage and clean-up the area where the Mock-up was situated.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes temporary utilities, construction facilities, and temporary controls not incorporated into the final or permanent work.

1.1 RELATED SECTIONS

.1	Project Managing & Coordination	Section 01 31 00
.2	Temporary Construction	Section 01 52 00
.3	Traffic Control	Section 01 55 26

1.2 TEMPORARY UTILITIES

.1 The Contractor shall arrange and pay for all temporary utility services required.

.2 Provide sufficient sanitary facilities for workers in accordance with local health authorities.

.3 If required, provide a continuous supply of potable water for construction use.

.4 Supply and install all temporary fire extinguishers, hydrants, or other equipment necessary for adequate protection of the Work as directed by the Emergency Services Department.

.5 Contact Fortis Alberta Inc. if temporary power is required.

1.3 CONNECTIONS TO EXISTING UTILITIES

.1 Connection to existing mains to be made in accordance with Section 01 14 00.

1.4 USE OF HYDRANTS

.1 Projects that require the use of bulk water may apply to the Engineering Services Department for use of a service hydrant during the project.

.2 A Water Use Permit will be issued by Environmental Services. This permit will designate the hydrant(s) that may be used, the duration of use, and conditions that may apply.

.3 A Water Use Permit is required for each unit that loads water from a service hydrant. An air gap backflow preventer, approved by the Water Distribution Lead Operator, is required on the inlet fill point of each unit.

.4 To obtain a Water Use Permit, or obtain equipment approval, contact The Town of Olds main office at 403-556-6981.

1.5 DEWATERING

See Section 01 57 13 for information regarding site dewatering into the existing Town sewer system.

1.6 ROAD CLOSURES

See Section 01 55 26 if a road closure is required due to work proximity to an existing roadway.

1.7 WORK SITE

See Section 01 52 00 for general requirements related to work site storage / meeting / parking, etc.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section provides the minimum requirements for a temporary work camp and general precautions when the work involves existing infrastructure.

1.1 Related Sections

Work Restrictions	Section 01 14 00
Environmental Procedures	Section 01 35 43
Temporary Erosion and Sediment Control	Section 01 57 13
Site Cleaning	Section 01 74 11

1.2 Protection

The Contractor shall protect all trees, water courses, fences, streets, or other structures from damage and make good any damage unless otherwise directed by the Engineer.

1.3 Meeting Area

.1 The Contractor shall provide an area where the on-site First-Aid station, Muster point(s), latrine service, heavy equipment parking, staff parking, and notification board etc. shall be located and easily identifiable.

.2 The meeting area shall be separate from the construction area; typically located at or near the primary access / egress point to the Work site.

.3 The meeting area shall be maintained in a neat and orderly fashion with surface drainage that will promote dry and mud free conditions to support easy access / egress by emergency vehicles.

.4 An on-site office is optional to the Contractor. If provided, the office will be at the Contractor's cost.

.5 If the Meeting Area cannot be fully contained on-site due to the nature, size, location, or time line for the project, the Contractor may be required to provide an alternate off-site Meeting Area.

.i If an existing Town roadway is chosen as the meeting area the Contractor shall maintain access for the public to residences and commercial sites. The Contractor shall follow the Use of Streets bylaw and apply for applicable Permits.

.ii If an existing Town owned greenspace is selected for a Meeting Area, the Contractor shall negotiate with the Town's Operation Services for their permission and requirements for use, unless this has been set forth in the Contract.

1.4 Site Storage and Over Loading

.1 Confine the Work and the operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.

.2 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work.

1.5 Security

.1 On site security is optional to the Contractor and considered incidental to the Contract therefore no payment will be made for this item.

.2 If the Contract identifies a security requirement, through a Supplementary Condition, payment will be by Prime Cost Sum.

.3 The Contractor may use personnel from their company if the security is only required during normal business hours.

.4 If the Supplementary Condition states security is required during off-hours, the security personnel are to be from a reputable security company.

1.6 Work Site Boundary

.1 Confine the Work and the operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.

.2 Review Environmental Procedures (Section 01 35 43) to be considered when establishing the boundary.

.3 Review Erosion and Sediment Control measures (Section 01 57 13) to be considered when establishing the boundary.

.4 Erect hoarding / fencing around entire perimeter of site or where indicated on drawings to protect the public, workers, and public/private property from injury or damage.

1.7 Cutting and Patching

.1 The Contractor shall do all cutting, fitting, or patching of their work that may be required to make its several parts come together properly and fit it to receive or to be received by work of Other Contractors shown in or reasonably implied by the Contract Documents.

.2 Any cost caused by ill-timed or improperly performed work shall be borne by the Contractor.

.3 The Contractor shall not endanger any existing work by cutting, digging or any other method and shall not cut or alter any work without the consent of the Engineer for Town projects or the consulting engineer / project manager for private projects.

1.8 Existing Utilities and Structures

.1 Excavation in the vicinity of existing structures and utilities shall be carefully performed and any utilities which cross an excavation must be properly supported or shored to prevent settlement. Where trenching is to be done under existing utilities, such utilities shall be shored before excavation commences and shoring shall be left in place. Exposed utilities shall be inspected for damage by the respective utility company before backfilling the trench.

.2 The existence, location, and/or elevations of underground utilities are not guaranteed, and notwithstanding any other provision in the Contract, the Contractor shall be responsible for determining the location and elevation of all sewer, water, and gas mains or lines; electric light, power, or telephone conduits; or other structures or utilities; and shall pay for any service supplied by the utility company or by any department of the Owner for the location of utilities. See Section 01 14 00 for contact information.

.3 The Contractor shall indemnify and save harmless the Owner of any such main, line, conduit, or other such structure or utility for any loss or damage which may be suffered by any such Owner because of damage to any such main, line, conduit, or other such structure or utility, in any way caused by the operations of the Contractor in the performance of this Contract.

1.9 Clean Up

At the conclusion of the construction the Contractor shall clean-up and restore the work site to Section 01 74 11.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section provides the definition, requirements, and method of payment for the movement of equipment and materials and the routing.

1.1 RELATED WORK

.1	Project Managing and Coordination	Section 01 31 00
.2	Submittal Procedures	Section 01 33 00
.3	Traffic Control	Section 01 55 26
.4	Temporary Construction Signing	Section 01 58 99
.5	Roadway Dust Control	Section 32 15 60

1.2 DEFINITIONS

.1 Hauling
Hauling is the transporting of material from its point of loading to its designated delivery point.

.2 Haul Roads
A route over which materials are hauled for the performance of the Work, conforming to the following:

.a An approved route from a designated source or waste disposal site.

.b A contractor selected route from a contractor supply source or waste disposal site.

.3 Free Haul
Distance excavated soil or granular material is hauled without additional compensation. For the Unit Price Contract, free haul distance shall be unlimited unless noted otherwise in the Supplementary Conditions of the contract.

.4 Over Haul
Distance excavated soil or granular material is hauled beyond the limits of free haul. This will require a Supplementary Condition in the contract if a payment item is provided for.

1.3 MEASURE OF PAYMENT

Unless otherwise stated, hauling is included in the unit price for the material being hauled. No additional compensation will be made for hauling.

1.4 REGULATIONS

Haul vehicles shall comply with the requirements of the Alberta Traffic Safety Act (T-6 RSA 2000) when travelling on or across Public Roadways.

1.5 PUBLIC NOTICE

The Contractor shall prepare Shop Drawings and Public Notices as detailed in Section 01 58 99.

1.6 MAINTENANCE AND RESTORATION OF HAUL ROADS

The Contractor shall be responsible for all costs associated with the maintenance and restoration of haul roads.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 HAULING

.1 The Contractor shall not haul when hauling operations may result in unsafe conditions for the travelling public. These conditions may occur at the following times:

.a when spring thaw is taking place,

.b during or after inclement weather, or

.c during a period of exceptionally heavy traffic.

.2 The Contractor shall abide by all load restrictions established by the road or bridge authority having jurisdiction.

3.2 HAUL ROUTES

.1 Haul roads and hauling equipment to be approved by Engineer.

.2 Prior to commencement of haul, haul roads shall be inspected by authorized representatives of the local road authorities, the Contractor, and the Engineer to establish and record the general road condition. If photographs are taken for record refer to Section 01 31 00 for further information and Section 01 33 00 for document submissions.

.3 Haul roads shall be maintained in a condition satisfactory to the Engineer throughout the period in which haul is underway. In the event of dispute as to the degree of maintenance required, the Engineer will be the final authority.

.4 Dust control requirements for gravelled haul routes shall be per Section 32 15 60.

.5 Provide adequate traffic control and warning signs along haul route to ensure public safety. Refer to Sections 01 55 26 and Section 01 58 99.

.6 Upon completion of haul, the road shall be restored to a condition equivalent to or better than that which was evident at the time haul commenced. Another inspection will then be carried out by authorized representatives of the local road authorities, the Contractor, and the Engineer. The Engineer will be the final authority in assessing the restoration required.

1. GENERAL

This Section identifies the procedures to be followed when traffic accommodation is required during construction.

1.1 RELATED WORK

.1 Temporary Construction Signing — Section 01 58 99

1.2 REFERENCES

.1 Manual of Uniform Traffic Control Devices for Canada (MUTCDC), Transportation Association of Canada (Current Version).

.2 Traffic Accommodation in Urban Work Zones (Current Version), Alberta Transportation.

1.3 PROTECTION OF PUBLIC TRAFFIC

.1 Comply with the requirements of Acts, Regulations, and By-laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out work or haul materials or equipment.

.2 When working on traveled way:

.a Place equipment in position to present minimum interference and hazard to the traveling public.

.b Keep equipment units as close together as working conditions permit and preferably on the same side of the traveled way.

.3 Do not close any lanes of roadway without the approval of the Engineer. Before rerouting traffic, erect suitable warning signs.

.4 Keep traveled way graded, free of potholes, and of sufficient width for the required number of lanes of traffic.

.a Provide minimum 8 m wide temporary roadway for traffic in two-way sections through the work and on detours.

.b Provide minimum 3.5 m wide temporary roadway for traffic in one-way sections through work and on detours.

.5 As indicated or as directed by the Engineer, provide temporary graveled or paved detour road(s) to facilitate passage of traffic around the restricted construction area:

.a Excavation / Construction of temporary detour road in accordance with Section 31 24 13 (Roadway Excavation and Backfilling).

.b Place and compact granular sub-base in accordance with Section 32 11 19 (Granular Subbase).

.c Place and compact granular base in accordance with Section 32 11 23 (Granular Base Course).

.d Place and compact asphalt concrete pavement in accordance with Section 32 12 16 (Hot Mix Asphalt Concrete Paving).

.e Provide and maintain road access and egress to property fronting along the Work under Contract and in other areas as indicated, unless another means of road access exists that meets the approval of the Engineer.

.f Maintain temporary gravel detour road(s) in accordance with Section 32 11 17 (Reshaping Granular Roadbed).

1.4 INFORMATIONAL AND WARNING DEVICES

.1 Provide and maintain signs, flashing warning lights, and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work which requires road user response.

.2 Supply and erect signs, delineators, barricades, and miscellaneous warning devices as specified in the reference listed in Clause 1.2.1 and Section 01 58 99.

.3 Place signs and other devices in locations recommended in the reference listed in Clause 1.2.1

.4 Meet with the Engineer prior to commencement of Work to prepare a list of signs and other devices required for the project. If the situation on site changes, revise the list to meet the approval of the Engineer.

.5 Continually maintain traffic control devices in use by:

.a Checking signs daily for legibility, damage, suitability, and location. Clean, repair, or replace to ensure clarity and reflectivity.

.b Removing or covering signs which do not apply to conditions existing from day to day.

1.5 CONTROL OF PUBLIC TRAFFIC

.1 When an arterial road requires a lane closure or detour, portable electronic sign boards are required.

.2 Provide flag persons (trained in accordance with and properly equipped), as specified in the reference listed in Clause 1.2.1, in the following situations:

.a When public traffic is required to pass working vehicles or equipment, which block all or part of traveled roadway.

.b When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high, and traffic signal system is not in use.

.c When workmen or equipment are employed on the traveled way over the brow of hills, around sharp curves, or at other locations where oncoming traffic would not otherwise have adequate warning.

.d Where temporary protection is required while other traffic control devices are being erected or taken down.

.e For emergency protection when other traffic control devices are not readily available.

.f In situations where complete protection for workmen, working equipment, and public traffic is not provided by other traffic control devices.

.g When delays to public traffic due to Contractor's operations exceed 10 minutes or as directed by the Engineer.

.3 When a roadway, carrying two-way traffic, is to be restricted to one lane, for 24 hours each day, provide a portable traffic signal system. Adjust, as necessary, and regularly maintain the system during the period of restriction as specified in the reference listed in Clause 1.2.1.

1.6 OPERATIONAL REQUIREMENTS

.1 Maintain existing conditions for traffic throughout the Work except in construction zones where measures, approved by the Engineer to protect and control public traffic, have been established.

.2 Maintain existing conditions for traffic crossing right of way except when required for construction. With the approval of the Engineer, existing conditions for cross traffic shall be restricted as follows:

.a Reduce the number of crossing locations,

.b Reduce the speed limit, and

.c Limit delays to public traffic to a maximum of 10 minutes.

1.7 PARKING RESTRICTIONS

.1 Obtain and set out No Parking signs, if required, from The Town of Olds Operational Services Department, and pay the said Department at the current published rates.

.2 Pay for replacement or repair of lost, damaged, or removed No Parking signs.

.3 Obtain parking restriction authorization from The Town of Olds Operational Services Department.

.4 Place equipment to minimize interference and hazard to travelling public.

.5 Do not leave materials or equipment on arterial roadways overnight. If equipment and/or material must be left on collector or local roadways overnight, permission must be obtained from the Engineer, and all equipment and material must be properly barricaded and signed.

1.8 REMOVAL AND INSTALLATION OF SIGNS

.6 All existing traffic signs that must be permanently or temporarily removed or relocated due to the construction shall be removed or relocated by The Town of Olds Operational Services Department. The Contractor shall provide sufficient notice to the Operational Services Department to have all necessary signs removed or relocated prior to commencement of construction.

.1 Contractor to maintain a record of all signs removed. Record sign type (stop sign, street name sign, etc.), location (station as per grade sheet), and date removed.

.2 The Contractor shall be responsible for the cost of repair or replacement of any traffic signs damaged as a result of construction activities if the Contractor has not requested the removal or relocation of such signs from the construction zone.

.3 Critical signs, such as Stop and Yield signs, necessary for the protection of traffic, shall be temporarily erected and maintained by the Contractor during the period of construction. Permanent signs required in accordance with the Construction Drawings shall be installed by the contractor in accordance with Section 10 14 54 (Traffic Signage).

.4 New signs will be installed in accordance with Section 10 14 54 (Traffic Signage).

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This section specifies project requirements for erosion and sediment control (ESC) during construction for the protection of land, water, and air. If the contractor can demonstrate that substitute materials can provide the same level of protection as those noted here, then alternatives may be considered.

Erosion and Sediment Control shall follow an ESC Plan provided by the consulting engineer unless the contractor is required to provide an ESC Plan under a Supplementary Condition of the Contract. Information regarding the requirements of an ESC Plan is located in Section 6 of the Design Guidelines.

1.1 RELATED SECTIONS

.1	Environmental Procedures	Section 01 35 43
.2	Asphalt Pavement Removal	Section 02 41 14
.3	Site Demolition	Section 02 41 16
.4	Clearing and Grubbing	Section 31 11 00
.5	Rough Grading	Section 31 22 13
.6	Trench Excavation and Bedding	Section 31 23 33
.7	Roadway Embankment & Compaction	Section 31 24 13
.8	Roadway Dust Control	Section 32 15 60

1.2 REFERENCES

The following reference materials (current editions) may be used to provide further detail as to requirements of ESC measure and the various products which may be used for that measure.

- Alberta Transportation - Design Guidelines for Erosion and Sediment Control for Highways
- Alberta Transportation – Field Guide for Erosion and Sediment Control for Highways
- Alberta Transportation - Fish Habitat Manual
- Alberta Transportation - Navigable Waters Protection Act Manual
- City of Calgary - Guidelines for Erosion and Sediment Control
- City of Calgary – Field Manual for Effective Erosion and Sediment Control

1.3 DEFINITIONS

.1 Erosion: Deterioration, displacement, or transportation of land surface by wind or water, intensified by land-clearing practices related to construction activates.

.2 Rain or Rain Storm: An inclement weather event defined as causing the pooling of water on road or other impervious surfaces.

.3 Sediment: Particulate matter transported and deposited as a layer of solid particles within a body of water.

.4 Snow Melt: An event that occurs when temperatures above freezing cause snow on the ground to melt.

1.4 SUBMITTALS

.1 Provide requested information within 14 days of date established for commencement of the Work. Additional submission information may be found in Section 01 33 00.

.2 The Weekly inspection record shall include the following:

.a General site activity (which primarily affects ESC),

.b Weather conditions over the week in question,

.c Identify and address standing rainwater or snowmelt conditions,

.d Changes in overland run-off patterns as construction progresses,

.e Any damages or deficiencies to the ESC measures,

.f And if maintenance or additional ESC measures are required.

.3 Additional Inspections are to be made after significant rain fall events and during snow melt, including mid-winter “Chinook” weather conditions.

.4 During the winter season or once construction activity has ended for the season, inspections may be reduced to bi-weekly but done to ensure snow fall, blowing snow etc. has not damaged the protective measure.

.5 De-watering Permit is required if the existing Town storm system is to be used as part of the ESC plan.

Note: If a more comprehensive submission is required, Design Guidelines - Appendix A is a checklist to assist in ensuring that all necessary elements of an ESC Plan have been addressed.

1.5 MODIFICATIONS TO THE ESC PLAN

A copy of the ESC Plan shall be located on the construction site for use by site personnel, inspectors and regulators. As site work progresses, the ESC Plan shall be modified by the consultant and/or contractor, in consultation with Town staff, to reflect changing site conditions.

Note: The Town considers that a contractor who fails to maintain an ESC Plan for the duration of the project may be considered in contravention of The Acts and Bylaws outlined in the Design Guidelines, Section 6. In the event of a non-compliance incident, including a spill or release, the general contractor is responsible for immediately notifying the project manager or owner. The general contractor and project manager/owner must work to ensure spills and releases are immediately reported to regulatory agencies.

1.6 MEASURE OF PAYMENT

.1 No direct payment will be made for ESC if there is no bid item for it.

.2 Where Erosion and Sediment Control (ESC) is included as a bid item, payment shall be compensation in full for the cost of equipment, labour, material, installation, maintenance, replacement, removal, inspections, and reports for the ESC measures necessary to protect the off-site areas and existing infrastructure from sediment and water contamination from the project area.

.3 The Owner will pay for ESC at the lump sum price bid for “Erosion and Sediment Control”, which payment shall be compensation in full for all costs associated with tender submission, tender and Work required.

.4 The initial payment by the Owner will be as follows:

.a Where the Lump Sum tender amount for ESC is less than or equal to 10% of the original Total Tender Amount, the Owner will pay 80% of the Lump Sum bid for ESC.

.b Where the Lump Sum tender amount for ESC exceeds 10% of the original Total Tender Amount, the Owner will pay 80% of an amount equal to 10% of the Total Tender Amount.

.c This payment will be included with the initial progress payment.

.5 The Owner will pay the balance upon approved Substantial Completion Certificate issuance.

.6 Initial payment for ESC will not be made until the value of the work completed on bid items, excluding Mobilization and Demobilization, Traffic Control, and Erosion Control, exceeds 10% of the Total Tender Amount.

.7 ESC will be paid only once, regardless of the amount of Work the Contractor has to erect, maintain, remove, document, etc.

Note: If the Town's treated water is the chosen method of dust control, refer to Section 01 51 00 for further information on the Water Use permit.

2. PRODUCTS

2.1 SILT FENCING

.1 Steel Post

.a Primed "T" Bar, with a minimum length of 1350 mm or as required to meet fencing height tolerances for the site.

.b Pre-drilled holes to allow for field attachment with plastic or wire ties.

.2 Wooden Post

.a Sizes: 38 mm x 38 mm OR 100 mm diameter Construction grade, preservative treated in accordance with CAN/CSA 080 Series.

.b Minimum length: 1220 mm

.c Sound, seasoned wood, peeled, straight, free from splits, shakes and excessive knots with existing knots trimmed flush with surface.

.d One end cut square with the other end shaped to a point.

.3 Geotextile

.a Woven polypropylene filter fabric, resistant to ultra-violet degradation.

.b 30 m roll length, 900 mm wide

.4 Wire mesh backing is optional.

.5 Prefabricated products (post and fabric combined off-site) meeting the above measures are acceptable.

2.2 NATURAL BARRIER

.1 Sedimentary basins

Sites 4.0 ha or greater in overall area must have properly designed sediment traps implemented and maintained during construction through to final stabilization. Sediment basins must be designed for minimum storage volumes of 250 cu. m. / ha.

.2 Sedimentary traps

Sediment traps are only acceptable for sites smaller than 4.0 ha in overall size. Sediment traps must be sized to a minimum range of 150 – 250 cu. m. / ha. The volume must be maintained in between run-off events (a drainage permit will be required to drain any traps into the Town's storm sewer system).

.3 Earth barrier / Wind Row

This refers to leaving a defined edge between the stripped / graded site (low) and original ground (high) or the use of wind rows.

2.3 INLET PROTECTION MEASURES

.1 Catch-basin

a. Dam / Donut / Sediment Trap Inset

.2 Culvert

a. Wattles, check dam, rip-rap

2.4 STABILIZED CONSTRUCTION ENTRANCE

.1 Gravel pad:

.a Rock size between 50 – 75 mm (ensure rock is hard, durable and angular).

.b Gravel thickness 150 mm (minimum)

.c Size (minimum): width of 3.6 m by length of 13 m

.2 Asphalt Pad

.a Structure (minimum): 50 mm Asphalt, 150 mm Base Course gravel

.b Size: See gravel pad.

.3 Wash Pad

.a Either an extension of the Entrance Pad or situated separately such that when the vehicle's tires have been cleaned the vehicle may exit the site without crossing muddy terrain. The pad shall be crushed rock (or asphalt surface) and drain to an approved sediment trap.

.4 Rig / Mud Matting

.a Optional if soil conditions are such that a constructed pad may not be stable enough.

2.5 DUST CONTROL

.1 Water spray *Note: if water used is supplied through a Town source (e.g. hydrant) the contractor will need to contact Engineering Services and apply for a Water Permit*.

.2 Shredded straw

.3 Wind row

.4 Revegetation

2.6 DEWATERING

.1 Mechanical pump

2.7 STEEP SLOPE PROTECTION

.1 Erosion control blankets with preference to natural product (e.g. straw) contained in a biodegradable net.

.2 Hydro seeding

.3 Compost socks

2.8 OTHER POLLUTANTS

Consideration of other pollutants (e.g. petroleum contamination), other than sediment, shall be incorporated into the ESC implementation. Select appropriate control measures for the control of these pollutants.

3. EXECUTION

3.1 SITE INVESTIGATION

Identify critical areas that have the potential for serious erosion or sediment problems. Include in this investigation neighboring areas such as streams, lakes, residential, commercial and/or industrial areas, environmental and/or municipal reserves, escarpments, and/or roads that may be affected by the land disturbance. If the site investigation reveals discrepancies when compared to the proposed ESC plan and drawings, the Contractor will be responsible to ensure these discrepancies are protected and brought to the attention of the Project Manager. The ESC plan and drawings shall be updated accordingly.

3.2 MINIMIZE CLEARING

When clearing along and/or adjacent to sensitive areas (e.g. stream buffers, forest conservation areas, wetlands, springs, highly erodible soils, steep slopes and environmental reserves etc.) ensure a natural buffer is maintained. As streams and waterways are particularly susceptible to sedimentation when clearing adjacent to a waterway particular attention is to be given to existing drainage ways as these will likely be the major routes that eroded sediments will take to reach the stream or waterway. Natural drainage courses are also prone to erosion due to the high velocity of runoff, these courses shall have flow restriction measures implemented if located inside a natural (protected) area. Where the drainage course is created due to the project construction, the drainage course shall be (re)constructed to disperse the water over a large area, reducing the overland flow rate, thus allowing for sediment to settle out prior to leaving the site or entering the storm system.

3.3 PRIORITY ESC PLACEMENTS

The following identifies natural features that receive priority for ESC protection.

.1 Steep Slopes

If a project site has steep slopes (6H:1V or greater), created either through cut or embankment during the site grading phase, these slopes are to receive priority stabilization to prevent overland drainage courses from developing into sever

scouring of the slope face. Ensure the protection includes the top and bottom of the slope.

.2 Water courses

Prior to clearing and grading ESC controls are to be installed. It is preferred the ESC control(s) is NOT used as the construction limit delineator; preference would be for the ESC to be behind the construction limit thus leaving a natural barrier between the exposed soil and the ESC control.

.3 Environmental Reserves

3.4 INSTALLATION OF PROTECTIVE MEASURES

.1 Silt Fencing

.a Install posts plumb and true along and / or around designated areas on an alignment to maintain a smooth and continuous horizontal fence line. Avoid a fence alignment / ground grade that may create a concentrated run-off flow and create either a diversion channel or fence failure due to water ponding.

.b Posts shall be driven a minimum of 450 mm into the ground.

.c Maximum post spacing: 2 m

.d Create a 150 mm deep by 150 mm wide anchor trench along the upstream side of the posts. Mechanical Slicing (Plough) Method is an optional alternative.

.e Install fencing on the upstream side of the post, run longitudinally along a slope contour to avoid creating a diversion channel.

.f Install the top of the fabric at the top of the post.

.g Extend the geotextile filter fabric into the anchor trench 150 mm below grade, and return 150 mm towards the opposite direction of flow.

.h The exposed fabric face shall be between 400 mm to 800 mm high.

.i A minimum of 450 mm shall be used where fabric sections overlap with the end posts wrapped together.

.j The fabric placed in the anchor trench shall be covered with clay material and packed by mechanical tamper or tractor tire to create a firm fill.

.k If the fence is to be installed through a drainage course the flow velocity of that course shall not exceed 0.03 m/sec. If the velocity is deemed to exceed this value (through calculation or through field observation of extreme channeling / sediment build-up) a diversion channel / drainage ditch shall be constructed as noted within this Section. The fence shall be removed at the drainage course.

.l Where long continuous runs of fence occur, diversion channels shall be created, minimally every 100 m. These channels shall be constructed as noted within this Section.

.m Additional silt fencing requirements are noted in other clauses within this Section.

.2 Protection for Existing Storm System

.a Install manufactured gutter dam, donut collar or sediment trap on / in all downstream catch basins and catch basin manholes as required. Manhole covers may require sealing if they are subjected to regular flooding until underground or surface construction is completed and the surface ponding has been eliminated.

.b An alternate method for the existing system is the installation of a temporary weir structure in downstream manholes. These weirs are **not** to restrict flow through the piping system to the extent that surcharging occurs or the weir is washed out do to back pressure. These weirs will require regular inspection and maintenance, particularly after a major rain fall event.

.c Where an existing ditch is used to channel water and the ditch leads directly to the Town's storm system the ditch and culvert ends may require reinforcement against higher water volumes and velocities.

.i Ditch

To slow velocities and promote sedimentation, straw bales, silt fencing, shallow rock weirs etc. shall be installed temporarily. To ensure the flow restriction method does not create new channel side erosion, the ditch sides may also require erosion control mats or blankets.

.ii Culvert

The upstream end shall be reinforced with additional rip-rap material and the downstream end with additional rip-rap material plus a silt fence section a few meters further downstream from the rip-rap.

.d Diligent efforts must be taken to ensure that the temporary drainage system does not flood adjacent properties.

.3 Creating Natural Filtration Measures

.a Compacted earth dikes may be used to direct low volume and velocity overland flows to a sediment basin or constructed channel.

.b Excavate sediment traps and / or basins at designed low points (typically along excavated right-of-ways). These basins may be interconnected to provide for on-going treatment until the overland water is carried off-site.

.c For large denuded areas, leave 10 m wide strips of original ground (wind row) to act as a water and wind buffer. The wind row is to be created perpendicular to the prevailing winds. Minimum length to be 50% of the width of the area stripped, measured along the line of the wind row. To provide a minimum of one complete wind row across the stripped area additional wind rows shall be staggered at 100 m spacing.

.d For perimeter boundaries, where topsoil stripping has occurred but the area is not to be developed immediately and the denuded area is graded to drain towards the perimeter, a minimum 100 mm vertical face of original ground may be used to trap overland storm drainage flows. If the trapped low over tops the original ground barrier, ensure it does so as sheet flow not as a concentrated flow.

.4 Diversion Channels

.a Typically required after a large area has been denude and will not be developed immediately. Created on-site along identifiable drainage courses were overland storm water volume and velocity are such they will create a nature channel.

.b A parabolic or trapezoidal cross sections channel shall be constructed to a maximum depth of 300 mm and wide enough to handle the water volume and graded such to maintain a low flow velocity.

.c Use 2:1 side slopes (or flatter) for mixed, cohesive or coarse-grained soils that can be compacted and 3:1 side slopes (or flatter) for poor cohesion / fine-grained soils. Prior to constructing a diversion channel, construct a stabilized outlet or ensure run-off will flow to a naturally stabilized channel or sediment trap or basin.

.d Where channel gradient exceeds 2%, armour / stabilize the channel with material designed to withstand water velocity / shear (such as riprap, rolled erosion control blankets, vegetation or a combination of suitable practices).

.e The channel should either lead to a treatment area or be dispersed to sheet flow prior to entering an original ground area (e.g. natural area approved to receive the water).

.f Where channelled run-off is directed to original ground and dispersed as sheet flow the flow shall not run onto or through private property.

.5 Check Dam

Check dams are only suitable for limited drainage areas: Rock check dams are suitable for channels draining areas < 4 ha; other materials (sandbags, wattles, compost socks, synthetic check dams) are suitable for channels draining areas < 2 ha.

.6 Site Access Containment Area

.a Prior to earthwork commencement the primary (and optional secondary) access locations are to be determined and preferred to be adjacent or part of the contractor's on-site staging / storage area (refer to Section 01 52 00 – Temporary Construction for further information regarding a staging area).

.b The area for the vehicle cleaning pad(s) shall be cleared of topsoil, graded and the pad structure placed.

.c Drainage from these areas shall be directed to a drainage trap.

.7 Dust Control

.a Water or chemical dust suppressant (See Section 32 15 60) will be the primarily wind suppression method for stripped land, on-site vehicle routes and haul roads.

.b Where significant area (greater than a quarter section of land) has been exposed (for earth balance purposes for example) and not planned for development within a one year period, the non-developing area shall be protected from wind erosion by the following methods:

.i Where surface material is clay based create trench and embankment ridges using plow equipment or Grader blade. This ESC measure is denoted with by a 300 mm deep trench and an adjacent 300 mm compacted embankment. This treatment is to be created on a "close spacing". If material drying is required to meet density / moisture content specification, leave areas not immediately in the construction zone in a "rough" state. This is for short term (less than one year) control.

.ii Revegetation with a course grass hydro seed mix.

.iii A mulch cover of shredded straw minimally 100 mm thick, compacted and held in-place with biodegradable mesh.

.iv Construct wind breaks by placing straw bales in staggered rows of 50 m lengths and 100 m apart.

.v Wind rowing, as described in this Section.

.c Work shall be suppressed during extreme wind conditions and additional dust control measures are to be implemented immediately.

.8 Stockpile Protection

.a During the stock piling of earth material, stabilize the stock pile against erosion by the following methods:

.i Machine finish with diagonal tracking and creating horizontal ridges.

.ii Create terraces to slow down flow velocity and create “shallow trap lows”.

.iii Place straw bales or brush wattles longitudinally across the stock pile face to prevent channel erosion.

.iv Ensure the top is crowned or sloped enough to avoid ponding and material saturation.

.b Where silt fencing or other method of erosion containment is placed at the bottom of a stockpile, ensure the control measure is 2 – 3 m away from the toe of slope. This is to create a flat surface for water disbursement and flow control.

.c For long term storage, the stockpile shall be revegetated for both dust and erosion control.

.9 Mechanical Pump Dewatering

.a Pump to be equipped to filter sedimentary material.

.b The inlet shall be placed on a rock shelf or a constructed rest to keep the inlet from direct contact with the pond’s bottom. Discharge water to be clear and free from particulate matter, as much as practical.

.c Discharged water is to be directed to a constructed channel (as described in this Section) and dispersed or to an existing storm sewer manhole. If the water to be discharged has any contamination of a non-sedimentary nature (e.g. petroleum

contamination) the discharge shall be directed to an existing sanitary sewer manhole.

.i Regardless of either manhole used the Contractor is to contact Engineering Services to obtain a Wastewater Discharge Dewater Permit or a Storm Water Discharge Dewater Permit. The permit is issued through the Source Control Section (403.342.8750).

.10 Steep Slope Protection

Refer to Stockpile protection within this Section.

3.5 MAINTENANCE

.1 Establish a schedule of regular inspections and expected repairs of the Erosion and Sediment Control measures. Minimum inspection requirements are provided in Clause 1.1.4.

.2 Repair the ESC control, record the repairs, update the ESC Plan etc. due to changing conditions, and as required.

.3 After each rainfall event and during snow melt times, inspect all measures, particularly those used to trap sediment, and remove excess sediment build-up to bring the control measure back to its optimum standard for efficiency.

.a Silt fencing shall have accumulated sediment removed from its upstream face when it reaches 50% of the fence height and from the downstream face when it reaches 25% of the fence height.

.b Replace damaged fabric and address flow-around and/or undermining problems immediately.

.c Sediment traps and basins shall be re-excavated once the sediment has filled 50% of the control measures depth.

.4 Maintain the access / vehicle cleaning pad through replacement of clean rock and re-establishing drainage paths away from the pads, as required.

.5 Immediately remove all objectionable material spilled, washed or tracked onto public roads after a rainfall event or during snow melt or at end of day as part of routine cleaning.

.6 Channels / Ditch Check

.a For non-lined channels and existing ditches, where no additional erosion controls where installed, check after every major rain fall event and remove sediment deposits as necessary. For a channel this may also require re-shaping.

.b For channels and ditches that have been constructed, lined, reinforced etc. to act as a temporary measure for a long time period; these controls shall be inspected monthly, minimally, and after a rain fall event, weekly during spring run-off when high flows may be anticipated.

.7 Additional measures such as re-seeding, fertilizing, erosion repairs and irrigation may be required until the vegetation is established and providing the required cover and erosion control function.

3.6 CLEAN-UP / REMOVAL

.1 Once construction activities are complete, as defined through the Development Agreement or Unit Price Contract (typically the issuance of the Final Acceptance Certificate), all ESC measures shall be removed and stored for re-use, recycled or properly disposed of.

.2 Areas adjacent to and downstream from the construction / developing area may have the ESC measures removed once the upstream construction / developing area has been stabilized (e.g. curb & gutter with catch-basins installed) prior to Final Acceptance.

.3 When the Town's storm system, including pipes, ponds and treatment units, has been used as part of the ESC plan, and prior to Final Acceptance of the project, any downstream existing storm system is to be cleaned, particularly the first downstream storm water treatment unit(s). For cleaning of the storm system, refer to Section 33 45 00.

.4 At the discretion of the Engineer, to reduce ground disturbance, the fencing may be cut at ground level, leaving the trenched-in portion of fence in the ground.

.5 Restore landscaping per Section 32 91 21.

1. GENERAL

This Section covers the installation, maintenance, and removal of temporary signing and traffic control devices which are specifically related to construction or repair situations and which are generally removed when the Work is complete.

1.1 RELATED WORK

.1 Traffic Control — Section 01 55 26

.2 Traffic Signage — Section 10 14 54

1.2 MEASURE OF PAYMENT

.1 The supply, installation, maintenance, and removal of temporary construction signing or other traffic control devices, including any modification requested by the Engineer, will be considered incidental to the Work and will not be paid for separately.

.2 The preparation of Traffic Accommodation Shop Drawings and daily recording of temporary construction signing will be considered incidental to the Work and not paid for separately.

.3 Where traffic accommodation is included as a bid item, payment will be made as described in Section 01 29 00 (Payment Procedures).

1.3 TRAFFIC ACCOMMODATION REPORT AND SHOP DRAWINGS

.1 The Contractor shall prepare a Traffic Accommodation Report stamped and signed by a Professional Engineer detailing the measures he proposes to use for accommodating traffic throughout the project. Where revisions of traffic patterns are required due to staging of the Work, separate traffic control drawings will be required to clearly identify all detour phases. For staged construction, provide traffic control Drawings numbered consecutively to correspond with identified phases of construction.

.2 The report shall consist of Drawings detailing the configuration of temporary construction signs and other traffic control devices in the work zone and written confirmation of the methods and procedures to be used by the Contractor to address specific traffic safety related issues or situations at the Work zone.

.3 The Contractor shall submit the Traffic Accommodation Report to the Engineer 14 days prior to the preconstruction meeting for the project or to a schedule agreed to

by the Engineer. The Engineer will review the Traffic Accommodation Report and communicate any concerns to the Contractor within seven days of the scheduled meeting. Any issues or concerns regarding the Contractor's proposed Traffic Accommodation Report shall be addressed to the mutual satisfaction of the Contractor and the Engineer prior to the commencement of the Work.

1.4 PUBLIC NOTICES

.1 The Consultant or Project Manager will prepare a detour drawing to be submitted to Engineering Services, Customer Services for notification of the upcoming traffic restrictions so that The Town has adequate time to inform Emergency Services, Transit and the Media.

1.5 TEMPORARY STREET NAME SIGNAGE

For new development areas the Contractor shall install, on behalf of the Owner, temporary street name identification signage per the Design Guidelines, Section 1.

2. PRODUCTS

2.1 MATERIALS

.1 The Contractor shall supply all signing materials, including sign posts, weighted stands, brackets, any mounting hardware, and other miscellaneous materials required for the erection of temporary construction signs.

.2 All signs, barricades, and other traffic control devices shall conform to the requirement for shape, colour, and size specified in the Manual of Uniform Traffic Control Devices for Canada. The orange portion of all signs shall be fully reflectorized using high brightness, retroreflective, non-metallized, prismatic sheeting material that incorporates durable, transparent, fluorescent pigment.

2.2 EQUIPMENT

.1 The Contractor shall supply all equipment required to complete the Work.

3. EXECUTION

3.1 ERECTION OF SIGNS

.1 Work on the project shall not commence until all necessary temporary construction signs and all other construction signs, as proposed in the Traffic Accommodation Report, are in place.

.2 When signs require frequent moves, portable type signs, mounted on weighted stands, may be used. Portable signs shall be placed on the shoulder of the road such that the face of the sign is fully visible to oncoming traffic and the bottom of the sign is not less than 0.3 m above the road surface. The stand shall be securely weighted and erected to ensure against being blown over by prevailing winds or gusts from passing vehicles.

.3 Non-portable signs shall be conspicuously posted, and erected at right angles to the roadway, with the bottom of the sign at a height of 1.5 m above the road, and not less than 2 m or more than 6 m from the nearest traffic lane.

.4 Traffic signs and devices shall be moved and kept as close to the Work area as practical, as construction proceeds.

.5 Objects within or immediately adjacent to the roadway, which constitute a hazard to traffic, shall be marked with alternating black and orange stripes attached directly to the object or erected immediately in front of it.

.6 The use of signs shall be kept to a minimum to prevent confusion.

.7 “Stop” signs shall be installed as directed by the Engineer.

.8 Speed zones, where required, shall be posted as indicated on the Traffic Accommodation Report drawings. Signs shall indicate the speed limits as ordered by the Engineer.

3.2 MAINTENANCE AND REMOVAL OF SIGNS

.1 Poorly maintained signs, defaced, damaged, or dirty construction signs shall be replaced, repaired, or cleaned without delay. Special care must be taken to ensure that construction materials and dust are not allowed to obscure the face of a sign.

.2 Signs not in effect shall be covered or removed.

.3 All construction signs shall be removed after the project is complete.

3.3 MODIFICATIONS TO EXISTING TEMPORARY CONSTRUCTION SIGNING

.1 The Contractor shall be totally responsible for the supply and proper placement of temporary construction signs. However, in the case of potential danger to the public or other circumstances where the Engineer or the Owner determines that the signing is inadequate, the Engineer will require changes to the Contractor’s operations to remedy the situation. These changes may involve the use of different types and/or

sizes of signs, modifying the number and/or location of signs, or any other modifications or additions required to protect the safety of the public.

3.4 DAILY RECORDING OF TEMPORARY CONSTRUCTION SIGNING

.1 Each day and as the Work area changes, the Contractor shall record the location of all temporary construction and any other traffic control devices used in the Work areas. The Contractor shall record this information on a form suitable to the Engineer and shall submit it to the Engineer on a weekly basis or when requested.

3.5 COMPLIANCE

.1 In cases where the Contractor is not in compliance with the Specifications and, in the opinion of the Engineer, there is eminent danger to the public the Engineer has the authority to order the immediate suspension of Work. Such orders must be made in writing.

.2 In cases where the Contractor is not in compliance with the specifications but, in the opinion of the Engineer, the infraction is not causing imminent danger to the public, the Engineer will use the following escalating process to address the situation:

.a Issue verbal instructions requiring the Contractor to correct the infraction.

.b Issue a written warning instructing the Contractor to correct the infraction.

.c Issue a written order instructing the Contractor to suspend Work until the infraction is corrected to the satisfaction of the Engineer.

1. GENERAL

This Section includes information regarding Product quality, availability, storage, handling, protection, transportation, and Manufacturer's instructions.

1.1 RELATED SECTIONS

.1	Alternatives	Section 01 23 00
.2	Quality Control	Section 01 45 00
.3	New Product Approval	Section 01 61 10

1.2 REFERENCE STANDARDS

.1 Within the text of each specification section, reference may be made to Reference Standards. A list of organizations who publish Standards is provided in Section 01 42 00 (References).

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, the Engineer reserves the right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be as specified in Section 01 45 00.

.5 Conform to latest date of issue of Reference Standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

1.3 QUALITY OF PRODUCTS

.1 Products, materials, equipment, and articles (referred to as products throughout the Specifications) incorporated in the Work shall be new, not damaged or defective, and of the best quality (compatible with Specifications) for the purpose intended. If requested, furnish evidence as to type, source, and quality of Products provided.

.2 Defective products, whenever identified prior to the completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is a precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to the quality or fitness of products, the decision rests strictly with the Engineer based upon the requirements of the Contract Documents.

.4 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the building.

.5 Permanent labels, trademarks, and nameplates on products are not acceptable in prominent locations, except where required for operating instructions or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

.1 Immediately upon signing the Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify the Engineer of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In the event of failure to notify the Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Engineer reserves the right to substitute more readily available products of similar character and quality, at no increase in Contract Price.

1.5 STORAGE, HANDLING, AND PROTECTION

.1 Handle and store products in a manner to prevent damage, adulteration, deterioration, and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in the Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.5 Remove and replace damaged products at own expense and to the satisfaction of the Engineer.

1.6 TRANSPORTATION

.1 Transport and handle Products in accordance with manufacturer's written instructions.

.2 Upon delivery, promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

.3 Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

.4 Pay costs of transportation of products required in the performance of Work.

.5 Transportation cost of products supplied by the Owner will be paid for by the Owner. Unload, handle, and store such products.

1.7 PRODUCT CHANGE

If the delivered Product is changed from the order, the product shall be returned or a request for substitution or alternative in accordance with Section 01 23 00 may be submitted.

1.8 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in the Specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify the Engineer in writing of conflicts between the Specifications and manufacturer's instructions, so that the Engineer may establish the course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Engineer to require removal and re-installation at no increase in Contract Price.

1.9 WASTE MANAGEMENT AND RECYCLING

.1 Packaging and associated materials shall be separated into recyclable and disposable.

.2 Packing material considered recyclable shall be disposed of at an appropriate recycling facility or the Town’s Waste Management Facility and its recycling program.

.3 The Contractor should inquiry to the Manufacturer / supplier if they have a recycling program for their packing material.

.4 Packing material that is non-recyclable locally or non-returnable to the Manufacturer / supplier shall be disposed of at the Town's Waste Management Facility per Section 01 35 43 (Environmental Procedures).

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section provides the basic information The Town requires when asked to accept a new product for use. The contractor wishing to use the product is to provide a report and documentation that will minimally answer the following questions. Further information regarding new products is available in Section 3 (Materials Compliance) of the Design Guidelines. This Section may be referred to for product substitution (alternatives) also.

1.1 RELATED WORK

.1 Alternatives — Section 01 23 00

.2 Common Product Requirements — Section 01 61 00

1.2 GENERAL QUESTIONS

.1 Does this product meet or exceed the criteria shown in this Specifications document?

.2 What are the products credentials based on?

a. Canadian standards organizations (e.g. CSA)

b. American Society for Testing and Materials (e.g. ASTM)

c. Other results from recognized national testing organizations

.3 Provide a copy (latest version) of the national standard the product is designed to meet.

.4 Has this product been used, tested, or endorsed by other Alberta municipalities?

.5 Is the product readily available in Olds or the surrounding area?

.a If not in Olds, available from where?

.b General delivery time (days or weeks)?

.c Any special requirements for shipping which may affect delivery (e.g. oversize load)

.6 Is this product compatible with the existing Town products (as referenced in the Town Specifications)?

.7 If the manufacturer was to no longer make this product (or went out of business) are there other (more common) products which could be substitute for it?

2. PRODUCT

.1 How does the product react to environmental exposure such as,

.a Cold weather?

.b Sun exposure?

.c Water or prolonged expose to moisture?

.d Soil contamination? (e.g. chlorides, sulphates, etc.)

.2 Is this considered a hazardous product?

.a Any special handling requirements?

.b Special PPE requirements?

.3 What is the design life span of the product's material?

.4 Does this product have specialized components?

.a Are these components readily available in Alberta?

.b Would this product be considered a "special" order?

.i Due to quantity, and / or,

.ii Uniqueness?

.5 Storage considerations?

.6 What products are required to make this product compatible or connectable to existing Town used products (as designated in the Contract Specifications)?

.7 What is the Manufacturer's name and how long have they been researching and suppling this product?

3. EXECUTION

.1 Is the product easily handled by human manipulation? Or

.a Does it require heavy equipment?

.2 Are there specialized installation requirements?

.3 Are there specialized tools required?

.4 Regular maintenance and inspections required?

.a Frequency?

.b Specifications?

.5 Any special considerations when doing repairs?

.6 Criteria for inspection and / or testing of product after installation?

1. GENERAL

This Section provides the basic requirements expected of a contractor when performing a site clean-up during or upon completion of the work. For multi-year projects these steps shall be performed on a regular bases through-out the construction period.

1.1 RELATED SECTIONS

.1 Temporary Construction — Section 01 52 00

.2 Hauling and Haul Routes — Section 01 53 40

Note: This section describes requirements applicable to all Sections within Divisions 02 to 34.

1.2 ON-GOING CLEANING

.1 Maintain haul routes per Section 01 53 40.

.2 Maintain the working area in a clean and orderly manner as the work progresses.

.3 Accumulated construction debris to be collected and removed from the site regularly (e.g. bi-weekly) to reduce debris accumulation that may pose a hazard to the workers. Disposal of material shall be to Section 01 35 43.

.4 Broom clean hard surfaces, rake clean other ground surfaces.

.5 Ensure protective measures are in-place when working adjacent to / along neighbouring property.

.6 Ensure erosion and sediment control (ESC) measures are in-place and maintained per Section 01 57 13.

1.3 FINAL CLEAN-UP

.1 Inspect catch basins and manholes and remove soil and debris which may have accumulated during construction per Section 01 57 13.

.2 Inspect valves to ensure they are exposed.

.3 Disposal of surplus, recyclable, re-useable, hazardous, or waste material to Section 01 35 43 or as noted in the specific sections.

.4 Remove surplus or salvaged materials belonging to the Contractor from the site.

.5 At time of or just after Final Acceptance Certificate (FAC) approval (or as directed by the Engineer) ensure all ESC measures have been removed, site is clean, temporary work infrastructure has been removed, permanent work (new and / or re-used) has been cleaned, and other conditions of FAC, per a Unit Price Contract, Development Agreement or Development Permit Development Agreement, have been met.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes a summarized description of the administrative process associated with preliminary and final inspections of the Work. If any conflicts arise from interpretation between this specification and those of the General Conditions, the General Conditions will prevail.

1.1 RELATED SECTIONS

.1	Project Forms	Section 00 60 00
.2	General Conditions	Section 00 71 00
.3	Payment Procedures	Section 01 29 00
.4	Submittal Procedures	Section 01 33 00

1.2 INSPECTION

.1 Contractor's Inspection

.a The Contractor and all Subcontractors shall conduct an inspection of the Work, identify deficiencies and defects and repair as required to conform to Contract Documents. Notify the Engineer in writing of satisfactory completion of Contractor's Inspection and that corrections have been made. Request an Engineer's inspection.

.2 Engineer's Inspection

.a The Engineer and Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The Contractor shall correct Work accordingly.

.3 Completion

.a Submit a written certificate that the following have been performed:

.i Work has been completed and inspected for compliance with Contract Documents.

.ii Defects have been corrected and deficiencies have been completed.

.iii Equipment and systems have been and are fully operational.

.iv Operation of systems has been demonstrated to Owner's personnel.

.v Work is complete and ready for final inspection.

.4 Final Inspection

.a When items noted above are completed, request a final inspection of the Work by Owner, Engineer, and Contractor. If Work is deemed incomplete by Owner and Engineer, complete outstanding items and request a re-inspection.

1.3 RE-INSPECTION

Should status of the Work require re-inspection by Engineer due to failure of Work to comply with Contractor's claims for inspection, Owner will deduct amount of Engineer's compensation for re-inspection services from payment to Contractor.

1.4 DECLARATION PROCEDURES

.1 Declaration of Substantial Performance

.a When Owner and Engineer consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance. Acceptance of Substantial Performance will be through the issuance of a Substantial Completion Certificate.

.2 Commencement of Lien and Warranty Periods

.a Date of Owner’s acceptance of submitted Declaration of Substantial Performance, issued as Substantial Completion Certificate or Construction Completion Certificate shall be the date for commencement of warranty period and commencement of lien period unless required otherwise by lien statute of the place of the Work.

.3 Construction Completion Certificate

.a When Owner and Engineer consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for Construction Completion Certificate.

.4 Final Payment

.a Following completion of lien period, submit claim for final payment in accordance with General Conditions.

.5 Final Acceptance Certificate

.a When Owner and Engineer consider all deficiencies and defects, identified as deficiencies during the maintenance period, have been corrected and it appears requirements of Contract have been totally completed, make application for Final Acceptance Certificate.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

1. GENERAL

This Section includes the administrative process associated with preliminary and final inspections of the Work.

1.1 RECORD DOCUMENTS

.1 As specified in other sections of the Specifications, the Contractor may be required to prepare Plan of Record drawings, to provide survey notes, to supply test results, or other documents. Such information shall be turned over to the Engineer upon Contract completion.

.2 Record documents shall be neat, legible, and accurate; drawings to the requirements noted in the Design Guidelines.

1.2 OPERATION AND MAINTENANCE MANUAL(S)

Provide the Manufacturer's operation and maintenance manual for storm water treatment units or product(s) requiring above normal or special maintenance processes.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 NOT APPLICABLE

Section 02 41 14 Asphalt Pavement Removal

Section 02 41 15 Hydro-Vac Requirements

Section 02 41 16 Site Demolition

1. GENERAL

This Section provides the basic requirements for the removal of asphalt, to its full depth, and the preparation for replacement. For specific depth asphalt pavement removal refer to Section 32 01 16.

1.1 RELATED SECTIONS

.1	Environmental Procedures	Section 01 35 43
.2	Traffic Control	Section 01 55 26
.3	Temporary Erosion & Sediment Control	Section 01 57 13
.4	Temporary Construction Signage	Section 01 58 99
.5	Site Cleaning	Section 01 74 11
.6	Reshaping Asphalt Pavement	Section 32 01 16
.7	Reshaping Granular Roadbed	Section 32 11 17
.8	Hot Mix Asphalt Concrete Paving	Section 32 12 16

1.2 MEASURE OF PAYMENT

.1 Removal of existing asphalt pavement will be measured in square meters of surface actually removed regardless of depth removed or number of operations required.

.2 Payment under this item will include all work involved in removing, hauling and disposing of the removed asphalt.

.3 Roadway base work shall be to Section 32 11 17.

2. PRODUCTS

2.1 EQUIPMENT

.1 Use cold milling or excavation equipment with the capability of removing the full depth of pavement as indicated.

3. EXECUTION

3.1 PREPARATION

.1 Prior to beginning removal operation, inspect and verify with Engineer areas and lines of asphalt pavement to be removed.

.2 Ensure the Town's Traffic Section has been notified if red light camera loops or traffic signal detector loops etc. will be affected by the work.

3.2 PROTECTION

.1 Protect existing pavement, concrete and protruding utility infrastructure from damage. In the event of damage, immediately replace or make repairs to the approval of Engineer at no additional cost.

.2 Provide protection for the storm water drainage system per Section 01 57 13.

3.3 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.4 REMOVAL

.1 Remove existing asphalt pavement to the limits established by the Engineer in field.

.2 Use equipment and methods of removal and hauling to minimize damage to the granular base course.

.3 When asphalt is to be recycled prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.4 Provide for suppression of dust generated by the removal process per Section 01 57 13.

.5 Provide continuous removal of excavated material from the adjacent sidewalk or boulevard.

3.5 CONCRETE REPAIRS

If concrete repairs are included as part of the contract, refer to Section 32 13 15 (Concrete Work).

3.6 WASTE MANAGEMENT AND DISPOSAL

.1 General

.a Removed material is the property of the Owner.

.b Dispose of removed asphalt pavement at a location designated by the Engineer.

.2 Reuse / Recycle

If the removed material is designated for recycling, stockpile at a location designated by the Engineer and to the following:

.a If removed asphalt is free of gravel or other contamination stockpile separately for recycling into new asphalt,

.b If removed asphalt is contaminated with base gravel stockpile separate for recycling into a granular base material,

.c If removed asphalt is contaminated with topsoil or other material not conducive to creating a recyclable product it shall be disposed of at the Town's Waste Management Facility, or

.d Other disposal options; refer to Section 01 35 43.

3.7 REPAIRS

.1 Base course repairs required due to grade, excess removal, contamination, etc. shall be per Section 32 11 17.

.2 Asphalt placement shall be to Section 32 12 16.

3.8 FINISH TOLERANCES

Finished surfaces in areas where asphalt pavement has been removed to be within ±5 mm of grade specified but not uniformly high or low.

3.9 SWEEPING

Sweep remaining, adjacent, asphalt pavement surfaces clean of debris resulting from removal operations using rotary power broom and hand broom as required per Section 01 74 11.

1. GENERAL

This section specifies general requirements regarding the use of hydrovac technology for locating of buried utilities.

1.1 RELATED SECTIONS

.1	Work Restrictions	Section 01 14 00
.2	Environmental Procedures	Section 01 35 43
.3	Topsoil and Finish Grading	Section 32 91 19
.4	Tree and Shrub Preservation	Section 32 93 50

1.2 MEASURE OF PAYMENT

.1 This work will be considered incidental to the Contract unless the Contract has a bid item.

.2 If a bid item is present payment shall be Prime Cost Sum. Payment shall be full compensation for all equipment, labour, and materials necessary to expose the utility and backfill the excavation.

2. PRODUCT

Not Applicable

3. EXECUTION

3.1 REGULATORY REQUIREMENTS

Prior to work commencing the contractor shall obtain all required permits and field locations from the appropriate utility and/or Town authority. Refer to Section 01 14 00 for further information.

3.2 ENVIRONMENTAL REQUIREMENTS

Prior to work commencing, the contractor shall provide:

.1 The necessary environmental protection for the surrounding area from excessive water/soil spray.

.2 Protection for the Town's storm sewer system adjacent to or downstream of the excavation in the event of an accidental escape or over production of water slurry used in the excavation.

.3 Comply with appropriate environmental procedures as noted in Section 01 35 43 and Section 01 57 13.

3.3 SAFETY

.1 If the utility excavation is exposed and unmanned, the excavation shall be protected by warning markers, to identifying the hazard, and:

.a Covered with 19 mm construction grade plywood or 3 mm sheet steel, or

.b Fenced, or

.c Barricades placed such to create a closed perimeter.

3.4 CLEAN-UP

Once the utility has been survey located the excavation is to be refilled with sand and the surface returned to original condition.

1. GENERAL

This Section includes the requirements for demolishing, salvaging, and removing, wholly or in part, various items designated to be removed, or partially removed, including backfilling and surface restoration from the resulting removals.

1.1 RELATED SECTIONS

.1	Environmental Procedures	Section 01 35 43
.2	Asphalt Pavement Removal	Section 02 41 14
.3	Clearing and Grading	Section 31 11 00
.4	Trench Excavation and Backfilling	Section 31 23 33
.5	Roadway Excavation and Embankment	Section 31 24 13
.6	Removal & Replacement of Concrete Work	Section 32 13 14
.7	Topsoil and Finish Grading	Section 32 91 19
.8	Tree and Shrub Preservation	Section 32 93 50

1.2 WASTE MANAGEMENT

The Contractor shall contact the Operational Services regarding which materials may be accepted at The Town's Waste Management Facility prior to submitting their Tender.

1.3 MEASURE OF PAYMENT

.1 General

.a Waste Management Facility charges shall be included in the Tender amount and considered incidental to the Contract. This item has no payment clause.

.b Restoration and disposal shall be considered incidental to the Work.

.c Items specified as "Remove and Replace" shall be measured and paid to Section 32 13 14.

.2 Asphalt and Concrete

.a Payment for saw-cutting will be made at the unit price tendered, within the depth ranges specified per lineal metre of saw-cutting. Horizontal measurement shall be measured as the surface length of cut. Vertical depth shall be based on the average depth measured at intervals determined by the Engineer.

.b Removal of asphalt pavement shall be measured and paid to Section 02 41 14.

.c Removal of granular base and subbase materials will be measured in cubic metres in place.

.d Removal of concrete work will be measured as follows:

.i Monolithic curb, gutter, and sidewalk to be measured in square metres.

.ii Separate sidewalk to be measured in square metres.

.iii Curb and gutter to be measured in lineal metres.

.iv Curb to be measured in lineal metres.

.v Miscellaneous concrete work removal to be measured as shown in the Schedule of Quantities.

.e Removal of paving stone shall be measured in square metres.

.3 Electrical and Traffic

.a Removal of cable duct banks, regardless of the number of ducts in each bank, will be measured in metres from end to end of duct bank for each size.

.b Removal of traffic davits, poles, signal heads, signage, parking meter etc. including the base and associated work shall be measured in units.

.c Removal of traffic controllers or other associated cabinets shall be measured in units removed.

.d Removal of road side signage, with no constructed base or pile (e.g. Telespar post), shall be considered incidental to the contract and no separate payment will be made unless the Contract has a bid item included.

.e URD boxes are considered non-salvageable and removal will be incidental to the work.

.4 Landscape and Other

.a Tree removal shall be measured in units removed. Excepting if individual plantings are included in a bedding area. Cost for removal of individual plant shall include all labour, equipment, disposal etc. The unit rate shall be based on:

.i 300mm calliper or smaller
.ii Greater than 300mm calliper

.b Shrub removal shall be measured in units removed, regardless of size. Excepting if individual plantings are included in a bedding area. Cost for removal of individual plant shall include all labour, equipment, disposal etc.

.c Removal of a planting bed shall be measured in square meters and include the removal of all plant material, regardless of size (calliper), ground cover, labour, equipment, disposal etc.

.d For removal of larger landscaped area and/or plant clusters the area shall be measured and paid to Section 31 11 00.

.5 Fences and Posts

.a Removal of fences and guard rails will be measured in metres.

.b Removal of a post (and attachments) in a constructed base or pile (e.g. parking meter) will be measured in units removed.

.6 Utility

.a Removal of culverts, pipe sewers, and drains will be measured in metres regardless of diameter. End points of measurements will be at centres of manholes or catch basins or open ends of pipes, as applicable.

.b Removal of hydrant, valves, manholes and catch basins will be measured in units.

.c For abandonment of culverts, pipe sewers, drains, manhole and catch-basin barrels, where the pipe or barrel is filled and / or capped as specified in the Section and regardless of size, payment will be lump sum and considered full compensation for all labour, equipment, materials, etc. required to complete the task.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 PREPARATION

1. Inspect site and verify with Engineer items designated for removal and items to remain.

2. Locate and protect utility lines. Preserve in operating condition active utilities traversing site.

3. Notify utility companies before starting demolition.

4. Install appropriate erosion and sediment control measures per Section 01 57 13.

5. Where vegetation or plant material has been identified for removal, refer to Section 31 11 00.

3.2 PROTECTION

Protect existing items designated to remain and materials designated for salvage. In the event of damage to such items, immediately replace or make repairs to the approval of Engineer and at no cost to Owner.

3.3 SAW-CUTTING

.1 Shall be made with a concrete or asphalt saw capable of providing a true, straight joint of consistent depth, as specified.

.2 For concrete work, shall be made at a construction or surface joint at each end of the designated repair area.

.3 For asphalt adjacent to designated areas of concrete removal, shall be parallel to the edge of concrete work at a minimum distance of 200 mm and a maximum distance of 500 mm from the lip of gutter.

.4 Water used in the process of cutting shall be prevented from entering the storm sewer system.

.5 Cuttings shall be removed by sweeping and not flushing with water.

.6 If the Contractor provides a containment structure (e.g. sand bag dam in the gutter, must be upstream of a catch-basin) the contained water shall be removed by vacuum or allowed to evaporate and the sediment / residue in the gutter removed by hand shovel.

3.4 REMOVAL

1. Remove items as indicated by Drawing(s) or the Engineer.

2. Do not disturb adjacent items designated to remain in place.

3. In removal of pavements, curbs and gutters:

   a. Square up adjacent surfaces to remain in place by saw-cutting or other method approved by Engineer.

   b. Protect adjacent joints and load transfer devices.

   c. Protect underlying granular materials.

   d. When removing curbs and gutters adjacent to pavements, saw-cut as per this Section and remove asphalt and granular material in order to complete form work.

4. When removing pipes under existing or future pavement area, excavate at least 300 mm below pipe invert.

3.5 ABANDONMENT OF UTILITY

.1 Pipe - General

.a Confirm all services attached to the pipe designated for abandonment have been abandoned or temporarily connected to another “in-service” main.

.b For water pipe, confirm water supply to proposed abandoned pipe is shut down.

.c Drain pipe of fluids and / or clean pipe of hazardous contamination. Cleaning per Section 33 45 00.

.d A minimum of one meter of pipe is to be removed at point of abandonment. If practical, preference is to have the entire line removed.

.e For PVC and DI pipe, a plug is to be installed. If the pipe type does not have a suitable manufactured plug, a section of PVC pipe is to be connected and a plug added to the PVC pipe.

.f Create a water tight seal around the plug, including 300 mm of exterior pipe length, with a low strength concrete surround.

.g Backfill to Section 31 23 33.

.2 PVC Pipe

.a For pipe less than 375 mm in diameter a plug is to be installed.

.b For pipe 375 mm or larger in diameter, place sandbags or other firm backing 300 mm inside the abandoned sewer, filling the void between the backing and the plug with a low strength concrete.

.c Install a manufactured compression type plug.

.d Create a water tight seal around the plug, including 300 mm of exterior pipe length, with a low strength concrete surround.

.3 Concrete Pipe

.a For pipe 375 mm to 675 mm diameter, place sandbags, bricks, or other firm backing 300 mm inside the abandoned sewer and seal with a low strength (slurry) concrete mixture. Break out a section of the pipe invert, in front of the sandbags, to allow the concrete to key into the pipe to prevent shifting.

.b The method for plugging each end of sewer pipes larger than 675 mm shall be detailed on the drawings.

.4 Hydrants and Valves

.a The nearest valve to the plug is to be shut-off and the valve stem removed.

.b If multiple valves are required to isolate the pipe that is to be abandoned the tee fitting is to be removed and replaced with a straight pipe or bend. If a valve is located on the abandon pipe, the valve, valve box and stem shall be removed.

.c If a hydrant is located on the abandoned pipe, it and its associated valve shall be removed and salvaged, re-located, stockpiled or disposed of, as applicable. The vertical section of pipe, including the bend, is to be removed

and the horizontal end of the former hydrant lead is to be plugged. If practical, preference is to have the entire hydrant lead removed back to the main.

.5 Service - 50 mm or less

.a The main stop for the abandoned service shall be removed and the tap hole sealed with an approved brass plug. Where approved by the Engineer, a Robar 6636AS, Ford FACC sleeve or approved equal may be used to abandon the service.

.b A record of the abandonment is to be forwarded to Engineering Customer Services.

.6 Service - 50 mm or greater

.a All services shall be abandoned at the property line.

.b A minimum of one meter of service pipe is to be removed at point of abandonment.

.c The service tee is to be cut-out and replaced with a straight section of pipe.

.d A plug is to be installed on the abandoned service. If the pipe type does not have a suitable manufactured plug the pipe end is to be encased in a stiff concrete mix, keeping the concrete from flowing into the pipe too far.

.e The curb stop shall be shut-off and the standpipe removed.

.f If practical, preference is to have the entire service line removed from the property line to the main.

.g A record of the abandonment is to be forwarded to Engineering Customer Services.

.7 Manholes and Vaults

.a All leads shall be plugged at the manhole. Use a low slump slurry concrete to fill the lead portion passing through the manhole. The concrete fill is to be trimmed flush to the walls of the barrel. If a piece of the pipe section remains in the manhole wall, ensure the slurry concrete overlaps the pipe piece to form a water tight seal.

.b Excavate and salvage each frame, cover, collar(s) and slab top.

.c Manholes that have an existing depth of cover 4.0 m or less shall have the barrels and base removed.

.d Manholes that have an existing depth of cover greater than 4.0 m shall have enough barrels removed to provide a minimum of 2.0 m cover over the abandon manhole, as measured to the finished surface.

.e For manholes where the barrels are left, the manhole shall be filled with sand and/or clay to within 50 mm of the top of the top barrel (to allow the concrete cap to lock to the barrel). The fill shall be compacted to meet standard compaction densities per Section 31 23 33.

.f A 300 mm thick low slump, non-reinforced, cast-in-place concrete cap shall be placed over and around the existing top barrel to provide a water tight seal, prior to backfilling.

.g Backfill the excavation and compact to Section 31 23 33.

.8 Catch basins

.a All leads shall be removed and the trench backfilled and compacted to Section 31 23 33.

.b Salvage each frame, cover, collar(s) and slab top, barrel and base.

.c Catch basin with a barrel size greater than 900 mm (including catch basin manholes) with a depth of cover greater than 4.0 m shall be abandoned as per manhole abandonment.

.d Backfill the excavation and compact to Section 31 23 33.

.9 Culvert

.a Remove the entire culvert length through excavation and the trench backfilled per Section 31 23 33.

.b If removal is not an option, the culvert, as identified on the drawings, shall be abandoned as follows:

.i For culverts less than or equal to 600 mm fill the culvert with a low strength concrete mixture. “Pinch” the ends of the culvert, by machine, after the concrete has stiffened but not set, ensuring concrete is squeezed into the compressed end to form a water tight seal.

.ii If the culvert is tore or ripped during abandonment ensure the concrete filler plugs and covers these openings to ensure a water tight seal.

.c The method for plugging culverts larger than 600 mm shall be detailed on the drawings.

.d If the culvert ties to a manhole or catch basin barrel, remove the culvert and plug the manhole wall as noted in this Section.

.10 Underdrain

.a Where the pipe is being abandoned at a manhole or catch basin, refer to this Section.

.b Inject a low slump concrete mix (slurry) through the entire length of the underdrain, ensuring the perforations are plugged.

.c Install a manufactured compression type plug on each end per this Section.

.11 Force main

.a Confirm a new force main (or replacement main) is “in-service” before abandonment.

.b Where a pipe is being abandoned at a vault (manhole) or chamber, refer to “Manholes” in this section.

.c If the abandon force main has valves located along it, they are to be abandoned by setting the valve to the “closed” position and removing the valve stem and box.

.d If the abandoned force main had a valve(s) located inside a chamber, it shall be completely removed and the pipe ends capped appropriately.

.12 Private Land

All utility pipe and appurtenances located on future private land shall be excavated and removed completely up to the property line. At the property line, the utility infrastructure shall be abandoned per the procedures in this Section.

3.6 SALVAGE

.1 Carefully dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated above or as directed by Engineer.

.2 Item to be clean and free of cracks, punctures and contaminates (e.g. dirt, rust, fungi, sludge etc.).

.3 Item to be free of blemishes and exterior damage due to removal.

.4 If the item has an operating component, that component is to be (confirmed) operational after removal and prior to storage or re-use.

3.7 DISPOSAL OF MATERIAL

Disposal of materials shall be to Section 01 35 43.

3.8 BACKFILLING

.1 Trench excavations that are not required for further construction shall be backfilled per Section 31 23 33.

.2 Removals affecting roadway or concrete work, where the excavation requires fill to re-establish grade shall be to Section 31 24 13.

3.9 RESTORATION

1. Upon completion of work, remove debris, trim surfaces, and leave work site clean per Section 01 74 11.

2. Re-instate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work, as outlined in specific sections for each type of work.

3. Re-instate landscaping per Sections 32 91 19, 32 92 19 and 32 93 10 as applicable.

Section 03 05 13	Basic Concrete Materials and Test Methods
Section 03 05 13	Table A: Concrete Design Requirements
Section 03 05 13	Table B: Compressive Strength / Entrained Air
Section 03 11 00	Concrete Formwork
Section 03 12 10	Slip Formed Concrete
Section 03 20 00	Concrete Reinforcement
Section 03 30 00	Cast in Place Concrete
Section 03 48 00	Precast Concrete Specialties

1. GENERAL

This Section provides the basic information for the products required for concrete mixing and the testing requirements of the finished concrete.

1.1 RELATED SECTION

.1	Concrete Reinforcement	Section 03 20 00
.2	Concrete Work	Section 32 13 15
.3	Manholes and Catch-basins	Section 33 05 13

1.2 REFERENCE STANDARDS

Supply ready-mixed concrete in accordance with CSA-A23.1 and testing of ready-mixed concrete in accordance with CSA-A23.2 except where specified otherwise.

1.3 MEASURE OF PAYMENT

No measurement to be made under this Section.

2. PRODUCTS

2.1 GENERAL

Concrete shall consist of the following components:

.1 Aggregates

.a Coarse aggregate: greater than 5 mm particle size, and

.b Fine aggregate: less than 5 mm particle size of natural or approved manufactured sand.

.2 Paste

.a Portland Cement,

.b Supplementary cementing materials,

.c Water,

.d Air-entraining admixture, and

.e Additional admixtures where permitted by the Engineer.

2.2 AGGREGATE MATERIALS

.1 General

.a Upon request by the Engineer and prior to establishing a source of aggregates, the Contractor shall have the aggregate sampled at the source of supply by The Town's appointed testing firm. The source of supply will be approved if the samples submitted meet the requirements of these Specifications.

.b Records of the testing of all aggregates used for the production of concrete must be maintained and be disclosed to the Engineer upon request.

.2 Fine Aggregate

.a Fine aggregate shall meet the requirements of 'FA 1' as provided in CSA-A23.1, Table 10 except as modified by the following paragraph:

.i Fine aggregate shall be natural sand or approved manufactured sand, washed clean, having hard, strong, sharp, durable uncoated grains, and shall be free from injurious amounts of dust, lumps, soft or flaky particles, mica, shale, alkali, organic matter, loam, or other deleterious substance. Sand shall be tested for impurities by colorimetric test in conformity with CSA Test Method A23.2-7A and sand giving a colour darker than the reference standard colour will be subjected to CSA Test Method A23.2-4A to determine its acceptability.

.b Fine aggregate sizing shall conform to CSA-A23.1, Table 10:

SIEVE SIZE	TOTAL PASSING SIEVE % BY MASS
10 mm	100
5 mm	95 - 100
2.5 mm	80-100
1.25 mm	50-90
630 um	25-65
315 um	10-35
160 um	2-10
80 um	0-3

.c Should the necessity for frequent rejections occur, no further sand will be accepted from that source and another approved source will be required

.3 Coarse Aggregate

.a Coarse aggregate shall conform to the requirements of CSA-A23.1, Table 11, Group 1 except as modified by the following paragraph:

.i Coarse aggregate shall consist of gravel or broken stone composed of strong, hard, durable uncoated pebbles, or rock fragments, washed clean and free from injurious amounts of shale, coal, clay, lumps, soft fragments, dirt, glass and organic, or other deleterious substances.

.b Aggregates shall be kept clean and free from all other materials during transportation and handling. The aggregates shall be kept separated from each other at the Site, until measured and placed in the mixer.

2.3 PORTLAND CEMENT AND CONCRETE MATERIALS

.1 General

.a Portland Cement shall conform to CSA-A23.1, Table 6 for all types of cement.

.b The cement manufacturer's mill test reports must be submitted to the Engineer upon request.

.2 Air-Entraining Admixture

.a An air-entraining admixture conforming to ASTM C260 must be added to the batch independently. Sufficient air-entraining admixture shall be added to produce the air content specified, at the time of placing in the forms.

.3 Water Reducing Admixture

.a Water reducing admixture, if approved, shall conform to the requirements of ASTM C494.

.4 Calcium Chloride Admixture

.a Calcium chloride conforming to ASTM C494 shall only be used when approved by the Engineer, but in no case will the amount added be greater than 2% of the cement weight.

.5 Use of Chemical Admixtures in Concrete

.a Chemical composition, classification of admixtures, effects of admixtures and the application of admixtures for use in concrete shall be as detailed in ASTM C494. Use of chemical admixture must be approved by the Engineer.

.6 Water

.a Water conforming to CSA-A23.1 to be used and shall be furnished from sources approved by the Engineer. For Town supplied water refer to Section 01 51 00 (Temporary Utilities – Use of Hydrant) for additional information.

.7 Supplementary Cementing Materials

.a Pozzolanic mineral or fly ash shall conform to the requirements of CSA-A23.5, Supplementary Cementing Materials and their use in Concrete Construction. Fly ash to be Type C or Type F.

2.4 COLOURED CONCRETE

Coloured concrete shall not be used, unless approved by The Town.

2.5 CONCRETE MIX DESIGN

.1 An independent testing firm shall prepare concrete mix designs which will be submitted to the Engineer for each source of concrete supply prior to the commencement of the Contract. Concrete suppliers may submit their own mix designs, provided they submit documentation to show that they have been approved by an independent testing firm. All submitted mix designs must be stamped and signed by a professional engineer registered to practice in the Province of Alberta.

.2 Trial mixes shall be prepared in the batch plant and/or truck mixed in accordance with The Town of Olds Concrete Specifications. In each case where there is a change in the materials used, a new trial mix will be required.

.3 Concrete supplied shall conform to the (minimum) requirements noted in Table ‘A’.

TABLE 'A'
CONCRETE DESIGN REQUIREMENTS

Concrete Class	Concrete Uses	Concrete Strength (min.MPa)	Air Content (%)	Maximum Slump (mm)	Cement Type	Maximum Flyash Content (%)	Maximum Water/ Cement Ratio by Mass	Minimum Portland Cement Content (Kg/m^3)
A	Traffic Davit Base	30	5 - 8	80	GU, HS	20	0.5	325
B	Sidewalk, Curb and Gutter	32	5 - 8	80	GU, HE	0	0.45	350
D	Manhole and Catch-basin Bases, Benching, Thrust Blocks, Class A Bedding, Underground Ducts	25	5 - 8	80	HS	20	0.5	275
E	Lean Concrete Slurry Mix for Road Repairs	2 - 4	5 - 8	N/A	GU, HS	N/A	N/A	N/A
F	Fill Concrete for Trench Backfill	0.2 - 0.5	4 - 7	150	GU, HS	N/A	N/A	N/A

3. EXECUTION

3.1 SEASONAL AND COLD WEATHER REQUIREMENTS

.1 Concrete shall not be placed on subbase if the ground temperature is less than 5 degrees Celsius.

.2 No concrete shall be placed during rain.

.3 When rain appears imminent placement operation shall cease. Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with CSA A23.1/A23.2. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.

.4 Hot and cold weather requirements shall conform to the requirements of CSA-A23.1, Section 7.1 and Table 19 unless specified otherwise.

.5 Concrete placed between April 16 and September 30 shall attain the minimum allowable compressive strength in 28 days. For concrete placed between October 1 and April 15, 85% of the minimum allowable compressive strength shall be attained in 7 days. After placement the concrete surface temperature is to remain at or above 10°C until the concrete has attained at least 85% of the minimum allowable compressive strength. The Engineer will determine if High Early Strength concrete is required before September 30 based on forecast weather conditions 48 hours prior to the placement of concrete.

.6 When the air temperature is at or below 4°C or is likely to drop below 4°C within 24 hours of placing concrete, the temperature of the concrete immediately after being deposited in the forms, is not to be less than 16°C nor more than 32°C.

.7 During cold weather (ambient air temperature at or below 5°C) hoard and / or heat the space around the fresh concrete to maintain the concrete surface temperature at 10 degrees Celsius or more until the concrete has attained at least 85% of the minimum specified compressive strength.

.8 Where coloured concrete is to be used the air temperature shall be between 8°C and 27°C; based on a shaded condition.

.9 For mass concrete, the minimum temperatures stated above may be reduced at the discretion of the Engineer.

3.2 TESTING PROCEDURES AND SPECIFICATIONS

.1 The testing laboratory and field personnel shall meet the requirements of CSA-A23.1, Clause 4.4.1.4.

.2 Concrete shall be tested by a recognized testing laboratory appointed by the Engineer which will test according to CSA-A23.2 testing procedures unless otherwise specified for the following:

.a Test Methods and Standard Practices: CSA-A23.2

.b Sampling plastic concrete: CSA-A23.2-1C

.c Making and curing concrete compression and flexural test specimens: CSA-A23.2-3C

.d Air content of plastic concrete by the pressure method: CSA-A23.2-4C

.e Slump of concrete: CSA-A23.2-5C

.f Density and yield of plastic concrete: CSA-A23.2-6C

.g Compressive strength of cylindrical concrete specimens: CSA-A23.2-9C

.h Obtaining and testing drilled cores for compressive strength testing: CSA-A23.2-14C

.i Standard Test Method for Microsopical Determination of parameters of the Air-Void system in hardened concrete: ASTM C457

.3 Where reference is made to an A.S.T.M. designation or a CSA standard, the current standard applies.

.4 There shall be at least one strength test, slump test and air content test for each 50 cubic metres of concrete or fraction thereof; in any event, not less than one test for each class of concrete used. For the purposes of this Section the Engineer will determine the volume of concrete represented by each test taken.

.5 When making tests on fresh concrete, not less than three specimens for each test shall be moulded for compressive tests. One cylinder is to be tested at seven days and two at 28 days. The Engineer may require more tests than outlined above.

.6 When the air temperature is below 0°C during concrete placement, or is likely to fall below 0°C within 72 hours after placement, two additional cylinders will be made for each test. These two cylinders will be field cured in a manner that simulates curing of the concrete placed.

.7 A minimum of two field cured cylinders will be required for any cast-in-place concrete which is to be post-tensioned regardless of air temperature at the time of pouring.

.8 The Contractor shall give the Engineer 24 hours notice prior to any concrete placement or any work requiring testing in order that the Engineer may arrange for required testing. The Engineer shall be reimbursed by the Contractor for any charges to the Engineer by the Testing Agency for stand-by time resulting from the Contractor's performance.

.9 The foregoing does not apply to preparation of concrete mix designs for projects which the Contractor shall engage an independent Testing Agency. Cost of such mix design shall be borne by the Contractor. Copies of mix designs shall be submitted to the Engineer for approval, however, such approval does not constitute acceptance of the final product which shall meet the requirements set forth elsewhere in this Section.

.10 If testing indicates substandard materials and workmanship, further testing, as approved by the Engineer, shall be completed at the Contractor's expense.

.11 The Contractor shall supply, as part of the Contract, all materials, scaffolding, labour, etc. required to facilitate testing services on a job site.

3.3 TESTING REPORTS

.1 Reports for concrete testing shall contain the following information:

.a Job to which concrete is being supplied,

.b Date of sampling,

.c Air temperature when sampling,

.d Temperature of mix when sampling,

.e Name of concrete supplier,

.f Exact location in which the concrete is being placed,

.g Ground temperature at location, if requested by the Engineer,

.h Specimen number,

.i Test number,

.j Slump,

.k Age of test,

.l Cylinder strength,

.m Method of curing,

.n Air content,

.o Type of cement, and

.p Minimum and maximum concrete surface temperature readings during the initial curing period of at least 72 hours.

3.4 DEFECTIVE WORK

.1 Concrete that fails to meet any requirement of this specification will be removed and replaced at the Contractor's expense.

.2 The compressive strength of concrete shall be determined in accordance with CSA A23.1-14 clause 4.4.6.1.

.3 Except as noted in clause 4.4.6.4.2 concrete strength shall be determined as the compressive strength of cylinders tested at 28 days.

.4 The strength level of concrete shall be considered acceptable if for a given strength class the following two criteria are met for concrete produced from a single mix design:

.a Each individual strength test equals or exceeds the specified 28 day strength – 3.5 MPa when the specified compressive strength is 35 MPa or less or where the individual strength test is at least 90% of the specified strength when the specified compressive strength is above 35 MPa., and

.b The moving average of three consecutive strength tests for the same concrete equals or exceeds the specified 28 day strength.

.5 When structural requirements permit, the specified compressive strength requirements for mass concrete, high strength concrete, high performance concrete,

high-volume supplementary cementing materials concrete subjected to sulphate attack may be evaluated at a later age (i.e. 56 days or 91 days) as specified by the Engineer.

.6 If the concrete strength does not meet the specified strength requirement, and when structural requirements permit, the Engineer may at his discretion, offer the option of leaving the concrete in place and reducing payment by 50% in lieu of removing and replacing the concrete.

.7 The application of an adjusted unit price does not relieve the Contractor of the Contract maintenance requirements.

3.5 SUPPLY AND DELIVERY OF CONCRETE

.1 Mixing and Delivery

.a Ready mixed concrete shall be mixed and delivered in accordance with the requirements of CSA-A23.1.3 and subject to all provisions herein relative to materials, strength, proportioning, consistency, measurement and mixing unless noted otherwise.

.b If concrete placing is interrupted for a period of more than one-half hour, the work shall be removed back to the last surface cut and a construction joint shall be formed.

.c A maximum time limit of 120 minutes from the time of batching to complete discharge shall be observed. No concrete older than 120 minutes shall be placed without the authorization of the Engineer.

.2 Re-tempering

.a Concrete shall not be re-tempered if test values are within specifications at the time of delivery to the site.

.b Concrete may be re-tempered at the job site in accordance to CSA-A23.1, 5.2.5.3.2:

.i Mixing time after the admixture or water has been introduced shall not be less than five minutes at mixing speed.

1. GENERAL

This Section provides the requirements for formwork in conjunction with concrete work.

1.1 RELATED WORK

.1 Concrete Reinforcement — Section 03 20 00

1.2 MEASURE OF PAYMENT

No measurement will be made under this Section. Include costs in items of work for which concrete formwork is required.

2. PRODUCTS

2.1 MATERIAL

.1 Formwork materials shall be of wood or steel, free of blemishes, capable of providing a smooth face surface. Formwork to be held in place with stakes, either wood or steel material, secured by nail or tie.

.2 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.

.3 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 24 mm diameter in concrete surface.

.4 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.

.5 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal at 40° C, flashpoint minimum 150° C, open cup.

3. EXECUTION

3.1 PROTECTION

Provide barrier and warning signage to pedestrian and vehicles of open excavation and formwork to Section 01 55 26.

3.2 ERECTION

.1 Verify lines, levels and column centres before proceeding with formwork and ensure dimensions agree with drawings.

.2 Stagger formwork joints from opposite side during lay-out, prior to installation.

.3 Hand trim sides and bottoms of excavation where forms to be placed.

.4 If the base of the concrete is over excavated once formwork has been placed:

.a And the base is a prepared, compacted, granular crush rock additional (compacted) granular material may be added to bring the base to grade.

.b Or the base is on native material either a granular material may be added if a sufficient depth can be achieve to reach compaction densities or the over-excavation is filled with concrete during the regular pour.

.5 Construct forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1.

.6 Ensure enough formwork bracing (stakes) is used to resist the lateral forces of the plastic concrete.

.7 Install reinforcement to drawing and per Section 03 20 00.

.8 Remove loose earth from forms. Clean formwork in accordance with CSA-A23.1, before placing concrete.

.9 Provide 12 hours prior notice to the Engineer to concrete placement, for approval of formwork.

.10 Apply releasing agent to forms and/or moisten formwork and base material prior to concrete placement.

.11 Remove formwork with caution not to damage newly placed concrete. Do not wedge pry bars, hammers or other tools against the finished concrete surface. Remove formwork in accordance with CSA-A23.1.

.12 Re-use of formwork subject to requirements of CSA-A23.1.

1. GENERAL

This Section specifies requirements for use of slip-form machines (a.k.a. Extruders) for concrete curbs, curbs and gutters and sidewalks.

1.1 RELATED WORK

.1	Concrete Reinforcement	Section 03 20 00
.2	Cast-in-Place Concrete	Section 03 30 00
.3	Concrete Work	Section 32 13 15

1.2 MEASURE OF PAYMENT

No measurement to be made under this Section.

2. PRODUCTS

2.1 MATERIALS

.1 Concrete to Section 03 30 00 with 50 mm maximum slump.

.2 Reinforcement to Section 03 20 00.

2.2 EQUIPMENT

.1 Subgrade trimmers: self-powered trimmers capable of producing a clean smooth surface true to line and grade indicated. Remaining loose material on subgrade not to exceed 6 mm in depth.

.2 Concrete extruders: self-powered extruders with automatic line and grade control capable of placing, consolidating, screed, and float finishing in one pass.

3. EXECUTION

3.1 PREPARATION

.1 Ensure the surface is to grade and cross-section as specified on the drawing(s) or as directed by the Engineer.

.2 Ensure guide line is to alignment as specified on the drawing(s) or as directed by the Engineer.

3.2 EXECUTION

.1 Operate concrete extruder continuously until section or scheduled pour completed. Empty hopper of concrete and construct joint containing two 1.2 m 10M deformed steel bars when operations delayed more than 30 minutes.

.2 Vibrate concrete to obtain a dense, smooth finished mass.

.3 Finishing handwork to be minimized. Concrete requiring excessive hand finishing to be rejected.

.4 Construct joint containing two 1.2 m 10M deformed steel bars at end of each section of extruded concrete.

.5 Areas of concrete to be formed and placed by hand shall be completed within 7 days of completion of adjacent extrusion.

.6 Concrete reinforcement placement shall be to Section 03 20 00.

.7 Concrete work required to be hand placed shall be to Section 32 13 15.

1. GENERAL

This Section specifies concrete reinforcing materials, their fabrication and general placement to be used in conjunction with cast-in-place concrete.

1.1 RELATED WORK

.1 Concrete Formwork — Section 03 11 00

.2 Cast-in-Place Concrete — Section 03 30 00

1.2 REFERENCE STANDARDS

.1 Do reinforcing work in accordance with CSA-A23.1 and welding of reinforcing with CSA-W186, except where indicated otherwise.

1.3 TEST REPORTS

.1 Upon request, provide Engineer with certified copy of mill test report of steel supplied, showing physical and chemical analysis.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00.

.2 Clearly indicate bar sizes, spacing, location, and quantities of reinforcement, mesh, chairs, spacers and hangers with identifying code marks to permit correct placement with out reference to structural drawings.

.3 Detail placement of reinforcing where special conditions occur.

.4 Design and detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise specified on drawings.

1.5 STORAGE AND HAULING

.1 Ship bar reinforcement in standard bundles easily identifiable and marked in accordance with bar lists.

.2 Store reinforcement to prevent deterioration or contamination by dirt, detrimental rust, loose scale, paint, oil, or other foreign substances that will destroy or reduce bond.

.3 Do not straighten or re-bend reinforcement in any manner.

.4 Do not use bars kinked or bent by improper handling or storage.

1.6 MEASURE OF PAYMENT

.1 No measurement to be made under this Section.

2. PRODUCTS

2.1 MATERIALS

.1 Steel

.a Reinforcing Steel: billet steel, Grade 400, deformed bars to CSA-G30.18 unless indicated otherwise.

.b Reinforcing bars: weldable low alloy steel deformed bars to CSA- G30.18.

.c Tie Bars: to CSA-G30.18 grade 300, billet-steel, deformed bars, uncoated; or to ASTM D3963 for epoxy-coated.

.d Steel Dowels: to CSA-G30.18, clean, straight, free from flattened or burred ends, uncoated; or to ASTM D3963 for epoxy-coated.

.e Plain Steel Bars: to CSA-G40.21

.f Cold-drawn steel wire for concrete reinforcement to CSA-G30.3M.

.g Welded steel wire fabric to CSA-G30.5M.

.h Chairs, bolsters, bar supports, spacers: adequate for strength and support of reinforcing and live loads during construction conditions.

.i Tie Wire: Cold-drawn annealed steel to CSA-G30.3

.j Epoxy Coating: to ASTM A775/A775M

.2 Synthetic Reinforcing Fibres

.a Synthetic reinforcing fibres such as fibre mesh or equivalent may be used as an alternative to steel wire mesh upon written approval of the Engineer.

.b Synthetic reinforcing fibres shall meet the following specifications:

.i To be used with Class B or C Concrete only.

.ii Fibre shall be polypropylene.

.iii Fibre tensile strength shall be a minimum of 550 MPa.

.iv Fibre content shall be a minimum of 1 kg/cubic metre.

.v Fibre length shall be the following:

FIBRE LENGTH	AGGREGATE TOP SIZE
50 mm	40 mm
50 mm	25 mm
38 mm	15 mm

2.2 FABRICATION

1. Fabricate reinforcing to CSA-A23.1.

2. Obtain Engineer's approval for location of reinforcement splices other than shown on steel placing Drawings.

3. Ship bundles of bar reinforcement, clearly identified in accordance with bar list.

3. EXECUTION

3.1 PREPARATION

Prepare formwork to Section 03 11 00.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel to CSA-A23.1 and as indicated on reviewed shop drawings or per Division 50 drawings and as directed by the Engineer.

.2 Clean reinforcing steel before placement.

.3 Pre-place reinforcement bars to set clearances, overlaps, and depths specified.

.4 Place sufficient chairs, and supports to adequately maintain the position of the reinforcing steel during placement of concrete, to within tolerances specified in the referenced CSA guidelines.

.5 Use tie wire to prevent the moving or dislodging of reinforcing steel during placement of the concrete.

.6 Check, after reinforcement has been set and tied, to ensure reinforcing wire and / or bars meet the concrete coverage prior to concrete placement. Reinforcement shall meet minimum concrete coverage per CSA-A23.1 standards.

.7 Obtain the Engineer's approval of reinforcement position and coverage prior to concrete placement.

.8 Concrete placement shall be to Section 03 30 20.

1. GENERAL

This Section specifies requirements for the basic work required in placing concrete, including finishing and curing methods.

1.1 RELATED WORK

.1	Basic Concrete Materials and Test Methods	Section 03 05 13
.2	Concrete Formwork	Section 03 11 00
.3	Concrete Reinforcement	Section 03 20 00
.4	Concrete Work	Section 32 13 15
.5	Manholes and Catch-basins	Section 33 05 12

1.2 REFERENCE STANDARDS

Do cast-in-place concrete work in accordance with CSA-A23.1 except where specified otherwise.

1.3 MEASURE OF PAYMENT

No measurement to be made under this Section.

2. PRODUCTS

2.1 CONCRETE MIXES

.1 See Section 03 05 13 for concrete mix design requirements.

.2 Dry pack: premixed or non-premixed composition of non-metallic aggregate, cement and sufficient water for mixture to retain its shape when made into a ball by hand and capable of developing compression strength of 50 MPa at 28 days.

2.2 MATERIALS

.1 Non-shrink grout: premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 50 MPa at 28 days.

.2 Curing compound to ASTM C309 and containing a fugitive dye, sufficiently free from permanent colour to result in no pronounced colour change from natural concrete.

.3 Formwork material to Section 03 11 00.

.4 Form stripping agent to Section 03 11 00.

.5 Additives to Section 03 05 13. Obtain Engineer's approval before using chemical admixtures other than those specified in Section 03 05 13.

3. EXECUTION

3.1 WEATHER

.1 Weather shall be to CSA-A23.1 and Section 03 05 13.

.2 Provide Engineer with submission of proposed method for protection of concrete during placing and curing in the event of adverse weather or anticipated adverse weather prior to starting work.

3.2 WORKMANSHIP

.1 Ensure the work is to grade and cross-section as specified or as directed by the Engineer.

.2 Ensure formwork is to alignment and braced accordingly. Refer to Section 03 11 00 for further form work information.

.3 Ensure reinforcement, if applicable, is spaced, seated, tied, and to the amount (for steel or density for fibre) as determined by drawing or directed by the Engineer. Refer to Section 03 20 00 for further reinforcement information.

.4 Provide 24 hours prior notice to the Engineer, before placing concrete, to receive approval on the above items.

.5 Place concrete for specific work to Section 32 13 15 and in accordance with CSA-A23.1.

.6 Ensure reinforcement and inserts are not disturbed during concrete placement.

.7 Maintain accurate records of poured concrete items to indicate date, location of pour, quality and air temperature. To be provided to Owner upon demand.

3.3 INSERTS

Set sleeves, ties, anchor bolts, pipe hangers and other inserts, openings and sleeves, in concrete walks or retaining wall as required by other trades. Sleeves, openings, etc., greater than 100 mm x 100 mm not indicated on structural Drawings must be approved by Engineer.

3.4 FINISHING

.1 General

.a Finish exposed surfaces to a smooth uniform finish, free of open texturing and exposed aggregate.

.b Do not use neat cement as a drier to facilitate finishing.

.2 Surface Moisture

Do not apply water to concrete surface to facilitate finishing under any circumstances. To retain surface moisture and facilitate concrete finishing, the contractor may elect to fog the surface with Master Builders “Confilm” or an approved equivalent. “Confilm” is not to be used as a surface finish only as a preventative measure to avoid shrink cracking.

.3 Floated Surface Finish

.a Strike off the compacted concrete to the cross section and elevation shown on drawings. Keep a slight excess of concrete in front of screed at all times.

.b Obtain a uniform surface by floating as necessary. If floating is not completed before excess water appears at the surface, remove this water before continuing with floating.

.c Add or remove concrete during floating as required to obtain a surface with no more than 3 mm deviation from the required surface in any 3 m length.

.d Do not overwork concrete surface. Float only enough to obtain a dense uniform surface.

.e Allow to rest and for bleed water to finish coming to the surface*

**Note: Depending on ambient conditions, bleed water may be evaporating at a rate equal to or greater than it’s rise to the concrete surface. Special precautions should be taken to ensure that there is a balance between bleeding and evaporation. In hot dry windy conditions this may require the application of an*

evaporation retarder to the concrete surface, between finishing operations, to avoid issues such as plastic shrinkage cracking or surface delamination from premature finishing.

Precautions may also be required to balance bleeding and finishing operations in hoarded conditions if concrete is placed on cold ground and relative humidity is not aligned. Too humid and condensation could occur, raising the water to cementitious materials ratio on the surface before final finishing, leaving it with a weakened non-durable wearing surface. Too dry and the concrete may dry out or "crust" before the underlying concrete has set enough to walk on it and apply the final finish.

.4 Broom Finish

After completion of floating the surface, broom to produce a non-slip surface with regular corrugations not more than 3 mm deep.

.5 Trowelled Finish

.a Round edges, including edges of joints, with 10 mm radius edging tool.

.b Finish surfaces to within 5 mm in 3 m from line, level or grade as measured with a straight edge placed on surface.

.c After completion of floating surface, trowel to produce a dense smooth finish.

.6 Surface Hardener

Apply according to manufacturer's instructions in conjunction with floating operations.

.7 Curing Compound

For curb, gutter, sidewalk and other exposed concrete, a curing compound shall be uniformly sprayed, applied immediately on completion of finishing of surface.

.8 Sealing Surface

.a Apply with spray method only; two coats of sealing solution.

.b Ensure concrete surfaces are dry, free of dirt or dust, before applying coating.

.c Apply each coat at a rate of 0.1 L/m.

.d Dry first coat thoroughly before applying second coat.

.e Protect adjacent surfaces from spray.

1. GENERAL

This Section specifies requirements for precast concrete parking curbs and barriers.

1.1 MEASURE OF PAYMENT

.1 Supply and installation of precast parking curbs to be measured in units installed.

.2 Supply and installation of precast concrete barriers to be measured in units installed, excepting for a large volume / long continuous length and at the Engineer's discretion precast concrete barriers may be measured in lineal metres installed.

2. PRODUCTS

2.1 MATERIALS

.1 Cement to CAN3-A5, type GU grey white.

.2 Water and aggregates to CAN3-A23.1.

.3 Air entraining admixture to CAN3-A266.1.

.4 Reinforcing steel to CAN3 G30.12, deformed, Grade 400, unless indicated otherwise.

.5 Concrete to CAN3-A23.1: minimum 30 MPa compressive strength at 28 days for Class A exposure

.6 Curb anchors: steel dowels or pins to CAN3 G30.12, minimum 15 mm diameter x 600 mm length.

2.2 FABRICATION

.1 Fabricate to CAN3-A23.4, precast reinforced concrete curbs and New Jersey traffic barriers as shown on Drawings.

.2 Finish to standard grade.

.3 Fabricate to location, size and dimension as shown on Drawings.

3. EXECUTION

3.1 INSTALLATION

.1 Install curbs and/or barriers as indicated or directed.

.2 Ensure natural ground or finished surface is levelled so curb or barrier will sit equally on all corners.

.3 Secure curbs in position by driving steel dowels through precast holes until flush with top of curb.

.4 Rejected, damaged, or defective units shall be removed from site and replaced with sound units.

.5 Where barriers are used to guide traffic or restrict vehicle access ensure barrier has reflective markings for visibility including appropriate signage, if applicable.

Section 05 52 00 Protective Metal Railing

1. GENERAL

This Section specifies requirements for supply and installation of metal railings used for pedestrian's protection from hazardous situations, restricting access, route guidance and / or decoration.

1.1 RELATED WORK

.1	Cast-in-Place Concrete	Section 03 30 00
.2	Topsoil and Finish Grading	Section 32 91 19
.3	Mechanical Seeding	Section 32 92 19
.4	Sodding	Section 32 92 23
.5	Construction Specification Drawings	Division 50 07 07

1.2 REFERENCE

Alberta Building Code (current edition)

1.3 MEASURE OF PAYMENT

Supply of railing and fittings and all associated installation work will be measured in lineal meters of rail installed and measured from outer ends of the metal railing.

2. PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials to Section 03 30 00. Concrete to have a minimum compressive strength of 32 MPa at 28 days.

.2 Bolts, nuts and washers to ASTM A307, & A563, 304 grade stainless steel. Bolts are to be M12 x 1.75.

.3 Steel type ASTM A53 with yield strength of 240 MPa.

.4 Rails and posts to be sized DN 40 XS (outer diameter of 48.3 mm and wall thickness of 5.1 mm).

.5 Pre-fabricated 2 rail units:

.a Rail length: 2200 mm to 4500 mm

.b Post length: top section - 1070 mm, bottom section – 1150 mm

.c Second rail installed 500 mm below top rail.

.6 Mounting plates: 130 x 130 x 15 mm pre-drilled holes

.7 Optional: 50 mm x 50 mm x 6 mm mesh.

.8 Organic zinc-rich coating to CGSB 1-GP-181M.

.9 Finishes shall be powder coated unless noted otherwise.

.10 The coating is to provide a minimum of 10 years protection from the natural elements.

.11 All railing pieces shall be shaped with rounded edges and corners and smooth surfaces.

.12 The colour of the railing shall be black unless noted otherwise in the Contract.

.13 Optional: white reflective tape

2.2 FABRICATION

.1 All welds are to be continuous and welding to CSA-W47.1 and CSA-W59-M.

.2 Edges cut by a welding torch shall be ground to a smooth finish.

.3 Steel work shall be sandblasted SP-10 (near white metal blast), with a blast profile of 1.5 mm (minimum), prior to coating.

.4 Apply a thick zinc rich prime coat powder to a minimum finished thickness of 2 mm.

.5 Flash heat in oven to gel zinc coating powder; cool to below 65˚ C.

.6 Apply a 2 mm thick application of super durable UV stable black color powder coating. Epoxy coating shall be applied to the underside of all mounting plates.

.7 Cure in oven with the thickest substrate temperature at 204˚ C for 15 minutes minimum.

3. EXECUTION

3.1 EROSION & SEDIMENT CONTROL

Install appropriate ESC measures to Section 01 57 13.

3.2 GRADING

.1 Remove debris and correct ground undulations beneath rail to obtain smooth uniform gradient between posts. Provide a clearance between bottom of horizontal rail and ground surface of 30 mm to 100 mm.

3.3 INSTALLATION OF RAILING

.1 Erect railing along lines as indicated on drawing or as directed by the Engineer.

.2 Excavate 200 mm diameter postholes to dimensions and distances shown in the Drawing or match to pre-fabricated unit's pole spacing.

.3 Pour concrete into postholes leaving the top of the concrete 150 mm below final grade

.4 With a (bottom) plate welded to the foundation posts, insert the foundation post into the concrete to the depths indicated on the Drawing. Leave the bottom mounting plate 200 mm above the top of the concrete or 50 mm above finished ground level. Using a miscellaneous rod (or other scrap material); fit the rod snuggly inside the foundation pole. Brace the rod to hold the foundation pole plumb and on true alignment until the concrete has set.

Optional: If the foundation post and the top railing are contiguous or bolted together prior to placement into the concrete pile, brace the railing to ensure alignment is true and plumb until the concrete has set.

.5 Allow concrete pile to set for a minimum of seven days before removing bracing. If high early strength cement is used the set time may be reduced to 3 days.

.6 Bolt railing section to the foundation posts.

.7 If the railing is for protection of a cycle route, reflective tape shall be installed. Apply a strip of white reflective tape (width equal to one half the railing diameter by 300 mm in length, minimally) along the top railing, located half way between posts, at four meter spacing, and on the cyclist side of the railing.

3.4 TOUCH UP

.1 For galvanized rails clean damaged surfaces with a 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.

.2 For powder coated rails clean damaged surfaces by sanding the rail until all loose and cracked coatings are removed. If the metal surface is exposed then apply one coat of organic zinc-rich paint to the exposed areas then apply two coats of black enamel paint to the remaining damaged areas. Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

3.5 SITE CLEANUP AND LANDSCAPE

1. Clean and trim areas disturbed by operations to Section 01 14 11.

2. Dispose of surplus material.

3. Place topsoil (Section 32 91 19), as required, to provide smooth surface for seeding or sodding and to fill depression above concrete pile.

Section 10 14 54 Traffic Signage

1. GENERAL

This Section specifies requirements for the supply and installation of roadside signage.

1.1 RELATED SECTIONS

.1 Submittal Procedures — Section 01 33 00

.2 Temporary Construction Signing — Section 01 58 99

1.2 MEASURE OF PAYMENT

.1 Measurement for supply, installation and finishing of signs will be based on individual units.

.2 Measurement for supply, installation and finishing of sign supports, including poles and foundations, as specified, will be based on each complete sign installation.

1.3 SHOP DRAWINGS

Submit Shop Drawings in accordance with Section 01 33 00 for signs not conforming to the Manual of Uniform Traffic Control Devices for Canada (MUTCDC).

2. PRODUCTS

2.1 MATERIALS

.1 Standard Tubular Metal Supports for Small Signs

.a Maximum Sign Size: 750 mm x 750 mm (0.56 sq. m.)

.b To be Telespar Sign Post System installed in soil.

.c One 2.4 or 3.0 m (post) section of 12 gauge, 44 mm square tubing, hot dipped galvanized steel with 11 mm diameter punched holes on 25 mm centres, full length on four sides.

.d One 1 m section (base) of 12 gauge, 50 mm square tubing, hot dipped galvanized steel with 11 mm diameter punched holes on 25 mm centres, full length on four sides.

.e One 46 cm section (sleeve) of 12 gauge 57 mm square tubing, hot dipped galvanized steel with 11 mm diameter punched holes on 25 mm centres, full length on four sides.

.2 Vertical Tubular Support

.a Steel Breakaways to be used for all signs installed in medians, in concrete, or where the presence of underground utilities prevents use of Telespar post.

.i May be used for signs ranging in size from 750 mm x 750 mm (0.56 sq. m.) to a maximum of 1200 mm x 900 mm (1.08 sq. m.).

.ii Above ground post structure to consist of:

- Pipe: 50 mm I.D. Schedule 40 galvanized, pre-cut to required length.
- Pipe outside diameter: 57 mm to 60 mm.
- Pipe inside diameter: 50 mm.
- Pipe wall thickness: 3.2 mm (minimum)
- Plate: 102 mm x 102 mm x 6.35 mm steel plate, with 4 pre-drilled 10 mm holes at each corner, 20 mm in from each plate edge.
- Plate to be welded to one end of pipe.
- Drill a 15 mm hole in post 30 mm up from plate (for water drainage from post).

.iii At / below ground post structure to consist of:

- Plate: 102 mm x 102 mm x 6.35 mm steel plate, with 4 pre-drilled 10 mm holes at each corner, 20 mm in from each plate edge.
- Pipe: 50 mm I.D. black steel pipe or equivalent.
- Pipe wall thickness: 9 mm
- Pipe length: 305 mm
- Weld a 102 mm x 19 mm rebar horizontally onto pipe approximately 115 mm from bottom.
- Weld plate to top of post (opposite end to rebar).

.3 Steel Elbows to be used on Parking Meter posts.

.a 32 mm, Schedule 40, black steel pipe, welded 152 mm out and 152 mm down from base of meter.

.b Cut at 45^{o} angle, weld all around, prime weld and paint silver in colour.

.4 Oversize Breakaways

.a To be used on signs larger than 1200 mm x 900 mm (1.08 sq. m.) up to 4.67 sq. m.

.b Above ground post structure to consist of:

- 77 mm I.D. Schedule 40 galvanized pipe, pre-cut to required length,
- Pipe outside diameter: 90 mm,
- Pipe inside diameter: 77 mm,
- Pipe wall thickness: 5 mm,
- Plate: 150 mm x 150 mm x 10 mm steel plate, with 4 pre-drilled 12 mm holes at each corner, 30 mm in from each plate edge,
- Plate to be welded to one end of pipe,
- Drill a 15 mm hole in post 30 mm up from late (for water drainage from post).

.c At / below ground post structure to consist of:

- Plate: 150 mm x 150 mm x 10 mm steel plate, with 4 pre-drilled 12 mm holes at each corner,
- 30 mm in from each plate edge,
- Pipe: 77 mm I.D. black steel pipe or equivalent,
- Pipe wall thickness: 9 mm,
- Pipe length: 760 mm,
- Weld a 150 mm x 30 mm rebar horizontally onto pipe approximately 200 mm from bottom,
- Weld plate to top of post (opposite end to rebar).

.5 Breakaway 'I' Beam

.a To be used on signs larger than 3000 mm x 1500 mm (4.67 sq. m.).

.b Refer to Alberta Transportation for further requirements.

.6 Sign Material

.a Aluminium Sheet: to ASTM B209M, pre-cut to required dimensions with corners rounded to meet MUTCDC standards. Thickness to be 0.081 sign grade aluminium.

.b Aluminium Extrusions: pre-cut to required dimensions. Extruded aluminium Alcan #6063-T6C street sign blade.

.c Crezone - 75 mm (3/4 in), medium density overlaid Douglas Fir, premium grade, good one side.

.d Primer for Crezone: Premium Alkyd Exterior Enamel undercoat.

.e Finish paint: All exterior grade enamel to appropriate colour.

.7 Fasteners

.a Bolts, nuts, washers and other hardware for roadside signs to be cast aluminium alloy, or galvanized steel. Stainless gear clamp HS32.

.b Concrete based posts

.i Coarse plated 6 mm x 32 mm. NC Grade 5 hexcap screws for breakaway posts (concrete base). Street name blade bracket K-6 or K-9 for side mount, ID-28 for top mount (Alberta Traffic Supply) or equivalent. Bandit strapping materials for 13 mm bandit strapping.

.c Telespar Post

.i Coarse plated 8 mm x 64 mm. NC Grade 5 hexcap screws.

.8 Silk Screen Ink

.a Appropriate ink to be used for the substrate being printed on.

.b Acceptable Ink product:

.i 3M series 88OI process ink

.9 Reflective Sheeting and Tape

.a ASTM D4956 Type X1 on all stop, yield, playground, school zone, crosswalk (RA-4), overhead street name and temporary conditions (construction) signs and ASTM D4956 Type 1V on all other regulatory signs.

.b Avery 900 Vinyl.

.c Refer to ASTM D4956.

.10 Clear Vinyl Protective Coat

.a 3M 1160 series clear / transparent or equivalent anti-graffiti coating that will not affect retro reflectivity of sign, and is compatible with ink and sheet noted above.

2.2 FABRICATION

.1 Crezone Sign Board Blanks

.a Cut crezone blanks to required shapes and dimensions. Fill edges with wood filler suitable for outdoor use and sand smooth.

.b Lightly sand surfaces and wipe clean.

.c Paint signboard back and edges with one prime coat and two finish coats in the same colour as the sign face.

.2 Aluminium Sign Blanks

.a Clean surfaces with Dupont Enamel Reducer or approved equal and allow to thoroughly dry.

.b Reflective background sheeting and lettering:

.i Cut and apply in accordance with manufacturer's instructions.

.ii Apply pressure sensitive material with roller or squeegee.

.iii Match pieces of sheeting from different rolls for each signboard to ensure uniform appearance and brilliance by day and night.

.iv Reflective signboard faces must be prepared using appropriate ink for the substrate being silkscreened.

.v Non-reflective lettering and symbols to be cut from Avery 900 series or equivalent, vinyl film or silkscreen ink appropriate for type of sheeting.

.vi Protect finished signboard faces with cut lettering with one overlay of transparent vinyl.

.3 Sign Identification

.a Mark the back of each sign with The Town of Olds. Lettering to be 13 mm (minimum) high black letters, using outdoor non-fading ink covered with a transparent, gasoline vapour resistant vinyl.

3. EXECUTION

3.1 PREPARATION

Where Public Works, Meters and Signage section, is contracted to install signage for a subdivision the Engineer shall ensure they are contacted two weeks prior to scheduled installation.

The contractor shall provide 48 hours prior notice to Public Works, Meter and Signage section, prior to the installation of signage related under this Section to confirm location and method of installation is sufficient for the Work.

3.2 INSTALLATION

.1 Sign Support

.a Erect supports as indicated. Permissible tolerance: 50 mm maximum departure from vertical for direct buried supports.

.b Erect posts plumb and square to details as indicated.

.2 Telespar Sign Post Systems

.a Ensure sleeve and base are flush at the top; attach the two together 140 mm down from the top of the base/sleeve.

.b Drive unit to required depth, without damage, leaving 150 mm (minimum) of base/sleeve exposed to attach post.

.c Insert post portion into the base/sleeve portion.

.d Attach the post to the base/sleeve 25 mm and 75 mm down from the top of the base/sleeve. The lower bolt to be installed perpendicular to the upper bolt.

.3 Steel Breakaways

.a Base is placed in concrete with approximately 75 mm to 100 mm maximum of pipe exposed above ground.

.b Use four 6 mm x 32 mm steel bolts, to attach post to base plate.

.c In finished concrete surfaces, backfill with concrete or grout. Protect from adverse conditions until cured.

.4 Signboard

.a Fasten signboard to:

.i Telespar post with bolts, nuts and washers as noted in “Fasterners”.

.ii Steel Breakaways with stainless gear clamp HS32; to street or traffic light standards with bandit strapping materials.

.b Use strapping with crimped or bolted connections where signs fastened to light poles (no fastening allowed to wooden utility poles).

.c Fasten street markers using the K-6, K-9, or ID-28 (Alberta Traffic Supply) or equivalent, bracket and aluminium bolts.

3.3 REPAIR/RESTORATION

.1 Prepare new message on 0.081 sign grade aluminium sheet.

.2 Replace damaged sign with new sign.

3.4 PROTECTION

Place temporary covering on new signboards where indicated. Covering shall be capable of withstanding rain, snow, wind, and be non-damaging to the signboard. Replace deteriorated covering as required. Remove covers as directed by Engineer.

3.5 CORRECTING DEFECTS

Correct defects identified by The Town of Olds Engineer or designate, in sign message, consistency of reflectivity, colour, or illumination. Correct angle of signboard and adjust luminaire aiming angle for optimum performance during night conditions to approval of The Town of Olds Engineer, or designate.

3.6 REMOVAL AND SALVAGE

.1 Carefully dismantle and salvage aluminium materials.

.2 Salvage or dispose of existing materials as required in contract.

.3 Contact the Public Works Office at 403.342.8238 to confirm delivery time.

.4 Deliver materials to Public Works Yards and unload at designated drop-off location.

3.7 COMPLIANCE

.1 Regulatory Traffic Control Signs

.a Regulatory traffic control signs must be completely installed as illustrated on the approved construction Drawings and in accordance with MUTCDC and Town

Standards, prior to eliminating construction zone signage and allowing non-construction vehicles to travel on the constructed roadway.

.2 Non-Regulatory Signs

.a Non-regulatory signs must be installed as per the approved construction Drawings and in accordance with MUTCDC and Town Standards within two weeks of Substantial Completion.

.3 Completion of Sign Installation

.a The Tow of Olds Engineer or designate, may extend the time allowed to complete the sign installation, providing the Contractor submits a written request to The Town of Olds Engineer, or designate.

3.8 PLAN OF RECORD

Upon completion of a sign installation the contractor is to provide a record of the installation to Public Works. The record shall consist of:

- Sign Type / Name
- Location
- Date installed

Section 31 05 16	Aggregate Materials
Section 31 05 16	Table A: Aggregate Gradation
Section 31 11 00	Clearing and Grubbing
Section 31 22 13	Rough Grading
Section 31 22 16	Roadway Subgrade Reshaping
Section 31 23 33	Trench Excavation and Backfilling
Section 31 24 13	Roadway Excavation and Embankment
Section 31 32 19	Geogrid
Section 31 32 21	Geotextiles
Section 31 32 41	Soil Insulation
Section 31 36 00	Gabions
Section 31 37 00	Rip-Rap

1. GENERAL

This Section specifies general requirements for supplying and processing of aggregates to be stockpiled or incorporated into work. Specific requirements for physical properties of the aggregates are given in related work sections.

1.1 RELATED WORK

.1	Basic Concrete Materials and Test Methods	Section 03 05 13
.2	Trench Excavation and Backfilling	Section 31 23 33
.3	Roadway Excavation and Embankment	Section 31 24 13
.4	Granular Subbase	Section 32 11 16
.5	Granular Base Course	Section 32 11 23
.6	Hot-Mix Asphaltic Concrete Paving	Section 32 12 16

1.2 SOURCE APPROVAL

.1 The source of materials to be incorporated into work or stockpiled requires approval.

.2 Inform the Engineer of the proposed source of aggregates and provide access for sampling at least two weeks prior to commencing production.

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

.4 Should a change of material source be proposed during the work, advise the Engineer two weeks in advance of the proposed change to allow sampling and testing.

.5 Acceptance of a material at a source does not preclude future rejection if it is subsequently found to lack uniformity or if it fails to conform to the requirements specified or if its field performance is found to be unsatisfactory.

1.3 PRODUCTION SAMPLING

.1 Aggregate will be subject to continual sampling during production.

.2 Provide the Engineer with ready access to the source and processed material for the purpose of sampling and testing.

.3 Bear the cost of sampling and testing of aggregates in order to meet the design gradations and specifications.

.4 The Contractor shall be responsible for all sampling and testing required to show conformance of the aggregates with the specifications.

1.4 MEASURE OF PAYMENT

.1 No measurement to be made under this Section. Include all costs in items of work that require aggregates.

2. PRODUCTS

2.1 GENERAL

.1 Aggregate shall be sound, hard, durable material free from soft, thin, elongated, or laminated particles, organic material, or other deleterious substances.

.2 Flat and elongated particles are those whose greatest dimension exceeds five times their least dimension.

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

.a Natural sand

.b Manufactured sand and/or fines

.c Screenings produced in crushing of quarried rock, boulders and gravel.

.4 Coarse aggregates satisfying the requirements of the applicable section shall be one of following:

.a Crushed rock

.b Gravel composed of naturally formed particles of stone

.5 Irrespective of compliance or non-compliance with the physical requirements, aggregates may be accepted or rejected on the basis of field performance. Field performance shall be determined by the Owner.

2.2 MATERIALS

.1 Gradation

.a To be within the limits and for the types of materials specified in Table A (appended to this Section) when tested to ASTM C117 and ASTM C136 and having a smooth curve without sharp breaks when plotted on a semi-log grading chart to ASTM E11.

.2 Production of Manufactured Fines

.a Manufactured fines are defined as that portion of the material passing the 5,000 sieve size which is produced by the crushing process.

.b In the event the manufactured fines in the total combined aggregate do not meet the requirement for the specified Asphaltic Concrete Mix, extra manufactured fines shall be produced by screening the pit-run material so that the screened material contains no more than 5% material passing a 5,000 sieve. This screened material shall then be crushed so that 100% passes the 10,000 sieve and a minimum of 95% passes the 5,000 sieve. All material produced by this crushing process shall be placed in a separate stockpile and designated as manufactured fines.

.3 Moisture Content

.a As specified in specific sections.

3. EXECUTION

3.1 PROCESSING

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

.2 Split and combine aggregates, if required, to obtain the gradation specified. Use approved methods and equipment. Do not blend in stockpiles.

.3 Blending to increase the percentage of crushed particles or to decrease the percentage of flat and elongated particles is permitted.

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

.5 Further testing is required whenever material is produced from a new source or a new area in a pit or whenever significant change in aggregate production or material occurs that may affect the quality of the material.

3.2 HANDLING

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

.2 Each truck load of aggregate weighed in shall have a ticket filled out and shall subsequently be submitted to the Engineer.

.3 The Contractor shall furnish the details of Truck Weigh Scales and get the scales inspected and certified by the Weights and Measures Branch of Canada Consumer and Corporate Affairs prior to the start of every construction season and ensure their accuracy.

3.3 STOCKPILING

.1 Stockpile aggregates on site in locations indicated or designated. Do not stockpile on completed pavement surfaces where damage to pavement may result.

.2 Stockpile aggregates in sufficient quantities to meet the project schedule.

.3 Stockpile sites shall be level, well drained and of adequate bearing capacity and stability to support stockpiled materials.

.4 Except where stockpiled on acceptably stabilized areas, provide a compacted sand base not less than 300 mm in depth to prevent contamination of the aggregate or, if permitted, stockpile aggregates on the ground but do not incorporate the bottom 300 mm of the pile into the work.

.5 Separate aggregates by substantial dividers or stockpile far enough apart to prevent intermixing.

.6 Reject intermixed or contaminated materials. Remove and dispose of rejected materials as directed within 48 hours of rejection.

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

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

b. Max 2 m for fine aggregate and subbase materials.

c. Max 1.5 m for other materials.

.8 Complete each layer over the entire stockpile area before beginning the next layer.

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

.10 Coning of piles or spilling of material over the edges of the pile will not be permitted. Stacking conveyors will not be permitted for stockpiling road base and graded seal coat aggregates.

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

.12 Aggregates that have mixed with foreign matter of any description or aggregates that have become mixed with each other shall not be used and shall be immediately removed from the stockpile.

.13 Where a stockpile is not to be used immediately or is staged near an environmentally sensitive area or drainage course, appropriate erosion and sediment control measures are to be implemented. Refer to Section 01 57 13.

3.4 QUALITY ASSURANCE

.1 The quality assurance laboratory will conduct sieve analyses to ASTM C136 and other tests to ensure that aggregates being produced and supplied meet the requirements.

.2 A minimum of one sieve analysis per 1000 tonnes of aggregate supplied to a jobsite is required. The aggregate may be sampled from a stockpile at the site or at the source site.

.3 If the aggregate fails to meet the specified gradation, the Contractor shall suspend gravel placement until the proof of compliance with the specification is provided to the Engineer.

.4 For general testing requirements related to reporting refer to Section 01 45 00.

3.5 STOCKPILE CLEAN-UP

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

.2 Remove any unused aggregates as directed.

.3 Refer to Section 01 74 11 for further clean-up requirements.

TABLE A.1
February 2018

	Designation 1: Trench Bedding Material a. Native Fill Sand b. Clean Fill Sand c. 40 mm Screened Rock			**Designation 2:** Sanding Material a. 5mm crushed b. 7.5mm crushed c. 10mm crushed		
Designation	**1a.**	**1b.**	**1c.**	**2a.**	**2b.**	**2c.**
SIEVE SIZE PERCENT PASSING METRIC SIEVE						
150 000						
125 000						
80 000						
63 000						
50 000			100			
40 000			95 - 100			
25 000						
20 000			5 - 10			
16 000						
12 500						
10 000			0 - 5			100
8 000					100	
6 300						
5 000	100	90 - 100	0 - 5	100	75 - 100	75 - 100
2 500		80 - 95				
2 000						
1 250	66 -	55 - 85		0 - 70	0 - 65	0 - 65
630	52 -					
400						
315	35 - 78	10 - 35		0 - 30	0 - 30	0 - 30
160	18 - 43			0 - 18	0 - 18	0 - 18
80	7 - 13	0 - 5		0 - 10	0 - 10	0 - 10

TABLE A.2
REVISED March 2017

	Designation 3: Subbase Aggregate a. 75mm pit-run gravel b. 150mm pit-run gravel		**Designation 4:** *Crushed Gravel* Base Course Aggregate a. 16mm gravel b. 20mm gravel		c. 25 mm gravel d. 63mm gravel	
Designation	**3a.**	**3b.**	**4a.**	**4b.**	**4c.**	**4d.**
SIEVE SIZE PERCENT PASSING METRIC SIEVE						
150 000		100				
125 000						
80 000	100	80 - 100				
63 000						100
50 000	80 -					
40 000						
25 000	50 - 75	50 - 80			100	55 – 75
20 000				100	82 - 97	50 – 70
16 000			100	84 - 94	70 - 94	45 – 65
12 500			89 - 100			40 – 60
10 000			78 - 94	63 - 86	52 – 79	
8 000						
6 300						21 - 47
5 000	25 - 55	25 - 55	55 - 70	40 - 67	35 – 64	20 - 45
2 500			33 - 54			
2 000						14 – 38
1 250			25 - 45	20 - 43	18 - 43	12 – 34
630			18 - 38	14 - 34	12 - 34	10 – 28
400						8 - 24
315			12 - 30	9 – 26	8 - 26	7 - 22
160			8 - 20	5 - 18	5 - 18	4 - 17
80	2- 10	2- 10	4 - 10	2 - 10	0 - 10	0 - 10

TABLE A.3
REVISED March 2017

Designation 5:
Asphaltic Concrete Pavement Aggregate

a. Type 10
b. Type 12.5
c. Type 16
d. Type 20

	Designation	5a.	5b.	5c.	5d.
SIEVE SIZE PERCENT PASSING METRIC SIEVE	150 000				
	125 000				
	80 000				
	63 000				
	50 000				
	40 000				
	25 000				
	20 000				100
	16 000			100	90 - 100
	12 500		100	80 - 92	
	10 000	100	83 - 92	70 - 84	56 - 84
	8 000				
	6 300				
	5 000	60 - 75	55 - 70	50 - 65	35 - 64
	2 500	40 - 57	38 - 55	37 - 52	21 - 49
	2 000				
	1 250	26 - 45	26 - 45	26 - 45	11 - 34
	630	18 - 38	18 - 38	18 - 38	8 - 30
	400				
	315	12 - 30	12 - 30	12 - 30	5 – 2 1
	160	8 - 20	8 - 20	8 - 20	3 - 13
	80	4 - 10	4 - 10	4 - 10	2 - 8

1. GENERAL

This Section specifies requirements for clearing and grubbing native vegetation as related to new development.

1.1 RELATED SECTIONS

.1	Environmental Procedures	Section 01 35 43
.2	Temporary Erosion and Sediment Control	Section 01 57 13
.3	Tree and Shrub Preservation	Section 32 93 50

1.2 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees and surface debris.

.2 Close cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing flush with existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than a specified height above ground, of trees designated, grubbing and disposing of felled trees and debris.

.4 Grubbing consists of excavation and disposal of stumps and roots to not less than a specified depth below existing ground surface.

1.3 PROTECTION

.1 Prevent damage to existing fencing, root systems to trees designated to be preserved, landscaping, natural features designated to be preserved, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, and water courses.

.2 For environmental requirements and erosion protection refer to Sections 01 35 43 and 01 57 13 respectively.

.3 Where tree and shrub preservation has been identified as noted within this Section, preservation shall be in accordance with Section 32 93 50.

1.4 PENALTY FOR EXCESS CLEARING

If excess clearing and grubbing occurs beyond the Drawing limits the Contractor may be liable for penalty from the appropriate authority, as determined by the nature or designation of the impacted area.

1.5 MEASURE OF PAYMENT

.1 Following items will be measured in hectares within limits as indicated on Drawings or as directed by Engineer.

.a Clearing

.b Grubbing

.c Close cut clearing

.2 Clearing isolated trees and grubbing isolated tree stumps will be measured as number of isolated trees cleared and number of isolated stumps grubbed.

.3 At the discretion of the Engineer, under guidance from the Urban Forester, at the time of initial clearing, if additional vegetation is recommended to be removed, for the safety of adjacent lands (e.g. potential dead fall onto structure) and / or promotion of the health of the existing vegetation, this work shall be considered incidental to the contract.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 PERMIT

The Contractor shall have a copy of the Development Permit available, on site, for inspection, if requested.

3.2 EROSION CONTROL

Erect and maintain temporary erosion control per Drawing(s) and to Section 01 57 13.

3.3 SITE MEETING

Operational Services Urban Forester shall be notified 2 business days prior to work commencement to confirm limits of clearing if there is vegetation designated to be preserved within or adjacent to the work site. The Urban Forester may recommend, to the Engineer, additional fencing or protection based on their assessment.

3.4 ERECTING FENCE

Erect fencing or other highly visible barrier along / around areas designated “Not to be disturbed”.

3.5 CLEARING

.1 Clear trees, shrubs, uprooted stumps and surface debris not designated to remain.

.2 Cut off trees, brush and scrub as indicated by drawing or as directed by the Engineer, at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above existing ground.

3.6 CLOSE CUT CLEARING

Cut off trees, shrubs, stumps and other vegetation at ground level.

3.7 ISOLATED TREES

.1 Cut off isolated trees as indicated or as directed by the Engineer to a height of not more than 300 mm above existing ground.

.2 Grub out isolated tree stumps.

3.8 PROTECTION OF REMAINING VEGETATION

To promote the health of the remaining vegetation and / or prevent potential damage from future dead fall, at the Engineer’s discretion, based upon recommendation from the Town’s Urban Forester, have select plant vegetation trimmed or removed.

3.9 GRUBBING

Grub out stumps and roots to not less than 200 mm below existing ground surface.

3.10 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials to disposal area designated by Engineer.

.2 Timber greater than 100 mm diameter, to be cut to 1200 mm lengths and stockpiled; becomes property of Owner.

.3 Tree limbs 20 mm to 100 mm shall be stockpiled for chipping by others.

.4 Dispose of cleared and grubbed materials per Section 01 35 43 or burying as directed by Engineer.

3.11 DUTCH ELM DISEASE

All Elm trees shall be disposed of at The Town of Olds Waste Management Facility and / or in accordance with the Alberta Agricultural Pests Act regulations. Elm trees are not to be composted.

3.12 FINISHED SURFACE

Leave ground surface in condition suitable for site grading operations.

1. GENERAL

This Section specifies requirements for the earthwork (i.e. excavation, embankment, stockpiling, and disposal of native material) related to the ground contouring of a site. All grading shall be to lines, grades, dimensions, and typical cross sections shown on plans or as established by the Engineer.

1.1 RELATED WORK

.1	Environmental Procedures	Section 01 35 43
.2	Hauling and Haul Roads	Section 01 53 40
.3	Temporary Erosion and Sediment Control	Section 01 57 13
.4	Clearing and Grubbing	Section 31 11 00
.5	Trench Excavation and Backfilling	Section 31 23 33
.6	Roadway Excavation and Embankment	Section 31 24 13
.7	Tree and Shrub Preservation	Section 32 93 50

1.2 DEFINITIONS

.1 Topsoil Stripping

The excavation and stockpiling of surface material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding. Topsoil is general considered material having 10% or more organic content by weight.

.2 Rock Excavation

.a Rock Excavation shall include the removal, from their original position, of rock in solid beds or masses and boulders or detached rock having a volume of 0.75 cubic meters content or more plus the placing, disposing, or stockpiling of the materials as directed by the Engineer.

.b Rock excavation is divided into two categories; (A) and (B), contingent upon its hardness and difficulty experienced in excavation. It shall be the Contractor's responsibility to demonstrate, to the Engineer's satisfaction, that the material cannot be removed or that difficulty is being experienced through excavation by conventional means. In doing so, the Contractor may be required by the

Engineer to seek and explore planes of weakness or layers that may ease the excavation process. Frozen material is not classified as rock.

.c Type ‘A’ Rock

.i This material may be removed by a small mechanical construction excavator (e.g. a 245 excavator) for the depth of trench excavation and size of pipe being installed. Examples of this type of rock: fractured sandstone, shale or ledge rock. For open excavation, it refers to materials, which, in the opinion of the Engineer, results in:

.ii Substantial delay or decrease in the normal rate of excavation using conventional equipment.

.iii Significant damage or wear to the excavating equipment.

.d Type ‘B’ Rock

.i Requires drilling, blasting, wedging or jackhammering to remove, as determined by the Engineer.

.3 Common Excavation

Excavation, placement and compaction in embankments of all on-site materials whatever nature, which are not included under the definition of topsoil stripping, waste excavation, borrow excavation or rock excavation, including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.

.4 Waste Excavation

Any earthwork material unsuitable for use in the Work or surplus to requirements, as designated by the Engineer, excluding contaminated material.

.5 Borrow Excavation

Excavation, delivery to site, placement and compaction of suitable material obtained off-site or as shown on the drawings and used in embankment.

.6 Contaminated Material

Isolated pocket(s) of material or debris excavated under normal Work practice and not prior identified on drawings, in the Contract, or to the knowledge of the Engineer, Contractor or local authority. This includes concentrated hazardous substances.

.7 Marginal Material

Marginal material refers to the "brown dirt" layer of material encountered between the bottom of topsoil (‘B’ horizon) and top of common material. Marginal material may be considered structural sufficient for building on, subject to review by the Engineer or as determined with a geotechnical report. Marginal material considered unsuitable shall be treated as waste excavation.

.8 Embankment (Fill)

Material derived from usable excavation and placed above original ground or in stripped or undercut areas up to subgrade level.

.9 Subgrade Elevation

This relates to the elevation immediately below the pavement structure.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

Adhere to municipal, provincial and national codes if blasting is required.

1.4 MEASURE OF PAYMENT

.1 Excavated materials to be measured and paid for in cubic metres for in-situ cut or for in-place fill. Volumes will be calculated by the Engineer.

.2 Where contaminated material is excavated, as described in this Section, that can not be accepted at the Town’s Waste Management Facility, and is required to be hauled out of the Town’s limits, an additional surcharge may be claimed otherwise any disposal fees shall be considered incidental to the Work.

.3 Solid rock excavation shall be measured for the area of excavation, as indicated on the Drawings or by the Engineer, multiplied by the depth of rock, defined as, from rock surface to finished grade.

.4 Alternate: Volume excavated from solid rock masses to be calculated from cross sections of original rock surface and design grade line for excavation. Excavated boulders and rock fragments to be measured by Engineer and volume determined by measuring three maximum mutually perpendicular dimensions.

.5 No additional payment to be made for:

.a Unnecessary excavation beyond lines established including trees or vegetation.

.b Extra handling of windrowed materials blended on embankment slopes.

.c Moisture adjustment of material.

.d Construction, maintenance and restoration of haul roads.

.e Watering for dust control.

.f Over haul.

2. PRODUCTS

2.1 MATERIALS

Embankment materials require approval of Engineer.

2.2 EQUIPMENT

.1 Use excavation and / or hauling equipment (e.g. scraper or backhoe / truck combination) capable of removing, hauling and placing material to achieve a rough grade.

.2 Use soil compaction equipment (e.g. vibratory rollers or “sheep foot” roller, etc.) continuously in areas of fill when placing material. Compaction equipment must be capable of obtaining the specified levels of compaction for materials on project. Equipment that does not achieve specified densities must be replaced.

.3 Use equipment capable of maintaining a clean and smooth graded site (e.g. grader, bulldozer) in conjunction with the compaction equipment to provide uniform layers of compacted material and / or mixing of materials to achieve uniformity in the material’s characteristics.

2.3 WATER DISTRIBUTORS

Apply water with equipment capable of uniform distribution and in a manner acceptable to Engineer.

3. EXECUTION

3.1 PREPARATION

.1 Install or ensure ESC measures are in-place, as applicable to the Work, prior to undertaking any grading activity. Refer to Section 01 57 13 for ESC specifications.

.2 Provide advanced notice (minimally 1 week) to the Engineer prior to Work commencement for initial cross sections to be taken.

3.2 CLEARING AND GRUBBING

.1 Remove vegetation and plant material (e.g. trees, brush, etc.) from surfaces to be excavated within limits indicated to Section 31 11 00.

.2 Other obstructions or items noted for removal, including ice and snow, shall be to Section 02 41 16.

3.3 TOPSOIL STRIPPING

.1 Strip topsoil from areas and to depths indicated or directed prior to beginning of excavation and embankment work.

.2 Avoid contamination of topsoil and underlying subsoil.

.3 Do not strip topsoil during periods of wet weather or snow melt.

.4 Highly saturated topsoil shall be disposed of and not retained for re-use in a finished landscape area, including residential lots.

.5 Separate the stripped topsoil into separate stockpiles based on quality of material as defined in the geotechnical report. At the Engineer's discretion other sources of expertise may be contacted for guidance with determining soil separations.

.6 Strip marginal material and dispose of in designated locations.

.7 Excavated topsoil, for re-use in Work, to be stockpiled in a location per drawing(s) or as directed by Engineer.

.8 Once material is no longer being added to the stockpile, weed control measures (e.g. herbicide treatment) shall be implemented (refer to Section 32 91 19).

.9 Refer to Section 01 57 13 for long term storage of stockpiled material.

.10 Excess topsoil, not designated for re-use in Work, may be disposed of on-site or off-site as directed by Engineer.

3.4 ROCK EXCAVATION

.1 If during excavation, material appearing to conform to classification for rock is encountered, notify Engineer in sufficient time to enable measurements to be made to determine volume of rock.

.2 Remove rock to 300 mm below sub-grade elevation indicated.

.3 Provide effective drainage to ditches, leaving no undrained pockets in foundation.

.4 Scale down rock slopes and remove rock fragments which are liable to slide or roll down slopes.

3.5 BLASTING

.1 Control blasting to minimize flying particles.

.2 Damaged vegetation, as a result of blasting, shall be assessed by the Operational Services Urban Forester to determine appropriate corrective measures.

.3 Based on the Urban Forester's assessment, felled or severely damaged vegetation shall be handled per Section 31 11 00.

3.6 COMMON EXCAVATION

.1 Break material down to sizes suitable for compaction and mixing.

.2 When directed, scarify or bench existing slopes in side hill or sloping sections to ensure a proper bond between new materials and existing surfaces. Obtain prior approval of method to be used.

.3 Scarify existing ground to a depth of 150 mm and mix embankment material with existing materials to ensure a good bond.

.4 Do not place material which is frozen or place material on frozen surfaces.

.5 Maintain a sloped surface during construction to ensure ready run-off of surface water.

.6 After a period of wet weather remove or scarify, dry and re-compact embankment materials softened by moisture.

.7 Wetting or drying of fill material shall be carried out such that in-place fill has a moisture content of optimum plus or minus 2%.

.8 Compact each layer to a density of 95% (minimally) of Standard Proctor Maximum Dry Density.

.9 For areas of fill greater than 1.2 m, particularly in roadway, utility and building sites, compaction requirements may be increased based on geotechnical study and / or through the Contract.

.10 With material containing less than 25% by volume of stone or rock fragments larger than 100 mm, place and compact to full width in uniform layers not exceeding 150 mm loose thickness. Engineer may authorize thicker lifts if specified compaction can be achieved.

3.7 WASTE EXCAVATION

.1 Notify Engineer whenever unsuitable materials are encountered in cut or embankment sections and remove unsuitable materials to depth and extent directed.

.2 Dispose of waste excavation in waste site designated. If no site is designated dispose of material off-site in an area located by Contractor and approved by Engineer. Costs associated with disposal to be included in unit rate for waste excavation.

3.8 BORROW EXCAVATION

.1 Use all suitable materials removed from excavations in embankments before taking materials from Borrow areas.

.2 Obtain from borrow areas, indicated on plans, additional suitable embankment material.

.a Engineer to designate location and extent of borrow areas and allowable depth of cutting.

.3 If the borrow area is from a pit:

.a That is to be a storm pond or public / park area; upon completion of the project ensure the slopes meet the requirements of storm ponds and / or minimally graded to a 4:1 side slope for landscape and maintenance.

.b That is not for public access and will be filled in as part of the project the excavated slopes may be reduced to meet OH&S guidelines and soil conditions.

.c During excavation of a borrow pit and for the duration until the pit is closed and finished as noted in this Section, it shall be signed and fenced to warn of the danger of an open pit.

.4 If the borrow area is from a hill side where:

.a The public may have access; upon completion of the project ensure the cut slope(s) is graded to 4:1 from the crest to the toe. The slope is to be shaped for ease of maintenance and re-seeded for erosion control.

.b It is not for public access but will remain available for future excavation the slopes shall be reduced to meet soil conditions or per direction from the Engineer. Warning signage and fencing shall be installed with erosion control and drainage measures to Section 01 57 13.

.5 Trim and leave borrow pits in a condition to permit accurate measurement of material removed.

3.9 UNSUITABLE SUBGRADE

.1 Notify Engineer when unsuitable materials are encountered at design subgrade elevation. Under the direction of the Engineer, sub-cut and dispose of unsuitable material (see waste excavation) and replace with a compacted approved material.

.2 When subgrade after sub-cutting is still unsuitable, geotextile or geogrid may be installed per direction of Engineer. Refer to Sections 31 32 19 or 31 32 21 for further information regarding soil stabilization.

.3 Dispose of unsuitable subgrade materials at designated waste site. If no waste site is designated, dispose of material off site in an area located by Contractor and approved by Engineer. Costs associated with disposal to be included in unit rate for waste excavation.

3.10 CONTAMINATED MATERIAL

.1 If during the course of excavation contaminated material is extracted from a location not prior identified as such, the Contractor is to immediately cease work in that area and notify the Engineer (see Section 01 35 29). The Engineer shall engage a qualified environmental professional to assess the level and extent of contamination, supported by laboratory analysis, of the suspected contaminated material.

.2 If it is determined that the contamination is more than a minor, surficial issue, all work adjacent to the identified contamination will cease, to allow for further assessment and delineation of the area of impact.

.3 All material exceeding the Alberta Tier 1 Guidelines is to be disposed of at an approved facility (refer to Section 01 35 43) or be included in a long term Risk Management Plan as outlined in the Design Guidelines, Section 4.

.4 The Contractor will move all operations from the area, leaving a significant “buffer” zone, as determined by the environmental professional, until the environmental professional has provided notice otherwise.

3.11 DITCHES AND DRAINAGE

.1 Maintain crowns, cross slopes, pumps or ditches to keep excavations free of running or standing water.

.2 Provide ditches as work progresses to provide drainage.

.3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

.4 Construct side ditches to depths and widths indicated or directed, to permit ready flow of surface water.

.5 Maintain and keep ditches open and free from debris until final acceptance of work. Refer to Section 01 57 13 for maintenance requirements and possible ESC protection of a ditch.

3.12 DUST CONTROL

Control dust during site grading operations by watering. Refer to Section 01 57 13 for further requirements.

3.13 FINISHING AND TOLERANCES

.1 Blade finished surfaces in cut and fill areas free from ruts, depressions, rocks in excess of 75 mm, and debris.

.2 Roll finished surfaces to a tight dense condition.

.3 Surfaces to be within 100 mm of design contour elevations but not uniformly high or low.

.4 Remove and dispose of excess excavated material as directed by the Engineer.

3.14 MAINTENANCE

.1 Maintain finished surfaces in a condition in accordance with this Section until acceptance by Engineer.

.2 Ensure erosion and sediment control measures are in-place and maintained per Section 01 57 13.

.3 Report to the Engineer any damage to existing trees and/or shrubs. Repairs to be completed in accordance with Section 32 93 50.

1. GENERAL

This Section specifies requirements for re-compacting and reshaping of subgrade to lines, grades and typical cross sections indicated or as established by the Engineer.

1.1 RELATED WORK

.1 Roadway Excavation and Embankment — Section 31 24 13

1.2 MEASURE OF PAYMENT

.1 Reshaping subgrade will be measured in square metres of roadway subgrade reshaped.

.2 Additional subgrade material will be measured under Section 31 24 13.

2. PRODUCTS

2.1 NOT APPLICABLE

3. EXECUTION

3.1 SCARIFYING AND RESHAPING

.1 Scarify subgrade to full width as indicated or as directed by the Engineer and to a minimum depth of 150 mm.

.2 Pulverize and break down scarified material to 10 mm maximum soil clod size; stones larger than this size may be left intact as directed by the Engineer.

.3 Flip (roll) scarified material to windrows to mix and meet moisture content.

.4 Exposed surface shall be compacted to 100% Standard Proctor Maximum Dry Density.

.5 Windrowed material shall be replaced, bladed and trimmed to elevation and cross section dimensions as indicated or as directed by the Engineer.

.6 Re-worked subgrade material shall be compacted to 100% Standard Proctor Maximum Dry Density at optimum moisture content plus or minus 2%.

.7 Finished surface shall conform to lines, grades and cross sections indicated on Drawings, within a tolerance of 13 mm.

.8 Where deficiency of material exists, add and blend additional subgrade material as directed by the Engineer.

.9 Reuse excess waste material in areas of material deficiency.

3.2 COMPACTING

.1 Compact to density not less than 100% Standard Proctor Maximum Dry Density in accordance with ASTM D698.

.2 Shape and roll alternatively to obtain smooth, even and uniformly compacted subgrade surface.

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

.4 If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is reduced to optimum value for compaction in accordance with ASTM D698.

3.3 SITE TOLERANCES

Reshaped, compacted, surface to be within plus or minus 10 mm of elevation as indicated.

3.4 PROTECTION

Maintain reshaped surface in condition conforming to this Section until succeeding material is applied or until accepted by the Engineer.

1. GENERAL

This Section specifies requirements for excavating, bedding and backfilling of trenches, for pipelines, sewers, conduits and appurtenances, conforming to lines, grades, dimensions and typical cross sections shown on plans or established by Engineer.

1.1 RELATED WORK

.1	Hauling and Haul Roads	Section 01 53 40
.2	Temporary Erosion and Sediment Control	Section 01 57 13
.3	Aggregate Materials	Section 31 05 16
.4	Soil Insulation	Section 31 32 41
.5	Tree and Shrub Preservation	Section 32 93 50
.6	Manholes and Catch-basins	Section 33 05 13
.7	Water Mains	Section 33 11 16
.8	Sanitary Sewer Mains	Section 33 31 13
.9	Sewage Force Mains	Section 33 34 00
.10	Storm Sewer Mains	Section 33 41 00
.11	Water, Sanitary and Storm Service Connections	Section 33 41 16
.12	Pipe Culverts	Section 33 42 13
.13	Sub-drainage	Section 33 46 16
.14	Catch Basin Leads	Section 33 49 16
.15	Boring or Jacking Conduits	Section 33 71 15
.16	Construction Specification Drawings	Division 50 01 xx

1.2 DEFINITIONS

.1 Common Excavation

Refer to Section 31 22 13 for definition of common excavation.

.2 Rock Excavation

Refer to Section 31 22 13 for definition of rock excavation and Type 'A' and 'B' categories.

.3 Bedding Material

Materials placed at the bottom of the trench beneath and up to the spring line of the pipe, as specified and approved by the Engineer.

.4 Pipe Foundation

The pipe foundation relates to the subgrade material immediately below bedding.

.5 Initial Backfill

Material placed within the trench, above the spring line of the pipe to 300 mm above the crown of the pipe.

.6 Bedding Class

Pipes to be bedded to one of following classes, as specified on drawings:

.1 Class A

.a Concrete Cradle
Pipe is bedded in concrete up to ¼ outside pipe diameter, for a minimum width of pipe diameter plus 200 mm. Above cradle, granular backfill is placed and compacted to 300 mm above pipe.

.b Concrete Arch
Pipe is bedded in carefully compacted granular bedding to spring line. Top half of pipe is covered with concrete to minimum depth of ¼ of inside diameter of pipe. Arch width is to be a minimum of pipe outside diameter plus 200 mm.

.2 Class B

.a Shaped Subgrade
Bottom of undisturbed excavation is shaped to conform to pipe shape and uniformly support pipe. Pipe is bedded on a 50 mm levelling course of sand. Granular bedding is placed and compacted up to the spring line of the pipe.

Pipe is backfilled with imported granular or hand-placed native backfill and compacted to 300 mm above crown of pipe.

.b Granular Bedding
Pipe is bedded on compacted granular material placed on flat trench bottom, depth of bedding to be:

Pipe Diameter (mm)	Bedding Depth (mm)
675 and smaller	75
750 to 1500	100
1650 and larger	150

Trench bedding is placed and compacted up to the spring line of the pipe. Pipe to be backfilled and compacted with imported granular or hand-placed native backfill to 300 mm above crown of pipe.

.7 Fill Concrete

Controlled density, low strength concrete used as trench backfill material where specified by Engineer.

1.3 PROTECTION

.1 Existing Buried Utilities

.a Size, depth and location of existing utilities shown on Drawings are for guidance only; completeness and accuracy are not guaranteed.

.b Prior to commencing any excavation work, notify the applicable utility authorities and establish location and state of use of buried services. Clearly mark such locations to prevent disturbance during work. Refer to Section 01 14 00 for a list of the common utility companies in Olds.

.c Maintain and protect from damage, water, sewer, gas, electric, or other utilities encountered.

.d Obtain written authorization of owner of utility and Engineer before moving or otherwise disturbing utility.

.2 Existing Surface Features

.a Protect existing buildings, trees and other plants, lawns, fencing, service poles, wires or paving located within right of way or adjoining properties from damage

while work is in progress. Repair to Engineer's satisfaction any damage which may occur.

.b Where excavation necessitates root or branch cutting, do so only under direct control of the Engineer. Protect existing trees and shrubs in accordance with Section 32 93 50.

.3 Shoring and Bracing

.a Whenever shoring, sheeting, timbering and bracing of excavations is required, engage services of a Professional Engineer (registered to practice in Alberta) to design and assume responsibility for adequacy of shoring and bracing.

.b When requested by the Engineer, submit for review Shop Drawings and calculations signed and stamped by the Professional Engineer responsible for their preparation. Shop Drawings to be submitted in accordance with Section 01 33 00.

.c Close sheeting, when required, to be designed and constructed to prevent adjacent soil or water from entering excavation.

.4 Access

Maintain unobstructed access to fire and police appurtenances, telephone, electric, water, sewer, gas or other public utilities and private properties.

.5 Flooding

Protect open excavation against flooding and damage from surface water run-off.

.6 Temporary Erosion and Sediment Control (ESC)

In developed areas ensure ESC measures are in-place to protect the storm water drainage system and all waterbodies from infiltration of material run-off from the trench excavation piles and material stockpiles to Section 01 57 13.

.7 Haul Route

The contractor will maintain any haul route, used to support the project, to Section 01 53 40.

1.4 SAFETY REQUIREMENTS

.1 Adhere to Section 01 35 29.

.2 Adhere to all crossing permit (railway, pipeline, telecommunications duct, etc.) requirements.

.3 Provide barricades, illuminated warning signage, etc. to adequately denote area of excavation adjacent to roadways.

.4 Provide traffic control, as applicable to the Work, in accordance with Section 01 55 26.

1.5 MEASURE OF PAYMENT

Payment for trench excavation, initial backfill, backfill and compaction will be made at the unit price tendered, within the pipe size depth ranges specified, per lineal metre of trench excavated, backfilled and compacted in accordance with this section. Trench depth shall be the vertical distance between the ground surface immediately prior to excavation and the pipe invert as measured at intervals determined by the Engineer.

Horizontal measurement for each type of installation will be made as follows:

.1 Water Mains

Along centre line of main, including hydrant laterals, through valves and fittings.

.2 Sub-drains

Centre to centre of manholes and catch basins, or from centre of manhole/catch basin to designated termination point.

.3 Storm Sewer Mains

Centre of manhole to centre of manhole, or from centre of manhole to designated termination point.

.4 Corrugated Steel Pipe Culverts

Along invert of pipe from inlet to outlet, included bevelled end section.

.5 Catch Basin Leads

Centre of manhole to centre of catch basin.

.6 Sanitary Sewer Mains

Centre of manhole to centre of manhole, or centre of manhole to designated termination point.

.7 Sanitary and Storm Sewer Force Mains

Centre of manhole to centre of manhole, or from designated start point to designated termination point.

.8 Water, Sanitary Sewer and Storm Sewer Service Connections

As specified in Section 33 41 16.

.9 Concrete Encased and Direct Buried Duct Bank

From designated start point to designated termination point, including length through manholes.

.10 Sand Bedding

Sand bedding is not a permitted bedding material within the Town of Olds. Screened rock is the bedding material that will be utilized.

.11 Screened Rock Bedding

Payment for supply and placement of screened rock bedding material according to this Section will be made at the unit price tendered, within the pipe ranges specified, per lineal metre of screened rock bedding material installed, measured horizontally as specified in Clauses 1.5.1 through 1.5.9. Unit price to include supply and placement of screened rock bedding material from the trench bottom (75 mm to 150 mm below bottom of pipe as specified on Specification Drawing 50 01 03) to spring line of the pipe or to 300 mm above top of pipe, as specified in the Tender Form. Use of non-woven geotextile shall be considered incidental to the work.

.12 Unsuitable Pipe Foundation

Payment for supply and placement of screened rock bedding material according to this Section for unsuitable pipe foundation will be made at the unit price tendered per cubic metre. Unit price to include excavation of unsuitable foundation material and replaced with screened rock. (See Specification Drawing 50 01 01). Use of non-woven geotextile shall be considered incidental to the work.

.13 Solid Rock Excavation

Measurement for solid rock excavation shall be for a consistent trench width, multiplied by the length, as indicated on the Drawings, multiplied by the depth of rock defined as, from rock surface to 150 mm below pipe barrel.

.14 Utility Crossings

a. Measurement for payment of pipeline and utility crossings shall only be applicable to oil and/or gas pipelines and other underground mainline municipal utilities and shall be on a lump sum basis for each crossing made. Measurement for payment shall not be applied to building service lines or buried cables unless specifically provided for in the Contract. Notwithstanding the above statements, payment shall not be made where pipeline or utility being crossed falls below pipe being installed or where pipe being crossed was installed under this Contract.

b. Tendered unit price for each crossing shall include all extra costs, including but not limited to, support of the utility, utility crossing agreements and utility inspection charges over and above normal excavation costs.

2. PRODUCTS

2.1 BEDDING AND INITIAL BACKFILL MATERIALS

.1 Material to be used as specified by Engineer or as shown on Drawings.

.2 Initial backfill and bedding materials shall be to Section 31 05 16, Table A: Designations 1 and 4b.

.3 Concrete required for backfilling or Class A bedding, grades, supports, encasement to be as specified in Section 03 05 16 - Table A.

.4 Native backfill to be approved material selected from trench excavation or other source, unfrozen and free from deleterious material and with moisture content within 3% of optimum.

2.2 ROADWAY TRENCH BACKFILL MATERIAL

.1 To minimize fill settlement under self-weight, excavated soil with a water content exceeding the plastic limit of the soil by more than 10%, shall not be used as fill; unless the moisture content is lowered.

.2 Wet fill material should be dried or blended with drier material prior to use as trench backfill to achieve the specified level of compaction and where bearing capacity is not required.

.3 Replacement soils shall be suitable for compaction and compatible with in-situ material to minimize the potential for differential frost heave. All replacement soils must be approved by the Engineer prior to use.

2.3 FRONT STREET SERVICING

When trenching in areas of front-street servicing the excavation is to be of a uniform level, 1500 mm below the design road sub-grade elevation. The excavation width is to extend a minimum of 300 mm behind the back of concrete to 300 mm behind back of concrete. Back of concrete is considered to be back of monolithic walk or separate sidewalk (or curb if no sidewalk is present) depending upon the relevant road cross-section.

3. EXECUTION

3.1 SITE PREPARATION

.1 Install or ensure ESC measures are in-place, as applicable to the Work, prior to undertaking any excavation activity. Refer to Section 01 57 13 for ESC specifications.

.2 If applicable:

.a Remove vegetation and plant material (e.g. trees, brush, etc.) from surfaces to be excavated within limits indicated to Section 31 11 00.

.b Other obstructions or items noted for removal, including ice and snow, shall be to Section 02 41 16.

.c Strip topsoil from within limits of excavation, stockpile for re-spreading after backfilling or disposal off-site, to Section 31 22 13.

.3 Provide advanced notice (minimally 1 week) to the Engineer prior to Work commencement for initial survey.

3.2 DEWATERING

.1 Keep excavations dry while work is in progress.

.2 Dispose of water in a manner not detrimental to public health or the environment, on public and private property, or any portion of work completed or under construction. (Refer to Section 01 35 26 and 01 57 13).

3.3 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions indicated on Drawings. Ground profiles are approximate only. Precise line and grade will be set out by Engineer. Allow Engineer two working days advance notice to set out line and grade.

.2 Where applicable, cut pavement or sidewalk neatly along limits of proposed excavation.

.3 Notify Engineer when soil, at proposed elevation of trench bottom, appears unsuitable for foundation of installation. Remove unsuitable material, under direction of the Engineer and replace with approved 40 mm screened rock bedding and geotextile as indicated in Drawing 50 01 01.

.4 Notify Engineer if new construction conflicts with discovered obstruction. Allow Engineer sufficient time to consider alternative alignment to avoid conflict with obstruction. Modify alignment as directed by Engineer.

.5 Unless otherwise authorized by Engineer, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m of open trench at end of days operation.

.6 Stockpile suitable excavated materials required for trench backfill in approved location.

.7 Dispose of surplus and unsuitable material at a waste site designated by Engineer or a site located by Contractor and approved by Engineer.

.8 Where the trench bottom has been over-excavation, bring bottom of excavation to design grade with 40 mm screened rock.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Obtain Engineer’s approval for method of excavation.

.11 Excavated rock to a level 150 mm below the barrel of pipe.

.12 Excavation adjacent to existing vegetation designated to be preserved shall be to Section 32 93 50.

3.4 PIPE BEDDING AND INITIAL BACKFILL

.1 Concrete Bedding and Encasement

.a Do concrete work to Section 03 30 00. Place concrete to details indicated or directed.

.b Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.c Do not backfill over concrete within 24 hours after placing.

.2 Granular Bedding

.a Place granular bedding materials to Class B unless otherwise indicated on drawings.

.b Shape bed true to grade to provide continuous uniform bearing surface for pipe exterior. Do not use blocks when bedding pipe.

.c Shape transverse depressions in bedding, as required, to make joints.

.d Compact full width of bed to a density of 100% Standard Proctor Maximum Dry Density.

.e Place and compact layers simultaneously on both sides of installed work to equalize loading.

.f Place material by hand under, around and over pipe until 300 mm of cover is provided. Dumping material directly on pipe will not be permitted.

3.5 UNSUITABLE MATERIAL

.1 If unsuitable pipe foundation is encountered use 40 mm screened rock for the bedding.

.2 Place the rock to a minimum depth of 400 mm below the pipe and up to the spring line of the pipe.

.3 Use filter fabric to separate sub-grade material and bedding material.

3.6 SOIL INSULATION

When directed to or as per Drawings, install insulation over / around pipe to Section 31 32 41.

3.7 BACKFILLING

.1 General

.a Do not place backfill in freezing weather without written permission of Engineer.

.b Place backfill material in uniform layers not exceeding 200 mm in compacted thickness up to subgrade elevation or top of trench. Compact each layer before placing succeeding layer.

.c Imported backfill material may be used when approved by the Engineer.

.d Compact native and / or imported backfill materials to a minimum density of 95% Standard Proctor Maximum Dry Density to within 1.0 m of the top of subgrade elevation. The level of compaction in the upper 1.0 m of the trench backfill zone shall be increased to, minimally, 98% Standard Proctor Maximum Dry Density. Backfill materials shall be compacted to moisture contents at or within 3 percent of the material's Optimum Moisture Content

.e Compact using approved mechanical vibrator rollers, vibrator tamping plates, or by hand tamping equipment, to achieve specified levels of compaction.

.2 Shoring, Sheeting and Bracing

.a Unless otherwise indicated, or directed by Engineer, remove sheeting and shoring from trench during backfilling operations.

.b Do not remove bracing until backfilling has reached level of bracing.

.c Pull sheeting in 150 mm increments until clear of installations, simultaneously placing and compacting backfill to fill voids left by pulled sheeting.

.d Pull sheeting thereafter in increments that will ensure backfill is maintained at an elevation at least 450 mm above toe of sheeting.

.e When sheeting is to remain in place, cut off tops at elevations indicated or directed.

.3 Sewer Structures

For backfilling and compaction specifications related to manholes, catch-basins, vaults, etc. refer to Section 33 05 13.

.4 One-Point Proctor

.a In lane, utility lot and park areas, the Engineer may reduce the compaction requirement to 100% of a one-point proctor test if, in his opinion, it is not feasible to achieve the specified density. An application to the Engineering Department for relaxation of this specification is required before one point proctors are accepted. The one-point proctor density is to be measured at the in-situ soil moisture content.

.b One Point Proctor's shall not be used in street areas; drying and/or mixing of backfill soil or importing dry material may be necessary to achieve the levels of compaction as specified above.

.5 Front Servicing

Where front servicing is occurring, backfill trench density shall be, minimally, 98% Standard Proctor Maximum Dry Density; full trench depth.

3.8 FILL CONCRETE BACKFILL

.1 Place bedding and initial backfill material as per Clause 3.5.

.2 Backfill with fill concrete to level directed by Engineer.

.3 Vibrate to ensure all voids are filled.

.4 Allow 48 hours curing time prior to working over top of fill concrete.

3.9 SHALLOW UTILITY

For backfill and trench compaction specifications for shallow utilities refer to Section 33 65 76.

3.10 RESTORATION

.1 New Developments

.a Leave excavated areas to grade and elevation as shown on Drawings.

.b Remove and dispose of excess excavated material as directed by the Engineer.

.c Leave area graded for drainage and / or entrapment of overland drainage as directed by the Engineer.

.d Ensure ESC measures are in-place and maintained per Section 01 57 13.

.2 Developed Area

.a Replace topsoil as directed by Engineer.

.b Restore travelled areas to the pavement or concrete structure shown on the contract drawings.

.c Where edge of existing pavement is damaged as a result of trench excavation in shoulder, a minimum 300 mm width shall be cut neatly and continuously and the asphalt reinstated in accordance with Section 32 12 16.

.d Where concrete is damaged as a result of trench excavation, reinstated in accordance with Section 32 13 14.

.e Clean and reinstate areas affected by work as directed and per Section 01 74 11.

.f Remove ESC measures once surface areas have been restored appropriately.

1. GENERAL

This Section specifies requirements for the excavation and / or embankment earthwork required to establish a roadway; conforming to lines, grades, dimensions and typical cross sections shown on plans or established by Engineer.

1.1 RELATED WORK

1. Hauling and Haul Roads	Section 01 53 40
2. Temporary Erosion and Sediment Control	Section 01 57 13
3. Aggregate Materials	Section 31 05 16
4. Rough Grade	Section 31 22 13
5. Roadway Subgrade Reshaping	Section 31 22 16
6. Geogrid	Section 31 32 19
7. Geotextile	Section 31 32 21
8. Soil Insulation	Section 31 32 41
9. Sub-drainage	Section 33 46 16

1.2 DEFINITIONS

.1 Topsoil Stripping

Refer to Section 31 22 13 for definition of topsoil stripping.

.2 Rock Excavation

Refer to Section 31 22 13 for definition of rock excavation and Type ‘A’ and ‘B’ categories.

.3 Common Excavation

Refer to Section 31 22 13 for definition of common excavation.

.4 Waste Excavation

Refer to Section 31 22 13 for definition of waste excavation.

.5 Borrow Excavation

Refer to Section 31 22 13 for definition of borrow excavation.

.6 Embankment

Refer to Section 31 22 13 for definition of embankment.

.7 Subgrade Elevation

Refer to Section 31 22 13 for definition of subgrade elevation.

.8 Unsuitable Subgrade

Material at design subgrade level not suitable for pavement structure, shall be removed as directed by Engineer and replaced with suitable material.

.9 Pavement Structure

The combination of material layers of unbound or stabilized granular subbase, base and asphalt, gravel or concrete surfacing to form a road structure. This combination may, in some cases, include geo-synthetics within the layers.

1.3 PROTECTION

.1 Existing Buried Utilities

.a Size, depth and location of existing utilities shown on drawings are for guidance only; completeness and accuracy are not guaranteed.

.b Prior to commencing any excavation work, notify the applicable utility authorities and establish location and state of use of buried services. Clearly mark such locations to prevent disturbance during work. Refer to Section 01 14 00 for a list of the common utility companies in Olds.

.c Maintain and protect from damage water, sewer, gas, electric, or other utilities encountered.

.d Obtain written authorization of owner of utility and Engineer before moving or otherwise disturbing utility.

.2 Existing Surface Features

a. Protect existing buildings, trees and other plants, lawns, fencing, service poles, wires or paving located within right of way or adjoining properties from damage while work is in progress. Repair to Engineer's satisfaction any damage, which may occur.

b. Where excavation necessitates root or branch cutting, do so only under direct control of Operational Services Urban Forester in accordance with Section 31 11 00 and / or Section 32 93 50 depending upon the work.

.3 Access

Maintain unobstructed access to fire and police appurtenances, telephone, electric, water, sewer, gas or other public utilities and private properties.

.4 Temporary Erosion and Sediment Control (ESC)

Ensure ESC measures are in-place to protect the storm water drainage system and all waterbodies from infiltration of material run-off from the trench excavation piles and material stockpiles.

.5 Haul Route

The contractor will maintain any haul route, used to support the project, to Section 01 53 40.

1.4 SAFETY REQUIREMENTS

.1 Adhere to Section 01 35 29.

.2 Adhere to all crossing permit (railway, pipeline, telecommunications duct, etc.) requirements.

.3 Provide barricades, illuminated warning signage, etc. to adequately denote area of excavation adjacent to existing roadways.

.4 Provide traffic control, as applicable to the Work, in accordance with Section 01 55 26.

1.5 MEASURE OF PAYMENT

.1 Excavated materials to be measured and paid for in cubic metres for in-situ cut. Volumes will be calculated by the Engineer.

.2 Unit price bid shall be full compensation for all work necessary for the excavation or embankment (fill) of the specified material.

.3 Solid rock excavation shall be measured per Section 31 22 13.

.4 Removal of unsuitable subgrade material and replacement with pit run gravel backfill material to be measured in cubic metres for the volume of material removed and the volume of pit run gravel material supplied.

.5 Subgrade preparation to be measured in square metres for the area of subgrade prepared beneath pavement, curbs and sidewalks.

.6 No measurement to be made for:

.a Unnecessary excavation beyond lines established.

.b Extra handling of windrowed materials blended on embankment slopes.

.c Moisture adjustment of material.

.d Construction, maintenance and restoration of haul routes.

.e Subgrade preparation where unsuitable subgrade is removed and replaced with granular material.

.f Subgrade preparation in areas having fills greater than 300 mm.

.g Overhaul.

2. PRODUCTS

2.1 MATERIALS

.1 Embankment Material

To be approved by the Engineer.

.2 Subgrade Replacement Material

.a To be in accordance with Section 31 05 16, Aggregate Materials, Table 'A', designations 3a or 3b.

.b Material to be used as specified by the Engineer or as shown on the Drawings.

2.2 EQUIPMENT

Refer to Section 31 22 13.

3. EXECUTION

3.1 SITE PREPARATION

.1 Install or ensure ESC measures are in-place, as applicable to the Work, prior to undertaking any excavation activity. Refer to Section 01 57 13 for ESC specifications.

.2 If applicable:

.a Remove vegetation and plant material (e.g. trees, brush, etc.) from surfaces to be excavated within limits indicated to Section 31 11 00.

.b Other obstructions or items noted for removal, including ice and snow, shall be to Section 02 41 16.

.c Strip topsoil from within limits of excavation, stockpile for re-spreading after backfilling or disposal off-site, to Section 31 22 13.

.3 Provide advanced notice (minimally 1 week) to the Engineer prior to Work commencement for initial survey.

3.2 EXCAVATION

.1 Rock Excavation

If rock is encountered during roadway excavation refer to Section 31 22 13.

.2 Common Excavation

Material designated as common excavation shall be excavated, hauled and compacted in designated fill areas on site. Refer to Section 31 22 13 for additional specifications related to common, excavated material handling, placement, and compaction.

.3 Waste Excavation

Refer to Section 31 22 13 for specifications related to the disposal of unsuitable excavated material considered as waste.

.4 Borrow Excavation

Refer to Section 31 22 13 for specifications related to borrowed material.

.5 Unsuitable Subgrade

If unsuitable subgrade is encountered during roadway excavation refer to Section 31 22 13.

.6 Contaminated Material

If, during the course of retro-fitting or repair of an existing roadway, an isolated pocket of material or debris is excavated under normal work practice and has not been prior identified on drawings, in the Contract, or to the knowledge of the Engineer, Contractor or local authority, the Contractor shall stop work in that area and refer to Section 31 22 13 for further requirements.

3.3 SUBGRADE PREPARATION

Refer to Section 31 22 16 for subgrade preparation.

3.4 DITCHES AND DRAINAGE

To maintain a dry work site and control overland storm drainage refer to Section 31 22 13 for requirements.

3.5 EMBANKMENTS

.1 Material designated for embankment shall be excavated, hauled and compacted, in designated fill areas on site, to Section 31 22 13 specifications related to common excavation.

.2 Operate compaction equipment continuously on the embankment when placing material.

3.6 PROOF ROLLING

.1 The contractor shall proof roll embankment material and submit documentation of the proof rolling along with other testing submissions, unless directed otherwise by the Engineer.

.2 For proof rolling, use a roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 915 mm maximum.

.3 Engineer may authorize use of other acceptable proof rolling equipment. Alternately, use a single axle dual wheeled truck with a load of 9,100 kg on the rear axle with tires inflated to a minimum of 275 kPa.

.4 Proof roll at level in subgrade indicated. If alternative proof rolling equipment is authorized, Engineer will determine level of proof rolling.

.5 Make sufficient passes with proof vehicle to ensure the surface is subjected to, minimally:

.a Three passes of a loaded tire, and

.b Within 500 mm of any previously passed point.

.6 Where proof rolling reveals areas of defective subgrade or subbase the Engineer shall determine limits of unsuitable material excavation and specify replacement material per Sections 32 11 16 and 32 11 23.

3.7 FINISHING AND TOLERANCES

.1 Shape entire roadbed to within 50 mm of design elevations.

.2 Finish Borrow pits to Section 31 22 13.

.3 Finish slopes and ditch bottoms true to lines, grades and drawings where applicable.

.4 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.

.5 For cut slopes in bedrock steeper than 1:1, remove loose fragments by scaling the slope.

.6 Slopes that cannot be finished satisfactorily by machine are to be hand finished.

.7 Unless noted otherwise by Drawing or direction of Engineer, the top of slope shall be rounded 1.5 m both sides.

.8 Refer to Section 01 57 13 for appropriate ESC measures to protect against erosion and methods to stabilize slope material.

.9 Trim between constructed slopes and edge of clearing to provide drainage to Section 01 57 13.

3.8 DUST CONTROL

Control dust during site grading operations by watering. Refer to Section 01 57 13 for further requirements.

3.9 MAINTENANCE

.1 Maintain finished surfaces in a condition in accordance with this Section until acceptance by Engineer.

.2 Ensure ESC measures are in-place and maintained per Section 01 57 13.

1. GENERAL

This Section specifies requirements for supply and installation of a geo-synthetic material produced in an open grid configuration, commonly known as Geogrid, which shall be used primarily for reinforcement in slope stabilization and roadway pavement structure reinforcement.

1.1 RELATED WORK

.1	Roadway Excavation and Embankment	Section 31 24 13
.2	Geotextiles	Section 31 32 21
.3	Gabions	Section 31 36 00
.4	Rip-Rap	Section 31 37 00

1.2 MILL CERTIFICATES

Minimally one week prior to start of Work, Engineer to be provided with copies of mill test data and a certificate that Geogrid material delivered to job site meets the requirements of this Section.

1.3 APPROVAL

Obtain written approval of acceptance from Engineer for Geogrid material before installation of material in the Work.

1.4 MEASURE OF PAYMENT

Geogrid will be measured in square metres regardless of application. No allowance will be made for overlaps.

2. PRODUCTS

2.1 MATERIAL

.1 Synthetic Polymer Fabric

.a To be rot-proof.

.b Treated to be unaffected by naturally encountered chemicals, alkalis and acids.

.c Treated to be unaffected by insects or rodents.

.d Free of striations, roughness, pinholes, blisters, undispersed raw materials or any sign of contamination by foreign matter.

.e Treated with inhibitors to resist deterioration by ultra-violet light and heat exposure.

.2 Type

.a Uniaxial Geogrid to be used for slope stabilization.

.b Biaxial Geogrid to be used for road base reinforcement and other similar load bearing applications.

2.2 PHYSICAL PROPERTIES (MINIMUM)

.1 Uniaxial Geogrid

.a Tensile strength @ 5% strain to be greater than 24 kN/m and meet ASTM D6637.

.b Rigid junction strength to be 2 times greater than tensile strength and meet GGI-GG2.

.c Tensile creep strength to be greater than 30 kN/m and meet ASTM D5262.

.d Long term design strength for sand, silt and clay to be greater than 12 kN/m and meet GGI-GG4.

.2 Biaxial Geogrid

.a Tensile strength at 5% strain to be greater than 13 kN/m and meet ASTM D6637.

.b Junction efficiency to be greater than 90% tensile strength and meet GGI-GG2.

.c Grid size to be minimally 25x25mm.

3. EXECUTION

3.1 INSTALLATION

.1 Place Geogrid by unrolling onto prepared surface, stretch taut and retain in position.

.2 Protect Geogrid from displacement or damage until and during placement of overlaid material layers.

.3 Place Geogrid on sloping surfaces in one continuous length, from toe of slope to upper extent of roll.

.4 Overlap each successive strip of Geogrid minimally 500 mm at seams.

.5 Seams are to be connected as per Manufacturers recommendations.

.6 Protect Geogrid from displacement and damage during placement of granular sub-base and/or granular base material.

.7 After installation, cover with granular material within four hours of placement.

.8 Remove and replace damaged or deteriorated geogrid as directed by Engineer.

3.2 PROTECTION

.1 Do not permit passage of any vehicle directly on Geogrid at any time.

1. GENERAL

This Section specifies requirements for supply and installation of a geo-synthetic material (referred to as Geotextile) produced in either a woven or a non-woven configuration.

1.1 RELATED WORK

.1 Roadway Excavation and Embankment — Section 31 24 13

.2 Granular Sub-base — Section 32 11 16

1.2 MILL CERTIFICATES

Minimally one week prior to start of Work the Engineer shall be provided with two copies of mill test data and a certificate that the Geotextile material delivered to job site meets the requirements of this Section.

1.3 APPROVAL

Obtain written approval from Engineer for Geotextile material before installation of material in the Work.

1.4 MEASURE OF PAYMENT

.1 Geotextiles will be measured in square metres of subgrade covered when used as a separation membrane. No allowance will be made for seams and overlaps.

.2 No measurement when geotextile material is used as a hydraulic filter in a sub-drain application. Refer to Section 33 46 16 (Sub-drainage).

2. PRODUCTS

2.1 MATERIAL

.1 Synthetic Polymer Fabric

.a To be rot-proof.

.b Treated to be unaffected by naturally encountered chemicals, alkalis and acids.

.c Treated to be unaffected by insects or rodents.

.d Free of striations, roughness, pinholes, blisters, un-dispersed raw materials or any sign of contamination by foreign matter.

.e Treated with inhibitors to resist deterioration by ultra-violet light and heat exposure.

.2 Type

.a Non-woven polymer: needle-punched; shall be used in filtration and separation applications.

.b Woven polymer: shall be used for granular separation and stabilization applications.

.3 Ultraviolet Protection

Store and protect geotextiles from direct sunlight. Store indoors, off the ground, and a dry environment. On the construction site; do not expose the geotextile to more than 14 days of direct weather as it is acceptable to ultraviolet deterioration.

2.2 PHYSICAL PROPERTIES (MINIMUM)

.1 Non-woven Geotextile

.a Grab Tensile Strength 800 N

.b Mullen Burst Strength 2000 kPa

.c Trapezoidal Tear Strength 270 N

.d Permeability K 0.1 cm/sec

.2 Woven Geotextile

.a Grab Tensile Strength 890 N

.b Puncture Strength 420 N

.c Mullen Burst Strength 2900 kPa

.d Trapezoidal Tear Strength 400 N

.3 Seams

.a Sewn to Manufacturers specifications. Threading material to equal or exceed specifications of fabric. The strength of the finished joint shall meet the same specifications required for the fabric.

3. EXECUTION

3.1 INSTALLATION

.1 Place geotextile by unrolling on to prepared surface, stretch taut and retain in position.

.2 Place geotextile smooth and free of tension stress, folds, wrinkles and creases.

.3 Protect geotextile from displacement or damage until and during placement of overlaid material layers.

.4 Place geotextile on sloping surfaces in one continuous length from toe of slope to upper extent of roll.

a. The top edge of the filter fabric shall be anchored by digging a 300 mm deep trench, inserting the top edge of the fabric and backfilling with compacted soil.

.5 Overlap each successive strip of geotextile, minimally 500 mm, at seams. Pin or sew seams together as recommended by manufacturer.

.6 Protect geotextile material from displacement and damage during placement of granular sub-base and/or granular base material.

.7 After installation, cover with granular material within four hours of placement.

.8 Remove and replace deteriorated fabric.

3.2 PROTECTION

.1 Do not permit passage of any vehicle directly on Geotextile at any time.

1. GENERAL

This Section specifies requirements for supplying and installing soil insulation.

1.1 RELATED WORK

.1	Trench Excavation and Backfilling	Section 31 23 33
.2	Roadway Excavation and Embankment	Section 31 24 13

1.2 DELIVERY AND STORAGE

.1 During delivery and storage, protect insulation from direct sunlight, physical damaged and incompatible chemicals (solvents, petroleum products, etc.). On the job site, cover temporarily stored insulation with a light coloured tarpaulin. Insulation must not be exposed to flame or other ignition source.

1.3 MEASUREMENT FOR PAYMENT

.1 Utility Main Insulation

Soil insulation will be measured in square metres of material installed for the thickness specified, either in a horizontal layer or inverted U. No additional payment will be made for additional trench width and/or depth required to install soil insulation.

.2 Roadway Insulation

Soil insulation will be measured in square metres of material installed for the thickness specified.

2. PRODUCTS

2.1 MATERIAL

Extruded Polystyrene Insulation shall meet the following specifications:

Physical Property Requirements	Units	Test Method	Specification
Minimum Thermal Resistance per 25mm @ 24^0C	$m^2 \bullet {}^0C/W$	ASTM C518	0.75
Minimum Compressive Strength	kPa / PSI	ASTM D1621	275 / 40
Minimum Flexural Strength	kPa / PSI	ASTM C203	414/60
Maximum Water Vapour Permeance	ng/(Pa•s •m^2)	ASTM E96	90
Maximum Water Absorption	% by volume	ASTM D2842	2.0

3. EXECUTION

3.1 UTILITY MAIN INSULATION

.1 Complete trench excavation and bedding material placement in accordance with Section 31 23 33. Increase trench width to accommodate required insulation width and/or depth.

.2 Install utility pipe as specified in the various sections of Division 33.

.3 Install soil insulation in accordance with manufacturer's instructions and as shown on Drawing 50 01 04, included as part of Division 50.

.4 When placing multiple layers of insulation to achieve the specified overall thickness, ensure the joints of the lower layer(s) are fully overlapped at least 50 mm by the successive layer(s).

.5 Insulation placed around catch basin or manhole barrels shall be cut to fit so that a gap no larger than 15 mm exists between the outside of the barrel and the insulation.

.6 Backfill to be finished smooth.

.7 Backfill and compact trench in accordance with Section 31 23 33.

3.2 ROADWAY INSULATION

.1 Complete roadway excavation and subgrade preparation in accordance with Section 31 24 13.

.2 Place soil insulation as shown on the Construction Drawings. To prevent wind blow-off, pin in place with wooden skewers or weigh down with granular material.

.3 To prevent damage to the insulation layer during subsequent construction, place a 50 mm thick layer of sand bedding (Designation 1a or 1b) immediately below and above the insulation.

.4 When placing multiple layers of insulation to achieve the specified overall layer thickness, ensure the joints of the lower layer(s) are fully overlapped at least 50 mm by the successive layer(s).

.5 Place and compact first lift of granular sub-base material carefully to prevent damage or displacement.

.6 Place subsequent lifts of granular material and asphalt as specified.

3.3 PROTECTION

.1 Do not permit passage of any vehicle directly on soil insulation at any time.

1. GENERAL

This Section specifies requirements for supply and installation of baskets and/or mats fabricated from wire mesh or Geogrids filled with stone. A Gabion structure consists of a number of baskets or mats connected together forming a monolithic structure.

1.1 RELATED WORK

.1 Geogrid — Section 31 32 19

.2 Geotextile — Section 31 32 21

1.2 REFERENCES

.1 ANSI/ASTM D 638 M, Test Method for Tensile Properties of Plastic (metric).

.2 ASTM A 313, Specification for Chromium-Nickel Stainless and Heat Resisting Steel Spring Wire.

.3 ASTM A 764, Specification for Steel Wire, Carbon, Drawn, Galvanized and Galvanized at Size for Mechanical Springs.

.4 CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 MEASURE OF PAYMENT

Installation of Gabions will be measured in cubic metres and will include excavation and preparation of foundation bed, supply and installation of graded stone fill and supply and installation of backfill.

2. PRODUCTS

2.1 MATERIALS

.1 Gabion Baskets

.a Factory fabricated so that sides, ends, lid and internal diaphragms readily assemble at site into rectangular baskets of sizes as indicated.

.b Single unit construction or with joints having strength and flexibility equal to that of mesh.

.c When length exceeds horizontal width, provide diaphragms of same mesh as gabion walls to divide basket into equal cells of length not in excess of horizontal width.

.2 Wire Mesh Gabions

.a Wire mesh to be uniform hexagonal pattern wire woven in triple twist pattern with openings of approximately 80 mm x 100 mm and fabricated to be non-ravelling. Perimeter edges of mesh to be securely selvedge so that joints formed by connecting selvedge are as strong as body of mesh.

.b Wire to have the following dimensions:

.i Mesh: 3.0 mm diameter

.ii Selvedges: 3.8 mm diameter

.iii Binding: 2.0 mm diameter

.c Wire is to be hot dip galvanized with minimum coverage of 260 g/m^2 to CSA G164.

.d Interlocking wire fasteners are to be galvanized steel to ASTM A 764, finish 1, class 1, Type 3.

.3 Geogrid Gabions

.a Geogrid mesh to be rigid type, uniform, square pattern, non-corrosive, high density polyethylene with inhibitors added to resist deterioration by ultra-violet and heat exposure. Geogrid openings to be 50 mm x 50 mm.

.b Geogrid to have the following mechanical properties:

.i Tensile modulus at 2% elongation: to ANSI/ASTM D638M, modified to manufacturer's recommendations, minimum 290 kN/m.

.ii Junction strength: to ANSI/ASTM D 638M, modified to manufacturer's recommendations, minimum 90% of single rib strength.

.4 Gabion Mats

.a Factory fabricated so that sides, ends, lid and internal diaphragms readily assemble at site into rectangular mats.

.b Single unit construction or with joints having strength and flexibility equal to that of mesh.

.c When length exceeds horizontal width, provide diaphragms of same mesh as gabion walls to divide mat into equal cells not in excess of 1 m x 3 m.

.5 Wire Mesh Gabion Mats

.a Wire mesh to be uniform hexagonal pattern wire woven in triple twist pattern with openings of approximately 80 mm x 100 mm and fabricated to be non-ravelling. Perimeter edges of mesh to be securely selvedge so that joints formed by connecting selvedges are as strong as body of mesh.

.b Wire to have the following dimensions:

.i Mesh: 2.20 mm diameter

.ii Selvedges: 2.65 mm diameter

.iii Binding: 2.20 mm diameter

.c Wire is to be hot dip galvanized with minimum coverage of 260 g/m^2 to CSA G164.

.d Interlocking wire fasteners are to be galvanized steel to ASTM A-764, finish 1, class 1, Type 3, stainless steel to ASTM A-313.

.6 Geogrid Gabion Mats

a. Geogrid mesh to be rigid type, uniform, square pattern, non-corrosive, high density polyethylene with inhibitors added to resist deterioration by ultra-violet and heat exposure. Geogrid openings to be 50 mm x 50 mm.

b. Geogrid to have the following mechanical properties:

i. Tensile modulus at 2% elongation: to ANSI/ASTM D638M, modified to manufacturer's recommendations, minimum 290 kN/m.

ii. Junction strength: to ANSI/ASTM D 638M, modified to manufacturer's recommendations, minimum 90% of single rib strength.

.7 Stone Fill

a. Hard, durable, abrasion resistant such that it will not disintegrate from action of wetting and drying, wave action, freezing and thawing cycles.

b. Minimum 100 mm to maximum 200 mm dimension for individual stones.

.8 Geotextile Filter

Refer to Section 31 32 21.

3. EXECUTION

3.1 INSTALLATION

.1 Install gabions and geotextiles to lines and grades as indicated. Follow manufacturer's instructions in assembling baskets and mats.

.2 Excavate for and backfill behind gabions in accordance with Section 31 23 33.

3.2 PLACING GABIONS

.1 Wherever possible, place baskets and mats in position prior to filling with stones.

.2 Join adjacent baskets and mats together at corners as recommended by manufacturer, so that joints are as strong as mesh.

3.3 FILLING BASKETS AND MATS

.1 Tension geogrid gabions according to manufacturer's instructions before filling with stone. Do not release wall tension until sufficient stone fill has been placed to prevent wall slackening.

.2 On exposed faces of gabions, place stones by hand with flattest surfaces bearing against face mesh to produce satisfactory alignment and appearance.

.3 For wire mesh gabions, fill gabion cells in lifts not exceeding 300 mm and connect opposite walls with two tie wires after each lift.

.4 For geogrid gabions, fill cells in lifts not exceeding 300 mm and connect opposite walls with two polyethylene braids after each lift.

1. GENERAL

This Section specifies requirements for supplying and placing rock rip-rap for erosion protection at culvert ends, outfalls, ditch embankment, river embankment, and shore lines.

1.1 RELATED WORK

.1 Geotextiles Section 31 32 21

1.2 REFERENCES

.1 CSA-A3001, Portland Cement

.2 CSA A82.56, Aggregate for Masonry Mortar

.3 CSA-A23, Concrete Material and Methods of Concrete Construction

1.3 MEASURE OF PAYMENT

.1 Rip-rap used as erosion protection for waterway bank or water body shore armouring shall be measured by the tonne placed.

.2 Rip-rap used for erosion protection at an outfall shall be measured by the square metre in place.

.3 Rip-rap used for erosion protection or stabilization of an existing ditch or slope shall be measured in square metres, at the depth specified, in place. New ditch excavation or new embankment construction will be measured per Sections 31 23 33 and 31 24 13 respectively.

.4 Rip-rap, used with cement mortar, shall be measured in square metres, at the depth specified, in place.

.5 All unit prices include full compensation for any royalties, permits, hauling of materials, equipment, tools, labour and incidentals necessary to complete the work including but not limited to clearing, grubbing, base preparation, trimming, excavation, backfilling, compaction, etc.

.6 Geotextiles shall be measured per Section 31 32 21.

2. PRODUCTS

2.1 STONE

.1 Hard, dense, durable stone, free from seams, cracks or other structural defects, to meet the following size distribution for the use intended.

.2 Shale and sandstone material shall not be used.

.3 The material provided for each class specified shall have a gradation that conforms to the following:

		CLASS			
		1M	**1**	**2**	**3**
Nominal Mass (kg) Nominal Diameter (mm)		**7** **175**	**40** **300**	**200** **500**	**700** **800**
None greater than:	kg or mm	40 300	130 450	700 800	1800 1100
20% to 50%	kg or mm	10 200	70 350	300 600	1100 900
50% to 80%	kg or mm	7 175	40 300	200 500	700 800
100% greater than:	kg or mm	3 125	10 300	40 300	200 50

Percentages are by mass. Sizes quoted are equivalent spherical diameters and are given for guidance only.

2.2 INSPECTION OF MATERIAL

.1 Control of gradation will be by visual inspection. The Engineer may request the Contractor to provide samples of rock proposed for use. The maximum sample sizing per class:

Class	Sample Size
1M	1 m x 1 m
1	2 m x 2 m
2	3 m x 3 m
3	4 m x 4 m

.1 These samples shall be considered acceptable if they conform to the required gradation by direct weighing of all the individual pieces with a suitable scale; the mass of each piece in the sample shall be painted on the piece.

.2 These samples are to be located at the construction site and at the source or quarry site.

.3 The samples shall be used for frequent reference in judging the gradation of the rip-rap being loaded at the source and placed at the site.

.4 Just prior to completion of rock placement, the samples may be incorporated into the finished rip-rap when they are no longer required for reference purposes.

.5 If, during the delivery of the material to the site, a particular load is found to be made up of pieces predominantly one size, or lacking in pieces of one size, the entire load may be rejected. The rejected material, at the discretion of the Engineer, may be disposed of or re-mixed on-site or returned to the source or quarry site for re-mixing with other material to meet the gradation required.

2.3 CEMENT MORTAR

.1 Cement: To CSA-A3000, Type GU

.2 Sand for mortar: To CSA A82.56

.3 Mortar mix: One part by volume of cement to three parts sand, to consistency approved by Engineer.

2.4 GEOTEXTILE

.1 Non-woven geotextile shall be used in conjunction with rip-rap placement for slope stabilization.

.2 Non-woven geotextile specifications shall be modified from Section 31 32 21 to the following table:

	For Class 1M, 1 and 2 rock	For Class 3 rock:
Grab strength	650 N	875 N

Elongation (failure)	50%	50%
Puncture strength	275 N	550 N
Bust strength	2.1 mPa	2.7 mPa
Trapezoidal tear	250 N	350 N

3. EXECUTION

3.1 PREPARATION

.1 Ensure appropriate erosion and sediment control (ESC) measures are in place to Section 01 57 13.

.2 If the work is adjacent to a water body (e.g. stream, river, wetland, or lake) additional or enhanced ESC measures will be required, Contractor shall ensure that all permits and additional requirements have been obtained from the Department of Fisheries and Oceans and Alberta Environment and Parks prior to work commencement.

Note: This does not relieve the contractor of other permitting or regulator obligations.

.3 If work area requires vegetation to be cleared and grubbed and earthwork to prepare the site refer to appropriate sections within Division 31.

3.2 GEOTEXTILE

The fabric shall be laid per Section 31 32 21 with the following adjustment; where geotextile is placed underwater, the minimum lap width shall be 1.0 m.

3.3 PLACING

.1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated. Rip-rap placement shall commence at the base of the blanket area and proceed up the slope, do not allow the rip-rap to roll down the slope.

.2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.

.3 Place geotextile on prepared surface as indicated. Place rip-rap on geotextile so as to avoid puncturing geotextile. Do not drive vehicles directly on geotextile.

.4 Place rip-rap to thickness, details, and cross sections as indicated.

.5 The height of drop of rip-rap shall be limited to 1.0 m or less.

.6 Place stones in manner approved by Engineer to secure surface and create a stable mass.

.7 Place larger stones at bottom of slopes or lower courses to use as headers for subsequent courses.

.8 Stagger vertical joints and fill voids with rock spalls or cobbles.

.9 The finished surface shall be reasonably uniform, free from bumps or depressions, and with no excessively large cavities below or individual stones projecting above the general surface.

3.4 MORTAR

.1 Use mortar within one hour after water has been added. Do not add additional water after initial mixing.

.2 Commence applying mortar at bottom courses and work upward completely filling voids except for sub-drainage relief holes as indicated and leaving outer faces of stones exposed. Remove excess mortar to expose faces of stones.

.3 Cure and protect mortar in accordance with CSA-A23.1 using absorptive mats or fabric kept continuously wet.

3.5 RE-VEGETATION

If required, revegetate rip-rap face per contract requirements.

Section 32 01 11	Pavement Marking Removal
Section 32 01 16	Reshaping Asphalt Pavement (Milling)
Section 32 01 18	Routing and Sealing Pavement Cracks
Section 32 11 16	Granular Sub-Base
Section 32 11 17	Reshaping Granular Roadbed
Section 32 11 23	Granular Base Course
Section 32 12 14	Asphalt Prime Coat
Section 32 12 15	Asphalt Tack Coat
Section 32 12 16	Hot-Mix Asphalt Concrete Paving
Section 32 12 21	Hot-in-Place Asphalt Recycling
Section 32 12 50	Asphaltic Concrete Overlay Paving
Section 32 12 60	Asphaltic Concrete Curbs
Section 32 13 13	*Concrete Paving (Draft – Requires Engineer approval before use)*
Section 32 13 14	Removal and Replacement of Concrete Work
Section 32 13 15	Concrete Work
Section 32 14 20	Precast Paving Stone
Section 32 15 60	Roadway Dust Control
Section 32 17 23	Pavement Marking: General
Section 32 17 24	Painted Traffic Lines and Markings
Section 32 17 26	Thermoplastic Pavement Markings
Section 32 31 13	Chain Link Fences and Gates
Section 32 31 16	Post and Cable Fence
Section 32 31 26	Wire Fences and Gates

Section 32 31 27	Wildlife Fencing
Section 32 32 34	Soil Reinforced Retaining Wall
Section 32 33 00	Site Furnishings
Section 32 91 19	Topsoil and Finish Grading
Section 32 92 19	Mechanical Seeding
Section 32 92 21	Hydraulic (Hydro) Seeding
Section 32 92 23	Sodding
Section 32 93 10	Planting of Trees, Shrubs, and Ground Covers
Section 32 93 43	Tree Pruning
Section 32 93 50	Tree and Shrub Preservation

1. GENERAL

This Section specifies requirements for removal of pavement markings.

1.1 RELATED WORK

.1 Asphalt Tack Coat — Section 32 12 14

.2 Hot-Mix Asphaltic Concrete Pavement — Section 32 12 16

1.2 MEASURE OF PAYMENT

.1 Lines removed to be measured in lineal metres for each type of marking material.

.2 Symbols and letters removed to be measured in units specified in the unit price schedule.

.3 Unit price tendered for removal to include:

.a Placement of a tack coat, if applicable,

.b Asphalt repair, if applicable,

.c Removal and disposal of sand blasting and / or grinding out of material,

.d Clean-up of road surface.

2. PRODUCTS

2.1 MATERIALS

.1 Abrasives used for removal of painted pavement markings to be products specifically designed for sand blasting.

.2 Resin based compound with granular material surface coating (e.g. System 400) are not an approved asphalt filler material.

3. EXECUTION

3.1 WEATHER

.1 Removals shall not be carried out during wet weather and shall cease upon the onset of a rain shower that has a significant enough moisture content to create surface water flow.

.2 If asphalt filler is required refer to Section 32 12 16 for additional weather restrictions.

3.2 PROTECTION

.1 Exercise care to avoid dislodgement of coarse aggregate particles, excessive removal of fines, damage to bituminous binder, or damage to joint and crack sealers.

.2 Avoid removal material from entering the Town's storm drainage system; this may require temporary installation of erosion and sediment control measures (per Section 01 57 13) for large volume removals.

3.3 REMOVALS

.1 Non-Approved Processes

.a Painting or blacking out the marking and / or leaving the marking to wear out over time.

.b Heater milling equipment.

.2 General

.a Remove markings as shown on drawings or as directed by the Engineer.

.b When grinding is the method of removal, take care not to over-grind the size or depth of the marking.

.c The start and stop of line marking removal shall be the full segment and complete symbols; partial marking removal is not acceptable.

.d Ensure the finished ground edges are straight and true to the existing pavement surface to provide a smooth and trimmed patch.

.3 Paint

.a Paint markings shall be sand blasted.

.4 Surface Applied Plastic

.a Surface applied line and symbol markings shall be ground flush to the asphalt surface, not exceeding 1 mm depth of grind into the asphalt surface.

.5 Inlaid Plastic

.a Inlaid plastic markings shall be machine ground.

.b Grind out line marking and underlying asphalt to the width and length of the line and a depth of 25 mm below the adjacent pavement surface.

.c Grind out symbol marking and underlying asphalt to a rectangular area equal to the width and length of the symbol and a depth of 25 mm below the adjacent pavement surface.

.6 Hydro-blasting

.a Utilization of high pressure water for the removal of pavement markings from an asphalt or concrete pavement course is acceptable.

.b The Contractor shall remove the residue and water immediately after contact between the water and the pavement surface. The removal process shall require a vacuum attachment operating concurrently with the blast operation or by an alternate method approved by the Engineer.

.c Removal of pavement markings by high pressure water is prohibited when the ambient air temperature is 4˚C or less or anticipated to decrease to 4˚C or less within 2 hours.

.d Hydro-blasting will require sediment control measures for the storm drainage system to be in-place.

3.4 TRIMMING

.1 Ensure all the marking material has been removed from the grind area to ensure a good seal between the existing asphalt and the patch material.

.2 Small portions of marking material not removed after grinding shall be removed with hand tools.

.3 If the grind creates a poor binding line to the existing pavement, re-trim the grind to create a smooth and trimmed patch.

3.5 REPAIR

.1 No repair is required for removal of painted surface applied pavement markings.

.2 For ground out markings, apply an asphalt tack coat, to Section 32 12 15, before placing the asphalt filler patch.

.3 Tack coat application shall be by hand-held spray or liquid, mopped to provide an even and well distributed coating along the edges and over the bottom of the grind. Do not over-spray or mop tack coat onto the top of the existing road surface.

.4 Asphalt filler shall be Type 5A, to Section 32 12 16.

.5 Place asphalt filler by hand shovel, levelled by luke or rake, and compacted with either a mechanically vibrator plate tamper or a small roller. Refer to Section 32 12 16 regarding hand tools and compaction requirements.

.6 Where markings have been removed but the overall road surface is not being repaired, repaved, or rebuilt and traffic will still have access, temporary markings shall be installed until new permanent markings are placed.

3.6 CLEANING

All residuals shall be removed from site and disposed of by the Contractor at an appropriate disposal facility.

1. GENERAL

This Section specifies the requirements for milling or grinding existing asphalt pavement to lines, grades and typical cross sections as indicated on the plans or as established by the Engineer. If full depth asphalt removal is required, refer to Section 02 41 14.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Temporary Construction Signing	Section 01 58 99
.3	Site Cleaning	Section 01 74 11

1.2 MEASURE OF PAYMENT

.1 Milling of existing asphalt pavements shall be measured in square metres of actual surface area milled, for the area milled in each depth category as specified on the unit price table. Depths shall be based on the average of the cut cross sections, as measured by the Engineer at 20 m intervals or as otherwise agreed by the Engineer.

.2 Payment under this item will include operations involved in milling, removing, hauling and stockpiling designated milled pavement and cleaning of the remaining pavement surface.

2. PRODUCTS

2.1 EQUIPMENT

.1 Use cold milling or grinding equipment capable of removing part of the asphalt pavement surface to depths or grades indicated with a vertical tolerance of 10 mm within areas designated.

.2 The machine shall be self-propelled and shall have sufficient power, traction and stability to maintain an accurate depth of cut.

.3 Sweeping and collecting equipment shall be capable of removing all residue from the milling operation.

.4 Apply water as necessary during the milling operation to suppress dust.

.5 All equipment shall be suitably muffled to conform to noise abatement requirements.

3. EXECUTION

3.1 PREPARATION

.1 Inspect the site and verify with the Engineer areas designated for milling. Verify milling depths with the Engineer.

.2 No milling will be permitted in excess of five calendar days prior to asphaltic concrete overlay paving scheduled to be completed unless authorized by the Engineer. All areas must be clearly marked and signed immediately after the milling work is completed.

3.2 PROTECTION

.1 Protect existing pavement, manholes, valves, curbs, gutters, catch-basins, etc. from damages. In the event of damage, immediately replace or make repairs to the approval of the Engineer and at no additional cost to the Owner.

.2 The contractor shall protect existing traffic detector loops and pucks, home runs, and red light camera units (collectively: traffic cable), if possible. Where the contract will impact traffic cables, contact the Utility company for location and replacement at no additional cost to the Owner.

.3 Provide protection for the storm water drainage system per Section 01 57 13.

3.3 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.4 REMOVAL

.1 Mill asphalt pavement to grade and cross section dimensions indicated or as directed by the Engineer.

.2 Exercise care to avoid disturbance to pavement or other work designated to remain.

.3 Asphalt is to be removed to a uniform level including the areas surrounding valves, manholes or other appurtenances.

.4 Remove all residual materials resulting from the milling operation.

.5 No milling is permitted on arterial roads from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. on weekdays unless permission is granted by the Engineer.

.6 All milled surfaces shall be left in a condition that can be reopened to traffic following removal of grindings.

.7 Milling will include removal of asphalt around manholes, catch-basins and valves at locations determined by the Engineer. The Contractor is to spray paint all manholes, valves, and pedestrian crossings using fluorescent orange paint to make them visible to motorists. Paint must be applied prior to the street being opened to traffic and must be maintained until paving operations are completed.

.8 Asphalt concrete that cannot be removed by the milling equipment because of physical or geometrical restraints shall be removed by other suitable methods approved by the Engineer. All costs associated with this additional work shall be considered incidental to the Work and no separate or additional payment will be made.

.9 Any distress of the newly milled surface caused by the milling which may constitute a driving hazard shall be promptly repaired to the satisfaction of the Engineer.

.10 Ramp transverse vertical edges created by milling operations to the satisfaction of the Engineer.

3.5 WASTE MANAGEMENT AND DISPOSAL

Removed pavement material is the property of the Owner and shall be stockpiled or disposed of at a location(s) designated by the Engineer.

3.6 FINISH TOLERANCES

Milled surface shall be within ±10 mm of the specified grade but not uniformly high or low.

3.7 CLEANING

During and after grinding operations have concluded ensure excess material has been removed from surround surfaces and the new milled road surface is cleaned to Section 01 74 11.

3.8 TEMPORARY PAVEMENT MARKING

If the roadway is open to the public prior to overlay paving the Contractor shall install temporary markings and ensure the temporary markings are in-place (and maintained) until the overlay has been placed.

1. GENERAL

This Section specifies requirements for repairing cracks in existing asphalt pavements.

1.1 RELATED WORK

.1 Site Cleaning — Section 01 74 11

1.2 MEASUREMENT FOR PAYMENT

.1 Pavement crack routing and sealing shall be measured in lineal metres.

.2 Each street routed and sealed will be measured and paid based on the unit price bid corresponding to the street class and crack density brackets (m / 1000 sq. m.) as outlined in the contract. Crack density will be calculated for each street and is determined by taking the lineal measurement of cracks routed and sealed on each street, dividing by the asphalt surface area for each respective street, and multiplied by 1000 square metres.

.3 Unit price bid shall be full compensation for all work involved in routing and sealing cracks.

Note: The asphalt surface area is determined by the Town's GIS program and disputes regarding the surface area after the work is completed will not be entertained.

2. PRODUCTS

2.1 MATERIALS

.1 Hot-poured rubberized asphalt sealant to meet ASTM D6690 Type 4 – Modified or equivalent.

.2 Compatible with asphalt.

.3 Pouring temperature at 170˚C.

.4 Maximum heating temperature of 200˚C.

.5 Shall maintain a bond (200%) at -29˚C for 3 cycles.

.6 The Town currently uses MACSEAL 6690-4 MOD product. Prior to use of an equivalent product, the Engineer shall contact Operational Services for their review and acceptance.

2.2 EQUIPMENT

.1 Router and Cutter Bits

.a Router shall be flexible and portable as required to follow random cracking.

.b Router shall have cutter bits that will cut the minimum size specified in this Section.

.2 Compressed Air Equipment

.a Compressor shall have a capacity of 2 cu. m. / min or greater at 550 kPa and shall be oil and water free.

.b Air shall be delivered through a blow-pipe with a maximum diameter of 16 mm to ensure an airstream capable of effectively cleaning out the routed cracks.

.3 Hot Air Lance

.a To be approved by Engineer.

.4 Boiler

.a Portable oil jacketed type double boiler with a mechanically operated agitator and separate thermometric controls and gauges for sealant and heat transfer oil shall be used when applying rubberized asphalt. A tar kettle may be used for catalytic asphalt.

.5 Pouring Pots

.a Pouring pots shall have an oblong body, no-splash top, drip-tight fingertip control valve and minimum sized pouring tip to prevent overspray.

3. EXECUTION

3.1 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.2 WEATHER

Place sealant when air temperature is above 10° C and daily low temperature does not fall below 5° C and no rain is forecast.

3.3 PREPARATION

.1 A review of surfaces to be crack sealed shall be undertaken with the Engineer to establish physical limits of cracks to be sealed.

.2 Existing sealed cracks designated to be re-sealed shall be routed.

.3 Where existing sealant has been removed, pulled out, or wore off, remove the remaining sealant from the crack by router.

.4 All cracks with an opening between 3 mm to 25 mm shall be routed to a minimum width of 19 mm and a depth of 19 mm. Router cut shall be perpendicular to the pavement surface.

.5 Cracks in an alligator or map pattern shall not be routed.

.6 Do not route along the gutter lines or asphalt seams.

.7 Routed cracks must be dry, free from frost, laitance, residual dust and debris. Cracks shall be cleaned immediately prior to sealing using compressed air equipment and other mechanical means as required. Cracks shall be completely cleaned to expose freshly routed surfaces.

.8 Prevent router tailings and sealant from entering the storm drainage system.

3.4 PLACING OF SEALANT

.1 Sealant shall be melted in accordance with Manufacturer's instructions. Diluted, overheated or burned materials shall be removed from work site and disposed of appropriately. Sealant should be heated to the lowest temperature recommended by the supplier. The contractor is not to reheat sealant for the purpose of crack sealing after the crack sealant has solidified.

.2 Melted sealant shall be placed into routed cracks in accordance with manufacturer's instructions. Sealant shall be placed using a pouring pot or approved pressure wand.

.3 Sealant shall be placed with a 25 mm over band on both edges and a 50 mm over band on the terminating ends of the crack.

.4 Sealant height above or below road surface shall not exceed 3 mm, once cooled.

.5 Squeegee is not to be pushed along pavement surface between routed cracks.

.6 Crack sealant is to be sprayed with an environmentally friendly, dustless blotting agent immediately after being placed, to stop traffic from tracking or pulling out sealant.

3.5 PROTECTION

Sealant spilled (dragged, dropped, dripped etc.) on pavement or concrete surface shall be removed and area sprinkled lightly with an environmentally friendly, dustless blotting agent.

3.6 REJECTED WORK

.1 Sealed cracks shall be rejected if there is evidence of poor workmanship or obvious defects, including:

.a Routed crack not at specified depth or width,

.b Excessive debris or moisture in the routed crack or crack to be filled,

.c Sealant is not within ±1 mm of required height above / below surface,

.d Over-banding not provided or not properly terminated along all edges within ±5 mm.

.2 The Contractor will repair rejected sealed cracks by removing the sealant and resealing the cracks, to the Engineer's satisfaction, at no cost to the Town.

3.7 CLEANUP

Refer to Section 01 74 11.

3.8 WARRANTY

.1 Completed and accepted Crack Sealing (Rout & Seal) shall be guaranteed for a two year period following the date of the Construction Completion Certificate.

.2 The warranty period for Crack Sealing shall commence on issuance of the Construction Completion Certificate.

.3 During the two year warranty period, ninety-five (95%) percent[1] of all sealant must remain within the crack and be fully bonded to the asphalt surface on all sides of the crack. Sealant not fully adhered on all sides of the routed crack will be considered to

have failed. Should the quantity of failed sealant exceed one (1) percent[1] over the length of sealant placed on any given road segment, the Contractor must clean and re-seal the failed cracks at no cost to the Town.

[1]*Percentages are in reference to the length in meters of sealant placed for the entire project.*

1. GENERAL

This Section specifies requirements for supplying, producing, placing and compacting granular sub-base to lines, grades and typical cross sections indicated on plans or as directed by the Engineer.

1.1 DEFINITIONS

.1 Subbase

Design depth of granular material constructed immediately on the prepared subgrade and prior to construction of base material.

1.2 RELATED WORK

.1	Aggregate Materials	Section 31 05 16
.2	Roadway Subgrade Reshaping	Section 31 22 16
.3	Roadway Excavation and Embankment	Section 31 24 13
.4	Geotextile Soil Stabilization	Section 31 32 21
.5	Granular Base Course	Section 32 11 23

1.3 MEASURE OF PAYMENT

.1 Subbase to be measured in square metres of compacted material, for the depth specified, incorporated into the work in accordance with design.

.2 Unit price bid shall be full compensation for all work involved in supplying and installing.

2. PRODUCTS

2.1 MATERIALS

.1 Granular subbase aggregate shall be to Section 31 05 16, Table A: Designations.

.2 Material to be used as specified by the Engineer or as shown on the drawings.

.3 Liquid limit: ASTM D423, maximum 25.

.4 Plasticity index: ASTM D424, maximum 6.

3. EXECUTION

3.1 INSPECTION OF SUBGRADE

.1 Do not place material until finished subgrade is inspected by the Engineer.

.2 If required, subgrade preparation shall be to Section 31 22 16.

3.2 PLACING

.1 Do not place frozen material.

.2 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow or ice.

.3 Where specified by Engineer, place geotextile in accordance with Section 31 32 21.

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

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

.6 Place material in uniform layers not exceeding 150 mm when compacted or to such other depth as approved by the Engineer.

.7 Shape each layer to a smooth contour and compact before succeeding layer is placed.

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

3.3 COMPACTING

.1 Compact to a uniform density of not less than 100% Standard Proctor Maximum Dry Density in accordance to ASTM D698 unless otherwise approved by the Engineer.

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

.3 Apply water as necessary during compaction to obtain specified density. If sub-base is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

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

.5 Verify uniformity of density by proof-rolling to ensure the subbase layer is stable.

3.4 PROOF ROLLING

The contractor shall proof roll embankment material and submit documentation of the proof rolling along with other testing submissions, unless directed otherwise by the Engineer. Refer to Section 31 24 13 for Proof Rolling requirements.

3.5 FINISH TOLERANCES

.1 Finish compacted surface to within ±10 mm of established grade but not uniformly high or low.

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

3.6 MAINTENANCE

Maintain finished sub-base in condition conforming to this Section until succeeding base is constructed or accepted by Engineer.

1. GENERAL

This Section specifies requirements for scarifying and reshaping of existing granular roads and lanes with addition of new granular base material where required, to lines, grades, and typical cross section as indicated or as established by the Engineer.

1.1 RELATED WORK

.1	Aggregate Materials	Section 31 05 16
.2	Roadway Excavation and Embankment	Section 31 24 13
.3	Granular Base Course	Section 32 11 23

1.2 MEASURE OF PAYMENT

.1 Removal of clay and other deleterious surface material shall be measured in cubic metres of material wasted based on truck box measure. Truck box volume to be calculated by the Engineer to the nearest 0.1 cu.m. based on the struck measure of the truck box.

.2 Reconditioning of gravel lane to include scarifying, reshaping, and compaction of existing roadbed, and shall be measured in square metres.

.3 New granular base material shall be measured in tonnes of material incorporated in work and based on weigh tickets as submitted to Engineer with each load installed.

2. PRODUCTS

2.1 MATERIALS

.1 Granular base aggregate to be 20 mm crushed gravel.

.2 Gradation to be in accordance with Section 31 05 16.

3. EXECUTION

3.1 PROTECTION

.1 Protect existing pavement, concrete and protruding utility infrastructure from damage. In the event of damage, immediately replace or make repairs to the approval of Engineer at no additional cost.

.2 Provide protection for the storm water system per Section 01 57 13.

.3 Provide traffic control and pedestrian protection per Section 01 55 26 and 01 58 99.

3.2 WASTE EXCAVATION

Remove contaminated gravel, clay, and other deleterious material and haul to a designated waste disposal site.

3.3 SCARIFYING AND RESHAPING

.1 Scarify remaining granular base material as directed by Engineer to a maximum depth of 100 mm.

.2 After removal of the contaminated material and where less than 100 mm of granular base material remains, scarification is not to penetrate the subbase material.

.3 Blade and trim scarified material to elevation and cross section dimensions indicated or as directed by Engineer.

.4 Where a deficiency of material exists, add and blend in new granular base material, as directed by Engineer, and as specified in “Materials” clause 2.1 above.

.5 If it is determined that the remaining base material, after the initial contamination removal, is of poor quality, the remaining base material shall be removed exposing the subbase, or in instances where no subbase gravels exist, the subgrade. The subgrade is not to be disturbed unless, at the discretion of the Engineer, the subgrade requires reshaping to re-establish drainage and cross-fall; this work shall be to Section 31 22 16.

.6 Maintain reshaped surface in condition conforming to this section until succeeding material is applied.

3.4 REPAIR OF SOFT AREAS

.1 Correct soft areas by removing defective material to depth and extent directed by the Engineer.

.2 Replace with appropriate subbase and base material, to Section 31 05 16, and compact to specified density.

3.5 LANEWAY APPROACHES

When directed by contract or Engineer, where the laneway ties to a roadway (laneway crossing) and is designated to be an asphalt surface, this work shall be to Section 32 12 16.

3.6 DRIVEWAYS

.1 Unless directed by drawing or the Engineer, where a laneway is being reshaped and driveways and garage pads exist, ensure the drainage is maintained from the private property to the laneway.

.2 Where gravelled driveways exist, blend new granular material into the existing driveway material.

.3 Ensure a smooth transition between the laneway and the driveway, avoiding a rut or a ridge of excess material.

.4 Ensure drainage is maintained along the laneways edge (or original design path) past the driveway.

3.7 COMPACTING

.1 Compact to a density not less than 100% Standard Proctor Maximum Dry Density.

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

.3 Apply water as necessary during compaction to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

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

3.8 TOLERANCE

Reshaped compacted surface shall be within ± 10 mm of elevation as indicated.

3.9 CLEAN-UP

.1 Remove excess material from site.

.2 If this work is related to laneway work, ensure granular material is removed from hard surfaced driveways.

1. GENERAL

This Section specifies requirements for supplying, producing, placing and compacting crushed gravel as a granular base to lines, grades and typical cross sections indicated on plans or as directed by the Engineer.

1.1 RELATED WORK

1. Aggregate Materials — Section 31 05 16
2. Granular Sub-base — Section 32 11 16

1.2 DEFINITIONS

.1 Base

Design depth of granular base constructed immediately on subbase or subgrade and prior to finish surface treatment e.g. asphaltic pavement or concrete.

1.3 MEASURE OF PAYMENT

.1 Granular base to be measured in square metres of compacted material for the depth specified and incorporated into the work in accordance with design.

.2 Unit price bid shall be full compensation for all work involved in supplying granular base and installing.

2. PRODUCTS

2.1 MATERIALS

.1 Granular base aggregate shall be to Section 31 05 16, Table A: Designation 4.

.2 Liquid Limit: ASTM D423 (AASHTO T89), maximum 25.

.3 Plasticity Index: ASTM D424 (AASHTO T90), maximum 6.

.4 Los Angeles Abrasion: ASTM C131 (AASHTO T6), maximum % loss by weight - 45.

.5 Crushed fragments: minimum 60% of fragments within each size range to have at least two freshly fractured faces; minimum 75% of fragments within the 63mm crushed gravel aggregate to have at least two freshly fractured faces.

.6 Reclaimed concrete material meeting all requirements contained within Clause 2.1 of this Section may be considered for use as granular base material upon written approval by the Engineer.

3. EXECUTION

3.1 INSPECTION OF SUBBASE

Do not place granular base until the finished subbase or subgrade surface has been inspected.

3.2 PLACING

.1 Do not place frozen material.

.2 Place material only on a clean unfrozen surface, properly shaped and compacted and free from snow and ice.

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

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

.5 Place material in uniform layers not exceeding 150 mm when compacted or to such other depth as approved by Engineer.

.6 Shape each layer to a smooth contour and compact before succeeding layer is placed.

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

3.3 COMPACTING

.1 Compact to not less than 100% Standard Proctor Maximum Dry Density, at optimum moisture content, unless otherwise approved by the Engineer.

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

.3 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

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

.5 Verify uniformity of density by proof-rolling to ensure the base course is stable.

3.4 PROOF ROLLING

The contractor shall proof roll embankment material and submit documentation of the proof rolling along with other testing submissions, unless directed otherwise by the Engineer. Refer to Section 31 24 13 for Proof Rolling requirements.

3.5 FINISH TOLERANCES

.1 Finished base surface shall be within ± 10 mm of established grade but not uniformly high or low.

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

3.6 MAINTENANCE

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

1. GENERAL

This Section specifies requirements for furnishing and applying an asphalt primer (binder) to a granular surface. This Section is only required if asphalt paving will NOT take place within seven days of base course being prepared or at the discretion of the Engineer.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Granular Base Course	Section 32 11 23
.3	Hot-Mix Asphaltic Concrete Paving	Section 32 12 16

1.2 SAMPLES

If requested, submit to Engineer one 4 litre container of asphaltic primer material proposed for use in work, at least two weeks prior to commencing operations.

1.3 MEASURE OF PAYMENT

.1 Asphalt prime coat to be measured in square metres based on nominal pavement widths shown on drawings. Unit bid tendered shall be full compensation for all work involved in supply and application.

.2 Sand or other absorbent product used for the blotting of excess asphalt due to over-spray or excess application of the primer shall be an incidental to the work.

2. PRODUCTS

2.1 MATERIALS

.1 The Contractor's choice of SEP-1, SEP-2 or SS-1 for application through to August 31 each season.

.2 The Contractor's choice of MC-30, SEP-1, SEP-2, or SS-1 for application after August 31 each season.

.3 Blotting Product:

.a Absorbent Sand, or

.b Environmentally friendly absorbent material or pads.

2.2 EQUIPMENT

.1 Asphalt Distributor

.a Distributor to be designed, equipped, maintained and operated such that asphalt material:

.i Maintains an even temperature.

.ii Is applied uniformly on variable surface widths up to 5.6 m.

.iii Is applied at controlled rates from 0.3 to 2.0 litres per square metre, with uniform pressure and with an allowable variation from any specified rate not to exceed 0.1 litres per square metre.

.iv Capable of a uniform spray without atomization at rate specified and temperature required.

.b The distributor shall be capable of distributing asphalt material in a uniform spray without atomization at rate specified and temperature required.

.c The distributor pump shall operate by a separate power unit independent of the truck power unit.

.d The distributor shall be equipped with an easily read, accurate device which registers the temperature of the liquid in the reservoir.

.e The distributor shall be equipped with accurate volume measuring devices or a calibrated tank.

.f The actual application rate shall be chosen by the contractor in consultation with the Engineer at the beginning of the project

.g The Contractor shall provide the calibration reports for the distributor to the Engineer. The Contractor shall recalibrate the distributor if deemed necessary by the Engineer.

3. EXECUTION

3.1 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.2 PREPARATION

.1 Shape and prepare surface to proper cross section to Section 32 11 23.

.2 Have surface approved by Engineer before applying prime material.

.3 Engineer may authorize a light spraying of water to moisten an excessively dry and dusty surface to aid penetration of asphalt primer.

3.3 WEATHER

.1 Apply primer only when surface is dry or slightly damp and air temperature is 10°C and rising and the wind speed is less than 60 km/h.

.2 Do not apply when rain is forecast unless asphalt pavement can be applied prior to and within the placement conditions referred to in Section 32 12 16.

.3 Do not apply if ground is frozen.

3.4 APPLICATION

.1 Heat asphalt primer material to temperatures required for pumping and spraying, without fogging, according to manufacturer directions.

.2 Apply primer material to granular base at a rate of 0.5 to 1.75 litres per sq. m.

.3 Using a hand brush, apply the contact surfaces of existing manholes, vertical gutter face, catch-basins, valve box, etc. with a uniform coat of liquefied primer material to avoid over-spray onto surface of fixture, structure or concrete.

.4 Where traffic is to be maintained, treat no more than one-half width of roadway surface in one application.

.5 Minimally, keep traffic off treated areas until liquid has cured, set or been absorbed.

.6 Prevent overlap at junction of spreads.

.7 Correct areas not sufficiently covered.

.8 Limit primer application to not exceed 0.5 m past the limits of asphalt paving.

3.5 PROTECTION

.1 Take precautions to prevent curbs, gutters, parked vehicles and adjacent traffic and structures from being over-sprayed with liquefied primer.

.2 Protect catch-basin and catch-basin manholes from receiving the liquid primer.

.3 Remove over-spray immediately, to avoid drying or setting on surface over-sprayed.

3.6 REMOVING EXCESS PRIMER

.1 When Removal is required do to:

.a Prime material failing to penetrate within a reasonable time, or

.b At joints where the application has overlapped creating too thick a coating.

.2 Spread sand blotter or place absorbent pads in amounts required to absorb the excess primer.

.3 Once the excess material has been absorbed, remove and dispose of the material.

.4 Re-apply the primer to the affected area if required.

.5 If sand is used:

.a For larger areas apply blotter sand to primed surfaces using roll type spreader or rotating disc sander capable of applying aggregate at variable widths and at variable rates.

.b For small isolated areas hand cast sand as required.

3.7 CLEANUP

.1 Blotter material shall be treated as contaminated material. Dispose of blotter material at an approved disposal facility. Refer to Section 01 35 43, Waste Management and Disposal clause.

.2 Do not allow contaminated material to enter the drainage system.

.3 Refer to Section 01 74 11 for further clean-up requirements.

1. GENERAL

This Section specifies the requirements for furnishing and applying an asphalt tack or fog coat to existing asphalt concrete pavement or Portland concrete surface.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Asphalt Pavement Removal	Section 02 41 14
.3	Hot-Mix Asphaltic Concrete Paving	Section 32 12 16
.4	Asphaltic Concrete Overlay Paving	Section 32 12 50

1.2 SAMPLES

If requested, submit to the Engineer one 4-litre container of asphaltic tack material proposed for use in the work, at least two weeks prior to commencing operations.

1.3 MEASURE OF PAYMENT

Asphalt tack coat shall be measured in square metres of area coated and based on the measured area of asphaltic concrete placed. The unit bid tendered shall be full compensation for all work involved in supply and application.

2. PRODUCTS

2.1 MATERIALS

.1 Tack Coat

.a SS-1 or SS-1H for application through August 31 each season.

.b The Contractor's choice of MC-30 RC-30, RC-70 or SS-1 for application after August 31 each season.

.2 Fog Coat

.a SS-1 for application through August 31 each season.

.b The Contractor's choice of MC-30 or SS-1 for application after August 31 each season.

2.2 ASPHALT DISTRIBUTION

.1 The distributor shall be designed, equipped, maintained and operated such that asphalt material:

.a Maintains an even temperature.

.b Is applied uniformly on variable surface widths up to 5.6 m.

.c Is applied at controlled rates from 0.3 to 0.5 litres per square metre, with uniform pressure and with an allowable variation from any specified rate not to exceed 0.1 litres per square metre.

.2 The distributor shall be capable of distributing asphalt material in a uniform spray without atomization at rate specified and temperature required.

.3 The distributor pump shall operate by a separate power unit independent of the truck power unit.

.4 The distributor shall be equipped with an easily read, accurate device which registers the temperature of the liquid in the reservoir.

.5 The distributor shall be equipped with accurate volume measuring devices or a calibrated tank.

.6 The actual application rate shall be chosen by the contractor in consultation with the Engineer at the beginning of the project

.7 The Contractor shall provide the calibration reports for the distributor to the Engineer. The Contractor shall recalibrate the distributor if deemed necessary by the Engineer.

3. EXECUTION

3.1 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.2 PREPARATION

.1 Before applying tack coat, the surface shall be swept clean of loose aggregates, if any and shall be free of unsuitable materials that may impair bonding of the tack coat.

.2 Ensure the surface is dry.

.3 Have surface and site conditions approved by the Engineer before applying the tack coat.

3.3 WEATHER

.1 Apply primer only when surface is dry and the surface temperature is above 0˚C for application of cutback asphalts, or 5˚C for emulsions, or as directed by the Engineer.

.2 Air temperature shall be 10°C and rising and the wind speed to be less than 60 km/h.

.3 Do not apply when precipitation is forecast unless asphalt pavement can be applied prior to and within the placement conditions referred to in Section 32 12 16.

.4 Do not apply if ground is frozen.

3.4 APPLICATION

.1 Heat asphalt material to the temperature required for pumping and spraying, without fogging, according to following table:

Type of Asphalt		Temperature (^{O}C)
Emulsified Asphalts	SS-1, SS-1H	24 to 54°C
Cutback Asphalts	RC 30, RC 70	49 to 88°C
	MC 30	per Manufacturer directions

.2 Apply the tack or fog coat material to the existing pavement surface at a rate of 0.3 to 0.5 litres per square metre.

.3 Using a hand brush, apply the contact surfaces of existing manholes, vertical gutter face, catch-basins, etc. with a uniform coat of liquefied tack material to avoid overspray onto surface of fixture, structure or concrete.

.4 Paint vertical faces of cold joints, etc. prior to placing asphalt on adjacent surfaces.

.5 If SS-1 is used for fog coat, the material, as delivered by the supplier, shall be diluted by adding an amount of water to be determined by the Contractor.

.6 Prevent overlap at junction of spreads.

.7 Correct areas not sufficiently covered.

.8 Take precautions to prevent curb faces, gutters, traffic or parked vehicles from being sprayed with liquefied tack material.

.9 Where traffic is to be maintained, treat no more than one-half width of roadway surface in one application.

.10 Minimally, keep traffic off treated areas until liquid has cured, set or been absorbed.

.11 Do not place asphaltic concrete mix until the liquid has cured, set or been absorbed.

3.5 PROTECTION

.1 Take precautions to prevent curbs, gutters, parked vehicles and adjacent traffic and structures from being over-sprayed with liquefied primer.

.2 Protect catch-basin and catch-basin manholes from receiving the liquefied material.

.3 Remove over-spray immediately, to avoid drying or setting on surface over-sprayed.

3.6 REMOVING EXCESS COATING

If required, refer to Section 32 12 14 (Prime Coat) for information.

3.7 CLEANUP

.1 Refer to Section 01 74 11 for further clean-up requirements.

.2 Do not allow excess material to enter the drainage system.

1. GENERAL

This Section specifies the requirements for producing and placing hot-mix asphalt concrete including the supply of aggregates and bituminous binder.

1.1 RELATED WORK

.1	Quality Control	Section 01 45 00
.2	Traffic Control	Section 01 55 26
.3	Temporary Construction Signing	Section 01 58 99
.4	Aggregate Materials	Section 31 05 16
.5	Asphalt Prime Coat	Section 32 12 14
.6	Asphalt Tack Coat	Section 32 12 15
.7	Asphaltic Concrete Overlay Paving	Section 32 12 50
.8	Pavement Marking: General	Section 32 17 23
.9	Painted Traffic Lines and Markings	Section 32 17 24
.10	Thermoplastic Pavement Markings	Section 32 17 26

1.2 DEFINITIONS

.1 Table A

Appended to this Section, lists the general uses for each type of asphaltic concrete mixture based on the asphaltic concrete aggregate gradation sizes specified under Section 31 05 16.

.2 Lot

A Lot is defined as the portion of the Work being considered for acceptance by the Engineer on the basis of compliance with Tables ‘C’, ‘E’, ‘F’, ‘G’, ‘H’ and ‘I’ of this specification and shall further be quantified as the successful plant production and on-the road placement of up to 300 tonnes, per mix type, of asphalt concrete. At the Engineer’s discretion, any portion of the Work may be deemed a Lot.

.3 Job Mix Formula

The job mix formula establishes the proportioning of aggregate, asphalt cement and reclaimed asphalt pavement (RAP) and/or liquid anti-strip agents, where applicable, to be used for the production of hot mix asphalt concrete.

1.3 MEASURE OF PAYMENT

.1 Asphalt concrete paving shall be measured in square metres. The unit price bid shall be full compensation for all work involved in supply and installation.

.2 Payment will be subject to the Unit Price Payment Reductions for density, thickness, asphalt content, APA rutting susceptibility, tensile strength ratio, and gradation as defined in this specification.

.3 All costs associated with segregation repair will be incidental to the work and no additional or separate payments will be provided.

2. PRODUCTS

2.1 ASPHALT CEMENT

.1 **Penetration Grade** shall be penetration grade 150 - 200A to CGSB-16.3 and shall possess the properties as shown in Table ‘B’ appended to this Section.

.2 **Performance Grade** shall be performance graded PG 64-28 meeting or exceeding AASHTO M320, Table 2 specifications. A certification statement, from the supplying agency, is required to be submitted with the mix design stating that the asphalt cement is straight run, non-air blown/oxidized, non-chemically modified asphalt cement and, if the asphalt is modified, it has been modified only with a SB-type copolymer to reach the performance grade, and that it complies with the requirements of this specification.

.3 Provide the approved storage, heating tanks and pumping facilities for asphalt cement.

.4 For mixes specifying the use of penetration grade binders, the Contractor may submit a written request to the Engineer seeking approval to use a Performance Grade (PG) asphalt binder instead of the penetration grade 150 - 200A. The submission shall clearly indicate the type of PG binder to be used and meet the requirements as stated above in clause 2.1.2 related to PG graded asphalt cements.

2.2 ANTI-STRIPPING ADDITIVE

.1 All asphalt produced for The Town of Olds shall have a liquid anti-stripping additive included.

.2 Acceptable products are:
- Redicote C2914
- AD Here 77-00
- Pavegrip
- Zyco Therm
- Zyco Therm EZ
- Morlife 5000

.3 The Contractor shall include the following information with the mix design submission:

.a Full details on the type of liquid anti-strip additive to be supplied, including product name, product manufacturer/supplier,

.b Additive rate,

.c TSR values for the treated and untreated mixes,

.d The proposed method for incorporating the additive into the plant produced mix.

.4 Payment for the liquid anti-strip additive shall be included in the unit price to supply asphalt concrete. This payment will be full compensation for the supply and incorporation of the anti-strip additive into the asphaltic concrete mix; including all labour, equipment, tools and incidentals necessary.

2.3 AGGREGATES

.1 Asphaltic concrete aggregate shall be crushed gravel. The gradation shall be in accordance with Section 31 05 16 (Aggregate Material – Table ‘A’, designation 5) and as specified herein. The maximum permissible gradation variation from the Job Mix Formula shall be in accordance with Table ‘C’ and Table ‘J’ appended to this Section.

.2 Sand equivalent: ASTM D2419 (AASHTO T176), minimum 50%. One test per mix design.

.3 Magnesium Sulphate soundness: ASTM C88 (AASHTO T104) percentage loss by mass, coarse aggregate: 18, fine aggregate 20. One test per aggregate source or as requested by the Engineer.

.4 Los Angeles Abrasion: ASTM C131 (AASHTO T96), maximum percentage loss by mass, coarse aggregate: 40. One test per aggregate source or as requested by the Engineer.

.5 Absorption: ASTM C127 (AASHTO T85), maximum percentage by mass, coarse aggregate: 1.75. One test per mix design.

.6 Loss by washing: ASTM C117 (AASHTO T11), maximum percentage passing 80 micron sieve, coarse aggregate: 1.5. One test per mix design.

.7 Lightweight particles: ASTM C123 (AASHTO T150), maximum percentage by mass less than 1.95, relative density: 1.5. One test per mix design.

.8 Flat and elongated particles: (with length to thickness ratio greater than 5), maximum percentage by mass, coarse aggregate: 15. One test per mix design.

.9 Crushed fragments: minimum percentage by mass with minimum of two freshly fractured faces. Retained on 5 mm sieve, coarse aggregate: 60 unless specified otherwise within Table 'D'.

.10 Regardless of compliance with the specified physical requirements, aggregates may be accepted or rejected on the basis of past field performance.

.11 When a dryer drum mixing plant is used, stockpile the fine aggregate separately from the coarse aggregate.

2.4 MANUFACTURED FINES

.1 Manufactured fines to Section 31 05 16.

.2 Add manufactured fines when necessary to meet the job mix aggregate gradation or as directed to improve the mix properties.

2.5 RECLAIMED ASPHALT PAVEMENT (RAP)

.1 Suitable RAP shall not contain any other additives including, but not limited to, sulphur, crumb rubber, asphalt rubber, asbestos, produced sand, paving fabrics and reinforcement grids.

.2 Unless specified otherwise, the Contractor may elect to use suitable RAP in the ACP mixture to a maximum RAP to virgin ration of 30/70, subject to the requirements of Clause 2.3 of this Section.

.3 Rheological testing of the RAP is required for all ACP mixtures with RAP to virgin aggregate ratio in excess of 10/90.

.4 For ACP mixtures containing RAP and specified to use penetration grade asphalts, the procedures outlined in Alberta Transportation Test TLT-300 “Recycling of Asphalt Concrete Pavement” shall be used to determine the rheology of the RAP and the grade of virgin asphalt to be used.

.5 For ACP mixtures containing RAP and specified to use straight run Performance Graded (PG) asphalt, the RAP rheology and the grade of the virgin asphalt to be used shall be determined according to Appendix ‘A’ of AASHTO M323.

.6 For ACP mixtures specified to use Polymer Modified Performance Graded (PG) asphalt cement:

.a The maximum RAP to virgin ratio shall not exceed 10/90.

.b The RAP rheology and the grade of virgin asphalt to be used shall be determined according to Appendix ‘A’ of AASHTO M323.

.7 Reclaimed asphalt pavement to be used in the production of asphalt concrete pavement shall meet the gradation requirements specified in the table below (from Alberta Transportation, Section 3, specification 3.16, Table 3.16.5.3 – Cold Milling Asphalt Pavement).

RAP GRADATION REQUIREMENTS TABLE

	Sieve Size	Percent Passing (%)
Percent Passing Metric Sieve µm	125 000 µm	100
	80 000 µm	99 - 100
	40 000 µm	95-100

2.6 MIX DESIGN

.1 Preparation and submission of the asphalt mix design for the Engineer's approval is the responsibility of the Contractor. The Contractor shall use professional engineering services and a qualified testing laboratory to assess the aggregate materials proposed for use and to carry out the design of the asphalt mixture. The mix design is to be submitted to the Engineer for approval at least two weeks prior to commencing paving operations.

.2 Submit test results with the mix design and certify in writing that the asphalt cement complies with the specifications. This certification shall include, but not be limited to:

- Name of the Supplier

- Source(s) of the Base Asphalt Cement(s)
- Type and source(s) of admixture(s)
- Proportions of materials
- Laboratory test results of the Asphalt Cement

Certification shall be provided for the binder used in the design of a job mix formula as part of the mix design submittal.

.3 The asphalt mix design shall follow the Marshall method of Mix Design as outlined in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2) and where applicable Alberta Transportation mix design procedures TLT - 301. The Mix Design, at the design Asphalt Content, shall meet the requirements shown in Table 'D', appended to this Section, for the Asphalt Mix Type specified. All samples shall be designed using 75 blows per side of the test specimen with a manual compaction hammer or a mechanical equivalent to 75 blows per side of the test specimen with a manual compaction hammer.

.4 Physical requirements to be measured as follows:

.a Marshall stability and flow index to Alberta Transportation, TLT 301 test method

.b Air voids to ASTM D3203

.c Voids in mineral aggregate to ASTM C127 and ASTM C128 with allowance for volume of asphalt absorbed in aggregate.

.d For mixes specifying high rutting susceptibility resistance, rutting tests will be performed on samples prepared and subjected to the Asphalt Pavement Analyser (APA) procedure (AASHTO T340-10) using an APA device equipped with an automatic rut measurement system. The APA equipment and load cells used for checking wheel loads will be calibrated at least once per year according to the procedures of the test method. Each test shall have 2 cylindrical samples fabricated and tested with an interior temperature of the APA set at 52°C. The downward force shall be set at 45 kg and the hoses shall be pressurized to 689 kPa. Each specimen shall be compacted to the air voids determined by the Marshall Mix design +/- 0.5 percent. The APA rut test results shall be provided to the nearest 0.1mm. The contractor shall include results of APA testing with the mix design. Rutting susceptibility testing shall be carried out in accordance with Clause 3.15 of this Section.

.e Tensile Strength Ratio (TSR)

.i All mixes shall be evaluated for moisture susceptibility in accordance with AASHTO T-283, Resistance of Compacted Bituminous Mixture to Moisture

Induced Damage, using Marshall compacted specimens. All mix design submissions shall include the test results as outlined in T-283, including the visual estimate of the degree of moisture damage. The minimum value for Tensile Strength Ratio (TSR) shall be 80%.

.ii Regardless of the TSR value of the untreated mix all mixes shall be treated with a liquid anti-strip additive at an additive rate of 0.3% by weight of binder and re-tested for moisture susceptibility. The treated mix will be considered suitable for mix production if the TSR value is 80% or higher. If the TSR value for the treated mix is less than 80%, the mix will be considered unsuitable and shall not be used for mix production.

.5 Submit the following with the mix design:

.a Temperature of asphalt pavement during mixing in plant.

.b Temperature of asphalt mat immediately prior to breakdown rolling.

.6 Do not change the mix design without prior written approval of the Engineer.

.7 A new mix design and mix designation documents and a new Job Mix Formula shall be completed when:

.a A material source is eliminated.

.b A new material source is added.

.c It is not possible to comply with maximum permitted fine aggregates blending ratio.

.d Changes to the material proportions have not resulted in the correction of the problems with the mix.

.8 A previously approved mix design of the required mix type may be accepted by the Town if the same materials for which the design was approved are used provided the job-mix formula requirements are met.

.9 Mix design submissions using Reclaimed Asphalt Pavement (RAP) shall include the RAP source name(s) and locations, all RAP asphalt content and gradation test results, the percentage by weight of RAP to be used in the mixture, and, when required, all RAP rheological test results, the design rheology and all blending charts used.

.10 For Designation 5 aggregates used for wearing surface (top lift), the Contractor shall produce aggregates such that material retained on the 5,000 micron sieve shall not

contain more than 3% detrimental matter based on the total mass of the combined aggregate in the final product. The detrimental matter will be tested in accordance with Alberta Transportation TLT-107 test method.

2.7 VARIATION FROM APPROVED JOB MIX FORMULA

1. Once the Job Mix Formula has been established and approved, no alteration will be permitted unless reviewed and approved by the Engineer.

2. Marshall Air Voids shall not vary from the air voids in the approved mix design by more than 0.5%. If the Job Mix Formula adjustments do not achieve the air void requirements a new mix design will be required.

3. If the sum of any approved alterations to the Job Mix Formula result in values exceeding any one of the following limits from the Design Mix Formula, a new mix design is required.

   - ± 5 % passing the 5,000 µm sieve
   - ± 1.0 % passing the 80 µm sieve
   - ± 0.3 % asphalt content
   - ± 5 % in target proportions of RAP

4. Any alteration to the Job Mix Formula shall not result in properties which do not meet the requirements of this Specification.

5. Any change to the target proportions for RAP shall meet the requirements for rheological testing of blended asphalt and maximum RAP to virgin aggregate ratio.

6. Subject to approval by the Engineer, the aggregate proportioning (including RAP), target gradation, asphalt content and air void content from the Mix Design will become the Job Mix Formula for the supply of hot mix asphalt concrete.

3. EXECUTION

3.1 PLANT AND MIXING REQUIREMENTS

.1 Mixing plants shall be operated in accordance with the Manufacturer's recommendations, Contract Documents and shall be calibrated prior to commencing production of the specified mix. The Contractor shall provide the Engineer with a

certificate of calibration which certifies that the plant has been calibrated to produce a uniform mixture in accordance with the Job Mix Formula.

.2 When asphalt concrete pavement contains reclaimed asphalt pavement, the mixing plant shall be capable of thoroughly separating and heating the RAP particles and blending the RAP with virgin aggregate and any required asphalt cement, to create a homogeneous mix at the plant discharge. The plant shall also contain specialized mixing equipment that will prevent the RAP from coming into direct contact with the flame, thus minimizing "blue smoke" and oxidation of the asphalt in the RAP.

.3 When the liquid anti-strip additive is added to the asphalt cement at the mixing plant, a separate pumping and metering system calibrated and electronically interlocked with the operating controls of the mixing plant shall be used. The Contractor shall have the necessary procedures in-place to safely sample the treated asphalt.

.4 Aggregates shall be loaded into the cold feed bins in a manner that prevents the mixing of separate sizes of aggregates.

.5 Provide a copy of the plant scale certificates to the Engineer before the start of work.

.6 The Contractor shall conduct inspections at least once per week during production to check plant calibrations, plant operation, production settings, temperatures and material handling.

.7 Plant production shall not proceed unless all plant scales have been certified by Weights and Measures, Canada Consumer and Corporate Affairs prior to start of construction season and as often as deemed necessary by the Engineer. Notify the Engineer at least 24 hours before plant calibrations are made or altered.

.8 Moisture in Mix: Maximum permissible moisture, at point of plant discharge, is 0.3% by mass of mix.

3.2 EQUIPMENT

.1 Pavers

Mechanical self-powered pavers capable of using automatic screed controls (where required), and capable of spreading mix within specified tolerances, true to line, grade and crown indicated.

.2 Rollers

A sufficient number of self-propelled rollers of type and weight to obtain the specified density of compacted mix shall be provided.

.3 Haul trucks

To be of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

.a Boxes with tight metal bottoms.

.b Covers of sufficient size and weight to completely cover and protect the asphalt mix when the truck is fully loaded.

.c During transport, the mix shall be completely covered to protect it from precipitation and excessive heat loss by securely fastened waterproofed tarpaulins, unless otherwise approved by the Engineer.

.4 Hand tools

.a Lutes or rakes are to be used during spreading and finishing operations.

.b Tamping irons having a mass of not less than 12 kg and a bearing area not exceeding 310 square centimetres for compacting material along curbs and other areas inaccessible to the roller. Mechanical compaction equipment, when approved by the Engineer, may be used instead of tamping irons.

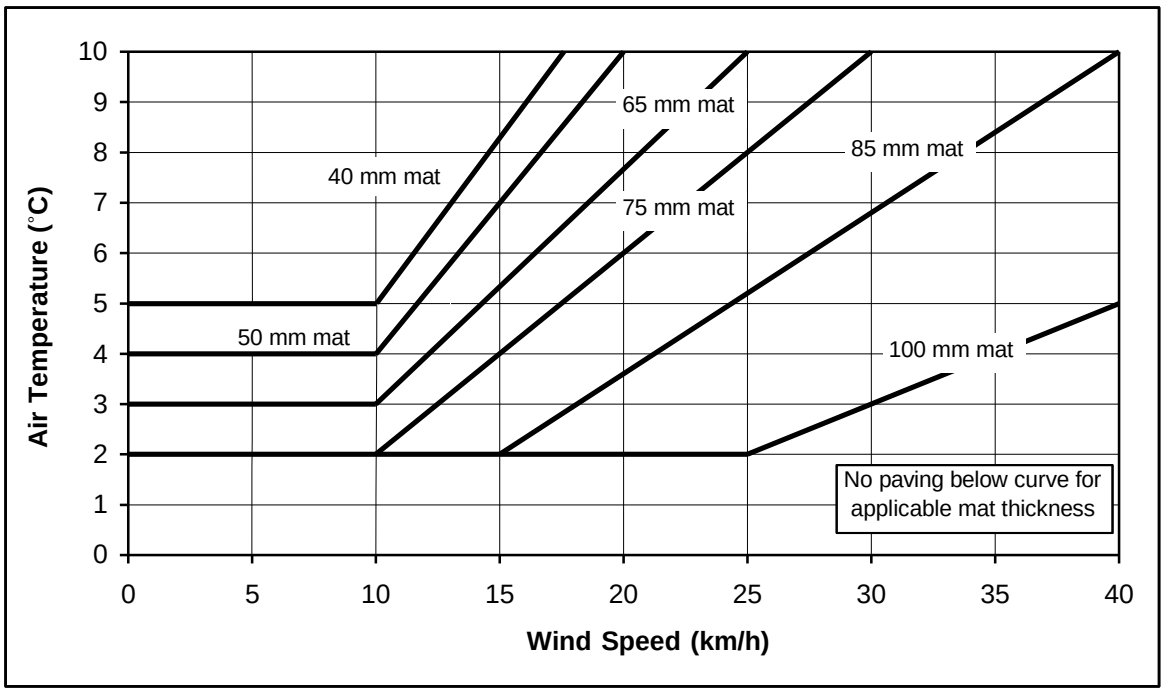
.c The finished surface of any pavement course shall have a uniform texture and be free of visible signs of poor workmanship and bumps and/or dips as measured with a 3 m straight edge to the satisfaction of the Engineer.

3.3 WEATHER

.1 No paving is permitted when rain or snow is imminent, or when the surface or base to be paved is wet, icy, snow-covered, or frozen, unless waived by the Engineer.

.2 No paving is permitted when the air temperature and wind speed conditions are below the applicable mat curve in the following Chart, unless waived by the Engineer.

.3 No paving is permitted unless the temperature of the surface on which the asphalt will be placed is above 2 degrees C.



Note: City of Edmonton chart; modified.

3.4 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.5 ENVIRONMENTAL PROTECTION

.1 The Contractor shall be responsible to protect adjacent curb, gutter and landscape from damage.

.2 Prevent asphaltic materials from entering storm drainage system.

3.6 PREPARATION

.1 The Contractor shall give written notice to the Engineer, 48 hours in advance of any paving operations to publicly advertise traffic disruptions and lane closure notices and to make arrangements for testing, material sampling and pre-site inspection.

.2 Ensure the surface to be paved is to grade and cross-section as specified or as directed by the Engineer. If correction is required and depending upon the contracted work the following Sections shall be referred to:

.a For granular road beds, Sections: 32 11 16, 32 11 17, 32 11 23

.b For overlays, levelling courses, and patch work, Section: 32 12 50

.3 Ensure the appropriate prime coat or tack coat has been applied where directed and in accordance with Section 32 12 14 or 32 12 15 prior to paving. Allow prime or tack to fully cure prior to placing ACP.

.4 Brush apply a coat of tack oil to the vertical contact face of all curbs, swales and other concrete features against which asphalt pavement will be placed.

3.7 TRANSPORTATION OF MIX

.1 Transport the mix to the job site in vehicles cleaned of foreign material.

.2 Use non-stick box liners to transport the mix or lubricate inside surfaces of truck boxes with a light coating of soap detergent solution, or an approved release agent, as required. Elevate the truck bed and thoroughly drain excess solution. Petroleum based derivatives are not permitted.

.3 Schedule delivery of the material for placing in daylight, unless the Engineer approves artificial light.

.4 Deliver loads continuously in covered vehicles. The protective covers shall be properly secured to the sides and back of the truck box so that no funnelling of air movement develops under the cover during hauling.

.5 Deliver the material to the paver at a uniform rate and in an amount within the capacity of the paving and compacting equipment. Discharge hot-mix asphalt into the paver hopper without spilling and without the truck box bearing down on the hopper.

.6 Deliver, place and compact mixes at the temperatures noted in the mix design or as per the asphalt binder manufacturer specifications. If the temperature of asphalt delivered to the paver falls below the temperature specified for initiating compaction, the asphalt concrete being delivered shall be rejected.

3.8 PLACING

.1 Place asphalt concrete to thickness, grades and lines indicated on drawings or as directed by the Engineer.

.2 Place asphalt concrete in compacted lifts of 75 mm maximum depth. The minimum initial lift of asphalt shall be 50 mm and the minimum depth of successive lifts,

including levelling course required to correct grades prior to placing to lift, shall be 40 mm,

.3 Spread and strike off the mixture with a self-propelled mechanical finisher as follows:

.a Construct longitudinal joints and edges parallel to line markings. Establish line markings for paver to follow parallel to the centre line of the proposed pavement. Position and operate the paver to follow the established line closely.

.b When using pavers in echelon, have the first paver follow the marks or lines and have the second paver follow the edge of the material placed by the first paver. Work the pavers as close together as possible and in no case permit them to be more than 30 m apart.

.c Do not pick up any hot-mix asphalt material that has been placed through a paver and put back into the paver hopper.

.d Excess hot-mix asphalt is to be wasted. Do not throw surplus material on freshly screeded surfaces.

.4 When hand spreading is used in small areas not accessible to the paver, and where permitted by the Engineer:

.a Wood or steel forms approved and rigidly supported to assure the correct grade and cross section, may be used. Use measuring blocks and intermediate strips to aid in obtaining the required cross section.

.b Distribute material uniformly. Do not broadcast material.

.c During the spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.

.d Following placing and before rolling, check the surface with templates and straightedges and correct any irregularities.

.e Provide heating equipment to keep hand tools free from asphalt. The temperature of the tools shall not be higher than the temperature of the mix being placed.

3.9 SURFACE IRREGULARITIES AND DEFECTS

.1 Correct irregularities which develop before completion of rolling by loosening the surface mix and removing or adding material as required.

.2 Correct irregularities in the surface of the pavement course directly behind the paver.

.3 Repair areas showing checking or hairline cracking by method approved by the Engineer.

.4 If segregation occurs, immediately suspend spreading operations until the cause is determined and corrected.

.5 Correct irregularities in alignment, left by the paver, by trimming directly behind the machine.

.6 Remove excess material forming high spots by shovel or lute.

.7 Fill and smooth indented areas with fresh asphalt material. Do not broadcast material over such areas to avoid segregation.

.8 If irregularities or defects remain after final compaction, promptly remove the surface course and lay new material to form a true and even surface, compacted to the specified density.

3.10 COMPACTING

.1 Roll asphalt continuously to meet the specified density.

.2 Provide at least two rollers, one of which must be a pneumatic-tired type and as many additional rollers as necessary to achieve the specified pavement density.

.3 Start the rolling operations as soon as the placed mixture can bear the weight of the roller without undue displacement of material or cracking of the surface.

.4 Operate the roller slowly on the first pass to avoid displacement of the material. For subsequent rolling do not exceed 5 km/h for steel-wheeled rollers and 8 km/h for pneumatic-tired rollers.

.5 Overlap successive trips of the roller by at least one-half the width of the roller and vary trip lengths.

.6 Keep the tires and steel drums of rollers slightly moistened with water to prevent pick-up of material but do not over-water.

.7 After the longitudinal joints and edges have been compacted, start rolling longitudinally at low side and progress to the high side.

.8 Where rolling causes the displacement of the material, loosen the affected areas at once with lutes or shovels and restore the surface of the affected area to original grade of the loose material before re-rolling.

.9 Do not permit heavy equipment or rollers to stand on the finished surface before it has thoroughly cooled.

.10 When paving in echelon, leave an unrolled 50 to 75 mm strip along the edge which the second paver is following. Roll this strip after the second paver has passed (see longitudinal joints).

.11 Ensure full compaction of the asphalt concrete before the temperature of the mat cools to a temperature where hairline cracking and checking of the mat occurs. Ensure full compaction of the asphalt concrete before the temperature of the mat falls below 77° Celsius.

3.11 JOINTS

.1 General

.a Trim the vertical face of joints to provide a true surface and cross section against which new pavement may be laid. Remove loose particles.

.b Apply a thin layer of tack coat to the joint face or preheat the joint face with an approved heater, prior to placement of fresh mixture against the joint face.

.c Overlap the previously laid strip with a spreader by 25 mm or less.

.d Remove excess material from the surface of previously laid strip. Do not dispose of excess material on the surface of the freshly laid strip.

.2 Transverse Joints

.a Transverse joints between existing and new asphaltic concrete pavement shall be of a vertical butt type, well bonded, sealed and finished to provide a continuous, smooth profile across the joint. Joint construction shall be as follows:

.i The existing pavement shall be cold milled to expose a vertical surface, of a depth equal to the final lift, against which new pavement may be placed.

.ii In plan, the Contractor shall stagger joints by at least 2 m in adjacent mats.

.b Transverse joints for final lift on arterial and collector roads shall be skewed a minimum of 15 degrees to perpendicular to the direction of travel.

.c When the existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a smooth taper at the joint area to a slope of at least 20 horizontal to 1 vertical. The taper may be placed on tar paper and shall be removed when paving is resumed. The transverse joint shall be straight and have a vertical face when the taper is removed.

.3 Longitudinal Joints

.a Before rolling, carefully remove and discard coarse aggregate in the material overlapping the joint with a lute or rake. Do not rake or discard aggregate material onto freshly screed surfaces.

.b Roll longitudinal joints directly behind the paving operation.

.c On the initial pass, operate the roller on the previously placed lane such that not more than 150 mm of the roller rides on the edge of the newly laid lane, then operate the roller to pinch and press fines gradually across the joint. Continue rolling until a thoroughly compacted neat joint is obtained.

.d Offset longitudinal joints in succeeding lifts by at least 150 mm.

.e On the final lift, offset longitudinal joints by at least 150 mm from intended lane markings.

.f Construct feather joints so that the thinner portion of the joint contains fine graded material obtained by changed mix design or by raking out the coarse aggregate in the mix. Place and compact the joint so that the joint is smooth and without visible breaks in grade.

3.12 FINISH TOLERANCES

.1 The finished asphalt surface shall be within 5 mm of the design elevation but not uniformly high or low.

.2 The finished asphalt surface shall not have irregularities exceeding 5 mm when checked with a 3.0 m straight edge placed in any direction.

3.13 CONTRACTOR QUALITY CONTROL PLAN

.1 Before beginning hot-mix production, the Contractor shall submit a quality control plan to the Engineer including the following recommended tests and frequency for each mix type produced.

.2 Hot Mix Testing during production:

- 3 Marshall Specimens per test
- Asphalt content
- Air Voids
- Stability and Flow
- Film thickness
- Moisture in mix
- Gradation in mix
- Plant discharge temperature
- Asphalt storage temperature

.3 Testing Frequency: 2 tests per day (minimum) during full production.

.4 Before beginning hot-mix production, the Contractor shall submit to the Engineer, certification as per the requirements of Clause 2.6.2, for the asphalt cement binder used during the life of an approved job mix formula. Binder substitution in an authorized job mix formula shall not be allowed, without prior approval by the Engineer. Freight and way-bills for asphalt binder shipments received shall be made available to the Engineer, upon request.

.5 Contractor's quality control plan during asphalt placement shall include compaction monitoring (Nuclear Density) at a frequency of approximately 1 test per 1000 m^2 of asphalt surface.

.6 The contractor shall make the test results available weekly to the Town for review.

3.14 FIELD QUALITY TESTING

.1 The Owner may retain the services of a materials testing firm to carry out field quality tests as follows:

.a Aggregate Gradation

.i One aggregate gradation test for each 300 tonnes of production or at least one per day (ASTM C136).

.b Mix Quality

.i Minimally one test of three briquettes for each 1000 tonnes of production and at least one test per day for each of the following:

- Marshall Stability — TLT 301, AASHTO T 245
- Specific Gravity — ASTM D 2726

- Air Voids and VMA — ASTM D 3203
- Flow Index — TLT 301, AASHTO T 245
- Asphaltic Content Extraction — ASTM D 2172
- Sieve Analysis — ASTM C 117, C 136

.ii The Engineer will determine the TSR of hot-mix field samples at a minimum frequency of one test for every 5000 tonnes of hot-mix produced, in accordance with AASHTO T283.

.iii Where specified, for all top lift paving applications using the 5b(3) mix type, the Engineer will determine the rutting susceptibility of laboratory hot-mix specimens at a minimum frequency of one test for every 5,000 tonnes of hot-mix produced by subjecting the hot-mix specimens to the APA procedure.

.c Field Density, Asphalt Thickness, Asphalt Content and Gradation

After asphaltic concrete has been laid and compacted, one pavement core from approximately each 1000 square meter of pavement will be obtained at locations determined by the Engineer.

.i **Asphalt thickness** will be measured from the cross sectional depth of the core.

.ii **Density** of the core will be measured and compared with the Marshall density taken from field samples of the asphalt mix placed in the area of the core.

.iii **Asphalt content and gradation** will be determined from either loose mix or cores and compared to the recommended asphalt content and gradation determined in the asphalt mix design.

.2 If test results fail to satisfy thickness, density, asphalt content or gradation requirements as specified, the Contractor shall immediately modify his construction procedures to produce a uniformly compacted surface which will satisfy these requirements. Tests which do not meet these specifications shall be subject to a payment reduction as defined under Clauses 3.16, 3.17, 3.18, and 3.19 or rejected, as directed by the Engineer.

.3 If initial loose mix or core tests are found to be deficient, two additional samples, extracted by coring, within each deficient area may be taken by an independent qualified testing firm at the Contractor's expense, in locations approved by the Engineer. In this case, additional core test results will be averaged with the first

result to represent the area in question. If test results indicate non-compliance with the tolerances specified in this Section, the pavement may be subject to payment reduction or rejected by the Engineer.

.4 If the contractor elects to do supplemental testing of failed areas to confirm test results, the contractor shall provide a plan showing the location of failed tests and the proposed locations for re-coring to the Engineer. No re-coring shall be done unless the Engineer has approved the locations for additional cores.

.5 The intent of re-coring is to confirm the failed test result. Therefore, the locations selected for re-coring shall be representative of the area in which the failed test was located. Confirmation re-coring shall be carried out within 10 metres of the failed test in the same mat.

.6 The cost of additional testing made necessary by the Contractor's desire to re-evaluate the test results will be charged to the Contractor.

.7 The cost of removal and replacement of asphalt pavement due to failure to meet specifications will be at the Contractor's expense.

.8 The Contractor shall perform all tests necessary to control the quality of the materials and assurance of the work to Section 01 45 00.

3.15 RUTTING SUSCEPTIBILITY SPECIMEN TESTING

.1 Where specified, the Engineer will determine rutting susceptibility from laboratory hot-mix specimens (as outline in Clause 3.14). The APA device will meet the requirements of AASHTO TP63-03 and shall be equipped with an automatic rut measurement system. The APA device will be calibrated at least once per year according to the procedures in the test method. In addition, the load cell used for checking wheel loads will be calibrated at least once per year. Each test shall have 2 cylindrical samples fabricated and tested with the interior temperature of the APA set at 52˚C. The downward force shall be set at 45 Kg and the hoses shall be pressurized to 689 kPa. Each specimen shall be compacted to the air voids determined by the Marshall Mix Design ± 0.5 percent. The APA rut test results shall be provided to the nearest 0.1 mm.

.2 Where specified, the Engineer will determine rutting susceptibility of hot-mix field core specimens. A set of two cores will be taken at each of the locations of the hot-mix samples discussed in the previous point at a minimum spacing of 2.5 m. Each set of two cores will be representative of the pavement area represented by the sampling in the previous point.

.3 Rutting tests will be performed on core samples subjected to the APA procedure (AASHTO T340-10) as described in the previous section. The average rut depth for

each core specimen tested shall not exceed the specified APA requirements for the mix type. If the APA rut depth in an initial core sample set exceeds this specification, that initial core results will be discarded and 6 new cores will be taken and tested for the area, at the Contractor's expense. The new cores shall be taken from the same mat within 10 m of the first cores at a minimum spacing of 2.5 m. The average APA rut depth of the 6 new cores will be taken as the Rutting Susceptibility Measurement in that represented area.

.4 Tests which do not meet the specified rutting susceptibility requirements shall be subject to a payment reduction as defined under Clause 3.21 or rejected, as directed by the Engineer. The cost of removal and replacement of asphalt pavement due to failure of meeting the rutting specification will be at the Contractor's expense.

3.16 ASPHALT CONCRETE THICKNESS TOLERANCES

.1 If the average core thickness is deficient, that area of asphalt pavement will be assessed a pay factor according to Table 'E', appended to this section, to be applied to the price of the quantity of the asphalt hot-mix in that mat area.

.2 Asphalt pavement with excess thickness may be accepted with no extra payment, at the discretion of the Engineer.

.3 Thickness pay factors in Table 'E' will not apply to asphalt tendered on a per tonne basis.

3.17 ASPHALT DENSITY TOLERANCES

.1 Each mat of hot-mix asphalt placed shall be compacted to the minimum density (percentage of Marshall Density) specified for the type of pavement as per Table 'F' appended to this Section.

If the asphalt density is found to be deficient according to core tests described under Clause 3.14 of this Section, payment for the asphaltic concrete surface course within the area represented by the deficient core(s) will be reduced. Payment reduction will be equal to the Unit Rate tendered for asphaltic concrete multiplied by the Payment Reduction Factor (derived from Table 'G' under the appropriate density column as specified in Table 'F' appended to this Section).

In multi-lift pavements where the core sample tested contains multiple lifts of ACP, and when the interface between lifts cannot be distinguished, the core sample shall be measured (from the top surface down) and cut at locations matching the nominal depth of mat thicknesses according to the specifications and drawings and the cut samples shall be tested separately.

.2 No adjustment to the unit price will be made for areas with a density higher than that specified.

3.18 ASPHALT CONTENT

.1 If the asphalt content is found to be deficient according to the loose mix or core tests described under Clause 3.14 of this Section, payment for the asphaltic concrete placed within the area represented by the loose mix sample(s) or core(s) will be reduced. Payment reduction will be equal to the Unit Rate tendered for the asphalt concrete multiplied by the Payment Reduction Factor (derived from Table 'H' appended to this Section).

.2 In multi-lift pavements where the core sample tested contains multiple lifts of ACP, and when the interface between lifts cannot be distinguished, the core sample shall be measured (from the top surface down) and cut at locations matching the nominal depth of mat thicknesses according to the specifications and drawings and the cut samples shall be tested separately.

3.19 GRADATION TOLERANCES

.1 If the aggregate gradation is found to be deficient when comparing the loose mix or core tests aggregate gradation described under Clause 3.14 of this Section and Table 'A.3' in Section 31 05 16, payment for gradation within the area represented by loose mix sample(s) or core(s) will be reduced as described under Table 'I' appended to this Section.

.2 If the initial test described under Clause 3.14 fails to satisfy the requirements of Section 31 05 16, Table A.3 or Table 'I' appended to this Section, two additional samples will be taken and will be tested for gradation as described under Section 3.14. The additional gradation test results will be averaged with the initial failed test result to obtain the Lot Mean Average for the purpose of Clause 3.19. The Contractor shall be responsible for the expenses associated with the additional testing.

.3 Price adjustments for aggregate gradation variation will be based on the variation of the Lot Mean Gradation from the Job Mix Formula tolerance, for each sieve size, as shown in Table 'C', the allowable deviation from the designation 5 aggregate specification shown in Table 'J' and the corresponding Adjustment Points as shown in Table 'I' appended to this Section.

.a The Lot Mean Gradation will be determined using the sieve analysis of loose mix and/or core samples as per the requirements of Clause 3.14 of this Section.

.i When the Lot Mean Gradation is outside the Job Mix Formula tolerance as per Table 'I' appended to this Section, the penalty assessment will be $0.04

per tonne for each Lot Mean Adjustment Point, up to the limits shown in Table 'A.3' of Section 31 05 16.

.ii When the Lot Mean Gradation is outside the limits of Table 'A.3' of Section 31 05 16, the penalty assessment will be $0.40 per tonne for each Lot Mean Adjustment Point, determined using Table 'I', outside those limits, regardless of the Job Mix Formula tolerance.

.iii The Lot shall be rejected if the maximum deviations shown in Table 'J', appended to this Section, are exceeded.

.1 Lot Mean Adjustment

Lot Mean Adjustment points will be calculated for each Lot based on Criteria 1 or 2 below:

.a Criteria 1

If payment for the asphalt concrete incorporated into the work is based on tonnage and the Lot Mean is within the gradation limits of Section 31 05 16 - TABLE 'A.3', a Payment Reduction per tonne shall be applied on that Lot based on the following formula:

PAg = (A x -$0.04)

Where:
PAg = Payment Reduction for Gradation per tonne,
A= Lot Mean Adjustment Points assessed for each sieve within the gradation limits specified in Section 31 05 16 – TABLE 'A.3' but beyond the Job Mix Formula tolerance requirements in Table I.

If payment for the asphalt concrete incorporated into the work is based on square metres and the Lot Mean is within the gradation limits of Section 31 05 16 - TABLE 'A.3', a payment for the entire area being considered by the Engineer shall be reduced based on the following formula:

$PAgSq = (A \times -\$0.04) \times (AREA \times H \times D) \times 10^{-06}$

Where:

- PAgSq = Payment reduction for gradation for the area being considered,
- A = Lot Mean Adjustment Points assessed for each sieve within the gradation limits specified in Section 31 05 16 – TABLE 'A.3' but beyond the Job Mix Formula tolerance requirements in Table 'I'.

- AREA = In-place Area in square metres equivalent to the lot tonnage being considered by the Engineer as per Clauses 3.14 of this Section.

- H = Compacted asphalt concrete thickness in “mm” obtained as per Clause 3.14.

- D = Field density in kg/m^3 obtained as per Clause 3.14.

.b Criteria 2

Payment for the asphalt concrete incorporated into the work shall be subjected to the following reduction if the Lot Mean falls outside the gradation limits of Section 31 05 16 - TABLE ‘A.3’ by tolerances not exceeding those shown in Table ‘J’ of this Section based on the following formula:

PAgSq = (A x -$0.40) (for payment based on tonnes)

PAgSq = (A x -$0.40) x (AREA x H x D) x 10^{-06} (for payment based on square metres)

Where:

- A = Lot Mean Adjustment Points assessed for each sieve as per the requirements of this Section, Clause 3.14.

- AREA = In-place Area in square metres equivalent to the lot tonnage being considered by the Engineer as per Clause 3.14 of this Section.

- H = Compacted asphalt concrete thickness in “mm’ obtained as per Clause 3.14.

- D = Field density in kg/m^3 obtained as per Clause 3.14.

3.20 TENSILE STRENGTH RATIO (TSR) TOLERANCE

.1 Deficient TSR

.a If the TSR test result, from field samples taken, and determined by the Engineer, under Clause 3.14, are below 80.0 percent (for laboratory prepared samples of field mix), the following actions will be taken by the Engineer:

.i First occurrence: the Contractor will receive a warning letter from the Engineer indicating the deficient TSR value.

.ii Second consecutive occurrence: In the event of a second consecutive TSR value below 80.0 percent, the Contractor shall suspend their production until the asphalt plant can produce HMAC having TSR test results acceptable to the Engineer. During this period of time the Contractor and the Engineer will meet to determine the impact of the non-compliance, and specify the necessary remedial action to be taken by the Contractor. Remedial action shall be either acceptance, acceptance at a pay adjustment as detailed in the following Table, or removal and replacement at no cost to the Town. If suspended, the paving program shall only continue upon approval by the Engineer.

TSR PAY FACTORS

Percentage of TSR	Pay Factor (%)
80.0 or higher	100.0
78.0 to 79.9	99.0
76.0 to 77.9	97.0
74.0 to 75.9	95.0
72.0 to 73.9	92.0
70.0 to 71.9	89.0
68.0 to 69.9	85.0
66.0 to 67.9	81.0
64.0 to 65.9	76.0
62.0 to 63.9	71.0
60.0 to 61.9	65.0
Less than 59.9	Remove and Replace

3.21 APA TOLERANCE (RUTTING)

.1 Maximum APA rutting (TOP LIFT ONLY)

.a Where a maximum APA rutting specification is provided and if the average core APA rutting is above the specified limit, the area represented by the average core result will be assessed a pay factor reduction applied to the price of the quantity of representative pavement area placed.

.b If the core APA rutting is above the maximum specification, the pavement may be rejected by the Engineer. Pavement thus rejected shall be removed and replaced at the Contractor's expense.

.c The Pay factors are provided in the following table:

APA RUTTING PAY FACTORS

Asphalt Mix Type 5b(3)	
Rutting Measurement (mm)	**Pay Factor (%)**
7.5	100.0
7.7	95.0
7.9	90.0
8.1	85.0
8.3	80.0
8.5	75.0
8.7	70.0
8.9	65.0
9.1	60.0
9.3	55.0
Over 9.3 mm	Grind and replace

3.22 SEGREGATION

.1 Definition

A segregated area is defined as an area of pavement where an absence of fine aggregates in the asphalt matrix causes the surface texture of the finished asphalt to appear visually coarser than the surrounding pavement. The finished surface of all lifts of ACP shall have a smooth, uniform texture, free of segregated areas. Segregation shall be evaluated by the Engineer to determine repair requirements.

For the purpose of classifying pavement segregation, only areas greater than 0.1 sq. m and centre-of-paver streaks greater than 1.0 m in length will be considered. Moderate or severe segregated areas which do not meet these size parameters will be considered obvious defects.

.2 Severity of Segregation

Pavement segregation shall be classified as follows:

.a Slight - The matrix of asphalt cement and fine aggregate is in place between the coarse aggregate particles, however there is more stone in comparison to the surrounding acceptable mix.

.b Moderate - Significantly more stone than the surrounding mix and exhibits a lack of surrounding matrix.

.c Severe - Appears as an area of very stony mix, stone against stone, with very little or no matrix.

.d Centre-of-Paver Streak - Appears as a continuous or semi-continuous longitudinal "streak" typically located in the middle of the paver "mat".

Note: Obvious defects and segregation reference photos and further classification descriptions can be found in Alberta Transportation's Paving Guidelines and Segregation Rating Manual. The manual shall only be utilized to assist with classifying the severity of segregation.

.3 Construction Inspection

.a The Contractor shall perform a daily inspection of the paving operations on all lifts of asphalt to identify any instances of pavement segregation. If segregation is evident, the Contractor shall take immediate corrective action to his operations to prevent any further occurrence of segregation.

.b During placement of the asphalt the Engineer will inspect all lifts of asphalt to identify any instances of pavement segregation. If segregation is evident, the Engineer will immediately notify the Contractor so that corrective action can be taken to prevent further occurrence of segregation.

.c Each mat should be inspected by both the Contractor and Engineer as soon as possible after the mat is placed. During the inspection(s) the Engineer will identify and record any areas of slight, moderate and severe segregation and any areas of center-of-paver streak. Areas requiring repair will be marked by the Engineer and a written assessment indicating location and severity of the segregated areas shall be provided to the Contractor as soon as practical following each inspection. All areas of segregation shall be repaired to the satisfaction of the Engineer prior to the issuance of a Construction Completion Certificate.

.4 Warranty Inspection

Prior to Final Acceptance of work, the Engineer will identify and record any areas of obvious defects, slight, moderate and severe segregation and any areas of centre-of-paver streak. The Engineer will provide the Contractor with a written assessment indicating location and severity of the segregated areas as soon as practical following this inspection.

.5 Repair Method

.1 Pavement segregation identified in the inspections performed during construction shall be repaired by the Contractor at his expense and in accordance with the following table:

REPAIR TABLE

Severity	Top Lift	Lower or Bottom Lift	Centre of Paver Streak Top Lift	Centre of Paver Lower or Bottom Lift
Slight	Repair	No Repair	No Repair	No Repair
Moderate	Repair	Repair (use Slight method)	Repair	No Repair
Severe	Repair	Repair *(not required in instances where the Contractor and the Engineer determine that the paver screed is "dragging" due to distortion of the existing surface)*	Repair	No Repair

.2 Repairs shall be completed during construction or shortly after construction, except when prevented by inclement weather or seasonal shutdown. In these

cases, the Contractor shall complete the repairs prior to June 15 of the following year.

.3 Segregated areas shall be repaired by the following methods:

.a Slight

The Contractor will use a sand-slurry seal coat or other (prior approved) proprietary coating to seal areas of slight segregation. The seal coat shall extend beyond the segregated area a minimum of 200 mm in all directions. Apply the seal coat in two lifts allowing the first lift to settle into any voids and become “tack dry” prior to placing the second coat. All voids shall be filled flush to the finished asphalt surface. Apply a blind coat of fine sand to the surface of the finished seal coat to prevent vehicle tracking or lifting of the seal coat from the surface until fully set.

.b Moderate and Severe Segregation on the Top Lift

Except when directed otherwise by The Engineer, the Contractor will have the option of milling and replacing the impacted segregation area or utilizing infrared heat technology to repair areas noted with segregation. Where moderate or severe segregation occurs at frequent intervals, as identified by the Engineer, the Engineer may require milling and removal of the entire mat.

.i Repairing segregated areas using milling and replacement shall be the full depth of the asphalt lift for the full mat width in which the segregation is located and extend one meter longitudinally in both directions for the area of segregation. The placement of the new ACP shall be per Section 32 01 16, excluding the payment clauses.

.ii For segregation repairs using infrared heat technology the repair area shall extend a minimum of 200 mm beyond the segregated area in all directions. For centre-of-paver streak, the repair area shall extend a minimum of 100 mm laterally and 500 mm longitudinally beyond either end f the streak. All repairs shall be regular in shape and finished using good workmanship practices to provide an appearance suitable to the Engineer. Traffic shall be kept off all repairs for a sufficient period of time for the asphalt to cool to ensure that damage does not occur. All asphalt placed for repairs shall be properly compacted in accordance with the Town specifications.

.c Severe Segregation of the Lower Lift(s)

The Contractor shall mechanically remove and replacing the impacted segregation. Mechanical removal may be done either by saw-cutting and

excavating or milling. Mechanically removed areas shall be prepare for patching by removing any deleterious material and tacking the vertical edge against which asphalt will be placed prior to placing a Town of Olds approved asphalt mix or approved proprietary patching material to bring the patched area flush with the surface of the lower lift.

.d Any other methods of repair proposed by the Contractor will be subject to the approval of the Engineer. The use of direct flames on the asphalt surface for the purpose of completing segregation and obvious defect repairs will not be acceptable.

.4 In the event repairs cover existing roadway pavement lines or markings, the Contractor shall reinstate the lines and markings at his expense and to the satisfaction of the Engineer.

3.23 APPLICATION OF REDUCED UNIT PRICE

The application of a reduced unit price pursuant to Clauses 3.16, 3.17, 3.18, 3.19, 3.20, and 3.21 does not relieve the Contractor of his Contract Maintenance requirements.

3.24 PAVEMENT MARKINGS

.1 The Contractor shall install temporary pavement markings, in accordance with Section 32 17 23, within two hours following placement of the first or final lift of pavement.

.2 Permanent pavement markings shall be installed within one week following the placement of the final lift of pavement as per Section 32 17 26.

.a The Contractor shall provide 24 hours' notice to the Engineer if the installation of permanent pavement markings will not occur within the one week time frame.

.b The Contractor shall maintain the temporary pavement markings to the Engineer's satisfaction until the permanent pavement markings have been installed.

.c Delays in installation of permanent markings shall not exceed 28 working days.

3.25 WARRANTY INSPECTION

Prior to Final Acceptance of work, the Engineer will identify and record any areas of obvious defects (cracking, shoving, rutting, ravelling, surface irregularities, prior repair failures, etc.).The Engineer will provide the Contractor with a written assessment indicating location and severity of the deficient areas as soon as practical following this

inspection. All deficiencies shall be repaired to the satisfaction of the Engineer prior to the issuance of a Final Acceptance Certificate.

4. APPENDIX

TABLE 'A'

ASPHALT MIX TYPES (Refer to Section 31 05 16 - Table 'A.3' for gradation specifications)	
MIX TYPE	**USE**
5a (10mm)	Thin Levelling Course Skin Patching
5b(1) (12.5mm)	Thin Levelling Course Skin Patching Bottom and Top Lift for Local Roads Lane and Parking Lot Paving Trench Repairs
5b(2) (12.5mm)	Overlay (crown) Paving for Local Roadways Bottom Lift for Collector and Arterial Roadways
5b(3) (12.5mm)	Overlay (crown) Paving for Collector and Arterial Roadways Top Lift for Collector and Arterial Roadways
5c (16mm)	Bottom Lift for Collector Roadways and Arterial Roadways (heavy truck traffic)
5d (20mm)	Bottom Lift New Construction with > 140 mm (80 mm min.)
Specific areas of use for each class of asphaltic concrete pavement will be defined on drawings and/or the unit price table.	

TABLE 'B'

PROPERTIES OF 150-200A ASPHALT CEMENT FOR ROADS (Refer to Alberta Transportation, Standard Specifications for Highway Construction, Specification 5.7 - Supply of Asphalt)		
Test Characteristics	**ASTM Test Method**	**Test Result**
1. Absolute Viscosity at 60° C (Pascals per second)	D 2171	Penetration (150) 78 - 155 (200) 50 - 92
2. Kinematic Viscosity at 135° C (mm^2 per second)	D 2170	Penetration (150) 255 - 360 (200) 205 - 285
3. Penetration at 25° C, 100 gm, 5 second, (dmm)	D5	150 - 200
4. Ductility of residue at 25° C (minimum cm)	D 113	100
5. Solubility in Trichloroethylene (minimum %)	D 2042	99.5
6. Flash Point - Cleveland Open Cup (°C)	D 92	205
7. Test on residue from thin film oven test (D 1754) ratio of absolute viscosity to original absolute viscosity	D 2171	4.0

TABLE 'C'

AGGREGATE VARIATION LIMITS FROM JOB MIX FORMULA	
SIEVE DESIGNATION (µm)	**MAXIMUM PERMISSIBLE VARIATION *PERCENT BY WEIGHT PASSING**
20000, 16000, 12500, 10,000, 5000 1250 630, 315 160 80	± 5 ± 3 ± 2 ± 1.5 ± 1.5
* Where Lot Average Gradation fails to meet the requirements of gradation tolerance per Section 32 12 16, Clause 3.19 shall be rejected.	

TABLE 'D'

MIX TYPES AND CHARACTERISTICS						
Aggregate Designation *See Section 31 05 16 Table 'A.3'*	**5a**	**5b(1)**	**5b(2)**	**5b(3)**	**5c**	**5d**
Aggregate Size	10	12.5	12.5	12.5	16	20
% Manufactured Fines, -5000 (Minimum) (See Note 1)	60	60	70	70	75	60
% Fractures, +5000 (2 Faces) (Minimum)	60	70	90	90	90	70
Asphalt Cement Grade	150 - 200A	150 - 200A	150 - 200A	PG 64-28	150 - 200A	150 - 200A
Minimum Marshall Stability, N	5300	8500	11500	14000	12000	10000
Number of Blows	75	75	75	75	75	75
% Air Voids	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5
VMA % (Minimum) by 3% Air Voids	14	13	13	13	13	12.5
VMA % (Minimum) by 4% Air Voids	15	14	14	14	14	13.5
VMA % (Minimum) by 5% Air Voids	16	15	15	15	15	14.5
Minimum Theoretical Asphalt Film Thickness, (Microns) (See Note 3)	7.0	7.0	7.0	7.0	7.0	7.0
Voids filled with Asphalt, %	65 to 78	65 to 75	65 to 75	65 to 75	65 to 75	65 to 78
Flow, mm	2 to 4	2 to 3.5	2 to 3.5	2 to 3.5	2 to 3.5	2 to 4.0
Minimum Retained Stability, %	70	70	70	70	75	70
APA (mm, 52^{o}C, 8000 cycles)	n/a	n/a	n/a	7.5	n/a	n/a

TABLE D (con't)
MIX TYPES AND CHARACTERISTICS

Note 1:	The percentage of Manufactured Fines in the -5000 portion of the Combined Aggregate.
Note 2:	The minimum theoretical film thickness value shall be established in accordance with Alberta Transportation TLT-311 test procedure.

General Requirements for Mix Design:

1. It is recommended that the Design Asphalt Content be determined at 4% air voids, which is the midpoint of the design air voids. The test properties at this asphalt content are then checked to ensure compliance with the respective criteria.

2. A minimum of four specimens shall be prepared for each asphalt content test.

3. Theoretical maximum specific gravity shall be determined in duplicate for a least three asphalt contents.

4. Retained stability after 24 hours soaking at 60°C to be run at the recommended Design Asphalt Content.

TABLE 'E'

PAYMENT REDUCTION FOR PAVEMENT THICKNESS	
Thickness Deficiency (% of design lift thickness)	**Payment Reduction Factor(%)**
10.0	0.0
11.0	3.0
12.0	6.3
13.0	10.0
14.0	14.5
15.0	19.5
16.0	25.0
17.0	32.0
18.0	40.0
19.0	50.0
Over 19.0	Remove and replace

Note: Refer to Section 32 12 50 (Asphaltic Concrete Overlay Paving) for unit price reductions specific to overlay (crown paving) work.

TABLE 'F'

SPECIFIED ASPHALT CONCRETE PAVEMENT DENSITY		
Type of Pavement	**Minimum Density**	**Payment Reduction Factor**
Levelling Course	96%	N/A
Crown Paving Locals	97%	B
Crown Paving Arterials and Collectors	98%	A
Bottom lift for local, collector and arterial roadways	97%	B
Top lift for collector and arterial roadways	98%	A
Top lift for local, Paved lanes, parking lots and trails	97%	B
Trench Repairs	97%	B

TABLE 'G'

PAYMENT REDUCTION FOR DENSITY			
A		**B**	
Specific Density = 98%		**Specific Density = 97%**	
Field Density (%)	**Payment Reduction Factor (%)**	**Field Density (%)**	**Payment Reduction Factor (%)**
98.0	0	97.0	0
97.9	0.1	96.9	0.1
97.8	0.2	96.8	0.3
97.7	0.4	96.7	0.6
97.6	0.6	96.6	0.9
97.5	0.9	96.5	1.3
97.4	1.3	96.4	1.8
97.3	1.7	96.3	2.3
97.2	2.2	96.2	2.9
97.1	2.8	96.1	3.7
97.0	3.5	96.0	4.5
96.9	4.2	95.9	5.4
96.8	5.0	95.8	6.4
96.7	5.8	95.7	7.5
96.6	6.7	95.6	8.7
96.5	7.7	95.5	10.1
96.4	8.9	95.4	11.6
96.3	10.2	95.3	13.3
96.2	11.5	95.2	15.2
96.1	12.1	95.1	17.3
96.0	14.5	95.0	19.7
95.9	16.2	94.9	22.4
95.8	18.0	94.8	25.7
95.7	20.0	94.7	30.0
95.6	22.3	94.6	34.0
95.5	25.0	94.5	40.0

<= 95.5	Remove and replace	≤ 94.5	Remove and Replace

TABLE 'H'

PAYMENT REDUCTION FOR ASPHALT CONTENT DEVIATION	
Deviation of the Actual Asphalt Content from the Approved Design Asphalt Content (%)	Unit Price Reduction for Asphalt Content
± 0 to 0.30	0.0%
± 0.31 to 0.35	4.0%
± 0.36 to 0.40	8.0%
± 0.41 to 0.45	16.0%
± 0.46 to 0.50	22.0%
± 0.51 or more	See Notes

Notes:

1. For top lift asphaltic concrete overlay paving, where the actual asphalt content is deficient by more than 0.5% from the approved design asphalt content, the Contractor shall remove and replace the previously laid mix.

2. For top lift asphaltic concrete overlay paving where the actual asphalt content is in excess of the approved design asphalt content by more than 0.5%, the contractor shall remove and replace the previously laid mix at the discretion of the Engineer. If the Engineer determines that removal and replacement is not required, no payment will be made.

3. For bottom lift(s) deviations of more than 0.50%, no payment will be made and the Engineer will determine whether removal and replacement is necessary.

TABLE 'I'

PAYMENT REDUCTION FOR GRADATION		
ADJUSTMENT POINTS FOR DEVIATION IN GRADATION FROM ALLOWABLE TOLERANCES		
Sieve Size µm	**Allowable Tolerances for the Lot Mean from the Job Mix Formula (3)**	**Lot Mean Adjustment Points "A" (5)**
(1) (2) 20000, 16000, 12500, 10000, 5000	± 5%	5 points for each 1% Deviation (4)
1250	± 3%	1 points for each 1% Deviation (4)
630	± 2%	2 points for each 1% Deviation (4)
315	± 2%	2 points for each 1% Deviation (4)
160	± 1.5%	0.2 points for each 0.1% Deviation (4)
80 Deviation ≤ 1.0% 80 Deviation > 1.0%	± 1.5%	1 point for each 0.1% Deviation (4) 2.0 points for each additional 0.1% Deviation (4)

(1) Note: Include all sieves up to one size smaller than top size.

(2) Each sieve in this category shall be assessed individually for deviation.

(3) Maximum permissible variation based on percent by weight passing.

(4) Deviation is defined as being in excess of the allowable tolerance.

(5) "A" See calculation for Lot Mean Adjustment

TABLE 'J'

MAXIMUM DEVIATION
OF THE LOT MEAN FROM THE GRADATION LIMITS FOR DESIGNATION 5
AGGREGATE GRADATION SPECIFICATIONS
As specified in Section 31 05 16 - TABLE 'A.3'

Sieve Size µm	Maximum Deviation for the Lot Mean
(1) 20000, 16000, 12500, 10000,	2%
5000, 1250, 630, 315	1%
160, 80	0.5%

(1) Note: Include all sieves up to one size smaller than top size

1. GENERAL

This Section specifies the requirements for preparing the existing road surface for overlay paving and completing overlay paving work.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Temporary Construction Signing	Section 01 58 99
.3	Site Cleaning	Section 01 74 11
.4	Cast-in-Place Concrete	Section 03 30 00
.5	Pavement Marking Removal	Section 32 01 11
.6	Reshaping Asphalt Pavement (Milling)	Section 32 01 16
.7	Asphalt Tack Coat	Section 32 12 15
.8	Hot-Mix Asphalt Concrete Paving	Section 32 12 16
.9	Removal and Replacement of Concrete Work	Section 32 13 14
.10	Pavement Marking: General	Section 32 17 13
.11	Adjustment of Manholes … Water Valves	Section 33 05 15

1.2 MEASURE OF PAYMENT

.1 Asphaltic Concrete Overlay Paving shall be measured in tonnes. All deliveries must be substantiated with "haul tickets" and signed by the Engineer. Haul tickets shall note the name of the project, the date and quantity of material hauled.

.2 Pavement Marking Removal shall be paid to Section 32 01 11.

.3 Asphalt Milling shall be paid to Section 32 01 16.

.4 Routing and Crack Sealing shall be paid to Section 32 01 18.

.5 Tack Coat shall be paid to Section 32 12 15.

.6 Concrete Replacement shall be paid to Section 32 13 14.

.7 New Pavement Markings shall be paid to Section 32 17 23.

.8 Adjustment of utilities shall be paid to Section 33 05 15.

.9 Pavement surface cleaning shall be considered incidental to the work done under this Section.

2. PRODUCTS

2.1 MATERIALS

For specifications of the material required for the project, as identified in the Unit Price Contract, refer to the specific Section (as noted above).

2.2 EQUIPMENT

Pavers, rollers, trucks, and hand tools to Section 32 12 16.

3. EXECUTION

3.1 WEATHER

Refer to Section 32 12 16.

3.2 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.3 PROTECTION

1. The Contractor shall be the responsibility to protect adjacent curb, gutter and landscape from damage.

2. Avoid asphalt material from entering the storm drainage system.

3.4 CONCRETE WORK

.1 Replace existing concrete at locations shown on drawing or as designated by Engineer.

.2 Concrete work to be constructed to match existing cross section unless shown otherwise on Drawings.

.3 Concrete work shall be to Section 32 13 14.

3.5 MILLING / GRINDING

.1 If concrete work preceded the asphalt work, the Contractor shall ensure the concrete has meet the minimum curing time, on the portion of roadway in question, before any asphalt grinding and / or overlay work may proceed.

.2 Milling / Grinding shall be to Section 32 01 16.

.3 Ensure the surface to be paved is to grade and cross-section as specified or as directed by the Engineer. If correction is required, refer to Section 32 12 16 for asphalt levelling course mix.

.4 Use alternative means or methods to remove any pavement that cannot be removed by milling equipment (i.e. around manholes, and other areas where milling equipment has limited access).

Note: If full depth pavement removal occurs or as directed by the Engineer, refer to Section 02 41 14 for separate requirements.

3.6 ELECTRICAL WORK

Coordinate installation of red light camera loops, traffic signal detector loops and home run wires with the Engineer.

3.7 ADJUSTING UTILITIES

Manholes, catch-basins, valves, etc. shall be adjusted to Section 33 05 15.

3.8 OVERLAY PAVING

.1 The Contractor shall give written notice to the Engineer, 48 hours in advance of any paving operations, to make arrangements for testing, material sampling and pre-site inspection.

.2 Clean existing surface of all dirt, excess grindings, and other objectionable materials.

.3 Supply and place asphaltic tack coat in accordance with Section 32 12 15 including the contact surfaces of existing manholes, gutters, catch-basins, etc.

.4 Supply and place asphaltic concrete as shown on the drawings and / or as directed by the Engineer.

3.9 FINISH TOLERANCES

.1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.

.2 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with a 3 m straight edge placed in any direction.

3.10 FIELD QUALITY TESTING

.1 Field Quality Testing including density, asphalt content, gradation, TSR and rut susceptibility (APA) and the application of a reduced unit price shall be to Section 32 12 16.

.2 Each mat shall be inspected by the Engineer and Contractor for pavement segregation as per Section 32 12 16.

.3 Unless otherwise specified by the Engineer, payment for asphalt thickness shall be made in accordance with item 3.10 of this section.

.4 Quantities, for the purpose of payment reduction, shall be calculated as:
area x measured depth x the average actual unit weight of ACP placed on the roadway.

.5 The Engineer's determination of variance from specified lift thickness shall take into consideration design variations in cross section as noted on the drawings.

.6 The application of a reduced unit price does not relieve the Contractor of his Contract maintenance requirements.

3.11 ASPHALT THICKNESS PAYMENT ADJUSTMENT

.1 For areas of Asphaltic Concrete Overlay Paving, unit prices will be adjusted as per Table "A" appended to this Section.

.2 Coring of the finished overlay will be done by an independent testing firm to determine the thickness of asphalt. The core test result will be deemed to represent the 1,000 m² area from which it was taken depending on the location of other cores taken. Boundaries of the area represented by the core tests results will be determined by the Engineer. The average depth of all cores taken within the area defined by the Engineer will be considered as the lift thickness for the purpose of calculating payment reduction.

.3 Regardless of the average lift thickness in a given area, if any asphalt core is noted to be less than 35mm the asphalt in that area will be removed and replaced. The Contractor shall pay for additional cores to be taken to define the deficient area, and the Engineer will determine the area of asphalt to be removed and replaced. The Contractor shall bear the cost of repair for any asphalt area where removal and replacement is required.

3.12 PAVEMENT MARKINGS

.1 Pavement markings shall be to Section 32 17 23.

.2 If the overlay placement is delayed and the roadway has been ground down and is open to the public, the contractor shall ensure temporary pavement markings are in-place (and maintained) until permanent pavement markings have been installed.

4. APPENDIX

Table A			
O/L Thickness		Variance on Total O/L Thickness	Payment Reduction Factor
Surplus	50mm	<= 15mm	No Payment Reduction
		>15mm	No Payment for Excess
	65mm and 75mm	<= 15mm	No Payment Reduction
		>15mm	No Payment for Excess
	>100mm	<=20mm	No Payment Reduction
		>20mm	No Payment for Excess
Deficient	50mm	<=15mm	No Payment Reduction
		>15mm	Remove and Replace
	65mm and 75mm	<10mm	No Payment Reduction
		10mm to 15mm	50%
		>15mm	Remove and Replace
	>=100mm	<20mm	No payment Reduction
		20mm to 30mm	50%
		>30mm	Remove and Replace

1. GENERAL

This Section specifies requirements for construction of asphalt curbs on an existing asphalt surface.

1.1 RELATED WORK

.1 Asphalt Tack Coat — Section 32 12 15

.2 Hot-Mix Asphalt Concrete Paving — Section 32 12 16

1.2 MEASUREMENT FOR PAYMENT

.1 Asphalt curb shall be considered incidental to the Work unless a pay item is included in the Contract. If the Contract has a pay item, payment will be as follows:

.a Asphalt curb will be measured in linear metres, taken along the face of curb.

.b The unit price bid shall be full compensation for all work involved in supply and installation.

2. MATERIAL

2.1 ASPHALTIC CONCRETE

.1 Mix design as per to Section 32 12 16, Type 5b (1), with the following modifications:

.a Normal Portland cement to be added to mix in amounts not less than 80 kg of cement to 1000 kg of hot-mix.

.b Asphalt binder to be CGSB16-GP-3M, grade 85/100 or 120/150. Binder content to be 6% to 8.5%.

.c Air void content to be 5% to 10%.

2.2 TACK COAT

Tack coat as per Section 32 12 15.

3. EXECUTION

3.1 WEATHER

Refer to Section 32 12 16.

3.2 PREPARATION

.1 If the curb work is independent and not part of a larger contract the following may be required:

.a The Contractor to provide adequate traffic control warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 35 14 and 01 58 99; and / or as directed by the Engineer.

.2 The Contractor shall be the responsibility to protect adjacent concrete work and landscape from damage.

.3 Prevent asphaltic materials from entering storm drainage system.

.4 Clean asphalt surface prior to applying tack coat.

.5 Apply, with hand sprayer, a high film of tack coat to the surface beneath the curb to be installed.

3.3 PLACING OF CURB MIX

.1 To be placed using a slip-form spreader to cross-section shown on Drawings.

.2 Asphalt temperature range 125° C to 150° C during placement.

3.4 HANDPLACING OF CURB MIX

.1 In areas not machine accessible, place curb mix by hand using wood or metal forms to design cross-section.

.2 Remove form when proper shape of material can be maintained.

3.5 JOINTS

.1 Curb construction to be continuous with minimum joints.

.2 Joints to be carefully made.

.3 Paint end of joint with tack coat material before placing fresh curb mix.

1. GENERAL

This Section specifies the requirements for the installation of Portland cement concrete for a roadway.

This Section is under review by The Town of Olds. It is provided for information. This Section is not to be used for projects, within the Town, without prior consent of the Engineering Services Manager.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Temporary Construction Signing	Section 01 58 99
.3	Site Demolition	Section 02 41 16
.4	Basic Concrete Materials and Test Methods	Section 03 05 13
.5	Concrete Form Work	Section 03 10 00
.6	Slip Formed Concrete	Section 03 12 10
.7	Concrete Reinforcement	Section 03 20 00
.8	Aggregate Materials	Section 31 05 16
.9	Roadway Excavation and Embankment	Section 31 24 13
.10	Granular Subbase	Section 32 11 16
.11	Granular Base Course	Section 32 11 23

1.2 QUALITY ASSURANCE

.1 Testing for quality shall be to Section 03 05 13.

.2 Samples for testing will be obtained at the point of pump discharge.

1.3 MEASURE OF PAYMENT

.1 Concrete paving shall be measured in square metres, per depth specified. The unit price bid shall be full compensation for all work involved in supply and installation.

DRAFT

.2 Other concrete work not specifically noted here shall be paid to Section 32 13 15.

.3 Payment will be subject to the Unit Price Payment Reductions per Section 03 05 13.

.4 Concrete items specified as "Remove and Replace" shall be measured and paid to Section 32 13 14.

.5 Measurement for embankment excavation, backfill, compaction and subgrade preparation for concrete work to be in accordance with Section 31 24 13.

2. PRODUCT

2.1 MATERIAL

.1 Concrete

.a See mix design in this Section.

.2 Concrete Aggregate

.a Concrete aggregate to Section 03 05 13 with the following modifications:

.i Aggregates for use in concrete pavement shall not be susceptible to D-cracking. Unless field experience, aggregate history or prior laboratory testing have proven otherwise.

.ii Aggregates for use in concrete pavement shall be tested in accordance with ASTM C666/C666M.

.iii Test shall be in accordance with Procedure A, for a period of 350 cycles.

.3 Protective Covers

.a Sheet material for curing: to ASTM C171, plastic sheets.

.b Protective covers and insulation for cold weather concreting: to CSA A23.1/A23.2.

.4 Curing Compound

.a To ASTM C309, Type 2, class B, white pigmented, resin based, liquid membrane-forming compound.

DRAFT

.5 Joints

.a Preformed Joint Filler: to ASTM D1751.

.b Joint sealant, hot poured. Bond breaker to Engineers approval. Joint Sealant: to ASTM D1190, Sika 2c or approved equivalent.

.c Joint seal, preformed polychloroprene elastomeric: to ASTM D2628.

.d Preformed expansion joint filler: to ASTM D1752.

.e Surface Sealant: to AT B388, Type 1b Penetrating Sealers for Traffic Bearing Surfaces, outdoor exposure where relative moisture content is ≤ 70%. Silane type sealants are not to be used for this application.

.6 Reinforcement

.a Refer to Section 32 20 00.

.b Dowel bars shall be plain round bars of grade 300 or better conforming to CSA G40.21 and be epoxy-coated to requirements of ASTM A775/A775M, also coated with bond breaker material.

.c Steel for tie bars or tie bolts to comply to CSA G30.18 and be epoxy-coated to ASTM A775/A775M.

2.2 MIX DESIGN

Concrete Class	Concrete Uses	Concrete Strength (min.MPa)	Air Content (%)	Maximum Slump (mm)	Cement Type	Maximum Flyash Content (%)	Maximum Water/ Cement Ratio by Mass	Minimum Portland Cement Content (Kg/m^3)
G	Concrete Pavement	32 or 35	5 – 8 4-6	50	GU, HS		0.45	290 to 335

.1 Type HS cement may be substituted for Type GU cement with the exception Type HS cement shall not be placed after September 30.

.2 Compressive strength to be tested in accordance with CSA A23.2-9C.

DRAFT

.3 Use of chemical admixture will be approved by the Engineer only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.

.4 Air content to be tested immediately after discharge in accordance with CSA A23.1/A23.2, (4C).

.5 Engineer to carry out 7 day strength tests, if average strength at 7 days is less than 70% of specified minimum 28 day strength, check mix at once and adjust to ensure required strength is obtained.

2.3 SUBGRADE & SUBBASE PREPARATION

.1 Refer to Section 32 11 16 and 32 11 23 respectively for placement, compaction and tolerances.

.2 Compacted at or above optimum moisture content to 95% Standard Proctor Maximum Dry Density.

.3 For slip-form paving, subbase travelled by tracks in paving machine shall be firm and have a smooth surface.

.4 Repair damage to subbase resulting from hauling or equipment operations.

.5 Prior to placing concrete, subbase shall be thoroughly wetted. Wetting shall be carried out, such that standing water is not present on grade.

.6 Surface condition of base to be approved by Engineer before placing concrete.

2.4 EQUIPMENT

.1 Fixed Form Paver

.a Mechanical self-propelled spreader capable of moving concrete forward and laterally.

.b Vibrator locations and spacing, whether surface or internal, to be installed as per manufacturer's specifications or as directed by the Engineer.

.c Mechanical, self-propelled finisher with two independently operated transverse screeds.

.d Float to be aluminum or magnesium, straight, smooth, sufficiently light to avoid sinking into concrete surface, operated mechanically or manually from edge to edge while advancing longitudinally.

DRAFT

.2 Slip Form Paver

.a Self-propelled slip form paver with crawler type tracks, designed to spread, consolidate, screed and float finish fresh concrete to required cross section, lines and grades. Paver to be approved by Engineer.

.b Pavement line and surface elevation to be automatically controlled from taut string or wire line or by laser equipment.

.c Internal type vibrators: to be installed and arranged as per manufacturer's specifications.

.3 Tools for Isolated Areas

.a Hand operated transverse screeds spanning side forms.

.b Mechanically powered vibrating beam spanning side forms.

.c Hand operated floats and fluting tools used by skilled workers.

.4 Self-propelled Sprayer

.a Able to span fresh concrete, equipped with fine spray nozzles suitable for application of membrane curing compound uniformly over surface and exposed edges, and with wind skirt to permit proper application during windy conditions.

.5 Self-propelled Saw

.a Equipped with rubber-tired wheels, readily adjustable blade depth controls and sawing line guide pointers both front and rear. Provide adequate number of units to complete sawing at rate required and have ample supply of suitable saw blades and at least one standby sawing unit available on job site before concrete placement is started.

.6 Heating Apparatus (Sealer)

.a Double boiler with space between inner and outer shells filled with oil, asphalt or other material for heat transfer.

.b Equip for positive temperature control of sealing compound.

.c Equip with readily calibrated device which accurately registers temperature of sealing compound.

DRAFT

.7 Miscellaneous equipment

.a Edging tool.

.b Water truck equipped with pump, hose line and fine spray nozzle.

2.5 TRANSPORT & MIX DELIVERY

.1 When mix is transported by agitating equipment (e.g. concrete truck) the time from initial mixing to final placement shall not exceed 120 minutes.

.2 Transport mix by non-agitating equipment only if;

.a Time from addition of cement to time of placing not to exceed 45 minutes.

.b Haul units to be of sufficient capacity to transport at least one regular size batch from mixer.

.c Haul routes to be well maintained to prevent undue disturbance of concrete mix during transport.

3. EXECUTION

3.1 EXAMINATION

.1 Verify that conditions of substrate previously installed under other Sections are acceptable for concrete paving installation in accordance with manufacturer's written instructions and to the tolerances as stated in those Sections.

.2 Visually inspect substrate in presence of Engineer.

.3 Inform Engineer of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied.

3.2 WEATHER

.1 For weather restrictions refer to Section 03 05 13 with the following modifications:

.a Concrete placed when the ambient temperature is at or above 27˚C to be cured by continuous water curing from soaker hoses providing complete coverage of the pavement to minimize the temperature rise of the concrete.

DRAFT

.b When concrete has been placed in cold weather and the sire temperature is expected to drop below 5˚C, insulating curing blankets or other suitable material shall be placed on the concrete pavement and weighted to prevent movement. Curing to continue until the cumulative number of days, or fraction thereof, during which the temperature of the concrete is above 10˚C, has totalled a minimum of 7 days. Alternatively, if compressive tests of cylinders cured under field conditions achieve at least 70% of the specified compressive strength, curing may be discontinued.

.c Concrete shall be protected from freezing for a minimum of 4 days after placement or for the time necessary to achieve 75% of the specified 28-day compressive strength.

3.3 PROTECTION

When placing concrete in lanes adjacent to existing concrete, operate placing equipment on rubber wheels or pads to prevent damage to existing surface.

3.4 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 35 14 and 01 58 99; and / or as directed by the Engineer.

3.5 ENVIRONMENTAL PROTECTION

.1 For retro-fit or stand-alone project in particular, the Contractor shall be responsible to protect adjacent curb, gutter and landscape from damage.

.2 Prevent concrete materials from entering storm drainage system through erosion and sediment control (ESC) unless the work is part of a larger project and ESC has been implemented by others.

3.6 FORMWORK

The use of or type of form work will depend upon the project refer to Section 03 11 00 for general requirements with the following modifications:

.1 Fixed Form Paving

.a Provide steel forms of sufficient strength to support and keep alignment under weight of spreading and finishing machines.

.b Use of wood forms for fillet areas to be approved by Engineer.

DRAFT

.c Set forms true to line and grade, join neatly and tightly and stake securely to resist concrete pressure and impact from tampers without springing.

.d Clean and oil forms before each use.

.e Obtain Engineer's approval of forms before placing concrete.

.2 Slip Form Paving

.a Provide sufficient length of slip form trailing behind paver to prevent slumping at slab edge. Ensure rigid lateral support.

.b Set grade and line for control string or laser equipment per drawings or as directed by Engineer.

.c Remove excess mortar that may accumulate on a slip formed vertical edge.

.d If slab edge sags, repair immediately by hand forming; do not use concrete mortar to top off the sag.

.e If edge sagging persists, suspend operations and perform corrective measures.

.3 Hand Form

.a On areas impractical for slip forming, place forms, reinforcement (if required) and concrete to Section 03 11 00 with the following modification:

.4 Place concrete continuously until the scheduled pour is complete. Arrange the rate of concrete delivery to ensure that the discharge interval between successive loads does not exceed 30 minutes. If the discharge interval is exceeded, place a construction joint.

3.7 REINFORCEMENT

.1 Reinforcing steel placement to Section 03 20 00 with the following modifications:

.2 Place sufficient number of joint dowel assemblies in advance of paver to avoid delay in concrete placement.

.3 Use micro-fibre reinforcement throughout mix. (Refer to Section 03 20 00.)

.4 If curb and gutter is part of the work, the curb is to be doweled to the concrete pavement and thickened to match the concrete pavement thickness thus creating a monolithically unit.

DRAFT

3.8 PLACING

.2 Place concrete to lines, grades and depths as indicated by drawing or as directed by Engineer.

.3 Discharge concrete into paver(s) / forms as soon as practical after mixing.

.4 Construct pavement lanes in sequence approved by Engineer.

.5 Use hand placing where machine spreading is not feasible.

.6 Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing. Do not apply external tractive force to paver.

.7 Operate with continuous forward momentum.

.8 Schedule concrete supply to minimize interruptions.

.9 Insert tie bars as indicated.

.10 When completing concrete placement for day, carry placement through to scheduled contraction joint location.

.11 Where concrete placement is stopped for more than 30 minutes due to breakdowns, weather, supply delay, etc. construct a bulkhead and construction joint as directed by Engineer.

.12 Concrete pavement placed in cool weather shall experience a minimum of 30 day air-drying period, following final curing, before first application of de-icing salts.

3.9 CONSOLIDATION

.1 Internal vibrators

.a For slab depths up to 50 mm, mount vibrators parallel to base at mid depth. For slab depths greater than 50 mm, mount vibrators with tips set a minimum 50 mm above base and tops set a minimum 50 mm beneath pavement surface.

.b Operate at manufacturer's recommended number of vibrations and specifications.

.2 Surface vibrators

.a Synchronize units on each individual screed or pan.

DRAFT

.b Operate at a minimum of 3,500 vibrations per minute and minimum amplitude of 0.4 mm.

.c Treat each pavement section to at least 2 passes of vibratory equipment unless otherwise directed by Engineer.

.d Stop vibrators when paver stops.

.e Use hand operated vibrator on odd shaped slabs inaccessible to frame mounted units. Do not operate vibrator in one location longer than 5 seconds.

.f Ensure concrete adjacent to edge forms or previously constructed slabs is thoroughly vibrated.

3.10 FINISHING

.1 After consolidation by vibration, finish with equipment approved by Engineer.

.2 When striking off concrete surface, maintain uniform roll of concrete ahead of first screed for its full length when finishing machine is on first pass.

.3 Make 2 passes with transverse finishing machine.

.4 Where joints are formed rather than sawn, form longitudinal and transverse joints after final pass of finishing machine.

.5 Hand finish areas inaccessible to finishing machines to same quality and surface characteristics as machine finished surfaces.

.6 Finish concrete surface with approved float at proper time. Operate from edge to edge with wiping motion while advancing, with each succeeding pass overlapping previous one.

.7 Check surface with approved 3 m long straightedge. Correct irregularities exceeding 5 mm before concrete takes initial set.

.8 Finish edges of slabs with edging tool to form smooth squared surface. Do not patch with cement paste.

3.11 SURFACE TEXTURING

.1 Commence texturing immediately after float finishing. Texturing may be done by either of the following two methods:

DRAFT

.a Provide surface texture by transverse wire comb leaving grooves in surface of plastic concrete as per American Concrete Pavement Association publications.

.b Provide transverse surface texture by self-propelled machine specifically designed for purpose, automatically controlled from string line reference used by paver, to produce an average surface texture as per American Concrete Pavement Association publication - Constructing Smooth Concrete Pavement.

.2 Texturing to be straight, precise and not damaging to pavement edges.

3.12 CURING

Placed concrete to be cured for a minimum of 7 days by one of following methods, as approved by the Engineer:

.1 Membrane Curing

.a Membrane curing will not be required when the maximum daily air temperature for the 72 hours following placement of the concrete is not expected to be greater than 5º C.

.b Apply in two coats with approved pressurized spray equipment to form complete and unbroken film on surface of concrete. Mechanically agitate compound before and during use.

.c For hand application apply first coat immediately after texturing operations, second coat to be applied immediately after first coat in a perpendicular direction.

.d For machine application, curing compound to be applied in accordance with manufacturers' specifications.

.i Apply second spray within 24 hours of first.

.ii Apply each spray at application rate recommended by manufacturer but not less than 1 litre per 4 sq. m. of surface.

.iii Spray slab edges immediately after removal of forms.

.iv Protect formed or sawed joints from evaporation during curing period.

.v Respray areas where membrane is damaged during curing period.

DRAFT

.2 Burlap or Polyethylene Film

.a As soon as concrete surface has been finished and can bear weight without marking, carefully cover with burlap or cotton mats.

.b Thoroughly wet mats before placing them on concrete.

.c Place mats such they overlap each other by 300 mm or more.

.d Overlap concrete slab by 300 mm or more at each side secured by a continuous bank of sand and gravel.

.e Cover sides and ends of slab with mats as soon as forms are removed.

.f Keep mats saturated during curing period with water spray sufficiently fine to avoid damaging concrete surface, avoiding wet/dry cycles.

.3 Sheet material:

.a Cover slab with waterproof sheet material as soon as concrete has set sufficiently to bear weight without marking, sheet shall be in full contact with concrete surface during curing process.

.b On leading slabs place sheet material at least 1 m wider than slab and after removal of side form fold down edges of sheet and bank with soil, sand or gravel to prevent air circulation.

.c Batten down sheet to prevent free access of air.

.d Keep sheet in place during curing period and promptly repair tears and pinholes.

3.13 JOINTS

.1 General

.a Construct joints plumb, straight and square at a 4.5 m maximum spacing, to the width and depth as detailed on the drawings.

.b Transverse joints to coincide with those in adjacent pavement unless indicated or directed otherwise.

.c Install preformed joint filler at locations and to details indicated.

.d Install isolation joints around structures and features that project through, into or against pavement.

DRAFT

.e Joints shall follow lane lines where applicable.

.2 Sawn joints

.a Ensure joints are sawn straight. Install end stakes to ensure straight joint alignment across paved area. Mark joint alignment with chalk line or other suitable guide to approval of Engineer.

.b Saw joints using approved equipment and methods to produce joint dimensions indicated.

.c Restrict speed of saw cutting to ensure proper joint alignment and to avoid damage to concrete.

.d Supply sufficient workers and equipment including standby equipment, to maintain satisfactory sawing schedule.

.e Schedule sawing operations on 24 hours basis and consistent with concrete placing.

.f Make initial saw cuts in progressive manner and as soon as concrete surface has hardened sufficiently to resist ravelling as cut is made and before shrinkage cracks occurs.

.g If cracking occurs ahead of saw cut, stop sawing immediately. Move ahead several joints and cut one or more joints before returning to saw intermediate joints. Where cracking persists, make 1 m saw cut from one edge and complete sawing from opposite edge. Adjust sawing schedule accordingly.

.h If uncontrolled cracking or other surface damage results from inadequate or improper sawing techniques suspend further concrete operations until situation is corrected and immediately remove and replace damaged slabs.

.i Immediately on completion of sawing, flush joints with water to remove laitance.

.3 Crack-Control Joints

.a Intended to control the location of shrinkage cracks in hardening concrete. Construct joints to the indicated dimensions, spacing, and pattern by any of the following methods:

.b Formed Joint

DRAFT

.i Form the groove by inserting a metal or fibre strip, or polyethylene film into the plastic concrete. Finish the edges to a 6 mm radius. Remove the insert immediately after the initial set of the concrete.

.ii Seal the joint with a specified sealant.

.c Tooled Joint

.i Hand form the groove using a jointing tool with a thin metal blade to impress a plane of weakness into the plastic concrete. Finish the edges to a 6 mm radius. Seal the joint with a specified sealant.

.4 Construction Joint

.a Required between concrete pours or for joining new concrete to existing work.

.b Construct the joint with a keyway, dowels or tie bars as detailed on the drawings or as directed by the Engineer.

.c Finish edges to a 6 mm radius.

.d Vertically trim the existing concrete by sawing at least 50 mm deep and breaking. Leave the joint form in place until the concrete has set, then remove the joint form without damaging the concrete.

.5 Isolation Joint

.a Required where concrete is placed adjacent to an immovable structure or where indicated on the Drawings.

.b Construct the joint by sawing or forming to create a clean break through the full cross-section of the concrete member.

.c Make the joint wide enough to permit a snug fit for the pre-formed joint filler. Alternatively, place the pre-formed joint filler against the structure and pour the concrete against the pre-formed joint filler.

3.14 SEALING

.1 An approved sealing solution shall be sprayed on all new, exposed concrete surfaces in accordance with the manufacturer’s recommendations.

.2 Provide Engineer with copy of sealant manufacturer's instructions for application.

.3 Seal joints before allowing vehicular traffic on the new pavement.

DRAFT

.4 Do not apply joint sealant in rainy weather or when ambient temperature is less than 5º C.

.5 The concrete shall be dry and swept clean prior to the application of the sealant.

.6 Prior to sealing joint, clean joint with compressed air or flush with high pressure water to remove laitance, curing compound and protrusions of hardened concrete. Clean and dry by compressed air and vacuum to remove loose and foreign material.

.7 Insert approved filler and bond breaking material in joint prior to applying sealant, then fill joint from bottom up with sealant to avoid trapping air.

.8 Prepare sealant for application using equipment and methods approved by Engineer.

.9 Apply sealant strictly in accordance with manufacturer's recommendations with special attention to temperature ranges for safe heating and for application of hot poured sealants and cleanliness of concrete to be bonded.

.10 On completion of first application of sealant, return and top up any under-filled areas.

.11 Replace sealant which fails to bond to concrete or fails to cure properly, as directed by Engineer.

3.15 TOLERANCES

.1 Finished concrete surface to be within 5 mm of design grade but not uniformly high or low.

.2 Finished concrete surface not to have irregularities exceeding 5 mm when checked with 3 m straight edge placed in any direction.

.3 Horizontal deviations of slab edge from alignment of pavement not to exceed 10 mm.

3.16 QUALITY ASSURANCE

.1 Quality assurance testing shall be conducted per Section 01 45 00 for the criteria outlined in Section 03 05 13 with the following modification:

.2 Thickness Testing

DRAFT

.a At the Town's request, one or more sets of cores from suspect concrete pavement; each set comprising of 3 cores whose average thickness represents not more than 500 sq. m. of concrete pavement.

3.17 DEFICIENT CONCRETE

.1 Determining deficient concrete, and possible payment penalty, shall be determined per Section 03 05 13 with the following modifications:

.a The average 28 day strength of any three consecutive strength tests is less than the specified minimum 28 day strength. For purposes of the penalty clause in Section 03 05 13, the highest and lowest test value will be used.

.b Concrete is defective when it contains honeycombing, embedded debris, uncontrolled shrinkage cracking, or other surface defects.

.c It has been subjected to temperatures, higher or lower than those outlined in Section 03 05 13 and no protective measures taken.

3.18 REPAIR / REPLACEMENT

.1 Correction of Hardened Surface

.a The following techniques shall be used to correct excessive variations from flatness or grade once the concrete has set:

.i Areas 3 mm to 15 mm higher than the designated grade shall be ground down with an approved machine to within tolerance. The finished surface, after grinding, shall have a texture as close as possible to a burlap finish. The ground surface shall not have a “polished” finish.

.ii Areas exceeding 3 mm below or exceeding 15 mm above the designated grade shall be removed and replaced to the full width between longitudinal joints and not less than 1.5 m in length. If the area extends to within 1.5 m of a transverse joint, replace the pavement to that joint.

.2 Replacement of defective concrete

.a Remove a minimum of 3 m of pavement by sawing through concrete across full lane width.

.b Construct contraction joint at boundary between sawn face of existing concrete and new concrete.

DRAFT

.c Install dowel bars between old and new concrete per Section 32 13 15 as directed by Engineer.

.d Replace with new concrete to this specification.

3.19 CLEANING

.1 Clean work area in accordance with Section 01 74 11.

.2 Leave Work area clean at end of each day.

3.20 COMMISSIONING ROADWAY

.1 Do not open new pavement to vehicular or pedestrian traffic until:

.a cylinder testing has confirmed that the concrete has attained 75% (minimum compressive strength of 26 MPa) of the specified strength.

.b Joints have been sealed and approved by Engineer.

.c As directed by The Town.

.2 Prior to opening the new pavement to traffic, ensure the pavement is clean, free of debris.

.3 Remove temporary signage and barricades if not required as part of a larger project or installed by others.

.4 Remove temporary ESC if not required as part of a larger project or installed by others.

3.21 PENALTIES

.1 Excess Thickness

.a Concrete pavement with excess thickness may be accepted if surface and grade tolerances are met, but no claim for additional payment will be accepted.

.2 Deficient Thickness

.a If the average core thickness is deficient, the area of concrete pavement will be assessed a pay factor accordingly:

DRAFT

Thickness Deficient	Pay Factor (% of Contract Price)
5 mm to 10 mm	90%
10 mm to 15 mm	75%
Over 15 mm	Remove and Replace

DRAFT

1. GENERAL

This Section specifies the requirements for the removal and replacement of small, non-contiguous portions of Portland cement concrete and concrete paving stone work typically considered as regular maintenance. For large, contiguous sections of concrete work where the base structure is rebuilt and mechanical extrusion may be used, refer to Section 32 13 15.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Temporary Construction Signing	Section 01 58 99
.3	Site Demolition	Section 02 41 16
.4	Basic Concrete Materials and Testing Methods	Section 03 05 13
.5	Concrete Formwork	Section 03 11 00
.6	Concrete Reinforcement	Section 03 20 00
.7	Roadway Excavation and Embankment	Section 31 24 13
.8	Granular Sub-Base	Section 32 11 16
.9	Granular Base Course	Section 32 11 23
.10	Concrete Work	Section 32 13 15
.11	Precast Paving Stone	Section 32 14 20
.12	Site Furnishings	Section 32 33 00
.13	Topsoil and Finish Grading	Section 32 91 19
.14	Sodding	Section 32 92 23
.15	Tree and Shrub Preservation	Section 32 93 50
.16	Construction Specification Drawings	Division 50 05 00

1.2 DEFINITIONS

.1 Hand-formed Concrete Work

The conventional method of constructing forms, on-site, by hand to match existing cross-sections.

.2 Extruded Concrete

The construction of concrete work using slip form extrusion machinery.

.3 Sidewalk Flagging

The removal and replacement of the sidewalk section of a monolithic curb, gutter and sidewalk cross section; by saw-cutting along the back of curb surface joint and removing the sidewalk panel.

.4 Curb Flagging

The removal and replacement of the curb and gutter of a monolithic curb, gutter and sidewalk cross-section; by saw-cutting along the back of the curb surface joint and removing the curb and gutter and installing dowel pins into the sidewalk.

1.3 CONCRETE WORK DIMENSIONS

The existing concrete work, in particular 1.5 m monolithic curb, gutter and sidewalk may vary in width from the current cross-section by 150 mm, plus or minus. The Contractor is to construct the new concrete work to the original dimensions or to the cross- sections as specified in Section 00 41 43 (Unit Price Contract), as directed by the Engineer. No additional payment will be made for a variance in width of 150 mm or less.

1.4 MEASURE OF PAYMENT

.1 General

.a Payment will be made based on measurements taken by the Engineer.

.b The quantities, determined as specified in this Section, will be paid at the contract unit prices, which shall be full compensation for furnishing of all materials, labour, tools and incidentals necessary to complete the work in accordance with the specifications, plans and instructions from the Engineer.

.c If street furniture is part of the work, payment for the furniture shall be to Section 32 33 00.

.2 Incidental

The following work will be incidental to the work specified in this Section and no separate payment will be made for the following:

.a Saw-cutting concrete work and asphaltic concrete pavement.

.b Removal and disposal of concrete work, asphaltic concrete pavement and other waste materials including designated street furnishing pads amalgamated with the sidewalk.

.c Subgrade preparation,

.d Supply and placement of 20 mm crushed gravel for hand-formed concrete work as shown on the drawings or as specified.

.e Formwork

.f Repair of roadway adjacent to new concrete work.

.g Granular backfill required behind new concrete work.

.h Placement of plastic sleeves and rebar around standpipes and valve boxes.

.i Supply and placement of dowel pins.

.j Construction of curb ramps shall be considered incidental to the sidewalk construction.

.k Removal and replacement of private precast concrete sidewalk blocks.

.l Removal and replacement of sign and sign posts without a concrete pile or base structure.

.m Tree and shrub preservation. Where Plantings are damaged due to construction activity, the Engineer, based on recommendation from the Urban Forester, may require the Plantings be replaced, at the Contractor's cost.

.3 Concrete

Measurement for concrete work shall be as follows:

.a 1.5 m monolithic curb, gutter and sidewalk shall be measured in lineal metres, as measured along the centre of the sidewalk.

.b Monolithic curb, gutter and sidewalk over 1.5 m in width (± 150 mm) shall be measured in square metres. Width to be measured from lip of gutter to back of walk.

.c Removal of existing 1.2 m (± 100 mm) separate sidewalk and replacement with 1.5 m separate sidewalk to be measured in lineal metres.

.d Removal of existing separate sidewalk and replacement of separate sidewalk of the same width (± 150 mm) to be measured in square metres.

.e Sidewalk flagging, including installation of dowel pins, to be measured in square metres.

.f Curb flagging, including installation of dowel pins, to be measured in lineal metres as measured along the face of curb.

.g Separate sidewalk pinned to existing curb and gutter to form a monolithic unit, including supply and placement of dowel pins, shall be measured in square metres.

.h Curb and gutter to be measured in lineal metres, as measured along the face of curb.

.i Curb on asphalt base, including supply and placement of dowel pins and reinforcing steel to be measured in lineal metres, as measured along the face of curb.

.j Concrete caps for medians and islands to be measured in square metres.

.k Monolithic slab medians and traffic islands to be measured in square metres.

.l Stamped concrete shall be measured in square meters. Unit price shall be full compensation for all work involved in supplying, placing and finishing. Coloured concrete shall be considered incidental to the stamped concrete.

.m Reinforced lane and driveway crossing shall be measured in square metres. Width to be measured from lip of gutter to back of walk.

.n Removal of existing curb, gutter and separate sidewalk and replacement with a reinforced monolithic driveway or lane crossing, shall be measured in square metres. Width to be measured from lip of gutter to back of walk.

.o Reinforced curb and gutter lane and driveway crossings to be measured in lineal metres, along the face of curb.

.p Removal and replacement of private sidewalk to be measured in square metres.

.q Concrete swales shall be measured in lineal metres, along the centre line of the swale, for the width specified.

.r Removal and replacement of site furnishing pad not amalgamated to a sidewalk, to be measured in square metres.

.s Removal and replacement of a stand-alone site furnishing curb to be measured in lineal metres.

.t Extra gravel or approved material will be measured in cubic metres.

.4 Paving Stone

Measurement for concrete paving stone work will be as follows:

.a New concrete paving stone sidewalks shall be measured in square metres, in place. The unit price bid will be full compensation for saw-cutting, removal and disposal of concrete work, subgrade preparation, supply and placement of granular base, supply and placement of edge restraint, supply and placement of sand levelling course, supply and placement of concrete paving stone and other incidentals necessary to complete the Work.

.b Concrete work, including curb and gutter required for new paving stone work, to be measured in square metres.

.c New concrete paving stone lane crossings, driveway crossings and crosswalks will be measured in square metres. The unit price bid will be full compensation for saw-cutting, removal and disposal of concrete work, subgrade preparation, construction of concrete base, supply and placement of levelling sand, supply and placement of concrete paving stone and other incidentals necessary to complete the Work.

.d Repair of existing concrete paving stone work shall be measured in square metres. Unit price bid will be full compensation for removal and stockpiling of existing paving stones, supply and placement of sand levelling course, replacement of paving stones and other incidentals necessary to complete the Work.

.e Repair of existing concrete paving stone lane and driveway crossings will be measured in square metres. The unit price bid will be full compensation for removal and stockpiling of existing paving stone, removal and replacement of concrete work, supply and placement of sand levelling course, replacement of paving stone and other incidentals necessary to complete the work.

.5 Other

.a Over excavation of unsuitable subgrade and replacement with 20 mm crushed gravel shall be measured in cubic metres in place.

.b Adjustment of manholes and catch basins shall be measured as the number of units reset and mortared.

.c Landscape repairs shall be measured in lineal metres of area repaired up to 1 m from edge of concrete work. Unit price bid shall be full compensation for removal and disposal of existing material, supplying and placing topsoil, preparing soil bed and placing sod.

.d When authorized by the Engineer to repair areas over 1 m from the edge of concrete, the additional area will be measured in square metres.

.e Per Contract or as directed by Engineer, if new plantings are required payment will be to Section 32 93 10.

2. PRODUCTS

2.1 GENERAL

.1 Concrete work products to Section 32 13 15. The cement type to be as specified by the Engineer for specific work or as dictated by climatic conditions.

.a Reinforcing steel to Section 03 20 00. Dowels shall be 10M reinforcing bar.

.b Concrete paving stone products to Section 32 14 20.

.c Topsoil to Section 32 91 19.

.d Sod to Section 32 92 23.

.e Plastic Sleeves: 250 mm long section of PVC pipe; diameter to suit standpipe and valve box O.D.

3. EXECUTION

3.1 GENERAL

Replace existing concrete at locations shown on drawing(s) or as designated by Engineer.

3.2 WEATHER

For restrictions due to weather conditions refer to Section 03 05 13.

3.3 TRAFFIC CONTROL

Provide adequate warning signage and devices for pedestrian and vehicular traffic per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.4 ENVIRONMENTAL PROTECTION

.1 The Contractor shall be responsibility to protect adjacent curb, gutter and landscape (particularly root systems) from damage.

.2 Prevent asphaltic materials from entering storm drainage system.

3.5 SAWCUTTING, REMOVAL AND DISPOSAL

.1 Saw-cutting, removal and disposal of concrete (and asphalt, if applicable) shall be to Section 02 41 16.

.2 When removing the designated concrete section ensure adjacent concrete or asphalt sections that are to remain, are not damaged or disturbed.

.3 In some areas of concrete removal and replacement, the existing streetlight duct is located immediately under the concrete work or encased in the concrete work. The Contractor shall have all electrical work located before proceeding with concrete removals. Responsibility for repair of damaged electrical duct/cable is to be as follows:

.a If the duct/cable is encased in the concrete work, the Owner shall be responsible for repair costs.

.b If the duct/cable is located below the concrete, the Contractor shall be responsible for repair costs.

.c The Contractor shall be responsible for coordination of power shut-off prior to concrete work removal and for reconnection for all damaged underground wires.

.4 Disposal or salvage of other items removed as part of the work shall be to Section 02 41 16.

3.6 SUBGRADE & SUBBASE WORK

.1 Subgrade preparation to Section 31 24 13.

.2 Removal and replacement of unsuitable subgrade to be approved by Engineer prior to work proceeding. Depth of excavation to be identified at the job site(s).

.3 Remove unsuitable subgrade material and replace with crushed gravel or crushed concrete, as approved by the Engineer, to 100% Standard Proctor Maximum Dry Density.

.4 Supply, place and compact granular subbase to Section 32 11 16 (if applicable) and granular base course to Section 32 11 23.

3.7 FORM WORK

.1 Install form work to Section 03 10 00.

.2 Set formwork to grade and cross-section to match the existing sidewalk or curb line.

.3 Per direction from Engineer, form work grade line may be adjusted to correct sags or rises that may appear; to provide a smooth grade line on the finished work.

.4 Use granular material for support of formwork and to backfill behind concrete but not to exceed the required topsoil depth.

3.8 ADJUSTMENT TO MANHOLES, CATCH BASINS, VALVES, STANDPIPES, AND HYDRANTS

.1 The Contractor shall complete minor adjustments (±100 mm) of manholes and catch basins. Adjustment shall consist of locating, raising or lowering catch basins and manholes to suit the finished pavement or concrete elevation as shown on the Drawings or as directed by the Engineer. Adjustments greater than 100 mm or reconstruction of manholes and catch basins to be completed by others.

.2 A cement mortar bond shall be used to repair storm manholes, sanitary manholes and catch basins which are required to be reset. Each joint shall be made water tight

with an approved cement mortar. All surplus mortar shall be cleaned from the interior surface of each unit as work progresses.

.3 The contractor will be responsible for all adjustments to fire hydrants, water valve boxes and standpipes.

.4 The Contractor shall accept all related responsibilities associated with barricading them and making them safe to the public, etc. or until asphalt paving is completed.

.5 The Contractor shall place a PVC sleeve around all valves and standpipes prior to concrete placement as shown in Division 50.

3.9 DOWELLING

.1 Dowel material to Section 03 20 00.

.2 Mark existing concrete for dowel placement, to Division 50 05 xx drawings.

.3 Pre-drill holes to lengths as noted on the Division 50 drawings.

.4 Bars are to be cleaned of dirt and rust prior to installation.

3.10 NEW CONCRETE

.1 New concrete work to Section 32 13 15.

.2 Mark new concrete work to Section 32 13 15.

3.11 PAVING STONE

.1 Repair

.a Remove and stockpile existing paving stone.

.b Replace edge restraint where required by the Engineer.

.c Place additional sand levelling course material where required.

.d Replace damaged paving stone with new material.

.e Complete paving stone installation to Section 32 14 20.

.2 New Paving Stone

New paving stone work to Section 32 14 20.

3.12 ROAD ASPHALT REPAIRS

.1 Where concrete removal and replacement has required the removal of asphaltic concrete material and after seven days curing time and the forms have been removed the contractor will:

.a Level and compact existing base course gravel.

.b Backfill area with lean concrete slurry mix to within 50 mm below lip of gutter.

.c After the lean concrete has set, apply an asphaltic tack coat to all surfaces where the asphalt will have contact.

.d Cover (cap) the lean concrete with 50 mm of asphalt; matching to lip of gutter and the existing asphalt roadway surface.

.e Asphalt repairs are to be coordinated through Contractor and completed by others.

.f Lean concrete slurry mix as per Section 03 05 13.

.g Tack coating per Section 32 12 15.

.h Asphalt material and work per Section 32 12 16.

3.13 LANDSCAPE REPAIRS

.1 Allow concrete to cure for seven days then remove formwork prior to backfilling.

.2 Remove all construction debris from area to be backfilled to ensure a uniform depth of topsoil along the concrete work.

.3 If required, backfill with native material or crushed aggregate to 300 mm below existing elevations, compact to 95% Standard Proctor Maximum Dry Density and shape to required contours within the disturbed area in preparation of landscape repairs.

.4 Topsoil

.a Supply and place 250 mm deep topsoil, to Section 32 91 19; leave 50 mm below existing, adjacent surfaces in preparation for sod.

.b Topsoil to be obtained from Town stockpiles within the Town limits.

.c Topsoil placement to be done within 7 days after sidewalk repair is complete.

.5 Sod

.a Supply and place sod to Section 32 92 23.

.b Sod to be placed within 15 days after the sidewalk repair is completed.

.6 Plantings

.a If applicable, supply and place to Section 32 93 10.

3.14 CONTRACTOR REPORTS

The Contractor shall provide records identifying the locations where concrete work has been completed, including the date when the work was completed. Reports shall be provided on a weekly basis and are to be submitted at the beginning of the week for the previous week's work.

1. GENERAL

This Section specifies requirements for concrete work in relation to specific uses.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Temporary Construction Signing	Section 01 58 99
.3	Site Demolition	Section 02 41 16
.4	Basic Concrete Materials and Test Methods	Section 03 05 13
.5	Concrete Form Work	Section 03 11 00
.6	Slip Formed Concrete	Section 03 12 10
.7	Concrete Reinforcement	Section 03 20 00
.8	Aggregate Materials	Section 31 05 16
.9	Roadway Excavation and Embankment	Section 31 24 13
.10	Granular Subbase	Section 32 11 16
.11	Granular Base Course	Section 32 11 23
.12	Construction Specification Drawings	Division 50 05 xx

1.2 DEFINITIONS

.1 Hand-formed Concrete Work

The conventional method of constructing form work using wood or metal forms, aligned, pinned and by hand to design cross-sections.

.2 Extruded Concrete

The construction of concrete work using slip form extrusion machinery.

1.3 MEASURE OF PAYMENT

.1 Concrete items specified as "Remove and Replace" shall be measured and paid to Section 32 13 14.

.2 Measurement for embankment excavation, backfill, compaction and subgrade preparation for concrete work to be in accordance with Section 31 24 13.

.3 Monolithic curb, gutter, sidewalk shall be measured in lineal metres, for the width specified, as measured along the face of curb.

.4 Concrete swales shall be measured in lineal metres as measured along the centreline of the swale.

.5 Separate curb and gutter shall be measured in lineal metres as measured along the face of curb.

.6 Separate sidewalk shall be measured in lineal metres, for width specified, as measured along centre of walk.

.7 Curb on asphalt surface shall be measured in lineal metres as measured along the face of curb. Unit price shall include dowels and reinforcing as shown in Division 50.

.8 Construction of curb ramps shall be measured, for sidewalk width specified, per ramp installed.

.9 Concrete cap for medians and islands shall be measured in square metres.

.10 Stamped concrete shall be measured in square meters. No additional payment will be made for coloured concrete. It shall be considered incidental to the stamped concrete.

.11 Monolithic slab medians and traffic islands on asphalt base shall be measured in square metres.

.12 Reinforced laneway and driveway crossings shall be measured in lineal metres, for width of (monolithic or separate) sidewalk specified, as measured along the face of curb. Measurement for granular subbase and base course shall be to Sections 32 11 16 and 32 11 23, respectively.

.13 Reinforced laneway and driveway (separate) curb crossing shall be measured in lineal metres as measured along the face of curb.

.14 Sand levelling course or granular base course placed beneath concrete to be incidental to concrete work. No separate payment shall be made.

.15 Pedestrian sidewalk barriers shall be measured in units installed.

.16 Precast tree wells; including tree grate, shall be measured in units installed.

.17 Parking meter post pads, including supply and installation of the parking meter post, shall be measured in units installed.

.18 Precast parking curbs, New Jersey barriers etc. shall be measured in units installed.

.19 Sign post, including supply and installation of break-away post bottom section, shall be measured in units installed.

.20 Concrete pad for mailbox unit shall be measured in square metres.

.21 Streetscape amenity pad, including supply and installation of break-away post bottom sections (if applicable), shall be measured in square metres

.

.22 Transit pad, excluding new sidewalk to access or sidewalk widening because of, shall be measured in square metres.

.23 Unit price bid shall be full compensation for all work involved in supplying and placing the specified items. Unless noted otherwise, reinforcement, anchor bolts, nuts, washers, bolts, grouting etc. will be considered incidental to the Work.

2. PRODUCTS

2.1 MATERIAL

.1 Concrete to Section 03 05 13.

.2 Reinforcing steel and welded wire to Section 03 20 00.

.3 Joint filler to ASTM D1751 (AASHTO M213) 20 mm preformed, non-extruding, resilient, bituminous type or approved alternates.

.4 Curing compound to ASTM C309 with fugitive dye or plastic film to ASTM C171. Curing compound not to be applied where frost is expected within 14 days.

.5 Sealing solution: 50% boiled linseed oil and 50% kerosene or other sealant approved by Engineer.

.6 Form release agent: non-staining mineral type, as per Section 03 10 00.

.7 Clean sand aggregate as per Section 31 05 16.

.8 Stamped Concrete – approved stamp pattern is Belgium Cobblestone as supplied by Cobble Crete or approved equal.

.9 For coloured concrete refer to Section 03 05 13.

3. EXECUTION

3.1 PREPARATION

Ensure the surface is to grade and cross-section as specified on the drawing(s) or as directed by the Engineer.

3.2 WEATHER

For restrictions due to weather conditions refer to Section 03 05 13.

3.3 TRAFFIC CONTROL

Provide adequate warning signage and devices for pedestrian and vehicular traffic per Sections 01 35 14 and 01 58 99; and / or as directed by the Engineer.

3.4 ENVIRONMENTAL PROTECTION

.1 The Contractor shall be responsibility to protect adjacent landscape (particularly root systems) from damage.

.2 Prevent concrete materials from entering storm drainage system.

3.5 SUBGRADE PREPARATION

.1 Subgrade preparation for concrete work as per Section 31 24 13.

.2 Supply, install and compact clean sand or 20 mm base course gravel to 100% Standard Proctor Maximum Dry Density.

3.6 FORMING

.1 Hand-forming as per Section 03 11 00.

.2 Slip forming as per Section 03 12 10.

3.7 REINFORCING STEEL

.1 Place steel as per Section 03 20 00 and Specification Drawings per Division 50 05 xx.

.2 Make overlaps 500 mm minimum where continuous reinforcement is required.

.3 Make overlaps 300 mm minimum width, where required, for wire mesh.

3.8 CONCRETE

.1 General concrete placement shall be to Section 03 30 00 and CAN3-A23.1.

.2 Concrete finishing shall be to Section 03 30 00.

.3 Transition from straight faced to rolled curb sections shall be done gradually over a 3 m length of curb.

3.9 MARKING CONCRETE WORK

.1 The Contractor shall mark the sidewalk and/or curb and gutter with a suitable marking tool approved by the Engineer, showing the name of the Contractor and the year of construction. The letters and numbers of the marking tool shall be 40 mm high.

.2 Marks shall be placed at the end of curve of each corner of the block, i.e. there shall be a minimum of eight marks per block. If the construction begins or terminates within the middle of the block, the Contractor shall also mark these locations or as directed by the Engineer. In addition, a similar mark shall be embossed on the corner of each lane crossing and driveway crossing.

.3 The Contractor shall mark all reinforced concrete work with a "R" adjacent to the Contractor's stamp at the beginning and end of all reinforced concrete work.

.4 The Contractor shall mark all dowelled concrete work with a "D" adjacent to the Contractor's stamp at the beginning and end of all dowelled concrete work and at intervals specified by the Engineer.

3.10 EXPANSION AND CONTRACTION JOINTS

.1 Install contraction joints at 1.5 m spacing. Contraction joints shall not be less than 30 mm deep, 6 mm in width and in monolithic sidewalk, curb and gutter, shall extend through the full width of sidewalk, curb and gutter. In curb ramps, the start, middle and end contraction joints shall extend through the full width of the ramp and curb and gutter as shown on the drawings in Division 50.

.2 Install construction joints at end of all reinforced sections.

.3 When sidewalk is adjacent to curb, make joints coincide.

.4 Install isolation joints in concrete around manholes, valve boxes, poles, hydrants, etc. and along length of concrete adjacent to concrete curb, building or permanent structure.

.5 On sidewalks 2.0 m or greater in width, installed on native fill material, saw cut a 25 mm deep groove along the centre line of the sidewalk within 12 hours after placing concrete. For sidewalk on compacted granular fill (100% Standard Proctor Maximum Dry Density), the saw cut will be at the discretion of the Engineer.

3.11 BACKFILL / LANDSCAPE REPAIR

Allow concrete to cure for seven days prior to backfilling unless high early strength is used. Refer to Section 32 13 14.

1. GENERAL

This Section specifies requirements for constructing sidewalks, medians, curb ramps, crosswalks, driveways and lane crossings using concrete paving stone.

1.1 RELATED WORK

.1	Site Demolition	Section 02 41 16
.2	Aggregate Material	Section 31 05 16
.3	Roadway Excavation and Embankment	Section 31 24 13
.4	Granular Base Course	Section 32 11 23
.5	Concrete Work	Section 32 13 15
.6	Construction Specification Drawings	Division 50 06 xx

1.2 MEASURE OF PAYMENT

.1 Paving stone work specified as "Remove and Replace" shall be measured and paid to Section 32 13 14.

.1 Subgrade preparation measured to Section 31 24 13.

.2 Granular base measured to Section 32 11 23.

.3 Clean sand levelling course shall be included in unit price tendered for paving stones.

.4 Concrete paving stone sidewalks, crosswalks, driveways and lane crossings shall be measured in square metres in place. Costs for concrete base used in areas specified to be included in unit price tendered for paving stone.

.5 Edge restraining material: pressure treated lumber, concrete edging adjacent to buildings and other approved edging material shall be measured in lineal metres.

2. PRODUCTS

2.1 MATERIAL

.1 Granular base to be 20 mm crushed gravel. Gradation to be in accordance with Section 31 05 16.

.2 Clean sand for levelling course to Section 31 05 16.

.3 Concrete paving stone:

.a Manufactured in conformance with ASTM C936.

.b Thickness

.i Sidewalk and curb ramp concrete paving stone: 60 mm.

.ii Crosswalk, driveway and lane crossing concrete paving stones: 80 mm.

.c Colour: standard red unless otherwise noted on drawings.

.4 Physical properties:

.a Compressive strength: minimum average 55 MPa with no individual unit less than 50 MPa.

.b Absorption: maximum average 5% with no individual unit greater than 7%.

.c Durability:

.i Freeze-thaw: to ASTM C67.

.ii Abrasion resistance: to ASTM C414.

.5 Permissible variation in dimensions:

.a Length or width: 1.5 mm.

.b Thickness: 3 mm.

.6 Edge Restraint:

.a Pressure treated lumber, concrete strip or preformed PVC edging as indicated on Drawings or approved by Engineer.

3. EXECUTION

3.1 WEATHER

.1 Weather restrictions for the concrete work shall be to Section 03 05 13.

.2 Prior to placing paving stone and sand, site shall be dry with no pooling of water.

3.2 PEDESTRIAN WARNING

Provide adequate warning signage and devices for pedestrian traffic per Sections 01 35 14 and 01 58 99; and / or as directed by the Engineer.

3.3 ENVIRONMENTAL PROTECTION

.1 The Contractor shall be responsibility to protect adjacent curb, gutter and landscape (particularly root systems) from damage.

.2 Prevent sand levelling course from entering storm drainage system.

3.4 PREPARATION

Ensure the surface is to grade and cross-section as specified on the drawing(s) or as directed by the Engineer.

3.5 SUBGRADE PREPARATION

Prepare subgrade for concrete work and brick pavers to Section 31 24 13.

3.6 GRANULAR BASE

.1 Subgrade to be approved by the Engineer before placement of granular base.

.2 Place 100 mm lift granular base to Section 32 11 23.

3.7 EDGE RESTRAINT

In areas not restrained by existing concrete work, place specified edge restraint material as shown in Section 50 06 xx drawings.

3.8 SAND LEVELLING COURSE

.1 Granular base to be approved by the Engineer before placement of sand course.

.2 Place and screed a 25 mm compacted thickness of sand levelling course over area to be paved.

.3 Once screed complete and levelled, do not disturb sand levelling course.

3.9 CONCRETE PAVING STONE

.1 Paving stones shall be laid in approved pattern.

.2 Joints between stones not to exceed 3 mm.

.3 Gaps at edge of paved surface shall be filled with standard edge pieces or with stones cut to fit. Stones shall be cut to a straight even surface without cracks or chips.

.4 Paving stones shall be vibrated to their final level by at least two passes of a vibrating plate compactor.

.5 After vibration, sand containing at least 30% - 3 mm particles shall be brushed over surface and vibrated into joints with additional passes of plate vibrator so as to completely fill joints.

.6 Surplus material shall be swept from surface and disposed of.

3.10 TOLERANCE

After final vibrating, surface shall be true to grade and shall not vary by more than 8 mm when tested with a 3 m board at any location on surface.

3.11 CLEAN-UP

Clean site to Section 01 74 11.

1. GENERAL

This Section specifies requirements for the supply and application of aqueous calcium chloride, for alleviation or prevention of dust nuisance caused by traffic. Refer to Section 01 51 00 and 01 57 13 for using water as a control agent.

1.1 REFERENCE

CGSB 15-GP-1M, calcium chloride.

1.2 MEASURE OF PAYMENT

.1 Supply and application of calcium chloride will be measured in litres.

.2 No extra compensation will be paid for calcium chloride ordered and applied on Saturdays, Sundays or holidays.

1.3 DELIVERY AND STORAGE

.1 Supply calcium chloride in quantities and at times as directed by the Engineer.

.2 Supply calcium chloride as 27% - 35% aqueous solution (dependant on material source).

2. PRODUCTS

2.1 MATERIALS

Calcium chloride, Type I: to CGSB 15-GP-1M (27% to 35% aqueous solution).

3. EXECUTION

3.1 APPLICATION

.1 Apply calcium chloride and water with equipment approved by the Engineer at a rate of 1 L/m^2 for liquid when directed by the Engineer.

.2 Apply aqueous calcium chloride with distributors equipped with spray system to ensure uniform application and with means of shut off.

1. GENERAL

This Section specifies the general requirements for pavement markings regardless of the type of pavement marking used. Deviations from these general requirements will be covered in the specific requirements for each material.

The Work shall consist of furnishing all materials, equipment and labour necessary for the required pavement preparation and application of uniformly retroreflective pavement marking materials in accordance with the plans or as described herein. All pavement markings shall conform to the Manual of Uniform Traffic Control Devices for Canada (MUTCDC - Current Edition).

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Temporary Construction Signing	Section 01 58 99
.3	New Product approval	Section 01 61 10
.4	Site Cleaning	Section 01 74 11
.5	Traffic Signage	Section 10 14 54
.6	Pavement Marking Removal	Section 32 01 11
.7	Painted Traffic Lines and Markings	Section 32 17 24
.8	Thermoplastic Pavement Markings	Section 32 17 26

1.2 REFERENCES

.1 ASTM D4060: Test Method for Abrasion Resistance of Organic Coating by Taber Abrasion.

.2 ASTM D256: Test Method for Impact Resistance of Plastics and Electrical Insulating Materials.

.3 ASTM D570: Test Method for Water Absorption of Plastics.

.4 ASTM E28: Test Method for Softening Point by Ring and Ball Apparatus.

.5 ASTM E1347: Test Method for Directional Reflectance, 45º 0º, of Opaque Specimens by Broadband Filter Reflectometry.

1.3 DEFINITIONS

Plastic Pavement Marking refers to any pavement marking product, excluding paint, consisting of various materials that when heated, blended, and placed, harden and retain their shape after being applied to a road surface.

1.4 MEASURE OF PAYMENT

.1 All work performed and measured as described below will be paid for as provided in the respective items for each type of pavement marking material supplied and installed. Payment shall include all labour, equipment and materials necessary to complete the work.

.2 Line markings shall be measured in lineal metres of material installed for each type of line marking installed. Gaps between line segments are not measured.

.3 Symbols and letters will be measured in specified units.

.4 Pavement marking removal as per Section 32 01 11.

.5 No additional payment will be made for the supply of pavement marking material, reflective glass beads, pre-marking or corrections to pre-marking.

2. PRODUCTS

2.1 MATERIALS

.1 New marking materials shall be formulated, as identified by a manufacturer's code number and have the same composition as the prequalified marking material.

.2 Pavement marking materials for Painted Traffic Lines and Markings shall conform to Section 32 17 24.

.3 Pavement marking materials for Thermoplastic Pavement Markings shall conform to Section 32 17 26.

.4 A material safety data sheet for each material, including resin, catalyst, activator, glass beads and cleaning solvent to be used on the project shall be furnished by the Contractor to the Engineer prior to the start of work.

.5 Glass beads: Overlay type as per CGSB1-GP-74M as follows:

.a Imperfections: surface of spheres shall be smooth and free from film, scratches and pits. At least 90% shall be of true spherical shape and free from milkiness, dark or air inclusions and other defects.

.b Index of Refraction: liquid immersion method at 25° C may be used to determine refraction index of glass spheres. A refractive index of 1.50 to 1.60 is required.

.c Gradation: spheres shall meet the following gradient requirements when tested in accordance with ASTM D-1214.

.i Spheres included in manufacture of thermoplastic material:

Sieve Size (Microns)	% Passing
250	80 - 100
100	0 – 10

.ii Spheres for application on molten thermoplastic material:

Sieve Size (Microns)	% Passing
850	90 - 100
300	20 - 50
180	0 - 10

.d Beads shall show resistance to corrosion after exposure to a 1% solution (by weight) of sulphuric acid.

.6 The Contractor shall furnish to the Engineer copies of current manufacturer's instructions and recommendations for application of any marking material, including primer, activator, catalyst and/or adhesive, called for in the plans.

.7 The Contractor or application sub-contractor shall provide the shipper's invoice noting the material shipped for the Contract in question, upon request of the Engineer.

.8 The Contractor or application sub-contractor shall maintain current material safety data sheets for all materials present with this work in an immediately accessible location.

2.2 EQUIPMENT

Equipment and methods used for marking removal, grinding, preparation, and application shall be subject to the approval of the Engineer.

2.3 CRITERIA FOR ACCEPTANCE OF CONTRACTOR AND MATERIAL

Refer to specific Section for type of application: Paint – Section 32 17 24; Plastic – Section 32 17 26.

2.4 STORAGE

Pavement marking material shall be stored as per the manufacturer's instructions. Glass beads shall be dry prior to use.

3. EXECUTION

3.1 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.2 PREPARATION

.1 Inspect the work area and ensure the pavement surface is free of surface water, snow, frost, ice, dust, oil, and other foreign materials.Clean and dry pavement surface as per Section 01 74 11.

.2 If required, remove existing markings and repair pavement surface as per Section 32 01 11.

3.3 PRE-MARKING

.1 Pre-marking with spray paint.

.2 Pre-mark all intended lines and symbols.

.3 Lines to be pre-marked at a minimum off-set of 150 mm.

.4 Symbols to be pre-marked by outline.

.5 The Town’s Traffic Engineer or designated alternate shall inspect and approve pre-markings and variances thereof prior to marking installation.

.6 Indicate the grind direction with an arrow on pre-mark lines. Inform the Traffic Engineer which side of the line the grind will be on.

3.4 PROTECTION

.1 Protect surrounding areas and structures from over-spray, disfiguration and damage. Repair of damage shall be at contractor's expense.

.2 Do not permit traffic over applied markings until directed by the Engineer.

3.5 INSTALLATION

1. Paint application as per Section 32 17 24.

2. Hot thermoplastic application as per Section 32 17 26.

.1 Lines shall be applied as solid, dashed or dotted stripes, either singularly or in combination, as shown on the Drawings.

.2 Width of inlaid permanent line or surface applied paint shall be the width specified as per Table ‘A’ appended to this section. Note: thermoplastic markings shall have an “over band” along the edges of the groove, over the asphalt surface, as shown in Section 32 17 26.

.3 The Contractor shall use an accurate dashing mechanism, which is capable of being easily adjusted to retrace existing dashed markings or to apply new materials at the correct spacing.

.4 New dashed lines that are to be applied over plainly visible existing dashed lines shall begin within 150 mm of the beginning of the existing dash, unless otherwise directed by the Engineer.

.5 Lines and Symbols shall be sharp, well defined and uniformly reflective to provide proper visibility.

.6 Symbols and letters to conform to dimensions indicated on the drawings or in the Manual of Uniform Traffic Control Devices for Canada.

.7 Other construction work such as shoulder paving, seeding and / or mulching shall be scheduled and performed in a manner to avoid damage to applied pavement marking.

3.6 WORKMANSHIP

1. Markings that have: insufficient material quantity, excessive overspray, non-uniform application, non-straight edges, improper location, discolouration, or poor reflective quality are not acceptable.

2. Faulty markings shall be redone within five working days of notification of non-acceptance.

3. Removal of pavement markings due to deficit items (as listed previously or as directed by Engineer) or obsolete marking(s) due to new roadway geometry, to be removed as per Section 32 01 11. Exception: If a newly applied marking depth is less than specified, therefore not acceptable, the marking may be re-ground to the correct depth, removing the existing marking material and correcting the shallow depth.

4. Removal processes that are not approved include: painting or blacking out the marking and/or leaving the marking to wear out over time.

5. Markings that are deemed un-acceptable and are to be removed and replaced will be done so at the contractor's expense, including furnishing of approved materials.

.7 All markings shall be within 12 mm of location as specified on construction drawings.

3.7 CLEAN-UP

Upon completion of work, the site is to be left free of debris and waste product and material; refer to Section 01 74 11 for further requirements.

4. APPENDIX

TABLE 'A'
LINE DIMENSIONS

Line Type	Colour	Width (excludes over-band)	Thermoplastic Asphalt Groove Depth	Pattern
Centre Line	Yellow	100 mm	5 mm	Continuous line; break at intersections 4.5 m from F.O.C. 1.0 m from crosswalk
Lane Line	White	100 mm	5 mm	3.0 m line, 6.0 m skip
Roundabout Circulatory lane	White	100 mm	5 mm	1.8 m line, 1.8 m skip
Continuity Lines	White	100 mm	5 mm	3.0 m line, 3.0 m skip
Edge Line	White or Yellow	100 mm	5 mm	Continuous line
Intersection Guide Lines	White or Yellow	100 mm	10 mm	0.5 m line, 0.5 m skip; colour as specified on Drawings
Roundabout Yield Lines	White	300 mm	10 mm	Single lane: 1 m line, 1 m gap Multilane: 1 m line, 0.6 m gap
Stop Bars	White	300 mm	10 mm	1.0 m separation from crosswalk; otherwise 4.5 m back of intersecting F.O.C. extension
Transverse Crosswalk	White	200 mm	10 mm	2 parallel lines; >=2.5 m apart typical width = 2.5 m
Zebra Crosswalk	White	600 mm	10 mm	Gap 600 mm. Length >= 2.5 m.
Arrow symbols	White	-----	10 mm	Arrow style and size to conform to MUTCDC* – Figures C1-4, A7-3
Other symbols	White	-----	10 mm	Dimensions to conform to MUTCDC*

*Manual of Uniform Traffic Control Devices for Canada

TABLE 'B'

MATERIAL TYPE by ROAD CLASSIFICATION

Item	Type of Material
Expressways and Arterial Roadways [1]	
1. Centre Lines	Type 1
2. Edge Lines	Type 1
3. Lane Lines	Type 1
4. Stop Bars, Yield Lines	Type 1
5. Crosswalk Lines	Type 1
6. Intersection Guide Lines	Type 1
7. Arrows and Symbols	Type 1
8. Bicycle Lanes & Symbols	Paint
9. Concrete Bridge Decks	Paint
10. Asphalt Bridge Decks	Type 1
Collector Roadways	
1. Centre Lines	Type1
2. Lane Lines	Type1
3. Stop Bars, Yield Lines	Type1
4. Crosswalk Lines	Type1
5. Bicycle Lanes & Symbols	Paint
Local Roadways	
1. Centre Lines	Paint
2. Stop Bars, Yield Lines	Paint
3. Crosswalk Lines	Paint
4. Bicycle Lanes & Symbols	Paint

Notes:

1. Expressway and Arterial roadways include any portion of a Collector or Local roadway within 50 m of an intersecting expressway or arterial roadway.

2. Type 1 - Thermoplastic "Hot In-Laid" material as specified in Section 32 17 26.

1. GENERAL

This Section specifies requirements for painted pavement markings.

1.1 RELATED WORK

.1 Pavement Marking: General — Section 32 17 23

1.2 MEASURE OF PAYMENT

As specified in Section 32 17 23.

2. PRODUCTS

2.1 MATERIALS

.1 Paint

.a Alkyd traffic paint to CGSB 1-GP-74M.

.b Alkyd reflectorized traffic paint to CGSB 1-GP-149M.

.c Colour to CGSB 1-GP-12C

.d White 513-301

.e Yellow 505-308

.f Thinner to CGSB-1.5

2.2 EQUIPMENT REQUIREMENTS

.1 Paint applicator to be an approved pressure type mobile distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified and to dimensions as indicated and to have positive shut-off.

.2 Thoroughly clean distributor tank before refilling with paint of different colour.

3. EXECUTION

3.1 GENERAL

Refer to Section 32 17 23 for general procedures and conditions related to the installation of markings.

3.2 WEATHER

Unless otherwise approved by the Traffic Engineer or designate, apply paint only when air temperature is above 10° C and no rain is forecast.

3.3 APPLICATION

.1 Apply paint evenly at a rate of 0.33 l/m^2. The first application of paint to new asphalt pavement surfaces shall be increased by 25% over the specified rate.

.2 Do not thin paint unless approved by The Town of Olds Traffic Engineer or Designate.

.3 Paint lines must be of uniform colour and density with sharp edges.

3.4 PROTECTION

Do not permit traffic over applied markings until dry, minimally 20 minutes.

3.5 WARRANTY

A warranty period is not applicable for Painted Pavement Markings.

1. GENERAL

This Section specifies requirements for supply and installation of thermoplastic marking on pavement; also referred to as Type 1 marking.

1.1 RELATED WORK

.1 Pavement Marking: General — Section 32 17 23

1.2 MEASURE OF PAYMENT

As specified in Section 32 17 23.

2. PRODUCTS

2.1 MATERIALS

.1 Thermoplastic pavement marking: hot-extruded, having a specific gravity of 2.0 minimum at 25° C, having a softening point of 90° C minimum according to ASTM E28 and conforming to the following:

.a Water Absorption: 0.5% maximum by mass retained water after 24-hour immersion, according to ASTM D-570 Procedure A.

.b Impact Resistance: Minimum 1.13 J at 25° C when material is cast into a bar 25 mm^2 cross-section by 75 mm long, with 25 mm extended above vice jaws in a cantilever beam (Izod type) tester using the 2.82 J scale, according to ASTM D-256 Method C.

.c Abrasion Resistance: Maximum weight loss of 0.6 grams when subjected to 200 revolutions on a Taber Abrader at 25° C using H-22 Calibrade wheels weighted to 500 grams with test sample kept wet during test with distilled water. Prepare test sample with representative material placed on 100 mm square plate, 3±0.1 mm thick.

.d Chemical resistance to anti-freeze, brake fluid, motor oil, diesel fuel, gasoline, transmission fluid calcium chloride, sodium chloride or other de-icing chemicals.

.e Reheating: The thermoplastic compound shall maintain proper performance properties when heated 4 times to the application temperature. After heating to 800° C for 6 hours while continually stirring at 50 to 100 RPM, the Brookfield viscosity shall not exceed 16,000 cps at 12 RPM.

.f No deterioration when in direct contact with asphalt cement in asphaltic concrete materials.

.g Non – toxic and not harmful to persons or property when in hardened state.

.h No discoloration from sunlight ultraviolet exposure and no bond failure for the warranted life of the material.

.i In the plastic state, the material shall not give off fumes that are toxic or otherwise injurious to persons or property.

.j Acceptable Products:

.i Lafrentz System 300 or approved equivalent.

.2 Glass Beads, refer to Section 32 17 23.

.3 Pre-marking Paint: As approved by Engineer.

.4 Asphalt Filler, refer to Section 32 01 11.

2.2 MIX FORMULATION

.1 White Colour: Conforming to U.S. Federal Standard 595B Colour Number 37925, 70% minimum when measured with the Colour Guide Reflectometer 0,45º daylight luminous directional reflectance, with a green filter.

.2 Yellow Colour: Conforming to U.S. Federal Standard 595B Colour Number 33538, 40% minimum when measured with the Colour Guide Reflectometer 0,45º daylight luminous directional reflectance, with a green filter.

.3 No formulation change unless approved by the Engineer. Any significant change will be subject to field trials.

2.3 EQUIPMENT

Refer to Section 32 17 23.

2.4 CRITERIA FOR ACCEPTANCE

.1 Submission of Information

.a In addition to the information requested under Section 01 61 10 and per the Design Guidelines, Section 3 – Material Compliance, The Contractor shall provide the following supporting information:

.2 Contractor

.a The Contractor has previously installed the product the bid is based on in other municipalities with similar climatic conditions and winter roadway maintenance practices as Olds.

.b The Contractor has provided three references for the products past performance including:

.i Construction Completion Certificate from reference source showing date of CCC.

.ii A package of high resolution pictures of the reference work 3 years AFTER CCC issuance, prior to repairs.

.iii Picture clarity to be such the marking condition can be easily seen (defects, missing pieces, cracks, etc.).

.iv Package to include surrounding landmarks outside of right-of-way for general context of marking location.

.v Package to include pictures of various marking uses (e.g. lane lines, crosswalk, stop bar, etc.).

.3 Material

.a The material was installed on roadways with more than 10,000 vehicles per day and over 90% of the marking material remained in good condition after three (3) years of service.

.b Plastic pavement marking material that does not meet the above noted criteria may be considered for installation at locations specified by The Town for evaluation purposes. The material will be considered an acceptable product if 90% of the markings remain in good condition after three (3) years of service.

3. EXECUTION

3.1 GENERAL

Refer to Section 32 17 23 for general procedures and conditions related to the installation of markings.

3.2 WEATHER

Unless otherwise approved by the Engineer, apply markings according to the manufacturer's specification regarding weather restrictions.

3.3 NOTIFICATIONS

Plastic pavement marking contractor shall provide a minimum of two working days, written notice, to the Town's Traffic Engineer or designate, prior to installing any plastic pavement markings.

3.4 INSTALLATION

.1 Cut grooves in asphalt to designated width, length and depth per Section 32 17 23, Table 'A'.

.a Remove grindings and haul to designated disposal location. Sweep or air blast groove clean and dry, preventing grindings from entering the storm sewer system.

.b No grooving of the roadway will be permitted in any one day beyond what can be cleaned and inlaid with thermoplastic material in that day.

.c The Engineer shall be contacted prior to thermoplastic being placed to confirm if the grooves met the specification.

.2 Heat material and apply by extrusion process according to manufacturer's instructions.

.3 Fill groove with hot molten material. Do not overfill more than 3.5 mm above pavement surface.

.4 Over band edges of groove by 5 mm to ensure a water seal along groove, see Figure 1.

.5 Apply glass beads to surface of extruded material while it is still molten or has not set, at a rate of 140 g/m^2 to 350 g/m^2.

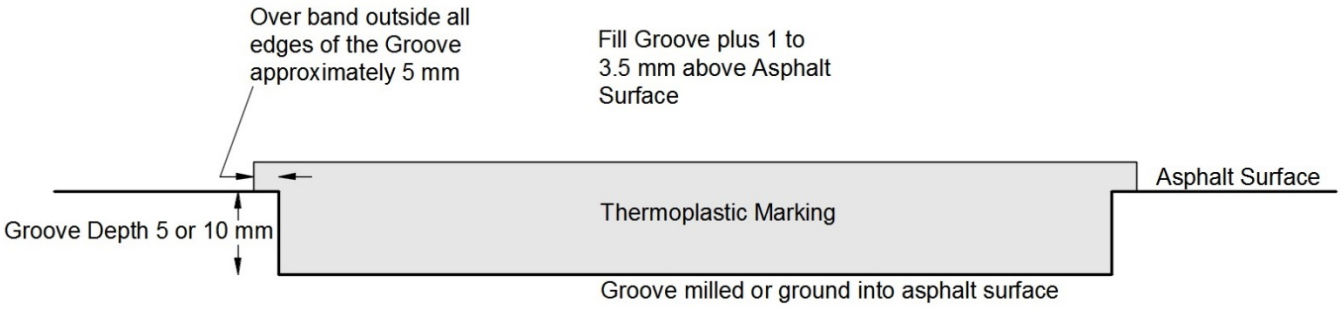


Figure 1

.6 Trim surplus material to give clean straight edges and let marking cure to a hardened state.

3.5 PROTECTION

Prevent traffic from travelling on pavement markings for a period of one hour after placement or until product has firmly set.

3.6 WARRANTY

.1 General

.a Plastic pavement markings shall be warranted against failure due to:

.i Poor adhesion.

.ii Defective materials.

.iii Improper installation.

.2 Warranty Period

.a The warranty period for plastic pavement markings shall be five years, commencing on issuance of the Construction Completion Certificate for Plastic Pavement Marking unless otherwise stated in the Contract.

.b Upon completion of Work, the Contractor will apply for a Construction Completion Certificate in compliance with the Unit Price Contract – Division 00 (General Conditions of the Contract). As part of the CCC submission, the Contractor shall submit a “Plastic Pavement Marking Warranty” form (refer to Division 00 Section 00 60 00.17) signed by the Contractor and Subcontractor (if applicable).

.i The guarantee for the plastic pavement marking material shall be subject to traffic and normal summer and winter roadway maintenance procedures.

.c During the warranty period, the Contractor, at no additional cost to the Owner, shall replace markings that the Town of Olds Traffic Engineer or designate, determines are not performing satisfactorily due to defective materials, workmanship, manufacture or application. During the warranty period, the minimum required retention percentage, by length, for markings installed will be as follows: (Symbol markings based on area)

.i The first year from the date stated in the Construction Completion Certificate, all lines and symbols must be 100% intact.

.ii The second year from the date stated in the Construction Completion Certificate, each line and symbol must be 95% intact. For lines that exceed 3m in length, each 3m section of that line must be 95% intact.

.iii The third year from the date stated in the Construction Completion Certificate, each line and symbol must be 90% intact. For lines that exceed 3m in length, each 3m section of that line must be 90% intact.

.iv The fourth year from the date stated in the Construction Completion Certificate, each line and symbol must be 85% intact. For lines that exceed 3m in length, each 3m section of that line must be 85% intact.

.v The fifth year from the date stated in the Construction Completion Certificate, each line and symbol must be 80% intact. For lines that exceed 3m in length, each 3m section of that line must be 80% intact.

Note: Percentages are in reference to the length of line remaining and / or the percentage of line intact.

.d The Contractor shall also guarantee that in all instances there shall be sufficient material remaining at end of the designated warranty period so that pre-marking is not necessary.

1. GENERAL

This Section specifies requirements for supplying and installing chain link fence.

1.1 RELATED WORK

.1	Cast-in-Place Concrete	Section 03 30 00
.2	Topsoil and Finish Grading	Section 32 91 19
.3	Mechanical Seeding	Section 32 92 19
.4	Sodding	Section 32 92 23

1.2 MEASURE OF PAYMENT

.1 Supply and installation of chain link fence will be measured in lineal metres, per fence height installed.

.2 Manually operated gates will be measured in units installed, per fence height.

.3 Mechanically operated gates will be measured in units installed, per fence height. Electrical and mechanical components shall be included in the gate cost.

.4 Length of gate (total opening), security wire top, fittings, etc. shall be considered incidental to the work.

2. PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials to Section 03 30 00. Concrete to have a minimum compressive strength of 20 MPa at 28 days.

.2 Chain link fence fabric: to be 50 mm mesh grid by 3.5 mm galvanized wire to CAN/CGSB - 138.1 (vinyl coated if specified) to heights specified.

.3 Posts, braces and rails: to Schedule 40 to CAN/CGSB - 138.2. Material outside diameters as follows:

.a Line posts - 60 mm

.b End and corner - 89 mm

.c Top rails - 42 mm

.d Gate posts as follows:

Gate Width (Span)	Gate Post Diameter
< 3.5 m	89 mm
3.5 m to 4.9 m	114 mm
>4.9 m	168 mm

.4 Bottom tension wire: to CAN/CGSB - 138.1, Table 2, single strand galvanized (or vinyl coated) steel wire, 5 mm diameter.

.5 Tie wire fasteners: to CAN/CGSB - 138.1, Table 2, 3.5 mm galvanized steel or Table 4, aluminium wire, single strand.

.6 Tension bar: to ASTM A525M, 5 x 20 mm galvanized steel.

.7 Gates: to CAN/CGSB - 138.4

.8 Gate frames: to ASTM A53, galvanized steel pipe, standard weight, 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.

.a Fabricate gates as indicated with electrically welded joints and painted with zinc pigmented paint after welding.

.b Fasten fence fabric to gate with tie wire fasteners to CAN/CGSB - 138.1, Table 2, 3.5 mm galvanized steel or Table 4, aluminium wire, single strand.

.c Furnish gates with galvanized malleable iron hinges, latch and latch catch (provision for padlock to be specified in contract) which can be attached and operated from either side of installed gate.

.d Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.

.9 Fittings and hardware: to Tie wire fasteners to CAN/CGSB - 138.2, cast aluminium alloy, galvanized steel or malleable or ductile cast iron. Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminium. Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail. Overhang tops to provide waterproof fit and hold top rails and outward or inward projection with clips or recesses to hold three strands of barbwire spaced 100 mm apart. Projection

arm to be approximately 300 mm long and project from the fence at 45° above horizontal. Turnbuckles to be drop forged.

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

.11 Barbwire: to CAN/CGSB - 138.2, 2.5 mm diameter galvanized steel wire to ASTM A121, two strand with four point barbs at 150 mm spacing.

.12 Grounding rod: 16 mm diameter copper well rod, 3 m long.

2.2 FINISHES

.1 Galvanizing

.a For chain link fabric: to CAN/CGSB-138.1.

.b For pipe: 550g/sq.m minimum to ASTM A90.

.c For barbed wire: to ASTM A 121

.d For other fittings to CAN/CSA-G164.

.2 Vinyl Coating

.a 0.045 mm dry film thickness minimum.

3. EXECUTION

3.1 PROTECTION

.1 If the fencing is proposed to be through / along an existing native growth area, peripheral trees and root systems are to be protected in accordance with 32 93 50.

.2 Ensure excavated material does not enter the storm drainage system due to run-off from rain or snow melt. Erosion and sediment control shall be to Section 01 57 13, if none is in-place at time of work.

3.2 PREPARATION

Review fence alignment and adjacent or proposed grade lines to ensure final fence elevations are per drawing or as directed by the Engineer.

3.3 GRADING

.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts. Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

.2 If grading is adjacent to an established green space or developed site, the fence grade is to match the adjacent property.

3.4 ERECTION OF FENCE

.1 Erect fence along lines as indicated on drawing or as directed by the Engineer and in accordance with CAN/CGSB - 138.3.

.2 Excavate post holes to dimensions shown on the Drawings.

.3 Space line posts 3 m apart, measured parallel to ground surface.

.4 Space straining posts at equal intervals, not exceeding 150 m, if distance between end or corner posts on straight continuous lengths, over reasonably smooth grade, is greater than 150 m.

.5 Install additional straining posts at sharp changes in grade and where directed by the Engineer.

.6 Install corner posts where change in alignment exceeds 10^{o}.

.7 Install end posts at end of fence and at buildings. Install gateposts on both sides of gate openings.

.8 Place concrete in post holes; embed posts into concrete to depths indicated on the Drawings. Extend concrete 50 mm above final grade and slope to drain away from posts. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

.9 Do not install fence fabric until concrete has cured a minimum of five days.

.10 Install brace between end and gateposts and nearest line post parallel to ground surface. Install braces on both sides of corner and straining posts in similar manner. Brace rails to be attached using brace bands and rail ends. No brace rails are required where fabric height is 1.8 m or less.

.11 Install caps and overhang tops. Overhang tops to face outwards.

.12 Install top rail between posts and fasten securely to posts with brace bands and rail ends. Secure waterproof caps and overhang tops.

.13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.

.14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals. Knuckled tie wire at bottom. Twisted tie wire at top.

.15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals. Give tie wires minimum two twists.

.16 Installation of grounding rods as indicated.

3.5 INSTALLATION OF GATES

.1 Install gates in locations as indicated.

.2 Level ground between gateposts and set gate bottom approximately 40 mm above ground surface.

.3 For manually operated vehicle gate; install gate rests where indicated. Determine position of centre gate rest for double gate. Cast gate rest in concrete. Finish concrete flush with ground surface. Gate rest may be substituted with a wheel for ease of operation.

.4 Install mechanical and electrical components for mechanically operated gate(s).

.5 Install gate stops where indicated.

3.6 TOUCH UP FENCE

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings.

.2 Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

.3 Apply, by brush, two coats of organic zinc-rich paint to damaged areas. Spray application will not be permitted. Allow enough time for first application to set prior to the second coat. Follow the coating manufacturer’s application directions.

3.7 LANDSCAPE REPAIR

.1 Clean and trim areas disturbed by operations. Dispose of surplus material and repair damaged area per Section 32 91 19.

.2 Place topsoil, as required, to provide smooth surface for seeding or sodding and to fill depression under bottom fence fabric grade line.

.3 Re-establish ground cover along the fence per Section 32 92 19, manual seeding, as applicable to the work.

3.8 CLEAN-UP

.1 Maintain a clean work site / area in accordance with Section 01 74 11.

.2 Separate waste materials for recycling or reuse and dispose of those materials at an appropriate facility.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal, if applicable.

1. GENERAL

This Section specifies requirements for supplying and installing post and cable fencing.

1.1 RELATED WORK

.1	Aggregate	Section 31 05 16
.2	Topsoil and Finish Grading	Section 32 91 19
.3	Construction Specification Drawings	Division 50 07 xx

1.2 MEASURE OF PAYMENT

Supply and installation of post and cable fence, including posts and necessary hardware, will be measured in metres of post and cable fence installed and measured from centre to centre of end posts.

2. PRODUCTS

2.1 MATERIALS

.1 Cable

.a Wire cable - Diameter of 8 mm galvanized wire rope.

.2 Square Timber Posts to CAN3-056.

.a Type - pressure treated in accordance with CAN/CSA-080 Series.

.b Dimensions - 150 mm x 150 mm x 2.0 m long.

.3 Aggregate - 16 mm crushed gravel to Section 31 05 16.

3. EXECUTION

3.1 PROTECTION

.1 If the fencing is proposed to be through / along an existing native growth area, peripheral trees and root systems are to be protected in accordance with 32 93 50.

.2 Ensure natural areas are protected to Section 01 35 43.

.3 Ensure excavated material is contained and restricted from enter the storm drainage system or carried over protected natural areas due to run-off from rain or snow melt. Erosion and sediment control shall be to Section 01 57 13, if none is in-place at time of work.

3.2 SITE PREPARATION

.1 Prior to construction start, ensure area of fence placement is prepared to grade, and free of underground and surrounding encumbrances.

.2 Where erosion and sedimentation control measures are installed as part of the work, inspect, repair, and maintain until permanent vegetation has been established.

.3 If required, clear brush, trees etc. and level ground within a minimum width working area along the length of the fence. Plant preservation shall be to Section 32 93 50.

.4 Level the ground along the fence line in order that the cable can be maintained between 725 mm to not more than 750 mm above finish ground.

3.3 INSTALLATION

.1 Set posts at locations as indicated by drawing or as directed by the Engineer.

.2 Excavate post holes to depths and diameter as indicated. Compact bottom to provide firm foundation. Set post plumb and centred in hole.

.3 Backfill around posts and anchorages using crushed gravel and compact in uniform layers not exceeding 150 mm compacted thickness.

.4 Cut off tops of posts as indicated.

.5 Erect cable and hardware to details as indicated. Tension cable so that sag between posts does not exceed 25 mm.

.6 Space cable splices a minimum of 15 m apart. Maximum one cable splice between adjacent posts.

3.4 TOUCH-UP

.1 Clean damaged surfaces with wire brush and/or sander. Remove splinters and smooth the area where the splinter has been removed from.

.2 Treat cut tops with two coats of alkaline copper quaternary (A.C.Q).

3.5 LANDSCAPE REPAIR

.1 Clean and trim areas disturbed by operations. Dispose of surplus material and repair damaged area per Section 32 91 19.

.2 Re-establish ground cover alone the fence per Section 32 92 19, manual seeding, as applicable to the work.

.3 Finished topsoil grade to be maintained to a maximum of 12mm below top of finished level of a hard surface (e.g. trail, pedestals, etc.).

3.6 SITE CLEAN-UP

Clean work area in accordance with Section 01 74 11.

1. GENERAL

This Section specifies requirements for supplying and installing wire fences and gates.

1.1 RELATED WORK

.1	Clearing and Grubbing	Section 31 11 00
.2	Topsoil and Finish Grading	Section 32 91 19
.3	Mechanical Seeding	Section 32 92 19
.4	Tree and Shrub Preservation	Section 32 93 50

1.2 CLASSIFICATION OF FENCE

.1 Fencing will be classified according to type as follows:

.a Class A - Three barbed wires with wooden posts at 5 m maximum spacing.

1.3 MEASURE OF PAYMENT

.1 Supply and installation of wire fence will be measured in lineal metres of fence erected, including gates.

.2 The removal of trees, brush or other obstacles will be measured and paid for in accordance with Section 31 11 00 (Clearing and Grubbing).

2. PRODUCTS

2.1 MATERIALS

.1 Wire Fence and Gates

.a Farm-field type: to CSA G42 - 748.

.b Barbed wire: to ASTM A121.

.i Galvanized steel

.ii Wire size: 2 mm diameter

.iii Barbs: 4 point at 125 mm or 150 mm spacing

.2 Steel Frame Gates

.a Frame: to ASTM A53, galvanized steel pipe, standard weight, 25 mm outside diameter.

.b Size: as indicated.

.c Joints: electrically welded.

.3 Timber Components:

.a Construction grade, pressure treated timber.

.4 Timber Posts

.a Sound, seasoned wood, peeled and with ends cut square or as indicated.

.b Intermediate posts: 2.5 m long and minimum 125 mm diameter at small end.

.c Corner, end, gate and anchor posts: 2.7 m long and minimum 200 mm diameter at small end.

.d Straight, free from splits, shakes and excessive knots.

.e Existing knots trimmed flush with surface.

.f Cleats for anchoring corner, gate, end and anchor posts: 38 mm x 140 mm x 910 mm.

.g Braces for end, corner and gateposts: 89 m x 89 m x 3 m long.

.h Posts to be treated in accordance with CAN/CSA 080 Series.

3. EXECUTION

3.1 PROTECTION

.1 If the fencing is proposed to be through / along an existing native growth area, peripheral trees and root systems are to be protected in accordance with Section 32 93 50.

.2 Ensure excavated material is contained and restricted from enter the storm drainage system or carried over protected natural areas due to run-off from rain or snow melt.

Erosion and sediment control shall be to Section 01 57 13, if none is in-place at time of work.

3.2 GRADING

Level ground along fence line in order that bottom wire of fence between posts can be maintained at not more than 300 mm above ground.

3.3 ERECTION OF FENCE

.1 Erect fence along lines as indicated on drawing or as directed by the Engineer.

.2 Installation of Posts

.a Space intermediate posts at 5 m.

.b Space corner, end and gateposts 3 m from adjacent post.

.c Locate and erect gateposts as indicated.

.d Install posts true to line and plumb with 1.5 m of post projecting above ground.

.3 Fencing with Wood Posts

.a Excavate post holes by methods approved by the Engineer.

.b Slant of post tops to be perpendicular to fence line and facing inward.

.c Install cleats for anchoring at corner, date, end and anchor posts as required.

.d Backfill around posts and compact to same density as surrounding ground. Dispose of surplus material as directed by the Engineer.

.e Install braces at end, corner and gateposts. Join braces into posts and spike securely.

.f Erect wires and stretch to have uniform tension. Splice wires as required.

.g Attach top wires to posts with minimum two staples. Fasten other wires to posts and cross braces with at least one staple. Staple wires securely at end, anchor and gateposts.

.h Stretch two strands of barbed wire along tops of posts and double staple on posts.

3.4 INSTALLATION OF GATES

.1 Install gates in locations as indicated on the drawings.

.2 Install steel frame gates to prevent over-stress on gateposts when gates are open. Install on level ground with ground clearance of 150 mm.

.3 For steel frame gates, locate anchor pipe for drop bolt and install pipe flush with surface.

3.5 TOUCH UP

.1 Clean damaged wood surfaces with wire brush and/or sander. Remove splinters and smooth the area where the splinter has been removed from.

.2 Apply, by brush, two coats of wood preservative to damaged areas. Spray application will not be permitted. Apply first coat of preservative liberally enough to ensure good penetration into the wood. Allow enough time for first application to set prior to the second coat. Follow the manufacturer's application directions.

3.6 LANDSCAPE REPAIR

.1 Clean and trim areas disturbed by operations. Dispose of surplus material and repair damaged area per Section 32 91 19.

.2 Re-establish ground cover alone the fence per Section 32 92 19, manual seeding, as applicable to the work.

3.7 SITE CLEAN-UP

.1 Repair damage to adjacent materials caused by fence installation.

.2 Leave Work area clean at end of each day in accordance with Section 01 74 11.

.3 Separate waste materials for recycling or reuse and dispose of those materials at an appropriate facility.

.4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal, if applicable.

1. GENERAL

This Section specifies requirements for supplying and installing wildlife fences for use along Expressways and Arterial roadways which pass through known wildlife areas and corridors, typically the river and escarpment.

1.1 RELATED WORK

.1	Basic Concrete Materials and Testing Methods	Section 03 05 13
.2	Cast-in-Place Concrete	Section 03 30 00
.3	Clearing and Grubbing	Section 31 11 00
.4	Topsoil and Finish Grading	Section 32 91 19
.5	Mechanical Seeding	Section 32 92 19
.6	Tree and Shrub Preservation	Section 32 93 50
.7	Construction Specification Drawings	Division 50 07 xx

1.2 CLASSIFICATION OF FENCE

.1 Class F – 134 mm Paige wire fencing attached to wooden posts.

1.3 MEASURE OF PAYMENT

.1 Supply and installation of wire fence will be measured in lineal meters of fence erected, including gates.

.2 The removal of trees, brush or other obstacles will be measured and paid for in accordance with Section 31 11 00 (Clearing and Grubbing).

2. PRODUCTS

2.1 MATERIALS

.1 Wildlife Fence to be Type 20-96 Big Game Fence, 2400 mm Roll width.

.2 Frame member to be galvanized steel pipe, standard weight, 73 mm outside diameter; size as indicated.

.3 Bracing member to be galvanized steel pipe, standard weight, 60 mm inside diameter by 4000 mm length.

.4 Galvanization to be organic zinc-rich coating to CGSB 1.181-99.

.5 Timber Posts:

.a Construction grade, preservative treated in accordance with CAN/CSA 080 Series

.b Sound, seasoned wood, peeled, with ends cut square or as indicated.

.c Corner, end, gate and anchor posts to be 200 mm x 200 mm by 4.25 m long (minimum).

.d Intermediate posts to be 150 mm x 150 mm by 3.7 m long (minimum).

.e Straight, free from splits, shakes and excessive knots.

.f Existing knots trimmed flush with surface.

3. EXECUTION

3.1 PROTECTION

.1 If the fencing is proposed to be through / along an existing native growth area, peripheral trees and root systems are to be protected in accordance with Section 32 93 50.

.2 Ensure natural areas are protected to Section 01 35 43.

.3 Ensure excavated material is contained and restricted from enter the storm drainage system or carried over protected natural areas due to run-off from rain or snow melt. Erosion and sediment control shall be to Section 01 57 13, if none is in-place at time of work.

.4 Protect installed products and components from damage during construction.

3.2 SITE PREPARATION

.1 Prior to construction start, ensure area of fence placement is prepared to grade, and free of underground and surrounding encumbrances.

.2 Where erosion and sedimentation control measures are installed as part of the work, inspect, repair, and maintain until permanent vegetation has been established.

.3 Clear brush, trees etc. and level ground within a minimum width working area along the length of the fence. Plant preservation to Section 32 93 50.

.4 Level ground line along fence alignment to a condition where small dips and rises in the terrain are eliminated creating a flush smooth profile with minimal, significant grade changes. If this grading is adjacent to an established green space or developed site, the fence grade is to match the adjacent property.

3.3 TERMINAL POST INSTALLATION

.1 Locate Corner, End, Gate and Anchor posts at locations indicated. In places of significant grade change additional anchor posts may be required.

.2 Excavate post holes by mechanical auger, or other method approved by the Engineer, 50% larger than post diameter.

.3 Remove excess earthwork material to a disposal location, approved by the Engineer.

.4 Install posts true to line and plumb with 2600 mm of post projecting above ground.

.5 Set posts in hole and fill with lean concrete mix per Section 03 05 13 Concrete Class E or F.

.6 Concrete to be distributed equally around the post to within 200 mm below of the finished surface. Refer to Section 03 30 00 for general concrete workmanship and requirements.

3.4 INTERMEDIATE POST INSTALLATION

.1 Locate intermediate posts along lines as indicated on drawing or as directed by the Engineer.

.2 An intermediate post is to be located 3 m from a corner, end, gate or anchor post to allow for bracing of the fence.

.3 Intermediate posts to be placed between terminal posts at a spacing of between 5 m to 7 m (maximum). Spacing to be adjusted to create equal separations over the length of the run.

.4 Excavate post holes by mechanical auger, or other method approved by the Engineer, 50% larger than post diameter.

.5 Remove excess earthwork material to an approved disposal location as approved by the Engineer.

.6 Install posts true to line and plumb with 2.6 m of post projecting above ground.

.7 Set posts in hole and fill with lean concrete mix per section 03 05 13 Concrete Class E or F.

.8 Concrete to be distributed equally around the post to within 200 mm below the finished surface. Refer to Section 03 30 00 for general concrete workmanship and requirements.

3.5 INSTALLATION OF FENCE AND BRACING

.1 Excavate a 500 mm deep trench along the fence line, between terminal posts.

.2 Install braces between the corner, end, gate and anchor post and the intermediate post. Braces to be fastened securely; with fastener flush to both parts.

.3 Braces to be installed at 800 mm below the top of posts.

.4 Weave a tension wire through the top strand of the fence mesh.

.5 Fasten the tension wire 200 mm below top of terminal posts.

.6 Erect fence material on the outside of the post (away from project) and stretch to uniform tension, per manufacturer's specification.

.7 Attach fence to intermediate posts with, minimally, four staples, spaced at 500 mm apart, approximately.

.8 Along the base of the fence, overlap the mesh 800 mm with 500mm below ground, placed in the trench, and 300 mm above ground for the entire length of the fence. Secure the overlap mesh with tie wire at 450 mm spacing.

.9 Once the mesh has been installed and fastened it is to have a smooth uniform appearance free of dents, bulges and sags.

.10 Where ground slopes become greater than 3:1 additional bracing to be incorporated. This bracing consists of a wire cable, fastened to an anchor (or terminal) post at each end, with a turn-buckle tensioner at mid-point.

.11 One end of the cable is to be fastened within 500 mm above ground, at the bottom of the terminal or anchor post closest to the slope.

.12 The other end of the cable is to be fastened to the post further from the slope, at 800 mm below the top.

3.6 INSTALLATION OF GATES

.1 Install gates in locations and sizes as indicated on the drawings.

.2 Install steel frame gates to prevent over-stress on gate posts when gates are open. Install on level ground with ground clearance of 50 mm.

.3 Horizontal bracing to be installed between the gate post and the intermediate post. Angular cable brace, with tension buckle, to also be installed. The cable brace is to tie 800 mm below the top of the gate post and 500 mm above the ground on the intermediate post.

.4 The gate post and gate is to have a latch attached to accept a typical padlock. If a double gate is required, a padlock compatible latch is required to fasten the two gates together.

3.7 TOUCH-UP

.1 Galvanized Steel

.a Clean damaged surfaces with wire brush removing loose and cracked coatings.

.b Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

.c Apply, by brush, two coats of organic zinc-rich paint to damaged areas. Spray application will not be permitted. Allow enough time for first application to set prior to the second coat. Follow the coating manufacturer’s application directions.

.2 Wooden Fixtures

.a Clean damaged surfaces with wire brush and/or sander. Remove splinters and smooth the area where the splinter has been removed from.

.b Apply, by brush, two coats of wood preservative to damaged areas. Spray application will not be permitted. Apply first coat of preservative liberally enough to ensure good penetration into the wood. Allow enough time for first application to set prior to the second coat. Follow the manufacturer’s application directions.

3.8 LANDSCAPE REPAIR

.1 Clean and trim areas disturbed by operations. Dispose of surplus material and repair damaged area per Section 32 91 19.

.2 Re-establish ground cover alone the fence per Section 32 92 19, manual seeding, as applicable to the work.

3.9 SITE CLEAN-UP

.1 Repair damage to adjacent materials caused by fence installation.

.2 Leave Work area clean at end of each day in accordance with Section 01 74 11.

.3 Separate waste materials for recycling or reuse and dispose of those materials at an appropriate facility.

.4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal, if applicable.

1. GENERAL

This Section specifies general requirements for reinforced soil retaining wall systems.

1.1 RELATED WORK

1.	Cast-in-Place Concrete	Section 03 30 00
2.	Protective Metal Railings	Section 05 52 00
3.	Aggregate Material	Section 31 05 16
4.	Trench Excavation and Backfilling	Section 31 22 16
5.	Roadway Excavation and Embankment	Section 31 24 13
6.	Sub-Drainage	Section 33 46 16

1.2 MEASURE OF PAYMENT

.1 The retaining wall system will be measured as the square metre of wall face installed. The area shall be determined as the length of wall for each height increment times the vertical height of the wall measured from the top of the footing to the top of the capping layer.

.2 The contract unit price shall include the cost of all labour, equipment and materials to supply and install the wall modules, including sub-drains, granular backfill, foundation, concrete work, geotextiles, railings etc. unless specified otherwise in the Contract.

.3 If the Contract has bid items for the following refer to the respective Sections for measure of payment:

.a Excavation and native backfill earthwork shall be to Section 31 24 13.

.b Concrete foundation / footing shall be to Section 32 13 15.

.c Sub-drain, complete with filter sock, shall be to Section 33 46 16.

.d Pedestrian / Protective railings shall be to Section 05 52 00.

.e Guard Rails shall be to Division 34.

2. PRODUCTS

2.1 MATERIALS

.1 Concrete to Division 03

.2 Granular to Division 31

.3 Geo-Fabric to Division 31

.4 Sub-drainage to Section 33 46 16

.5 Timber to CAN3-056, pressure treated in accordance with CSA-080 Series.

.6 Wall system shall be to the Manufacturer's specifications, including joint fillers.

.7 Ensure components come from single manufactured system.

.8 Use only one type of soil reinforcing element on project.

3. EXECUTION

3.1 WEATHER

.1 No work is allowed during periods of snow and ice conditions or precipitation; defined as enough moisture to cause water to flow and / or pool.

.2 If concrete work is required as part of the work, weather restrictions for concrete shall be to Section 03 05 13.

3.2 ENVIRONMENTAL PROTECTION

Refer to Sections 01 35 43 and 01 57 13.

3.3 PREPARATION

.1 Ensure the surface is to grade and cross-section as specified on the drawing(s) or as directed by the Engineer.

.2 Contractor to obtain copies of manufacturer's installation specifications and provide one copy to the Engineer.

3.4 EARTHWORK

.1 Earthwork and granular material shall not be frozen or saturated.

.2 Earthwork shall be to Sections 31 23 33 and 31 24 13.

3.5 FOOTING / BASE

Construct to drawings, or as directed by the Engineer, and in accordance to manufacturer specifications; with adherence to Division 03 for concrete work and Division 31 for earthwork and aggregate materials.

3.6 WALL CONSTRUCTION

.1 Erect retaining product in accordance with recommendations of wall system supplier.

.2 Construct to lines, grades and elevations as indicated on the drawings or by direction from the Engineer.

.3 Provide temporary clamps, hardwood wedges or other means to properly align and level wall components, and to allow for rotation of panels as backfilling operations precede.

.4 Where panel sections are used, verse interlocking block or timers, brace, minimally, the first row of facing panels externally until the backfill reaches a height of 1500 mm.

.5 Install permeable joint fillers, geotextile filters, and other means, to prevent washing of backfill particles through joints in accordance with wall system supplier's written recommendations.

3.7 EARTHWORK REINFORCEMENT

.1 If geogrid or geotextile is required, refer to manufacturer specifications; with adherence to Section 31 32 19 and / or Section 31 32 21 respectively.

.2 For geogrids, pull and anchor taut before placing overlying backfill and ensure that slack in connections to facing panels is removed.

.3 Where soil reinforcement is metal strips (not geo-fabric) place this reinforcing element perpendicular to the facing panels, as indicated.

.4 Lay reinforcing elements horizontally, on compacted backfill.

.5 Connect to facing panels as indicated and in accordance with wall system supplier's written recommendations.

3.8 SUB-DRAINS

Construct to manufacturer specifications; with adherence to Section 33 46 16.

3.9 IMPERVIOUS BARRIER

Construct to wall supplier’s specifications where indicated on drawings or per Engineers direction.

3.10 BACKFILLING

Backfill behind wall components to the following requirements:

.1 Place backfill by closely following erection of each lift (row) of wall components and in accordance with wall system supplier's written recommendations.

.2 At each level of soil reinforcing elements, grade and compact backfill to same elevation as connections with facing panels, before placing reinforcing.

.3 Place backfill to ensure reinforcing elements do not buckle or are displaced.

.4 Ensure that backfill is in contact with soil reinforcing elements for full length of each element.

.5 Ensure backfill occupies open spaces between solid components of wire mesh and geogrids.

.6 Avoid sudden braking and sharp turning of tracked and rubber-tired equipment on backfill.

.7 Place backfill in direction away from wall components.

.8 Before operating tracked vehicles over geogrid area, place fill thickness of 200 mm (minimum) above level of geogrid reinforcing.

.9 Place and compact backfill without causing displacement or rotation of wall components beyond the supplier’s tolerances.

.10 Use only hand-held or hand-guided compacting equipment within 1000 mm of wall components.

.11 Backfill footing trench in front of wall as soon as required alignment of wall face is assured and approved by the Engineer.

.12 Backfill compaction, moisture density and additional requirements shall be in accordance with Section 31 23 33.

3.11 FINISH TOLERANCES

.1 All dimensions within ± 5 mm, including diagonals measured between opposite corners of panels.

.2 The top of the foundation shall be within ± 3 mm of specified elevations.

.3 The wall's (face) vertical alignment shall not deviate more than 15 mm from vertical over 3 m height or as specified by the supplier instructions.

.4 Where panels are used for the wall, the joints offsets shall not to exceed 20 mm.

.5 The wall's (face) horizontal alignment shall not deviate more than 18 mm over 3 m distance.

3.12 SAFETY

.1 Where pedestrian safety has been identified on the drawings or by the Engineer, a safety railing shall be required per Section 05 52 00.

.2 Where vehicle safety has been identified on the drawings or by the Engineer, a guard rail shall be required per Division 34.

3.13 CLEANING

Progress and final clean-up shall be in accordance with Section 01 74 11.

1. GENERAL

This section specifies standards for manufactured furnishings used in the Town's parks, recreational areas and streetscapes (e.g. waste receptacles, benches, etc.).

1.1 RELATED WORK

.1	Asphalt Pavement Removal	02 41 14
.2	Site Demolition	02 41 16
.3	Basic Concrete Materials and Testing Methods	03 05 13
.4	Concrete Formwork	03 11 00
.5	Concrete Reinforcement	03 20 00
.6	Cast in Place Concrete	03 30 00
.7	Rough Grading	31 22 13
.8	Granular Base	32 11 23
.9	Hot Mix Asphalt Concrete Paving	32 12 16
.10	Removal and Replacement of Concrete Work	32 13 14
.11	Concrete Work	32 13 15
.12	Precast Paving Stone	32 14 20
.13	Topsoil and Finish Grading	32 91 19
.14	Mechanical Seeding	32 92 19
.15	Sodding	32 92 23
.16	Drawings	50 08 xx

1.2 REFERENCES

.1 The Town of Olds Trails Master Plan

1.3 MEASURE OF PAYMENT

.1 New Construction

.a Measurement for furnishings shall be paid at the contract unit rate, which shall be full compensation for the supply of the furniture, materials, labour, equipment, installation, and clean-up.

.b If site furnishings are part of a larger, multi-faceted project (e.g. subdivision development, new arterial road etc.) the following work items shall be considered incidental to the Work:

.i Earthwork (as defined in Section 31 22 13),

.ii Granular base work,

.iii Concrete pad,

.iv Asphalt pad work shall be paid to Section 32 12 16,

.v Paving stone pad work shall be paid to 32 14 20.

.c If site furnishings are a stand-alone project (e.g. retro-fitting an existing walkway or trail) the following work items shall be paid to:

.i Earthwork shall be in cubic metres placed (Section 31 24 13),

.ii Granular base work shall be in cubic metres placed (Section 32 11 23),

.iii Concrete pad shall be to Section 32 13 15,

.iv Asphalt pad work shall be to Section 32 12 16,

.v Paving stone pad work shall be to Section 32 14 20.

.d Where site furnishings require RPC specified sand bedding and surround, payment shall be in square metres, transported, placed and groomed.

.2 Remove and Replace

.a Where the work involves removal and replacement of existing furnishings, the pay item shall be per unit replaced only; removal, re-installation, disposal, etc. of the furnishing shall be considered incidental to the work.

.b Concrete or paving stone pads located with furnishings specified as "Remove and Replace" shall be measured and paid to Section 32 13 14.

.c Asphalt pad removal shall be considered incidental to the Work if the pad is amalgamated with a sidewalk or trail designated for removal.

.d A stand-alone asphalt pad designated for removal shall be paid to Section 02 41 14.

2. PRODUCTS

2.1 GENERAL

.1 Subdivision and Furniture Types

.a Furnishings for Park Systems and subdivisions shall be vinyl coated steel products as noted in Division 50 drawings. (unless approved by the Town prior to)

.2 Structural and Finish Characteristic:

.a Where concrete is used for post support it shall be 20 MPa, unless noted otherwise, cast-in-place construction to Section 03 30 00.

.b Frame shall be constructed of steel or heavy duty aluminum unless noted otherwise.

.c Seating areas and non-structural surfaces shall be constructed from 1.9mm (14 GA) standard steel plate.

.d Finishes shall be powder coated or vinyl coated, excepting composite materials, unless noted otherwise. Galvanization of metal is optional (not to be combined with other finish types). Type of finish treatment based on usage, durability, esthetics, and manufacturer’s recommendations.

.e The coating is to provide a minimum of 10 years protection from the natural elements and have an anti-graffiti compound within the coating or applied separately over the exposed surfaces.

.f All furnishing pieces shall be shaped with rounded edges and corners and smooth surfaces.

.g All fasteners shall be stainless steel.

.h The colour of the furnishing, as identified in items 2.2, 2.3, 2.4, 2.5, 2.6, shall be black unless noted otherwise in this Section or in the Unit Price Contract.

.i The colour of the frame, as identified in items 2.2, 2.3, 2.4, 2.5, 2.6, shall be black unless noted otherwise in this Section or in the Unit Price Contract.

.j Pre-drilled anchor holes for ground mount (plate and bolts) or fittings for direct bury (post and concrete pile), as identified in items 2.2, 2.3, 2.4, 2.5, 2.6, shall be per Contract Specification drawings 50 08 xx.

.k Units to be delivered to a storage facility for assembly and “made ready” for installation.

.3 Electrical Components

.a All products to be CSA approved.

.b Solar powered is preferred verse direct power.

.c Where illumination power is provided from the Town grid the following will be required:

.i Where an illuminated amenity is separated or not easily connected to a circuit, that amenity shall have an individual isolation breaker.

.ii Multiple luminaires shall be connected in a circuit(s).

.iii Circuits shall be protected (or isolatable) by a breaker per circuit, provided in a panel box with a meter base.

.iv The meter base shall be covered with a protective “blank” unless a meter is required per the Contract.

.v An individual breaker or a panel box and meter base shall be installed in a weather proof, securable cabinet, located adjacent to a public access area for ease of maintenance. The security of the panel shall be the appropriate electrical codes.

2.2 BENCH

.1 Length range from 1500 mm to 2400 mm,

.2 Back height between 762 mm to 813 mm off the ground,

.3 Seating width from 450 mm to 660 mm.

.4 Seating height between 430 mm to 500 above finished ground.

.5 Optional mid-bench divider compatible.

.6 Seat and back rest to be either perforated or slated to allow for drainage.

.7 Seating and non-structural surfaces shall be to Division 50 drawings.

2.3 TRASH AND/OR RECYCLING RECEPTACLE

Receptacles shall be a vertical strap frame style and not a fully enclosed unit. Refer to Division 50 drawings.

.1 Single Receptacle

.a Single Receptacle diameter from 500 mm to 700 mm,

.b Receptacle height from 550 mm to 700 mm,

.c Support leg shall be constructed of a 60 mm (O.D.) by 3.41mm (10 GA) in-line galvanized allied tube finished with super durable polyester powder.

.d One separate 90 L galvanized can or removable commercial grade plastic liner, and

.e ABS lid with top opening and fastening system capability to be locked.

.2 Multi-purpose Recycling Receptacle

.a Width from 500 mm to 700 mm,

.b Length from 140 mm to 160 mm,

.c Receptacle height from 600 mm to 1000 mm

.d One separate 90 L galvanized can or removable commercial grade plastic liner, per commodity, and

.e ABS lid with top opening and fastening system, per commodity, with capability to be locked.

.f Lid style to provide a “flush” look to the top of receptacle.

.g Lid openings for trash shall be round and coloured black.

.h Lid openings for bottle units shall be round and coloured blue.

.i Lid openings for paper shall be rectangular and coloured green.

2.4 ASH URN

.1 Shall be a side mount; compatible to the Trash / Recycle receptacle.

.2 Manufactured using solid cast aluminum.

.3 Height range from 200 mm to 300 mm,

.4 Width range from 200 mm to 250 mm, and

.5 Diameter range from 150 mm to 200 mm.

2.5 PICNIC TABLE

.1 Seating

.a Seat length range from 1500 mm to 2100 mm (where wheel chair accessibility is required the seating opposite the wheel chair access may be longer – to match the table top length),

.b Seating height between 430 mm to 500 mm off the ground,

.c Seat width from 580 mm to 660 mm.

.d Optional mid-bench divider compatible.

.e Seat and back rest to be either perforated or slated to allow for drainage.

.2 Table Top

.a Length range from 1500 mm to 2100 mm (where wheel chair accessibility is required – use longer length),

.b Height of 750 mm to 863 mm off the ground, and

.c A width from 610 mm to 711 mm.

.d Top to be either perforated or slated to allow for drainage.

2.6 BICYCLE RACK

.1 Single Stand

.a 50 mm tubing,

.b Width between 500 mm to 840 mm diameter ring, and

.c Height between 890 mm to 990 mm from the ground.

.2 Multiple Stand

.a 50 mm tubing configured to support multiple bikes,

.b Length between 863 mm to 1700 mm,

.c Width between 559 mm to 1300 mm,

.d Height between 559 mm to 915 mm from the ground,

2.7 PLAYGROUND STRUCTURE

All playground equipment purchased, installed or maintained by The Town of Olds, the Chinook Edge Public School Board or the Red Deer Catholic Board of Education must conform to the following requirements and specifications. Any variations from the following specifications must be requested and approved, in writing, by The Town of Olds Operational Services Department.

.1 General

.a All apparatus shall conform to C.S.A. Standard Z614-98, or any updates or amendments to this standard.

.b Maximum overall height of non-enclosed platforms shall not exceed 1.98 m (78").

.c Maximum critical fall height of all equipment shall not exceed 3.00 m (120").

.d Minimum safety zones shall be in accordance with CSA Standards. Minimum safety zone for stationery equipment shall be 2.13 m (84").

.e Minimum safety zones between adjacent pieces of stationery equipment with a designated play surface height of 0.76 m (30") or greater, shall be 2.74 m (108").

.f All equipment shall be free of overhead obstructions for a distance of 2.13 m (84") above the highest designated play surface or pivot point of swings.

.g Slide exit zones shall not overlap sides of adjacent slide exit zones or other equipment safety zones.

.2 Platforms

.a Platform surfaces shall be vinyl clad, 13-gauge steel.

.b Platform sections shall be one piece construction.

.c Edge of platforms shall be a minimum 6.35 mm (.25") radius.

.d Platforms shall have a minimum surface area of 0.84 sq. m. (9 sq. ft).

.e Minimum cross-measurement of all platforms shall be 914 mm (36") or greater in all directions.

.f Triangular platforms shall be used only in conjunction with other platforms of equal elevation, when play components are directly attached to the platform. Triangular platforms with surface area greater that 0.74 sq. m. (8 sq. ft.) shall be exempt.

.g Protective infills between adjacent platforms shall be vinyl clad perforated 13-gauge steel, or powder coated galvanized steel.

.3 Posts

.a All support post shall be a minimum of 76 mm (3") square 11-gauge galvanized tubing, or 89 mm (3.5") round 11 gauge galvanized tubing c/w polyester powder coat finish.

.b Post caps shall be secured by means of electronic weld, rivets or interference fit rib.

.c Length of posts shall allow for 305 mm (12") protective surface and 610 mm (24") concrete footings.

.4 Barriers / Guardrails

.a Barrier panels shall be a minimum of 1200 mm (47") height, regardless of age designation.

.b Barrier panels shall be required on all platforms greater than 711 mm (28") in height, regardless of age designation.

.c Guardrails shall be in accordance with height and dimension requirements of CSA Standards.

.d Guardrails shall be required on all platforms greater than 500 mm (19.7”) in height, regardless of age designation.

.e Vertical plane of guardrails & barriers shall be within 25 mm (1") of perimeter of the platform, landing, walkway or ramp.

.f Openings in barriers shall be a maximum of 375 mm (14 3/4"). Partial barriers shall be vertical rung type, meeting all requirements for barrier panels. "D" handles shall not be accepted as barriers on platforms.

.5 Stairs, Steps, Ramps

.a All stairs, steps, or ramps shall have a minimum of two handrails on each side of apparatus. Height of handrails shall be in accordance with CSA Standards.

.b Handrails for stairs, steps or ramps shall be between 24 mm (.95") and 39 mm (1.55") in diameter. Dimensional lumber shall not be used as handrails.

.c Stepping surface of stairs, steps & ramps shall be vinyl clad, perforated 13-gauge steel.

.d Stair risers shall be vinyl clad, perforated 13-gauge steel.

.6 Transitions

.a All climbing apparatus shall have one means of alternate hand support on each side of transitional opening to platform.

.b Platforms with elevation differences in excess of 305 mm (12") or 457 mm (18") (dependant on age designation) shall have alternate means of hand support on each side of transitional opening.

.c Platforms with elevation differences in excess of 305 mm (12") or 457 mm (18") (dependant on age designation) shall have an access component at a mid-point between elevations. Access component shall be finished with polyester powder coat or vinyl clad.

.d Elevation change between adjacent platforms shall not exceed 737 mm (29").

.e Inclined connector ramps between platforms shall require guardrails or barriers in accordance with the requirements of the adjacent platform with the greatest elevation.

.7 Bridges

.a Bridges shall be a minimum of 2.44 m (96") in length.

.b Bridge decks shall contain no tripping hazards, and shall have a minimum width of 305 mm (12").

.c Horizontal dimension between bridge decks and adjacent platform shall not exceed 38 mm (1.5").

.d Bridge decks shall be vinyl clad, perforated 13-gauge steel.

.e Bridge rails shall meet the requirements for barriers / guardrails as applicable.

.f Suspended bridges shall be secured by means of clevis hooks or bearing hangers. Quick links or "S" hook shall not be accepted.

.8 Upper Body Equipment

.a Overhead apparatus shall be a minimum of 2.44 m (96") in length.

.b Platform elevation for all overheads shall be a minimum of 305 mm (12") and a maximum of 610 mm (24").

.c Elevation of overheads shall be a minimum of 1.22 m (48") greater than the elevation of the adjacent platform.

.d Chains or cables utilized to suspend handgrips of overhead equipment shall comply with the requirements for "Looping" in accordance with CSA Clause 12.5.2.

.e Elevation of Track Rides shall be 1.83 m (72") to 1.98 m (78") above protective surface.

.f Platform elevation for track rides shall be a minimum of 305 mm (12") and a maximum of 533 mm (21").

.g Hand-gripping components of track rides shall be rigid in design, and shall not be capable of striking the user.

.h Upper body equipment shall not be located directly adjacent to bridge or platforms with an elevation greater than 381 mm (15") above the elevation of the platforms serving the respective upper body apparatus.

.9 Climbers

.a Chain climbers shall have horizontal pipe rungs only.

.b Top surface of vertical type climbers including but not limited to spiral climbers, tree climber, beanstalk climbers, and loop poles shall be a minimum of 1.52 m (60") above platform surface.

.c Climbing nets shall adjoin to a maximum platform height of 1.22 m (48").

.d Climbing nets shall meet the requirements for "Looping" in accordance with CSA Clause 12.6.2.

.e Adjacent portions of climbing nets shall not be capable of crossing over the plane of each other.

.10 Slides

.a Exit section of slide bed shall be a minimum 10 mm (.390") radius.

.b Slide entry elevation shall be no greater than 203 mm (8") above adjacent platform elevation.

.c Support posts of slide exit shall be recessed inside width of the outer dimension of the slide exit section.

.d Center support posts of slide bed-way shall be recessed inside the width of the outer dimension of the side bed-way.

.e Slide support posts shall be a minimum of 32 mm (1.25") steel tubing, galvanized, plated, or powder coated.

.f Tube slides shall be a minimum of 711 mm (28") inside diameter.

.11 To-Fro Swings

.a To-Fro swings shall be a maximum height of 3.05 m (120") above protective surfacing.

.b Seat & chains shall be connected by means of quick links, clevis hooks, or hammerlocks. "S" hooks shall not be permitted.

.c Bearing hanger shall be complete with oil impregnated bronze bushings.

.d Wrap free swing hangers shall be maintenance free with internal bushings or bearings.

.e Swing seats shall be made of shock absorbing materials with vandal resistant insert.

.f Infant seats shall be "bucket type", made of shock absorbing materials.

.12 Tire Swings

.a Tire swings shall be single bay only. Multiple tire swing units will **not** be accepted.

.b Tire swing swivel shall be complete with protective covering.

.c Tire shall be connected by means of lifting bolt and quick link, clevis hooks, or hammerlocks. "S" hooks shall not be permitted.

.13 Miscellaneous Apparatus

.a Balance beams shall be a maximum of 305 mm (12") above protective surfacing.

.b Crawl tubes shall be a minimum of 762 mm (30") inside diameter.

.c Crawl tubes shall be a maximum length of 2.44 m (96").

.d Roofs shall not be permitted over platforms, landings, walkways or ramps in excess of 914 mm (36") elevation.

.14 Hardware

.a Fastening devices shall be tamper resistant.

.b All set screws shall be secured by means of liquid thread-lock.

.c All fastening devices shall be capped or recessed.

.d All hardware shall be plated steel or stainless steel.

.e All hardware on posts shall be recessed or button head. Nuts shall be T-nut or sleeve nut.

.f All chains shall be 6.35 mm (1/4") or 7.94 mm (5/16") zinc plated or vinyl coated. Galvanized chains shall not be accepted.

.15 Footings

.a Footings shall be smooth sided and uniform diameter.

.b Footings shall be a minimum of 305 mm (12") diameter, 610 mm (24") depth, trowel finished on top to an elevation of 25 mm (1") below excavated depth.

.c Minimum strength of concrete shall be 25 mpa or greater.

.16 Warranty

.a Plastic warranty shall be a minimum of 5 years materials & workmanship.

.b Steel component warranty shall be a minimum of 10 years materials & workmanship.

.c Platform warranty shall be a minimum of 15 years materials & workmanship.

.d Steel posts warranty shall be a minimum of 25 years materials & workmanship.

.e Moving parts and swing seat warranties shall be a minimum of 1 year materials & workmanship.

.17 Prohibited Equipment

The following types of equipment are **prohibited** on all playgrounds owned, operated or maintained by The Town of Olds.

- Wood Structures
- Wood Posts
- Cable Rides or Pulley Rides
- Wheelchair Swings
- Horizontal Chain or Rope Climbers
- Horizontal Chain or Rope Bridge
- Tire Bridges
- Balance Cables
- Merry - go - rounds or other vertical axis equipment
- Suspended bridges using quick links as load bearing.

.18 Excavation

.a The sand area for the apparatus shall be excavated to a minimum depth of 356 mm (14 inches) below existing ground level, depending on site conditions (i.e. Slopes, excessive topsoil depth, drainage patterns, subgrade soil conditions).

.b Elevations may require adjustment with approval of Operational Services representative.

.c All supporting posts shall be enclosed in a minimum of 76 mm (3 inches) of concrete or 152 mm (6 inches) for “active” or moving equipment.

.19 Sand

.a The clean, washed sand will be placed to a minimum depth of 305 mm (twelve inches), leaving 51 mm (2”) of free space from the top of the surround to the sand level.

2.8 BOLLARD

.1 Material

.a Hollow Structural Steel tubing, various gages, refer to drawings 50 07 xx.

.b Decorative top and base may be cast aluminum.

.2 Styles

.a Swing Gate bollard for trails and limited vehicle access areas.

.b Post type for delineation between vehicle / pedestrian areas.

.c Optional post type with illumination, solar powered preferred.

.d Removable post to have fastener system which is padlock compatible.

.3 Dimensions

.a Height between 860 mm to 965 mm.

.b Diameter between 200 mm to 250 mm.

2.9 TREE GRATE

Cast Iron per Norwood Foundry NF-524 Tree Grate.

2.10 TRAIL SIGNAGE

.1 Structural Material

.a Welded steel column anchored to concrete pile preferred. Alternate: steel column embedded directly in ground *(Note: only for areas of limited access)*.

.b Welded steel framing members,

.c Ductal or Glass Fibre Reinforced Concrete (GFRC) slab faces for sign mounting. The GFRC shall be cast with a Pantene tone colour pigment additive and cast with the park or project name and The Town of Olds logo in the structure itself.

.d Graphic panels (sign) shall be manufactured from a phenolic (resin) fused compound.

.2 Typeface

.a Primary and secondary messages shall be in the typeface (font) Helvetica Neue 55 Roman.

.b Tertiary messages shall utilize Gill Sans MT.

.c Unless otherwise specified typeface shall be consist with The Town of Olds Corporate Standards Identity Guide.

.d Typeface size will be dependent upon sight distance, form of travel when viewing, location, etc.

.e Operational Services Department to accept typeface size and general layout prior to sign installation.

.3 Colour

.a Colours used in the signage shall be per The Town of Olds Corporate Standards Identity Guide.

.b If the colours, per Town standard, cannot be achieved a sample(s) shall be made and reviewed by the Parks Section for colour matching purposes; adjustments to be made accordingly.

.4 Signage Classification

.a Entry Sign

.i Positioned at main entrance, perpendicular to approaching traffic.

.ii Minimum distance of 2.0m from the outside edge of roadway to the inside edge of sign.

.iii Maximum distance of 4.5m from the outside edge of roadway to the inside edge of sign.

.b Nodal Sign

.i Positioned at parking access point or appropriate node.

.ii To be placed to be visible from the parking area, while facing the trail or node.

.iii Sign should be as close to the trail or node as possible without interfering with pedestrian traffic.

.c Marker Sign

.i Placed in a visible location, a minimum of 0.30 m to a maximum of 2.00 m away from the outside edge of roadway or parking stall, without obstructing traffic visibility.

.d Trail Sign

.i Positioned to face the trail, a minimum of 0.50 m from the approximate edge of the trail, to a maximum of 1.50 m.

.e Interpretive Sign

.i Position parallel to the trail, offset from the general traffic flow; aligned to the view or subject of the sign and placed to avoid obstructing the view.

.5 Cleaning

Signs shall be cleaned using the following method:

.1 Flush surface with clean water to remove any loose dirt and soften accumulated grime.

.2 Pressure wash concrete with a non-abrasive biodegradable, environmentally friendly detergent.

.3 Wash graphic elements with a soft brush, rag or sponge and a mild, non-abrasive biodegradable, environmentally friendly detergent. A list of appropriate cleaners is available from the signage manufacturer.

.4 Wash from the top down, taking care not to “over scrub” and abrade the sign surface of the anti-graffiti coating.

.5 Rinse the entire sign with clean water and allow to dry.

.6 Over the long-term, if the sign displays efflorescence (a leaching of minerals displayed on the surface as a whitish tint) restoration is possible with an acid wash. Upon completion of the acid wash a re-application of the anti-graffiti coating will be required.

2.11 NEIGHBOURHOOD PARK SIGNAGE

.1 Substrate

.a 610 mm (24”) vertical by 914 mm (36”) horizontal, 12 gauge aluminum.

.2 Font type and sizes

.a Font used is Helvetica Med. Acct. A.K. Rev. R

.b 1st line – Park name text height is 76 mm (3”).

.c 2nd line – “Neighbourhood Park” text height is 57 mm (2.250”).

.d 3rd line – Circles containing Pictographs height is 75 mm (3”). Number of Pictographs varies according to the amenities offered at each individual park.

.e Top left corner above 1st line is The Town of Olds logo: 70 mm (2.750”) vertical by 248 mm (9.750”) horizontal; 140 mm (5.5”) in from left edge of sign and 83 mm (3.250”) down from top edge of sign.

.f 1st, 2nd, and 3rd lines are centered within the sign dimensions.

.3 Colour

.a Parchment – Avery 900-905-0 vinyl for all text and Pictographs.

.b Black – Avery 900-790-0 vinyl for background.

.4 Signage Classification

This is for subdivision entry (or wayfinding) signs; the placement is determined by Recreation, Parks and Culture department.

3. EXECUTION

3.1 PRE-CONSTRUCTION SUBMITTALS

Provide information regarding the various furnishings proposed in accordance with Section 01 33 00 - Submittal Procedures.

3.2 DELIVERY, STORAGE, AND HANDLING

Deliver, store and handle materials in accordance with Section 01 61 00.

3.3 NOTIFICATION

Provide The Town 7 days notification prior to installing of site furnishings.

3.4 WEATHER

.1 When asphalt paving is required refer to Section 32 12 16.

.2 When concrete work is required, refer to Section 03 05 13.

3.5 EARTH AND/OR BASE WORK

.1 Depending upon the Contract and / or existing conditions, ensure the furnishing's site base is to grade and cross-section as designated in drawings or by the Engineer.

.2 If earthwork is required for a pad, refer to Division 31 for clearing and rough grading, excavation and compaction requirements.

.3 If aggregate base work is required for a pad, refer to Sections 32 11 16 and 32 11 23.

3.6 INSTALLATION

.1 General

.a In coordination with a Town representative and prior to installing a constructed pad or mounting pile verify the location, grade, size, finish etc. of the pad or pile is acceptable for the furnishing to be installed; and is in accordance with manufacturer's written instructions.

.b Proceed with installation only after unacceptable conditions have been remedied and after receipt of a written approval to proceed from a Town representative.

.c All areas surrounding installed furniture will be completed to finish grade, not exceeding 25mm variation from design.

.2 Pile Mount

.a Drill hole for pile (optional: install tube form) and place concrete per Section 03 30 00. Minimum pile diameter to be 300 mm.

.b Install post while concrete is fresh; Secure post plumb and true until concrete set (minimum of seven days).

.c Mount sign or furnishing to post with applicable brackets, fasteners or straps.

.3 Surface Mount

.a Remove excess clay base and / or fill surface area with sand to design grade,

.b Compact sand base,

.c Install (reinforced) concrete pad per Sections 03 30 00 (03 20 00) or paving stone per Section 32 14 20.

.d Install furnishing by affixing to concrete (or paving stone) with anchor bolts.

.4 Glass Fibre Reinforced Concrete (GFRC) Signage

.a Install concrete pile and grade beam including steel mounting brackets. Top of grade beam to be 380 mm below finished grade.

.b GFRC panel shall be mounted flush to the concrete base by a system of steel brackets and bolts.

.c Graphic panels mounted with bolts from the backside. Bolt heads to be countersunk and the holes capped to form a flush surface.

.5 Curbing

Install the containment barrier surround for those sites specified by drawing or as required per this Section.

.6 Furnishing or Signage

.a Assemble and install furnishings in accordance with manufacturer's written recommendations.

.b Graphic panels (sign) shall be bolted to the GFRC concrete panel structure.

.c Ensure all signs have been mounted to their respective sign post.

3.7 FINISH

.1 Surround

Depending upon the location and usage of the furniture or sign, the disturbed area around the furniture or sign shall be finished per drawing or as designated by Operational Services, with one of the following:

.a Washed pea-gravel including a weed control fabric,

.b Bark mulch including a weed control fabric,

.c Topsoil including hand cast grass seed or sod per Sections 32 91 19, 32 92 19 or 32 92 23 respectively,

.d Asphalt or concrete if consolidated with a trail or sidewalk that may be accessible to pedestrian or cyclist.

.2 Furniture

.a Install trash cans or liners in receptacle and ensure lid is fastened to receptacle.

.b Install rubber pavement (matting) around gym equipment.

.c Place pea-gravel around playground equipment.

.d Touch-up damaged (scratched) furniture finish as required.

3.8 CLEANING

.1 All cement tailings will be cleaned off furniture immediately after installation.

.2 Clean site in accordance with Section 01 74 11.

.3 Clean all furnishings and signage in accordance to manufacturer's instructions.

3.9 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by site furnishings installation.

3.10 CLOSEOUT SUBMITTALS

Provide maintenance data for care and cleaning of site furnishings for incorporation into a manual as specified in Section 01 78 00 - Closeout Submittals.

1. GENERAL

This Section specifies requirements for final site grading and topsoil finishing in preparation for new vegetation and plant material.

1.1 RELATED WORK

.1	Rough Grading	Section 31 22 13
.2	Mechanical Seeding	Section 32 92 19
.3	Hydraulic Seeding	Section 32 92 21
.4	Sodding	Section 32 92 23
.5	Tree and Shrub Preservation	Section 32 93 50

1.2 DEFINITIONS

.1 Topsoil

A fine friable medium loam, capable of sustaining good agricultural growth, meeting accepted horticultural practices and approved the Town Engineer.

1.3 SAMPLES AND TESTING

.1 Supply to the Engineer, four (4) weeks prior to start of topsoil placement, a one-litre sample of topsoil to be used in the Work.

.2 Subject to the results of soil testing, the Engineer may make recommendations for modifications to the soil to make it acceptable for use in the Work. Any modifications or additives required will be considered incidental to the Work.

.3 Once the Engineer has accepted the topsoil, a (modified, if applicable) sample will provided to Operational Services for approval to use in the Work. This sample shall be provided two weeks prior to placement of the topsoil.

.4 When the source of such topsoil is exhausted, topsoil from a new source shall not be used until tested and approved per the steps noted in this clause.

1.4 MEASURE OF PAYMENT

.1 Topsoil placed and prepared, from on-site source, will be measured in the field for payment by the square metre, per the depth specified.

.2 Imported topsoil (off-site source) placed and prepared will be measured in the field for payment by the square metre, per the depth specified. Free haul shall be unlimited.

.3 Fine grading of subgrade will be measured in square metres.

.4 Herbicide applied according to manufacturer's recommendations will be considered incidental to the preparation of the topsoil. There will be no separate payment for herbicide.

.5 Unit price bid shall be full compensation for all work involved in supplying, hauling, placing, and treating topsoil.

2. PRODUCTS

2.1 MATERIALS

.1 Topsoil

.a Contain a minimum 4% organic matter for clay loams and a minimum 2% for sandy loams.

.b Acidity range (pH) of 6.0 to 7.8.

.c Free of subsoil, roots, vegetation, weed seeds, stones larger than 50 mm in greatest dimension or any other extraneous material.

.d Topsoil containing noxious weeds is not acceptable.

.2 Herbicide

"Round-Up" or other approved chemical base glysophate equal.

3. EXECUTION

3.1 PREPARATION

.1 Prior to commencing any placement work, the Contractor shall ensure all surface fixtures related to deep and shallow utilities are clearly marked to prevent disturbance or bury during the work. Repair and / or exposure of a utilities surface fixture shall be at the Contractor’s expense.

.2 Verify grades per the drawings or as directed by the Engineer.

3.2 WEATHER

All work under this Section shall be on non-precipitation days and dry, unfrozen, ground conditions.

3.3 PROTECTION

.1 Existing Surface Features

Protect existing buildings, private lawns, fencing, service poles, wires or concrete located along or adjoining properties from damage while work is in progress. Repair to Engineer's satisfaction any damage, which may occur, at contractor's expense.

.2 Environmental

.a Protect existing trees and shrubs in accordance with Section 32 93 50.

.b Install or ensure erosion and sediment control measures are in-place prior to undertaking any topsoil spreading activity where storm water drainage is picked up or flows; along a roadway curb and gutter or field drain or ditch drain including culverts (to prevent sediment build-up in the culvert).

.c Erosion and sediment control shall be to Section 01 57 13.

3.4 DUST CONTROL

When ground conditions are such that dust becomes a nuisance, the dust shall be controlled per Section 01 57 13. If a truck haul is required as part of the work maintenance and dust control of the haul route shall be per Section 01 53 40.

3.5 SUBGRADE PREPARATION

.1 Work existing subgrade to eliminate high areas, shallow areas, ridges, lumps etc. left over from earthwork.

.2 Correct sub-grade contours that are not within 300 mm below final surface elevations.

.3 Modify sub-grade elevation due to design changes, as directed by the Engineer; ensuring sub-grade is within 300 mm below the revised final surface elevations.

.4 For requirements related to importing of or removal of sub-grade material refer to Section 31 22 13.

.5 Ensure sub-grade has defined drainage routes matching drawings or as directed by the Engineer.

.6 Where matching to adjacent, existing, surfaces ensure the sub-grade is 300 mm below the existing surface elevation.

.7 Remove debris (includes building materials), roots, branches, and stones in excess of 50 mm diameter.

.8 Remove subsoil that has been contaminated with oil or gasoline. This will be considered contaminated material and shall be handled per Section 31 22 13.

.9 For isolated areas of new construction or re-establishment of an existing green space: re-shape, remove, or import sub-grade material, as required and applicable, to ensure positive drainage and bring site to grade in preparation for new topsoil.

3.6 TREATMENT

.1 At the discretion of the Engineer (or if a pay item is included in the Contract); if the subgrade has been exposed for more than one season and significant weed growth has occurred (estimated to be more than 10% of exposed subgrade) a herbicide shall be applied 10 days in advance of topsoil spreading to kill existing weeds and grasses on-site.

.2 The herbicide shall be applied during a time when no precipitation is forecast for the day(s) of application and the designated rest time noted above.

3.7 SUPPLY SOURCE

Extracted topsoil, from the supply source, shall be dry enough to allow for ease of spreading, lump break down, levelling, and without creating excessive tracking if a haul route use required that involves existing roadways.

3.8 ROUGH PLACEMENT

.1 Spread topsoil in uniform layers not exceeding 150 mm per lift based on light compaction.

.2 Work topsoil to breakdown lumps to no greater than 200 mm in diameter.

.3 Bring topsoil to a minimum depth of 300 mm, lightly compacted, or to within 50 mm of design contour elevations.

.4 For isolated areas of new construction or re-establishment of an existing green space: re-shape, remove, or import topsoil material, as required, to ensure positive drainage and match to existing, adjacent, surfaces.

3.9 FINISHING TOPSOIL

.1 Machine Finish

.a Prior to vegetating, place and level the final topsoil lift to final design grade; with a tolerance of 25 mm but not uniformly high or low. Ensure designated planting beds have the minimum depth of topsoil, as noted within this Section.

.b Scarify to a depth of 225 mm to break up the lower horizons without substantial mixing of the topsoil.

.c Blade finished surface free from ruts, depressions, rocks in excess of 50 mm, and debris.

.d Roll finished surfaces to a tight dense condition.

.e Ensure positive drainage to the appropriate storm drainage inlet, swale, channel or ditch.

.f Apply 10-47-0 or equivalent fertilizer at a rate of 450 kg/ha.

.2 Hand Finish

.a Place and level the final topsoil lift to finished grade or to match existing, adjacent, surface. Ensure designated planting beds and tree voids have the minimum depth of topsoil, as noted within this Section.

.b Rake finished surface free from ruts, depressions, rocks in excess of 50 mm, and debris.

.c Roll or compact with foot or rake, finished surfaces to a tight dense condition.

.d Ensure positive drainage to the appropriate storm drainage inlet, swale, channel or ditch, if applicable.

.e For landscaping repair work required due to “Removal and Replacement” refer to Section 32 13 14.

3.10 MATCH TO EXISTING

.1 Ensure that the topsoil is properly blended into the adjacent property.

.2 Manually spread topsoil around existing trees and plants to prevent damage by equipment.

.3 Care must be taken not to raise existing soil levels within drip line of existing plant material.

3.11 PLANTING BED PREPARATION

.1 Verify locations for planting beds per the drawings or as directed by the Engineer.

.2 Prepare loose friable seed bed by means of rotor-tilling to a depth of 150 mm.

3.12 TOLERANCES

.1 Finished topsoil shall have a minimum, finished, compacted depth of:

.a All areas requiring topsoil treatment: 300 mm, with these exceptions,

.b Bedding areas: 450mm

.c Confined tree bed: 600mm

.d Berm cover: 150mm

3.13 MAINTENANCE

.1 Maintain finished surfaces in a condition in accordance with this Section until acceptance by Engineer.

.2 Ensure erosion and sediment control measures are in-place and maintained per Section 01 57 13.

.3 The contractor shall maintain any haul route, used to support the project, to Section 01 53 40.

3.14 CLEAN-UP

.1 Remove and dispose of excess excavated material as directed by the Engineer.

.2 Remove and clean all adjacent hard surfaces of topsoil left from spillage or tracking.

.1 Additional clean-up requirements; refer to Section 01 74 11.

1. GENERAL

This Section specifies requirements for supplying and sowing of grass seed by mechanical or hand cast method.

1.1 RELATED WORK

.1 Topsoil and Finish Grading — Section 32 91 19

1.2 MEASURE OF PAYMENT

.1 Payment for seeding will be made at unit price bid per square metre of area seeded according to this Section.

.2 Areas of blending into existing turf grass will not be measured and shall be considered incidental to the Work.

.3 Preparatory work of weed and debris removal and disposal, fertilizing, and herbicide application shall be considered incidental to the Work.

.4 The use of treated Town water (hydrant supply source) shall be considered incidental to the Work unless the contract has a pay item for such. *(Note: The Town charges for water usage taken from Town hydrants.)*

.5 Unit price bid shall be full compensation for all work involved in supply, placement and warranty maintenance as described in this Section.

.6 If this Section is a separate contract from that of topsoil placement (Section 32 91 19) cost for re-grading, importing, or disposal of topsoil; preparatory work of weed and debris removal and disposal, fertilizing, and herbicide application shall be paid to Section 32 91 19.

2. PRODUCTS

2.1 GRASS SEED

.1 Fine Grass Mixture: Canada "Certified" seed, "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada Seeds Act and Seeds Regulations, according to the following grass seed mixture:

35%	Kentucky Blue Grass Species
60%	Creeping Red Fescue
5%	Perennial Rye

.2 Coarse Grass Mixture: Canada "Certified" seed, "Canada No. 1 Ground Cover Mixture" in accordance with Government of Canada Seeds Act and Seeds Regulations, as specified by the Engineer.

.3 Supply in packages individually labelled in accordance with Seeds Regulations and indicating name of supplier and date bagged.

2.2 WATER

.1 Free of impurities that would inhibit germination and growth.

.2 Supplied by Owner at designated source. If a Town hydrant is the source contact Town Hall at 403-556-6981 for permit.

2.3 EQUIPMENT

.1 Mechanical seeding:

.a Use "Brillion" type mechanical landscape seedier with sand discs which accurately places seeds at specified depth and rate and rolls in single operation.

.b Use equipment and method acceptable to Engineer.

.2 Manual seeding:

.a Use "Cyclone" type manually operated seedier.

3. EXECUTION

3.1 WEATHER

.1 Do not perform work when site conditions have frozen soil, snow cover, ice or standing water, excessively wet soil or during spring thaw or rain.

.2 Protect newly seeded area if soil is dry and weather is or the forecast is for strong winds. Employ wind erosion measures.

3.2 PREPARATION

.1 Verify locations to be seeded per drawings or as directed by the Engineer. Locate planting beds and individual plantings for avoidance of grass seed being placed.

.2 Prior to commencing any seeding work, the Contractor shall ensure all surface fixtures related to deep and shallow utilities are clearly marked to prevent

disturbance or bury during the work. Repair and / or exposure of a utilities surface fixture shall be at the Contractor's expense.

.3 Remove and dispose of weeds, rocks, branches, and debris which may have accumulated after topsoil finishing and prior to seeding as described in Section 32 91 19.

.4 Remove any topsoil lumps in excess of 50 mm in size.

.5 Ensure areas to be seeded are moist to a depth of 150 mm before seeding.

.6 If there is any discrepancies noted with grade, drainage (pooling water), excess topsoil material where matching to existing, adjacent, surfaces:

.a Where Contractor is the same for the Topsoil placement make good as per Section 32 91 19 at Contractor's costs.

.b Where separate contract is issued for this Work, notify Engineer and do not commence Work until instructed by Engineer.

.7 Ensure erosion and sediment control (ESC) measures are in-place where surface drainage may carry seed and topsoil to storm water infrastructure.

3.3 SEED PLACEMENT

Mechanical Seeding

.a On cultivated surfaces, uniformly sow fine grass seed at rate of 340 kg/ha and coarse grass seed at rate of 150 kg/ha.

.b Blend applications 150 to 300 mm into adjacent grass areas and previous applications to form uniform surfaces.

.c Sow half of required amount of seed in one direction and remainder at right angles.

.d Embed seed into soil to depth of 6 to 10 mm. Not less than 85% of seed to be placed at specified depth and covered by soil.

.1 Hand Seeding

.a For small areas of repair hand casting of seed shall be acceptable with the following restrictions:

.i Hand cast in an even motion trying to create an even distribution pattern of seed.

.ii Rake surface to ensure seed is evenly distributed.

.iii Lightly tamp with rake to ensure seed is properly embedded.

.iv Re-rake to ensure topsoil retains a flush and clean appearance while consolidating seed and topsoil.

.2 Consolidation

.a If soil conditions warrant (e.g. dry and windy); consolidate seed and topsoil by rolling the area immediately after seeding.

.b Use equipment and method appropriate for work site.

3.4 ESTABLISHMENT

.1 Cut grass to 50 mm whenever it reaches height of 100 mm from time of seed application until acceptance by Engineer.

.2 Repair dead or bare spots to allow establishment of seed prior to acceptance.

.3 Eliminate weeds.

.4 Contractor to remove or mulch clumps of freshly cut grass to avoid smothering new growth.

3.5 PROTECTION

.1 Protect seeded areas against damage and erosion (per Section 01 57 13). Remove protection measures after seeded areas have been established and accepted by Engineer.

.2 Avoid seeding along a road edge where freshly applied pavement markings may be contaminated or damaged.

.3 For small landscaped areas or areas in developed neighbourhoods, the contractor may install temporary barriers around newly seeded areas to keep pedestrian and vehicle traffic off.

3.6 ACCEPTANCE FOR ISSUE OF CONSTRUCTION COMPLETION CERTIFICATE

.1 Seeded areas will be accepted by Engineer provided that:

.a Areas are uniformly graded and seeding has established.

.b Areas are free of perennial weeds, rocks and debris.

.2 Deficiencies to be corrected prior to issuance of the Construction Completion Certificate.

3.7 MAINTENANCE DURING WARRANTY PERIOD

.1 From the issue date of the Construction Completion Certificate to the issuance of the Final Acceptance Certificate (as per required warranty period), perform the following maintenance operations:

.a Repair and reseed dead or bare spots, repair rutting and areas of settlement to satisfaction of Engineer.

.b Repaired areas must be cut at least three times and seed must be fully established before area will be accepted.

.c Cut grass to 50 mm whenever it reaches height of 100 mm.

.d Contractor to remove or mulch clumps of freshly cut grass to avoid smothering new growth.

.e Control weeds to provide minimum grass coverage of 85%. Control methods include manual, mechanical, cultural, biological, or chemical (as per Integrated Pest Management best practices). If pesticides are to be used, application must be in accordance with Federal, Provincial and Municipal regulations as and when required. Obtain product approval from the Operational Services Department prior to application.

.f Contractor will have the option of watering the seeded area to sustain new growth.

3.8 INSPECTION FORMS

Refer to Design Guidelines, Section 14 Appendixes.

3.9 CLEAN-UP

.1 Unless this Section is part of a multi-work contract, ESC measures may be removed once grass has been accepted through a Construction Completion Certificate.

.2 Sidewalk, trails, curbs and other surface areas not designated to be seeded shall be cleaned of tracked or spilled topsoil and seed.

1. GENERAL

This Section specifies seed, blanket cover, slurry preparation, application, and maintenance for hydraulic seeding.

1.1 RELATED WORK

.1 Topsoil and Finish Grading — Section 32 91 19

1.2 PRODUCT DATA

.1 Provide product data for:

.a Seed,

.b Mulch,

.c Tackifier,

.d Fertilizer,

.e Erosion Control Blanket,

.f Anchors.

.2 Submit in writing to Engineer 14 days prior to commencing work:

.a Size of truck slurry tank in litres.

.b Amount of material to be used per tank based on size of slurry tank.

.c Number of tank loads required per hectare to achieve specified slurry mixture per hectare.

1.3 MEASURE OF PAYMENT

.1 Hydro-seeding will be measured in square metres of actual surface area seeded according to this Section.

.2 Erosion control blanket supply and installation will be measured in square metres.

.3 Areas of blending into existing turf grass will not be measured and considered incidental to the Work.

.4 Preparatory work of weed and debris removal and disposal, fertilizing, and herbicide application shall be considered incidental to the Work.

.5 The use of treated Town water (hydrant supply source) shall be considered incidental to the Work unless the contract has a pay item for such. *(Note: The Town charges for water usage taken from Town hydrants.)*

.6 Unit price bid shall be full compensation for all work involved in supply, placement and warranty maintenance as described in this Section.

.7 If this Section is a separate contract from that of topsoil placement (Section 32 91 19) cost for re-grading, importing, or disposal of topsoil; preparatory work of weed and debris removal and disposal, fertilizing, and herbicide application shall be paid to Section 32 91 19.

2. PRODUCTS

2.1 MATERIALS

.1 Mulch:

.a Fibres: 99% organic content.

.b Free of growth inhibiting ingredients.

.c 100% potential water uptake by weight.

.d Capable of dispersing in water to form homogeneous slurry.

.e Capable of forming an absorptive mat ground cover allowing water percolation.

.2 Tackifier

Tackifer will be a water dilatable liquid dispersion containing polyvinyl acetate polymer emulsion.

.3 Erosion control blanket

.a To be specified by Engineer.

.b Anchors:

.i Staples: single or double prong "U" type, with minimum 2.5 mm diameter wire, minimum 150 mm high.

.ii Pegs: wooden, minimum 25 mm x 25 mm x 200 mm high.

.4 Water

.1 Free of impurities that would inhibit germination and growth.

.2 Supplied by Owner at designated source.
(Note: The Town may charge the contractor for water usage taken from a hydrant.)

.5 Fertilizer

Completely synthetic, with minimum 65% water soluble nitrogen. Ratio: 1:4:1 or approved alternate.

2.2 GRASS SEED

.1 Fine Grass Mixture

Canada "Certified" seed, "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada Seeds Act and Seeds Regulations, according to the following grass seed mixture:

35%	Kentucky Blue Grass Species
60%	Creeping Red Fescue
5%	Perennial Rye

.2 Coarse Grass Mixture

Canada "Certified" seed, "Canada No. 1 Ground Cover Mixture" in accordance with Government of Canada Seeds Act and Seeds Regulations, according to the following grass seed mixture:

90%	Crested Wheat - Stream Bank
10%	Creeping Red Fescue

.3 Supply

Packages to be individually labelled in accordance with Seeds Regulations and indicating name of supplier and date bagged.

2.3 EQUIPMENT

.1 Truck equipped with a 4500 litre (minimum) slurry tank and pumps capable of maintaining continuous, non-fluctuating flow of solution.

.2 Slurry tank to include a mechanical agitation system capable of operating during charging of the tank, discharging of the slurry and maintaining recirculation of slurry mix to avoid segregation of the mix.

.3 Appropriate sized, hand operated, hoses and nozzles.

3. EXECUTION

3.1 WEATHER

.1 Do not perform work when site conditions have frozen soil, snow cover, ice or standing water, excessively wet soil or during spring thaw or rain.

.2 Do not perform work when wind speeds are over or forecast to be over 20 km/hour during time of spraying and until blankets are placed.

3.2 PREPARATION

.1 Verify locations to be seeded per drawings or as directed by the Engineer. Locate planting beds and individual plantings for avoidance of grass seed being placed.

.2 Prior to commencing any spray work, the Contractor shall ensure all surface fixtures related to deep and shallow utilities are clearly marked to prevent disturbance or bury during the work. Repair and / or exposure of a utilities surface fixture shall be at the Contractor's expense.

.3 Remove and dispose of weeds, rocks, branches, and debris which may have accumulated after topsoil finishing and prior to seeding as described in Section 32 91 19.

.4 Remove any topsoil lumps in excess of 50 mm in size.

.5 Ensure areas to be seeded are moist to a depth of 150 mm before seeding.

.6 If there is any discrepancies noted with grade, drainage (pooling water), excess topsoil material where matching to existing, adjacent, surfaces:

.a Where Contractor is the same for the Topsoil placement make good as per Section 32 91 19 at Contractor's costs.

.b Where separate contract is issued for this Work, notify Engineer and do not commence Work until instructed by Engineer.

.7 Ensure erosion and sediment control (ESC) measures are in-place where surface drainage may carry seed and topsoil to storm water infrastructure.

.8 Obtain Engineer's approval of topsoil grade and depth before starting to seed.

3.3 SLURRY APPLICATION

.1 Slurry mixture applied per hectare:

.a Seed: 300 kg.

.b Mulch: 1600 kg.

.c Tackifier: 50 kg.

.d Fertilizer: 450 kg.

.e Water: quantity as required to form slurry in accordance with manufacturer's recommendations.

.2 Apply seed slurry uniformly. Caution to not over-apply slurry creating erosion channels.

.3 Blend applications into adjacent grass areas and previous applications to form uniform surfaces.

.4 Re-apply areas where application is not uniform.

.5 Prevent spraying items such as structures, signs, guardrails, fences, plant materials and utilities.

3.4 EROSION CONTROL BLANKET

.1 Apply blanket over designated areas in accordance with manufacturer's instructions.

.2 Anchor blanket in accordance with manufacturer's recommendations which are to be used as minimum standard and ensure that blanket is held down to maintain firm contact with soil.

3.5 ESTABLISHMENT

.1 Cut grass to 50 mm whenever it reaches height of 100 mm from time of seed application until acceptance by Engineer.

.2 Repair dead or bare spots to allow establishment of seed prior to acceptance.

.3 Eliminate weeds.

.4 Contractor to remove or mulch clumps of freshly cut grass to avoid smothering new growth.

3.6 PROTECTION

.1 Protect seeded areas against damage and erosion (per Section 01 57 13). Remove protection measures after seeded areas have been established and accepted by Engineer.

.2 Avoid seeding along road edge where freshly applied pavement markings may be contaminated or damaged.

.3 For small landscaped areas or areas in developed neighbourhoods, the contractor may install temporary barriers around newly seeded areas to keep pedestrian and vehicle traffic off.

3.7 ACCEPTANCE FOR ISSUE OF CONSTRUCTION COMPLETION CERTIFICATE

.1 Seeded areas will be accepted by Engineer provided that:

.a Areas are uniformly graded and seeding has established.

.b Areas are free of perennial weeds, rocks and debris.

.2 Deficiencies are to be corrected prior to issuance of the Construction Completion Certificate.

3.8 MAINTENANCE DURING WARRANTY PERIOD

.1 From the issue date of the Construction Completion Certificate to the issuance of the Final Acceptance Certificate (as per required warranty period), perform the following maintenance operations:

.a Repair and reseed dead or bare spots; repair rutting and areas of settlement to satisfaction of Engineer.

.b Repaired areas must be cut at least three times and seed must be fully established before area will be accepted.

.c Cut grass to 50 mm whenever it reaches height of 100 mm.

.d Contractor to remove or mulch clumps of freshly cut grass to avoid smoothing new growth.

.e Control weeds to provide minimum grass coverage of 85%. Control methods include manual, mechanical, cultural, biological, or chemical (as per Integrated Pest Management best practices). If pesticides are to be used, application must be in accordance with Federal, Provincial and Municipal regulations as and when required. Obtain product approval from the Parks Department prior to application.

.f Contractor will have the option of watering the seeded area to sustain new growth.

3.9 INSPECTION FORMS

Design Guidelines, Section 14, Appendixes J, K & L

3.10 CLEAN-UP

.1 Unless this Section is part of a multi-work contract, ESC measures may be removed once grass has been accepted through a Construction Completion Certificate.

.2 Sidewalk, trails, curbs and other surface areas not designated to be sprayed shall be cleaned of tracked or spilled topsoil and slurry.

.3 Additional clean-up requirements; refer to Section 01 74 11.

1. GENERAL

This Section specifies material, placement, preparation and maintenance for sodding.

1.1 RELATED WORK

.1 Topsoil and Finish Grading — Section 32 91 19

1.2 SOURCE QUALITY CONTROL

.1 Sod material supplied under this Section shall meet “Nursery Sod” requirements as defined in "Canadian Standards for Nursery Stock", published by Canadian Nursery Landscape Association and modified in the Section.

.2 Obtain approval from Engineer of sod at source.

.3 When proposed source of sod is approved, use no other source without written authorization.

.4 Provide a sod certification for grass species and location of source to the Operational Services Department upon demand.

1.3 SCHEDULING

Schedule sod placement to coincide with topsoil operations.

1.4 MEASURE OF PAYMENT

.1 Sod will be measured in square metres.

.2 Preparatory work of weed and debris removal and disposal, fertilizing, and herbicide application shall be considered incidental to the Work.

.3 The use of treated Town water (hydrant supply source) shall be considered incidental to the Work unless the contract has a pay item for such. *(Note: The Town charges for water usage taken from Town hydrants.)*

.4 Unit price bid shall be full compensation for all work involved in supply, placement, pegging and warranty maintenance as described in this Section.

.5 If this Section is a separate contract from that of topsoil placement (Section 32 91 19) cost for re-grading, importing, or disposal of topsoil; preparatory work of weed and debris removal and disposal, fertilizing, and herbicide application shall be paid to Section 32 91 19.

2. PRODUCTS

2.1 MATERIALS

.1 Nursery Sod

.a Shall be certified “Number One Turfgrass” sod of premium grade.

.b Permeated with a strong fibrous root system.

.c Provided in good, healthy, condition with no decay or bare spots.

.d To be of uniform texture and free from weeds, undesirable native grasses and foreign debris.

.e Shall contain adequate moisture to maintain its vitality during transportation and placement.

.f Grown on fertile topsoil, by a sod producer specializing in sod production and harvesting.

.2 Sod Type

.a Kentucky Bluegrass Sod

.b Sod grown from minimum mixture of three Kentucky Bluegrass cultivars.

.c Kentucky Bluegrass/Fescue Sod

.d Sod grown from minimum 50% Kentucky Bluegrass, 40% Creeping Red Fescue.

.3 Sod Tolerances

.a Sod shall be 18 to 24 months in age prior to harvesting.

.b Place sod within 24 hours of being lifted.

.c Broken, dry, deteriorated, damaged or discoloured sod shall be rejected.

.d Soil portion of sod shall be 15 mm in thickness.

.i Thickness of the soil portion of the sod may vary with field and environmental conditions at time of harvest. Note that the soil portion is generally composed of at least 50% volume of grass roots

.e Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.

.f Density of sod sufficient so that no soil is visible from a height of 1500 mm when mown to height of 50 mm.

.4 Fasteners

Wooden pegs shall be 17 mm x 17 mm x 200 mm construction grade spruce, straight, free of splits, and knots larger than 5 mm.

Commercial metal or plastic fasteners shall be staples or hooks.

.5 Mesh

Jute or bio-degradable geotextile fabric.

.6 Fertilizer

.a Synthetic, slow release fertilizer,

.b Granular in composition,

.c 35% water soluble nitrogen, maximum, and

.d 50% of elements derived from organic sources, minimum.

2.2 WATER

.1 Free of impurities that would inhibit germination and growth.

.2 Supplied by Owner at designated source. If a Town hydrant is the source, contact Town hall at 403-556-6981 for permit.

3. EXECUTION

3.1 WEATHER

.1 Do not perform work when site conditions have frozen soil, snow cover, ice or standing water, excessively wet soil or during spring thaw or rain.

.2 Sod shall not be placed when the air temperature is below 5^{o}C and the overnight forecast is for frost.

.3 If sod is placed during abnormally hot and / or dry conditions the contractor shall keep the sod and exposed topsoil optimally moist.

3.2 PREPARATION

.1 Verify locations to have sod placed per drawings or as directed by the Engineer. Locate planting beds and individual plantings for avoidance to sod being placed.

.2 Prior to commencing any placement work, the Contractor shall ensure all surface fixtures related to deep and shallow utilities are clearly marked to prevent disturbance or bury during the work. Repair and / or exposure of a utilities surface fixture shall be at the Contractor's expense.

.3 Remove and dispose of weeds, rocks, branches, and debris which may have accumulated after topsoil finishing and prior to sod placement, as described in Section 32 91 19.

.4 Import or remove excess topsoil, as required, to meet final design contour elevations.

.5 Remove topsoil lumps in excess of 50 mm in size.

.6 Ensure areas to have sod are moist to a depth of 150 mm before placing.

.7 If there is any discrepancies noted with grade, drainage (pooling water), excess topsoil material where matching to existing, adjacent, surfaces:

.a Where Contractor is the same for the Topsoil placement make good as per Section 32 91 19 at Contractor's costs.

.b Where separate contract is issued for this Work, notify Engineer and do not commence Work until instructed by Engineer.

.8 Ensure erosion and sediment control (ESC) measures are in-place where surface drainage may carry loosened topsoil or over-spray of fertilizer and herbicide, to storm water infrastructure.

3.3 FERTILIZING

.1 Apply fertilizer prior to placing sod.

.2 Lightly rake and incorporate fertilizer into topsoil.

3.4 LAYING OF SOD

.1 Firm sod bed by rolling before laying sod as necessary.

.2 Lightly moisten and rake soil prior to laying sod.

.3 Lay sod in rows, perpendicular to grade, with joints staggered. Butt sections closely without overlapping or leaving gaps between sections.

.4 Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

.5 Water sod immediately after laying to obtain moisture penetration into top 100 mm of topsoil.

.6 Cut and remove all irregular, unhealthy and thin sections of sod with a sharp knife and install new replacement sod.

3.5 LAYING SOD ON SLOPES

.1 Where sod is to be placed on sloped areas 3:1 and steeper the following shall be required:

.2 Install a geotextile fabric netting on top of topsoil on the slopes indicated. Secure mesh in place with wooden pegs, plastic hooks or metal staples at a maximum spacing of 1.0 m. Cover mesh with a thin layer of topsoil.

.3 Initiate sod installation from bottom of slope, lay perpendicular to slope

.4 Secure sod with wooden pegs placing 4 to 6 wooden pegs per square metre of sod, to prevent shifting of sod. Drive pegs 10 mm below top of grass line or flush with top of sod soil.

.5 Where sod is placed in a drainage swale, place six pegs around entire edge of each square metre of sod.

3.6 ESTABLISHMENT

.1 Cut grass to 50 mm whenever it reaches a height of 100 mm from time of seed application until acceptance by Engineer.

.2 Remove or mulch clumps of freshly cut grass to avoid smothering new growth.

.3 Water sod areas in sufficient quantities and at frequency required to maintain soil under sod continuously moist, to a depth of 70 to 100 mm.

.4 Eliminate weeds.

.5 Replace dead sod and / or repair bare spots.

.6 When environmental conditions allow, all sod areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the sod type.

3.7 PROTECTION

.1 Protect sod against erosion (per Section 01 57 13).

.2 Provide adequate protection to newly sod areas from all damage, disturbance, other construction activity, and pedestrian traffic.

.3 Damaged sod resulting from inadequate protection shall be repaired at Contractor's expense.

.4 Keep site well drained and landscape excavations dry. Remove excess water from sod areas.

3.8 ACCEPTANCE FOR ISSUE OF CONSTRUCTION COMPLETION CERTIFICATE

.1 Sod areas will be accepted by Engineer provided that:

.a Sodded areas are properly established.

.b Sod is free of bare and dead spots, repair rutting and areas of settlement and without perennial weeds.

.c No surface soil is visible when grass has been cut to height of 50 mm.

.d Sod areas have been cut a minimum of two times.

.2 Sod placed in the fall may be accepted after June 30 provided acceptance conditions are fulfilled.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 From the issue date of the Construction Completion Certificate to the issuance of the Final Acceptance Certificate (as per required warranty period), perform the following maintenance operations:

.2 Repair areas which show root growth failure, deterioration, bare or thin spots, or which have been damaged by any means or cause, including replacement operations by installing new sod.

.3 Correct any erosion and settlement that results from faulty workmanship and / or material by:

.a Removing sod, adding topsoil as necessary and lay new sod. Roll sod to provide blending with adjacent sod or grass areas.

.4 Repair ruts resulting from maintenance equipment and personnel by:

.a Removing sod from rutted turf areas.

.a Placing and compacting new topsoil, to grade and depth applicable.

.b Place new sod and roll to provide blending with adjacent sod or grass areas.

.5 Cut grass to 50 mm whenever it reaches a height of 100 mm.

.6 Control weeds to provide minimum grass coverage of 85%. Control methods include manual, mechanical, cultural, biological, or, chemical (as per Integrated Pest Management best practices). If pesticides are to be used, application must be in accordance with Federal, Provincial and Municipal regulations as and when required. Obtain product approval from Operational Services prior to application.

.7 Apply second application of [20-5-10,] [24-5-11] or similar slow release granular turf fertilizer five to six weeks after sodding. Spread evenly at rate of 3 kg/100 m^2 and water in well after application. Postpone fertilizing until spring if application will occur after August 15th.

.8 Apply fertile topsoil to fill all minor open joints to prevent sod edges from drying.

.9 Repeat rolling of sod as necessary to maintain a smooth grass surface.

.10 Ensure all repairs are completed and sod has an appearance of clean lines, good colour, and thickness, prior to final acceptance inspection.

3.10 INSPECTION FORMS

Refer to Design Guidelines, Section 14 Appendixes

3.11 CLEAN-UP

.1 Unless this Section is part of a multi-work contract, ESC measures may be removed once sod has been accepted through a Construction Completion Certificate.

.2 Remove protection measures after sod areas have established and accepted by the Engineer.

.3 Sidewalk, trails, curbs and other surface areas not designated for sod placement shall be cleaned of tracked or spilled topsoil and sod.

.4 Additional clean-up requirements; refer to Section 01 74 11.

1. GENERAL

This section includes requirements for suppling, planting and maintaining landscape plant vegetation and ground covers and relocated existing plant life.

1.1 RELATED WORK

.1	Construction Schedule	Section 01 32 00
.2	Trench Excavating and Backfilling	Section 31 23 33
.3	Topsoil and Finish Grading	Section 32 91 19
.4	Construction Specification Drawings	Section 50 08 xx

1.2 REFERENCE STANDARDS

Planting material supplied under this Section shall meet the standards defined in "Canadian Standards for Nursery Stock", current edition, published by Canadian Nursery Landscape Association and modified in the Section.

1.3 SOURCE QUALITY CONTROL

.1 Source of plant material shall be grown in Zones 2A, 2B and 3A of the Canadian Hardiness Map. Plants grown outside of the previously listed Zones shall be approved by the Operational Services Department.

.2 Obtain approval from the Engineer of plant material at source prior to replacement or planting.

.3 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal and Provincial Regulations.

.4 Provide a copy of certification, permits, license etc. for plant species and location of source to the Operational Services Department upon demand.

1.4 SCHEDULING

.1 Obtain approval from the Engineer of schedule, seven days in advance of shipment of plant material.

.2 Schedule to include:

.a Date for selection of plant material or representative sample at source by Engineer.

.b Quantity and type of plant material.

.c Shipping dates.

.d Arrival dates on site.

.e Planting dates.

1.5 PRODUCT DATA

.1 Provide product data for:

.a Fertilizer,

.b Anti-desiccant,

.c Guying assembly including collar, guying rope and anchors,

.d Mulch,

.e Root barriers.

1.6 SAMPLES

Provide samples of material to be used for mulch.

1.7 DELIVERY, STORAGE AND PROTECTION

.1 Protect plant material from frost, excessive heat, wind and sun **until planted**.

.2 Protect plant material from damage during transportation:

.a When delivery distance is within 5 km of Town Limits, use tree spade operated at a maximum speed of 50 km/hr.

.b When delivery distance is 5 - 30 km or vehicle speed is less than 80 km/hr, tie tarpaulins around plants or over vehicle box.

.c When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/hour, use enclosed vehicle.

.3 Immediately store and protect plant material which will not be installed, within one day after arrival at site, in a storage location approved by Engineer.

.4 Protect stored plant material as follows:

a. For bare root plant material preserve moisture around roots by heeling-in or burying roots in sand, topsoil or sawdust and watering to full depth of root zone.

b. For pots and containers maintain moisture level in containers. Heel-in fibre pots.

c. For balled and burlap and/or wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

1.8 MEASURE OF PAYMENT

.1 Trees and shrubs will be measure in unit price per tree or shrub excepting, at the discretion of the Engineer, shrubs planted as a continuous hedge may be by lineal metre.

.2 Mulch or ground cover material will be measured in square meters, per specified depth, placed.

.3 New or reforestation of an area shall be per hectare regardless of plant species and quantity thereof.

.4 Unit price bid shall be full compensation for the supply of all materials, labour and equipment to prepare soil and/or bed including weed and debris removal and disposal, fertilizing, herbicide application, planting of trees/shrubs, and maintain plant material during the warranty period as described in this Section.

.5 The use of treated Town water (hydrant supply source) shall be considered incidental to the Work unless the contract has a pay item for such. *(Note: The Town charges for water usage taken from Town hydrants.)*

.6 Topsoil work shall be paid to Section 32 91 19.

2. PRODUCTS

2.1 PLANT MATERIAL

.1 General

.a Ensure type of root preparation, sizing, grading and quality of plant material complies with “Canadian Standards for Nursery Stock”.

.b Ensure plant material is structurally sound with strong fibrous root system, free of disease, insects, defects or injuries.

.c Plant material that is balled and burlap covered or in wire baskets must be planted in the current year's harvest. Container grown stock must be grown in the container for a minimum of 3 months or have a well-established root system reaching the sides of the container, so as to maintain a firm root ball.

.2 Tree and Shrub Sizing

.a Deciduous trees:
- 60 mm calliper measured
- 150 mm above ground level

.b Coniferous trees:
- 2.5 m height

.c Deciduous shrubs:
- Not Permitted

.d Coniferous shrubs:
- Not Permitted

.e Native deciduous trees for reclaiming native areas:
- #10 container class

.f Native coniferous trees for reclaiming native areas:
- 0.75 m height

.g Native deciduous shrubs for reclaiming native areas:
- Not Permitted

.h Native coniferous shrubs for reclaiming native areas:
- Not Permitted

.3 Deciduous and Coniferous Trees

.a Trees shall have straight trunks, well and characteristically branched for species except where specified otherwise.

.b Trees larger than 130 mm in calliper shall have half of the roots pruned during each of two successive growing seasons, the latter at least one growing seasons prior to arrival on site.

.c Coniferous trees are to exhibit strong top leaders (not sheared in previous years) and shall be planted in the same year as harvested.

.4 Stock

.a Bare rootstock shall be nursery grown, in dormant stage, not balled and burlap covered or container grown.

.b Collected stock shall be a maximum 40 mm in calliper, with well-developed crowns and characteristically branched

.c No more than 40% of overall height may be free of branches unless otherwise specified.

2.2 WATER

.1 Free of impurities that would inhibit plant growth.

.2 Supplied by Owner at designated source. If a Town hydrant is the source, contact Town Hall at 403-556-6981 for permit.

2.3 ACCESSORIES

.1 Guying Collar

Tube: plastic, 13 mm diameter, nylon reinforced.

.2 Guying Rope

Polypropylene - 6 mm (3 in.)

.3 Anchors

Tree anchors shall be "Land Anchor" with 300 mm Ardox spikes or approved equal.

.4 Trunk Protection

.a Wire mesh shall be galvanized, electrically welded, 1.4 mm wire with 25 mm x 25 mm mesh.

.b Fastener shall be galvanized (shingle) nail or staple.

.c Plastic wrap protector shall be perforated plastic; pliable to allow for wrapping around trunk and being fastened closed (e.g. “Tubex” product).

.5 Flagging Tape

Fluorescent, yellow colour

.6 Tree Vault

.a Precast or Cast-in-Place concrete box with no base. Cast-in-Place concrete shall be to Section 03 30 00.

.b Flanged to accept tree grate; per Division 50 drawings.

.c Sized to accept fully mature tree root system plus 200 mm of topsoil surround. Tree size determined from Design guidelines, Section 14 Appendix.

2.4 EQUIPMENT

.1 Tree Spade

.a Shall be of a size and capacity to remove, haul, dig, and place plant material as designated.

.b Shovels shall be clean and free of material from prior work.

.c The spade frame shall be clean and free of material from prior work.

.2 Tree Spade Sizing Calculation

The following formula shall be used to determine the size of the tree spade:

.a 10 cm of tree spade diameter for every ‘cm’ of tree calliper (e.g. a 15 cm calliper tree requires a 150 cm diameter tree spade).

.b Contact Parks Departments prior to spading trees with a calliper greater than 18 cm.

2.5 MULCH

.a Bark chip: varying in size from 25 mm to 100 mm in diameter, consisting of a mixture of coniferous and deciduous material.

.b Wood chip: varying in size from 50 mm to 100 mm and 5 mm to 20 mm thick.

.c Shredded wood: varying in size from 25 mm to 100 mm in length.

.d No other mulch types will be permitted.

2.6 FERTILIZER

Synthetic commercial type, ratio 2:5:2.

2.7 ANTI-DESICCANT

Wax-like emulsion

3. EXECUTION

3.1 WEATHER

.1 Do not perform work when site conditions have frozen soil, snow cover, ice or standing water, excessively wet soil or during spring thaw or rain.

.2 Plantings shall not be placed when the air temperature is below 5^{o}C and the overnight forecast is for frost.

.3 If planting is placed during abnormally hot and / or dry conditions the contractor shall keep the topsoil optimally moist.

3.2 PREPLANTING OPERATIONS

.1 Verify planting locations and beds, per Operational Services Department drawings, and as directed by the Engineer.

.2 Prior to commencing any placement work, the Contractor shall ensure all surface fixtures related to deep and shallow utilities are clearly marked to prevent disturbance or bury during the work. Repair and / or exposure of a utilities surface fixture shall be at the Contractor's expense.

.3 Contractor to verify all underground utility locations.

.4 Plant material to be inspected, by the Engineer on site, prior to planting.

.5 Ensure erosion and sediment control (ESC) measures are in-place where surface drainage may carry loosened topsoil, fertilizer, herbicide, mulch etc. to storm water infrastructure.

3.3 EXCAVATION

.1 Stake out locations of planting holes and beds; obtain approval from Engineer prior to excavating.

.2 Hedge plants are not permitted.

.3 Prepare planting bed soil as specified in Section 32 91 19.

.4 Prepare planting hole as follows:

.a Depth of hole to be equal to height of root ball or, minimally, 400 mm deep.

.b The excavated hole's width shall be twice the root ball diameter.

.5 If possible, separate surface topsoil from subsoil, rocks, roots, and debris excavated to be re-used as planting soil. Dispose of other material and excess material.

.6 If contaminated and / or toxic material is excavated, particularly in re-development areas, refer to Section 31 22 13. If multiple, contiguous, excavations extract contaminated material Work shall stop, the Engineer is to be notified and an environmental assessment shall be conducted as outlined in the Town's Design Guidelines.

.7 Remove water which enters excavations prior to planting. Notify Engineer if water source is groundwater.

3.4 PLANTING

.1 Remove root ball support material as follows:

.a Wire baskets and burlap container:

.i Remove bottom rings before placing tree in hole.

.ii Place tree at proper height and remove top two rings.

.iii Remove accessible burlap.

.b Fibre pots:

.i Place in hole to proper height.

.ii Remove entire pot.

.c Bare root ball preparation.

.i Remove all damaged tissue, taking care not to damage the remaining root material and leaving a clean cut surface.

.ii Place in hole on firm base to proper elevation.

.d Tree spade:

.i Prepare planting area as specified in Section 32 91 19.

.ii Remove soil plug using same tree spade used to relocate tree.

.iii Place tree to grade.

.2 Place plant in centre of hole and adjust height until original growth level matches surrounding ground level. Use topsoil to adjust height in hole. Lift plant by root ball only.

.3 When planting deciduous trees, maintain a minimum height clearance of 1.2 m measured from bottom of the canopy to the ground.

.4 Native trees and shrubs used for reclaiming native areas are to be planted in groupings and area fenced off with temporary fencing materials until established.

.5 The reclamation material should mirror the original stand or in special cases a mix of coniferous and deciduous plants are acceptable upon approval of the Engineer.

3.5 LANDSCAPE FABRIC

The installation of landscape fabric is **not** permitted.

3.6 SITE WORK AFTER PLANTING

.1 Backfill any voids between spaded plug and the native soil with topsoil in 150 mm lifts. Soil to be hand tamped only.

.2 Construct 100 mm to 150 mm high water reservoir berm using topsoil at the outside edge of prepared root zone.

3.7 WATERING

.1 Add water to reservoir within two hours of plants being installed. Minimum amount: 70 litres of water per 25 mm of trunk DBH (diameter at breast height). Water weekly for the first month after planting, then water a minimum of 12 times per year, excluding winter months or under or forecasted freezing condition, during the warranty period. Additional water may be required when recommended by the Engineer.

.2 Refill voids with topsoil to re-establish grade.

.3 Surface water only, subsurface probing is not permitted.

.4 Provide the Engineer with a copy of the watering schedule in accordance with Section 01 32 16.

3.8 MULCH

Place mulch to a depth of 75 mm to 125 mm within and over water reservoir within five days after planting; taper away from the trunks of the trees and from the crowns of shrubs.

3.9 TREE CARE AFTER PLANTING

.1 Remove only broken and dead branches in accordance with good horticultural practice and ISA Standards.

.2 Prune to Section 32 93 43.

3.10 TREE SUPPORT

.1 Use tree anchors when specified or directed by Engineer.

.2 Use type specified by Engineer.

.3 Use single anchor tree supports for deciduous trees less than 3 m tall and evergreens less than 2 m tall.

.a Place anchor on prevailing wind side and drive anchor spikes into undisturbed soil outside of prepared root zone.

.b Install 150 mm long guying collar 1.5 m above grade.

.c Thread rope through guying collar tube and secure firmly to anchor.

.4 Use three guy ropes and anchors for deciduous trees greater than 3 m tall and evergreens greater than 2 m tall.

.a Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/3 height for deciduous trees.

.b Guying collars to be of sufficient length to encircle tree plus 50 mm space for trunk clearance.

.c Install anchors at equal intervals about tree and away from trunk so that guy rope will form a 65° angle with the ground. Install anchor, at perpendicular angle to rope, to achieve resistance for guy rope.

.d Attach guy rope to anchors. Tension rope to allow slight tree canopy movement.

.e Install flagging tape to guys as required.

.5 Place a 2 m long stake driven 600 mm into the soil outside of the root ball through the tree well. Use hose and rope to secure the tree to the stakes.

.6 After tree supports have been installed remove broken branches with clean, sharp tools in accordance with good horticultural practice and ISA Standards.

3.11 TREE VAULTS

.1 Precast Vault

.a "Over" excavate the hole 200 mm wider than the diameter of the vault.

.b Excavate the hole to the trees design depth, as noted in this Section, allowing for the gravel base.

.2 Cast-in-Place Vault

.a If vault is to be constructed in the excavation, "over" excavate the hole 900 mm wider than the diameter of the vault otherwise excavate per precast vault requirements.

.b Excavate the hole to the trees design depth, as noted in this Section, allowing for the gravel base.

.c Construct formwork to Section 03 11 00. Formwork may be removed after seven days (minimum) from concrete pour. Leave recess in top of vault wall for tree grate. Ensure the grate will fit flush to the top of the vault.

.d Install reinforcement as per Section 03 20 00.

.3 Prepare Base and Backfill

.a If bottom of excavation is on clay, place 50mm of 25 mm crushed rock, level, and compact. This is the base for the vault.

.b Backfill around outside perimeter of tree vault in accordance with Section 31 23 33. Backfill material may be previously excavated material that is free of debris and contamination or clean native material.

.c Backfill to within 300mm of top of vault with clay material.

.d Compacted clay to 95% Standard Proctor Maximum Dry Density with a mechanical tamper or plate vibrator.

.e Complete backfilling with clean topsoil, finished to Section 32 91 19.

.f Obtain the Engineer's approval before installing the tree vault.

.4 Install Vault

Optional, excavate granular base material from inside the vault.

.5 Place Topsoil and Planting

.1 Ensure topsoil to be used is free of subsoil, rocks, weeds, roots, debris and toxic material.

.2 If gravel base material is removed replace with a layer of lightly compacted topsoil.

.3 Prepare and install planting per item 3.4 of this Section.

.4 Place topsoil in even lifts around the planting, lightly compact (hand tamp with rake) between each lift. Bring compacted topsoil to within 75 mm of bottom of grate.

.5 Place mulch to 75 mm depth or slightly below the bottom of the grate, to allow for proper watering.

.6 Place grate cover, ensuring it is flush to top of vault.

3.12 ESTABLISHMENT

.1 Water to maintain soil moisture conditions for optimum establishment, as noted in item 3.7 of this Section. Additional water may be required when recommended by Engineer.

.2 Remove weeds before they set seed, on a monthly basis or more frequently if required.

.3 Replace or re-spread damaged, missing or disturbed mulch. Taper away from the trunks of trees and the crowns of shrubs.

.4 Apply pesticides, in accordance with federal, provincial and municipal regulations, as and when required to control insects, fungus and disease. Obtain product approval from Engineer prior to application.

.5 Remove dead or broken branches from plant material in accordance with good horticultural practice and ISA Standards.

.6 Keep trunk protection and guy ropes in proper repair and adjustment.

.7 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

.8 For reclaimed native areas use mechanical weed (string) trimmers or hand pulling.

3.13 ACCEPTANCE FOR ISSUE OF CONSTRUCTION COMPLETION CERTIFICATE (CCC)

.1 Plant material may be accepted by Engineer after planting operation is completed provided that plant material exhibits healthy growing condition and is free from disease, insects and fungal organisms.

.2 Upon completion of planting, an inspection shall be arranged prior to leaf drop. Application for CCC is subject to all landscaping being completed within the appropriate development phase and a verified watering schedule being provided at the time of inspection.

.3 All CCC inspections will be conducted only on or between the dates of June 1st through to October 15th. Operational Services will require a minimum of 48 hours' notice prior to conducting an inspection. All applications for inspection will be received by the Parks section a minimum of 30 days prior to October 15th.

3.14 MAINTENANCE DURING WARRANTY PERIOD

.1 From the issue date of the Construction Completion Certificate to the issuance of the Final Acceptance Certificate (as per the required warranty period), perform the following maintenance operations:

.a Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion. Water a minimum of 12 times during the growing season. Additional water may be required when recommended by the Engineer.

.b Reform damaged watering saucers.

.c Keep area free of weeds.

.d Replace or re-spread damaged, missing or disturbed mulch. Taper away from the trunks of trees and the crowns of shrubs.

.e Control insects, fungus and disease using manual, mechanical, cultural, biological or chemical (as per Integrated Pest Management) best practices. If pesticides are to be applied, the application must be in accordance with Federal, Provincial and Municipal Regulations as and when required. Obtain product approval from Operational Services Department prior to application.

.f Remove dead, broken or hazardous branches from plant material in accordance with good horticultural practice and ISA Standards.

.g Keep tree supports in proper repair and adjustment.

.h Staking will be provided unless otherwise directed by the Engineer. Stakes will remain for a maximum of 1 year after planting. Following removal, tree supports will become the property of the owner.

.i Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

.j If tree vaults were part of Work, ensure mulch and grate is in-place. Add or remove mulch as applicable.

.k Submit annual written reports after each growing season to Engineer identifying:

.i Maintenance work carried out.

.ii Development and condition of plant material.

.iii Preventative or corrective measures required which are outside Contractor's responsibility.

.iv Record dates when maintenance work was performed.

.v Provide these records to Operational Services, upon demand.

.l Application for FAC is subject to all landscaping being completed within the appropriate development phase and a verified watering schedule for the entire maintenance period being provided at the time of inspection.

.m Any disease or insect infestations must be under control by the end of the warranty period. Any deformed or damaged plants must be removed and replaced.

3.15 INSPECTION FORMS

Design Guidelines, Section 14, Appendixes

3.16 CLEAN-UP

.1 Unless this Section is part of a multi-work contract, ESC measures may be removed once sod has been accepted through a Construction Completion Certificate.

.2 Remove protection measures after planted areas have established and accepted by the Engineer.

.3 Sidewalk, trails, curbs and other surface areas shall be cleaned of tracked or spilled topsoil and mulch.

.4 Additional clean-up requirements; refer to Section 01 74 11.

1. GENERAL

This Section specifies pruning, root girdling and care of wounds for plant material.

1.1 RELATED WORK

.1 Do pruning in accordance with International Society of Arboriculture “Best Management Practices – Tree Pruning”, current edition, except where specified otherwise.

.2 Pruning of trees or plant material on Town land is not permitted.

1.2 SCHEDULING

.1 Prior to commencing pruning:

.a Schedule timing of work with Engineer.

.b Notify Engineer seven days in advance.

.c Review extent of work with Engineer on site.

1.3 DEFINITIONS

.1 Crown Cleaning

This consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.

.2 Crown Thinning

This consists of selective removal of branches to increase light penetration, air movement and reduce weight.

.3 Crown Raising

This refers to the removal of lower tree branches to provide clearance.

.4 Crown Reduction or Crown Shaping

This refers to decreasing a tree’s height and/or spread.

.5 Vista Pruning

This refers to the selective thinning of framework limbs or specific crown areas to improve views.

.6 Crown Restoration

This refers to improving structure, form and appearance of trees that have been severely headed or vandalized.

1.4 MEASURE OF PAYMENT

No measurement shall be made under this Section.

2. PRODUCTS

2.1 DISINFECTANT

Disinfectant shall be a twenty percent (20%) solution of sodium hypochlorite or 70% solution of ethyl alcohol.

3. EXECUTION

3.1 SAMPLE PRUNING

Commence pruning by completing sample pruning operation to demonstrate technique and selection process used to establish desired form and shape.

3.2 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation.

.2 On diseased plant material, disinfect tools with disinfectant before each cut.

3.3 ANNUAL THINNING

.1 Remove dead, dying, diseased and weak growth from plant material as designated by the Engineer, in order to promote healthy growth. Retain natural form and shape of plant material.

.2 Remove growth designated by Engineer.

.3 For branches under 150 mm in diameter:

.a Make cuts smooth and just outside the branch collar. Do not cut lead branches unless directed by Engineer.

.4 For branches greater than 150 mm in diameter:

.a Make first cut on lower side of limb 300 mm from trunk, one third diameter of limb.

.b Make second cut on upper side of limb 500 mm from trunk until limb falls off.

.c Make final cut adjacent to and outside limb collar.

.5 Ensure that trunk bark and limb collar are not damaged or torn during limb removal.

.6 Remove one of crossed or rubbing branches. Where removal may affect natural form or health of plant, resolve pruning action with Engineer.

.7 Remove exposed portion of girdling root after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.4 TIMING OF PRUNING

.1 Prune during plant dormant period, after leaves have matured or as designated by Engineer.

.2 Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10˚C.

3.5 PRUNING CAUTIONS

.1 Retain natural form and shape of plant species.

.2 Do not:

- Flush cut branches.
- Crush or tear bark.
- Cut behind branch bark ridge.
- Damage branch collars.
- Damage branches to remain

3.6 PRUNING

.1 Remove dead, dying, diseased and weak growth from plant material to provide crown reduction, crown thinning, crown restoration, vista pruning, crown raising, or crown cleaning.

.2 Remove live branches that:

a. Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.

b. Are of weak structure including narrow crotches.

c. Obstruct development of more important branches.

d. Are broken.

.3 Remove live branches to re-establish natural species form including:

a. One or more developing leaders.

b. Multiple growth due to previous topping.

c. Branches extending outward from natural form.

d. Undesirable sucker growth.

.4 Remove loose branches, twigs and other debris lodged in tree.

3.7 REMOVE VINES

.1 For branches under [50] mm in diameter:

.a Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.

.b Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.

.c Do not cut lead branches unless directed by the Engineer.

.2 For branches greater than [50] mm in diameter:

.a Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.

.b Make second cut on upper side of branch 500 mm from trunk until branch falls off.

.c Make final cut adjacent to and outside branch collar.

.d Ensure that trunk bark and branch collar are not damaged or torn during limb removal.

.e Repair areas which are damaged, or remove damaged area back to next branch collar.

.f Remove additional growth designated by the Engineer.

3.8 ROOT GIRDLING

.1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.

.2 Remove exposed portion of girdling root as directed by the Engineer after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.9 HEADING BACK

Head back plant material designated by Engineer.

3.10 CONIFEROUS EVERGREENS

Prune plant material designated by Engineer.

3.11 HEDGES

Prune plant material designated by Engineer.

3.12 CARE OF WOUNDS

Shape bark around wound to an oblong configuration ensuring minimal increase in wound size.

3.13 CLEAN-UP

.1 Where trees have been removed or larger branches are involved refer to Section 31 11 00 for cutting sizes and wood disposal

.2 Pruned and other plant waste shall be sorted as to diseased material, useable for mulch, or usable for fire wood.

.a Elm trees shall be disposed of at The Town's Waste Management Facility or incinerated in accordance with the Alberta Agriculture Pest Act regulations regarding "Dutch Elm" disease.

.b Other diseased plant material shall be disposed of at the Town's Waste Management facility or as directed by the Engineer.

.c Mulch and campfire material shall be the Owner's and stored, as directed by the Engineer, in a designated location.

.3 Collect and dispose of pruned material daily and remove from site to location specified by Engineer.

3.14 REPORT

Report to the Engineer any condition detrimental to the health of plant material.

1. GENERAL

This Section specifies requirements for preserving and protecting trees and shrubs adjacent to excavations.

1.1 RELATED WORK

.1	Clearing and Grubbing	Section 31 11 00
.2	Trench Excavation and Backfilling	Section 31 23 33
.3	Topsoil and Finish Grading	Section 32 91 19
.4	Mechanical Seeding	Section 32 92 19
.5	Sodding	Section 32 92 23
.6	Direct Buried Underground Cable Ducts	Section 33 65 76

1.2 SCHEDULING

Obtain approval from the Engineer of schedule indicating commencement of work.

1.3 MEASURE OF PAYMENT

No measurement shall be made under this Section.

1.4 NOTIFICATION

The Contractor shall advise Operational Services 48 hours prior to any work proceeding around trees or shrubs. At the discretion of the Engineer, the Contractor may be required to provide a summary of any requirements the Town may have given.

(Note: This notification is important as The Town maintains a tree and shrub bed inventory that identifies the location and condition of all Town trees and shrubs).

2. PRODUCTS

2.1 MATERIALS

.1 Fill: excavated, pervious soil, free from roots, rocks larger than 75 mm, building debris and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by the Engineer before use as fill.

.2 Coarse washed stones: 35 mm to 75 mm diameter clear round hard stone.

.3 Do not use materials which will affect pH levels of soil.

.4 Drain tile: 100 mm diameter corrugated plastic perforated tubing complete with snap couplings to CGSB 41-GP-31M.

.5 Peat moss:

.a Derived from partially decomposed species of Sphagnum Mosses.

.b Elastic and homogeneous.

.c Free of wood and deleterious material which could prohibit growth.

.d Shredded minimum particle size: 5 mm.

.e pH less than 5.0.

.6 Fertilizer:

.a To Canada Fertilizer Act and Fertilizer Regulations.

.b Complete, commercial, slow release 1:5:1 content in water insoluble form

.7 Filter Cloth:

.a Type 1: 100% non-woven needle punched polyester, 2.75 mm thick, 240 g/m^2 mass.

.b Type 2: biodegradable burlap.

.8 Wood posts: 38 mm x 89 mm x 2,400 mm length, untreated wood or heavy duty metal T-Rail Post: 35mm x 35mm x 1830 mm, 3.85 kg.

.9 Metal farm fence, maximum 50 mm mesh spacing or equivalent.

3. EXECUTION

3.1 GENERAL

All Work shall be done in such a manner as to minimize the effect on trees and shrubs (including root systems). If, in the opinion of the Engineer, the Contractor has failed to

minimize the effect on trees and shrubs, the cost of removing, repairing and replacing them shall be borne by the Contractor.

3.2 IDENTIFICATION AND PROTECTION

.1 Identify plants and limits of root systems to be preserved to the satisfaction of the Engineer.

.2 Protect plant and root systems from damage, compaction and contamination resulting from construction to the satisfaction of the Engineer.

.3 The Engineer is to determine the best method of tree and root protection, i.e. retaining wall, fencing, transplanting.

.4 Metal farm fencing shall be installed and maintained minimally to the tree's outer drip line for any work requiring equipment which takes place within 10 m of a Town owned tree. Fence posts shall be maintained in an upright position, with the fence mesh attached and free from sag or gaps, throughout the duration of the project.

3.3 NEW DEVELOPMENT

For areas of native growth which are to be removed due to new development, refer to Section 31 11 00 regarding tree and brush protection and removal.

3.4 ROOT CURTAIN SYSTEM

.1 Identify limits for required construction excavation to satisfaction of Engineer.

.2 Maintain a minimum soil disturbance distance of twice the radius of the tree, measured from the trunk centre to the outer drip line.

.3 Prior to construction excavation, dig trench minimum 500 mm wide x 1.5 m deep, along perimeter of excavation limits.

.4 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.

.5 When depth of excavation for walls, foundations and footings exceeds 1.5 m, provide additional support for posts and curtain as required.

.6 Securely attached Type 2 filter cloth on plant side of wire mesh.

.7 Install wooden posts and welded wire fabric against construction edge of trench.

.8 Prepare homogeneous mixture of fertilizer, parent material and organic matter. Add organic matter to mixture to achieve 7% to 9% organic matter content by weight. Incorporate with mixture grade 1:5:1 ratio dry fertilizer at rate of 1.5 kg/m^3.

.9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.

.10 Protect root curtain during backfill operations. Ensure root curtain is removed.

.11 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to no more than flat foot weight to remove large air voids. After initial watering, top up with homogeneous mixture to fill any voids.

.12 Protect root curtain from damage during construction operations.

3.5 RAISING GRADE AROUND EXISTING TREES

.1 Use Clause 3.3 when raising grade around existing trees. Provide detail Drawings indicating layout and dimensioning.

.2 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system and slightly loosen topsoil (45 mm) surface. Avoid damage to root system.

.3 Lay horizontal system of perforated drainpipe on surface of existing grade. Slope drain tile minimum 3% for drainage away from trunk of tree. Connect system with general site drainage system or drain to low point on site.

.4 Install plastic "vent" pipes vertically over joints in horizontal pipe system or where indicated. Top of vent pipe to be 20 mm above finished grade of fill. Keep top of vent pipe covered during construction.

.5 Cover joints with Type 1 filter fabric and place coarse washed stone around joints and vertical pipes to secure their position.

.6 Construct dry well around trunk of tree. Ensure open ends of horizontal pipe system/vertical vent pipes are left exposed for air circulation to root system. Protect openings from blockage during construction. Install protective caps on exposed horizontal openings.

.7 Place 200 mm depth of coarse washed stone on surface of original ground and horizontal pipe system to limits.

.8 Place Type 1 filter fabric over surface of granular layer.

.9 Place Type A fill over filter fabric to required depth without disturbing or damaging drainpipe system. Avoid damage to filter fabric.

.10 Complete topsoil and sodding/finished paving over area of sub-surface system within one week of placing fill.

.11 Remove temporary protective covering from vent pipe openings. Install protective caps flush with finished grade.

3.6 LOWERING GRADE AROUND EXISTING TREE

.1 Lowering grade will be permitted outside the existing dripline of a tree. Refer to drawing
50 08 05, Tree Protection Fence.

.2 Use where lowering of grades is anticipated within tree root zone. Schedule work at time appropriate for plant species.

.3 Commence work in accordance with design and schedule approved by Engineer.

.4 The Engineer reserves the right to direct construction or required protection.

.5 Cut slope not less than 600 mm per 25 mm trunk diameter from tree trunk to new grade level.

.6 Excavate to depths as indicated. Protect from damage root zone which is to remain.

.7 When severing roots at excavation level, cut roots with sharp tools.

.8 Cultivate excavated surface manually to 15 mm depth.

.9 Prepare homogeneous soil mixture consisting by volume of:

.a 50% excavated soil cleaned of roots, plant matter, stones and debris.

.b 25% coarse, clean, sterile sand.

.c 15% organic matter.

.d Grade 1:5:1 fertilizer at rate of 1.5 kg/m^3.

.10 Place soil mixture over area of excavation to finished grade level. In 150 mm lifts compact each layer to no more than flat foot weight to remove large air voids. Top up with homogeneous soil mixture to fill any voids.

.11 Water entire root zone to optimum soil moisture level.

.12 Install surface cover of seeding or sodding as specified in accordance with Section 32 92 19 or Section 32 92 21 respectively.

3.7 EXCAVATION FOR UNDERGROUND SERVICES

.1 When utility service installation is required within limits of a tree root system (trunk greater than 150 mm diameter) tunnelling or directional drilling are the accepted methods of excavation.

.2 Alignment and limits of tunnel excavation or drilling to be approved by Engineer prior to work commencement. Where tree protection is required, a Tree Protection Fence is to be installed.

.3 Daylighting or hydrovac excavation shall not encroach within the Tree Protection Fence and / or tree roots system unless otherwise agreed to by the Engineer during the planning process.

.4 Tunnel excavation and drilling to extend 1 m from edge of trunk on either side.

.5 Minimum depth of tunnel or drilling is 1.5 m below root ball.

.6 Where open trench excavation is used, excavate manually within zone of root system or area designated by a Tree Protection Fence. Do not sever roots greater than 50 mm diameter. If required, roots less than 50mm diameter to be cut cleanly with sharp disinfected tools (e.g. loppers or hand pruners).

.7 Backfill compaction requirements for:

.a Deep utilities shall be to Contract Specification 31 23 33.

.b Shallow utilities shall be to Contract Specification 33 65 76.

.c Avoid damage to trunk and roots of tree.

.8 All work within the drip line of the tree and / or Tree Protection Fence to be completed within one week of starting work.

3.8 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Engineer to end of warranty period, perform following maintenance operations:

.a Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

.b Apply appropriate agents when required to control insects and disease. Obtain product approval from Engineer prior to application.

.c Apply fertilizer in early spring at rate of 0.025 kg of nitrogen/m^2 at manufacturer's suggested rate.

.d Remove dead, broken or hazardous branches from plant material.

.e Submit monthly written reports to Engineer identifying:

.i Maintenance work carried out.

.ii Development and condition of plant material.

.iii Preventative or corrective measures required which are outside contractor's responsibility.

Section 33 01 31 Relining Underground Pipelines

Section 33 05 13 Manholes and Catch-basins

Section 33 05 15 Adjustment of Manholes, Catch-basins, Hydrants, and Water Valves

Section 33 05 25 Horizontal Directional Drilling

Section 33 05 26 Boring, Jacking and Ramming Pipe

Section 33 05 27 Pipe Bursting

Section 33 11 16 Water Mains

Section 33 31 13 Sanitary Sewer Mains

Section 33 34 00 Sewage Force Mains

Section 33 41 00 Storm Sewer Mains

Section 33 41 16 Water, Sanitary and Storm Service Connections

Section 33 42 13 Pipe Culverts

Section 33 45 00 Sewer Cleaning

Section 33 45 10 Inspection of Sewers

Section 33 46 16 Sub-Drainage

Section 33 49 16 Catch-basin Leads

Section 33 65 73 Concrete Encased Duct Banks and Manholes

Section 33 65 76 Direct Buried Underground Cable Ducts

1. GENERAL

This Section specifies requirements for supplying the following services, materials and work for the installation of a cured-in-place sewer lining system.

1.1 RELATED WORK

.1	Work Restrictions	Section 01 14 00
.2	Submittal Procedures	Section 01 33 00
.3	Health and Safety Requirements	Section 01 35 29
.4	Regulatory Requirements	Section 01 41 00
.5	Temporary Utilities	Section 01 51 00
.6	Traffic Control	Section 01 55 26
.7	Site Cleaning	Section 01 74 11
.8	Sewer Cleaning	Section 33 45 00
.9	Sewer Inspection	Section 33 45 10

1.2 GENERAL INFORMATION

.1 This Section is specific to cured-in-place pipe (CIPP) liner installation and is in a generic format. The CIPP process involves the insertion of a flexible lining into the existing pipe and can be accomplished by inversion (water or air) or a mechanical means (e.g. winch).

.2 Contractors proposing CIPP systems and alternatives are required to submit detailed specifications, methodology, design and construction details, A.S.T.M. Standards and data complying too A.S.T.M. Standards. Relining shall be accomplished by trenchless methods.

1.3 CONSTRAINTS

.1 The Contractor's rehabilitation scheme shall not shut off the existing services for more than 8 hours. Portable toilets shall be provided by the Contractor at the home-owners request.

.2 The Contractor shall commit to comply with the work schedule.

.3 The rehabilitation scheme shall be executed without any excavation.

1.4 MEASURE OF PAYMENT

.1 Cured-in-place pipe liner shall be the length of installed sewer liner, measured horizontally along the centreline of the sewer from the inside face of manhole to the inside face of manhole. Unit price bid shall be full compensation for supply, material, equipment and plant, installation, and all incidentals as necessary and required to complete the work as specified in the Contract Documents and as directed by the Engineer.

.2 All work necessary for the diversion and control of flow from existing sewers and services, temporary service connections, testing, and television inspection shall be considered incidental to the Work.

.3 Re-establishment of service connections to be measured as the number of existing active service connection re-established after installation of the cured-in-place liner. Unit price bid shall be full compensation for all work necessary for the re-establishment of existing service connections.

.4 Removal of protruding services to be measured as the number of existing protruding services removed prior to installation of the cured-in-place liner. Unit price bid shall be full compensation for all work necessary for the removal of protruding service connections.

.5 CCTV sewer inspection payment shall be to Section 34 45 10.

.6 Engineering services provided by the contractor shall be considered incidental to the work.

.7 Costs to provide emergency pumping to prevent up-stream system back-up or flooding, clean-up due to spillage or leakage, disposal of contaminated sewage material etc. shall be considered incidental to the work.

1.5 SCHEDULING OF WORK

.1 Provide the Engineer with a schedule detailing each stage of the work.

.2 The work schedule shall be provided a minimum of seven working days in advance of project commencement. No work shall commence without an approved schedule.

2. PRODUCTS

2.1 CURED-IN-PLACE PIPE

.1 Supply all materials required to fabricate a CIPP liner to a size that, when installed, will closely fit the internal circumference of the conduit to be rehabilitated.

.2 The tube being inverted shall be sized correctly to allow for circumferential stretching during insertion and ensuring that the existing pipe is completely filled.

.3 The cured-in-place liner material shall consist of one or more layers of flexible needled fabric or an equivalent woven and/or non-woven fabric. The cured-in-place liner material shall be capable of carrying resin, withstanding installation pressures and curing temperature, be compatible with the resin system used and be able to cure in the presence or absence of water.

.4 Furnish a cured-in-place liner material that meets or exceeds the following structural properties:

PROPERTY	A.S.T.M. TEST	INITIAL	LONG TERM
Flexural Strength	D 790	34 MPa	N/A
Flexural Modulus	D 790 and D 2990	2069 MPa	1034 MPa

.5 The cured-in-place liner material shall conform to A.S.T.M. F1216 using test method D543 and show chemical resistance to the following types of materials under various concentrations:

CHEMICAL RESISTANCE	CONCENTRATION
Sulphuric acid	20%
Sodium Hydroxide	5%
Ammonium hydroxide	5%
Nitric acid	1%
Ferric Chloride	0.1%
Soap	1%
Detergent	0.1%
Bacteriological	BOD not less than 700 ppm

Note: The Contractor shall furnish data that illustrates the ability of the CIPP liner material to resist chemical attack.

3. EXECUTION

3.1 PREPARATION

.1 Contractor to confirm with Engineer the location of work, drawings and if any special requirements or measures, due to location, are necessary.

.2 Contractor may review existing CCTV video, sanitary sewer service records, sanitary sewer main and manhole record drawings for additional information.

3.2 TRAFFIC CONTROL

Provide adequate warning signage and devices to accommodate vehicular and pedestrian traffic flow per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer.

3.3 SAFETY

.1 Health and safety requirements as per Section 01 35 29.

.2 Operate in strict accordance with Provincial and Town Regulations, refer to 01 41 00.

.3 Observe the Occupation Health and Safety requirements for working and entering confined spaces and manholes.

.4 Observe the requirements for working with chemicals. Provide material safety data sheets for all chemicals to be used to The Town before usage.

3.4 CLEANING OF SEWER LINE

.1 Once the work site has been established, the Contractor shall clean the sewer line(s) that are to be repaired. Refer to Section 33 45 00 for cleaning requirements.

.2 Depending upon the amount of relining and the time to complete each line, the contractor shall schedule the cleaning so they are done shortly before relining is scheduled.

3.5 INSPECTION OF SEWER LINE

.1 Contractor to have the cleaned sewer line(s) video inspected, refer to Section 33 45 10 for video inspection requirements.

.2 Extra attention shall be made when inspecting the interior of the sewer line to allow for the careful determination of locating pipe defects and / or conditions which may prevent proper installation of the CIPP into the sewer line.

3.6 ENGINEERING SERVICE

.1 Prior to start of work the contractor shall provide a proposal for the design of the proposed liner system to be installed.

.2 The system is to be reviewed with the Engineer to ensure compliance with this Section and practicality to the project.

3.7 BYPASSING SEWAGE

.1 Provide for the flow of sewage around the section or sections of pipe designed for CIPP submit details for approval prior to implementation.

.2 Provide bypassing by plugging the line at an existing upstream manhole and pumping the sewage flow into a downstream manhole.

.3 Provide pumps and bypass lines of adequate capacity to handle the flow while ensuring no spillage.

.4 Provide equipment that will conform to applicable noise bylaws; refer to Section 01 14 00.

.5 Ensure that no contamination of basements, ditches, roadways, sidewalks, etc. with raw sewage shall occur. In the event of such contamination, immediate action shall be taken to close the source of contamination. Proper clean-up of the affected area shall be followed and no work shall recommence until a re-evaluation of the complete process has been carried out by the Environmental Services, Construction and Maintenance Superintendent. No rehabilitation work shall commence unless authorized by the Environmental Services, Construction and Maintenance Superintendent. No extra payment will be made for decontamination, clean up or down time.

.6 The rehabilitation scheme shall ensure that no upstream flooding occurs during construction. The Contractor shall allow in his bid price for monitoring of water levels in manholes and for emergency pumping.

3.8 LINE OBSTRUCTIONS

.1 Advise the Engineer of any lines that require cleaning or removal of obstructions such as solids, dropped joints, roots, sediments, etc. that will prevent insertion of the CIPP, when the work schedule is delivered. Line obstructions will be removed by Environmental Services prior to insertion of the CIPP and no extra payment shall be made for this work.

.2 If an obstruction cannot be removed by sewer clearing or obstacle removal methods, a point repair excavation shall be made by Environmental Services to uncover and remove or repair the obstruction. No payment shall be made to the Contractor for these repairs.

.3 Identify such locations during tender time after reviewing the available CCTV video and record plans. No extra payment shall be made for removal of obstructions that were not identified and reported to the Construction and Maintenance Superintendent prior to the commencement of the CIPP insertion.

.4 Contractor to be responsible for removing all protruding services that will adversely affect the installation and integrity of the CIPP.

3.9 INSTALLATION OF CIPP

.1 Job Commencement

.a Prior to commencing work, the Contractor shall submit for the Environmental Services Construction and Maintenance Superintendent's approval, his proposal for preparation of liners, transportation, handling, installing and curing.

.b Inform affected customers of the length of disruption to service, details of alternate service provided, traffic constraints, noise levels to be expected, hours of work and safety concerns.

.2 Processing

.a Prior to resin impregnation, each liner material shall be inspected for defects.

.b Allow The Town to inspect the materials and resin impregnation process.

.c Use a resin and catalyst compatible with the CIPP method.

.3 Installation

.a Make minimum lengths adequate to effectively span the distance from the inlet to the outlet of the respective manholes. Verify lengths in the field.

.b Make individual inversion runs over one or more manhole sections as determined in the field, shown on the Shop Drawings and reviewed by The Town.

.c The polyester saturated lining material shall be inserted through an existing manhole or other approved access point by means of an inversion process and the application of a hydrostatic head sufficient to fully extend the lining material to the next designated manhole or termination point. The procedure shall be required to produce an identifiable mark at the service connections.

.d Lubricants approved by the Construction & Maintenance Superintendent can be used to reduce friction during inversion.

.4 Curing and Cool Down

.a After the inversion placement is completed, supply a suitable heat source and water distribution or recirculation equipment and perform curing of the resin.

.b Provide equipment of adequate capacity for delivering hot water throughout the pipe section to uniformly raise the water temperature above the temperature required to effectively cure the resin. Temperature shall be maintained during the curing period as recommended by the resin manufacturer and approved by The Town.

.c Supply a suitable temperature gauge to monitor the incoming and outgoing water supply.

.d Install another temperature gauge between the impregnated CIPP and the pipe invert at the remote manhole to determine the temperature during curing.

.e Maintain curing temperature until the CIPP becomes hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exothermic reaction is occurring.

.f After the CIPP is cured, a cool down period shall be used prior to opening the downstream pipe system, reconnection of services and returning normal flow back to the system.

.g Cool the hardened CIPP to a suitable temperature before relieving the static head in the inversion standpipe.

.h Release the static head to prevent development of a vacuum that could damage the newly installed CIPP.

.i Arrange for supply of water required during curing process with the Construction and Maintenance Superintendent at 403.342.8750.

.5 Finish

.a Ensure that the finished CIPP is continuous over the entire length of an inversion run and be free from visual defects such as foreign inclusions, dry spots, pinholes, lifts, wrinkles and delamination. If any of these conditions are present, remove and replace the CIPP in these areas.

.b During the warranty period repair, at no cost to The Town, any defects which will affect the integrity or strength of the liner, to the satisfaction of The Town.

3.10 SEALING CIPP AT MANHOLES

.1 If the CIPP fails to make a tight seal at the manhole, apply a seal at that point.

.2 Apply a resin mixture seal which is compatible with the CIPP.

3.11 SERVICE CONNECTIONS

.1 After the curing is complete and the pipe system is placed into service, the existing active services shall be re-established.

.2 Reconnection of services shall be done without excavation by means of a remote control cutting device operating within small diameter pipes or directly where man entry is possible.

.3 A CCTV camera shall be attached to the cutting device for precise location of the service connections and inspection of the CIPP.

.4 The service connections shall be re-established in the same condition as prior to the installation of the CIPP.

3.12 CONSTRUCTION COMPLETION INSPECTION

.1 Upon work completion of the sewer line work, including but not limited to rehabilitation of the mains, manholes and service connections, the contractor shall clean the re-lined sewer, to Section 33 45 00 and re-camera, to Section 33 45 10, the pipe to ensure the work is acceptable.

.2 At locations where any protruding services have been removed, include in the video inspection, a view of the service lateral from the main to (minimally) 2 m into the service lead. Video inspection of services from private property to the main sewer may be required if ordered by the Engineer.

.3 Should the video inspection reveal defects in the liner or service connections the Contractor shall repair or replace these defects, as ordered by the Engineer, at no cost to the Town.

3.13 CLEAN UP

Upon acceptance of the CIPP, clean up and restore the affected area to the condition that existed prior to commencement of the work. Refer to Section 01 74 11.

1. GENERAL

This Section specifies requirements for supply and installation of manholes, catch basins and sewer appurtenances. Outfall structures, control structures, treatment structures etc. shall be treated as vaults with all configurations and types collectively called “sewer structures” for purposes of this section.

1.1 RELATED WORK

.1	Submittal Procedures	Section 01 33 00
.2	Site Demolition	Section 02 41 16
.3	Concrete Formwork	Section 03 11 00
.4	Concrete Reinforcement	Section 03 20 00
.5	Cast-in-Place Concrete	Section 03 30 00
.6	Trench Excavation and Backfilling	Section 31 23 33
.7	Adjustment of Manholes, Catch Basins, Hydrants and Water Valves	Section 33 05 14
.8	Construction Specification Drawings	Division 50 03 xx

1.2 MEASURE OF PAYMENT

.1 Measure excavation and backfill in accordance with Section 31 23 33.

.2 Measure 1200 mm standard manholes and catch basin manholes as follows:

.a Measure frames and covers for each type installed.

.b Measure manhole depth in vertical metres. Measure from the top of the frame to the lowest invert elevation. Grade rings, bricks, slab top, number of manhole barrels and 1200 mm diameter base shall be consider incidental to the vertical measure.

.3 Measure Type 1-S manhole and large diameter manhole vaults as follows:

.a Measure frames and covers for each type installed.

.b Measure Type 1-S and larger diameter manhole depth in vertical metres. Measure from the top of the frame to the top of the vault (vault meaning bottom and top precast sections required to complete one unit). Grade rings, bricks, slab top, and 1200 mm standard manhole barrels shall be consider incidental to the vertical measure.

.c Measure the Type 1-S manhole vault (whether one or two piece combined) per complete unit installed.

.d Measure Large Diameter Manhole vaults, including base and adaptor slab top, in units installed.

.4 Measure sanitary interior drop manholes as follows:

.a Measure frames and covers for each type installed.

.b Measure manhole depth in vertical metres. Measure from the top of the frame to the lowest invert elevation. Grade rings, bricks, slab top, manhole barrels, drop pipe section, (tee, bend, plug, lag bolts and strapping), and base shall be considered incidental to the vertical measure.

.5 Catch basins to be measured in units installed. Concrete base, concrete barrel, concrete top, frame and cover, and connection to lead shall be considered included.

.6 Inlet Control Devices installed at catch-basins shall be measured per unit, per pipe size.

.7 Measure for precast or cast-in-place flared outfall shall be in units, per pipe size, installed. Grate shall be considered incidental. Rip-rap material shall be paid to Section 31 37 00. If a protective railing is required, it shall be paid to Section 05 52 00.

.8 Measure storm water inlet/outlet structures in units installed.

.9 Measure storm water outlet control structures in units installed.

.10 Measure storm water treatment units in units installed.

.11 Safety Platform measured in units installed including hardware, grates, access panel, hinges etc.

.12 The following items shall be considered incidental to the work:

.a Adjustments of rims to final grade in contracts with underground and roadway work combined.

.b Breaking into manholes or catch basin manholes.

.c Ladder material and installation.

.d Granular base material under manhole or vault structure.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00.

.2 Submit shop drawings for Storm water Treatment Units at least 4 weeks prior to beginning Work.

.3 Contractor to confirm prior to field installation The Town has received the manufacturer's technical and maintenance manual(s) for the storm treatment unit, if applicable to project.

2. PRODUCTS

2.1 CONCRETE COMPONENTS

.1 Cast-in-place concrete:

a. In accordance with Section 03 30 00.

b. Portland cement to CSA-A5, Type HS.

c. Concrete mix design to produce 25 MPa minimum compressive strength at 28 days and containing 25 mm maximum size coarse aggregate, with water/cement ratio to CSA-A23.1.

d. Air entrainment to CSA-A23.1.

e. Additives: Fly ash to CSA-A23.5.

.2 Concrete reinforcement to Section 03 20 00

.3 Precast manhole units: to CSA-A257 and ASTM C478M, circular. Top sections: flat slab top type with opening offset for vertical ladder installation. Manhole base to be pre-benched, monolithic unit, for new construction.

.4 Precast catch basin sections: to ASTM C478M. Catch-basin base to be a monolithic unit, for new construction.

.5 Joint Sealer:

a. Preformed bituminous gasket (e.g. Rub-R-Nec) or other approved rubber gasket conforming to the requirements of CSA-A257.3 and ASTM C443.

.6 Mortar:

a. Aggregate: to CAN3 – A82.56

b. Masonry Cement: to CSA-A300-A8, sulphate resistant, Type HS.

.7 Ladder rungs:

a. CSA-G30.18, No.25M billet steel deformed bars, hot dipped galvanized to CSA-G164.

b. MSU 20mm O.D. aluminum tubing complete with 3 mm low density polyethylene coating or an approved equivalent.

c. Rungs to be safety pattern drop step type.

.8 Adjusting rings: to ASTM C478M.

.9 Concrete Brick: to CAN3-A165 Series.

.10 Drop manhole pipe: to be same as sewer pipe.

.11 Safety platform: aluminium grates to be MSU (Mississauga) or approved equal.

.12 “Stop Blocks” in diversion manholes shall:

a. **not** be a wood product or a product subject to expansion or contraction due to moisture level, and

b. Shall be resistant to the sewage and/or contaminants that are typical to the sewer system.

2.2 IRON CAST COMPONENTS

.1 Frames, Covers and Grates

.a Grates and covers to bear evenly on frames.

.b A frame with a grate or cover shall constitute one unit. Assemble and mark unit components before shipment.

.c Gray iron castings: to ASTM A48, Class 20

.i Includes frames, adjustment rings and solid covers

.d Ductile iron castings: to ASTM A536, Class 60-40-18

.i Includes CB and CBMH grates

.2 Castings

a. Sand blasted or cleaned and ground to eliminate surface imperfections,

b. Free from cracks, porosity, claws and excessive shrinkage,

c. Shall be true to pattern.

d. Coated or painted castings will not be accepted.

.3 Testing and Frequency

a. Gray Iron

.i Three test bar samples of gray iron shall be poured twice annually from the metal supplied for an individual cast production.

.ii Preparation of sample and testing shall be in accordance with ASTM A48 (latest edition).

b. Ductile Iron

.i Three test bar samples of ductile iron shall be poured twice annually from the metal supplied for an individual cast production.

.ii Preparation of sample and testing shall be in accordance with ASTM A536 (latest edition).

.4 Grade 60-40-18 Tolerances

Tensile strength (min):	414 MPa
Yield strength (min):	276 MPa
Elongation in 50 mm (min):	18

.5 Proof Load Testing

a. Test shall be in accordance to AASHTO M-306.

b. Proof load testing shall be performed on the grate and cover using a 229 mm x 229 mm block.

c. Load is taken to 178 kN and recorded. (Typically the load is 10% higher than 178 kN and held for 1 minute.)

.6 FAR Reports

First Article Reports are done on the first casting coming out of the pattern mould. Dimensions are taken, comparing those (actual) to drawing dimensions and recorded. The report shall be taken at the initial casting of the new pattern and twice thereafter per year. This report shall be included with the Certificate of Compliance.

.7 Drawings

.a The Town's required dimensions for a casting shall be as indicated on the drawings in Division 50. Detailed dimensioning and configuration of casting may require or be adjusted by the manufacturer to meet ASTM and AASHTO standards while maintaining the overall sizing of the Town casting.

.b The manufacturer shall submit to the Town stamped and signed shop drawings, fully dimensioned and containing all markings (as noted below) for Town review upon demand.

.c The casting shall be built to the following tolerances:

.i Mating Parts: Less than 50 mm +/- 0.8 mm

.ii Mating Parts: 300 mm to 50 mm +/-1.5 mm

.iii Mating Parts: Greater than 300 mm +/-3.0 mm

.iv Other Dimensions to 900 mm +/-3.0 mm

.8 Certification by Engineer

Certificate of Compliance shall be given to the Town upon demand. The certificate shall be signed and stamped by a professional engineer, licensed to practice in Canada (preference with APEGGA) and qualified in metal material testing and has witnessed the testing of the samples.

.9 Markings

.a Castings shall be marked with the following identification marking:

.i Town specification number

.ii Foundry identification marking

.iii Month and year of production

.iv Class or serial of material (e.g. ASTM, CL20)

.v Heat code and / or serial number; to trace the product to the test bar data and metallurgical composition records

.vi Province or State and Country code (e.g. AB CA) of foundry where product was manufactured

.b Markings shall be located in such a manner that they are easily identifiable. The markings shall be located on the “non-wear” location of the product.

2.3 MISCELLANEOUS

.1 Granular bedding and backfill in accordance with Section 31 05 16.

.2 Concrete mixes and materials in accordance with Section 03 05 13.

2.4 APPROVED STORM WATER TREATMENT UNITS

.1 CDS ™ Technologies supplied through Inland Pipe Limited (Calgary)

.2 Stormceptor ® supplied through Lafarge Canada Inc. (Calgary)

.3 Vortechnics ™ supplied through Proform Concrete Services Inc. (Red Deer)

Note: If a new or different product is requested by the Engineer or Contractor a New Product application package shall be submitted, refer to Section 01 61 10.

3. EXECUTION

3.1 EXCAVATION

.1 Excavation of trench area for structure shall be in accordance with Section 31 23 33 as indicated.

.2 Obtain approval of Engineer before installing sewer structure.

3.2 INSTALLATION

.1 General

.a Construct units in accordance with details indicated, plumb and true to alignment and grade.

.b Complete units as pipe laying progresses. A maximum of three units behind the point of pipe placement will be allowed.

.c Dewater excavation to approval of Engineer.

.d Mitigate unsuitable sub-grade to Section 31 23 33.

.2 Precast units

.a Set precast concrete base on 100 to 150 mm (thickness) of 40 mm washed rock, compacted to 95% standard proctor.

.b Check and adjust for level.

.c Where manhole base and the first barrel section are **not** precast as a monolithic unit, set the barrel unit in a bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight as follows:

.i Sanitary manholes: shall be with an approved rubber ring gasket or bituminous compound or combination thereof.

.ii Storm manhole and catch basin barrel: shall be with an approved rubber ring gasket, bituminous compound, cement mortar or combination thereof. Where high ground water is encountered, select joints may be left unsealed excepting the top barrel joint of the bottom barrel and the base joint.

.d Clean surplus mortar and joint compounds from interior surface of unit as work progresses.

.e Plug lifting holes with concrete plugs set in cement mortar or mastic compound.

.3 Cast-in-Place Structure

Note: This method is not preferred and shall be used only at the discretion of the Engineer. This method shall not be used for new construction unless directed by the Engineer.

.a Ensure enough working space in excavation for formwork.

.b Cast bottom slab directly on undisturbed ground or 150 mm of 40 mm screened rock, compacted to 95%, unless otherwise directed by the Engineer.

.c Construct formwork to Section 03 11 00.

.d Install concrete reinforcement to Section 03 20 00.

.e Pour base slab, ensuring it is level. Once the concrete is firm but not set place the precast barrel, ensuring it is level.

.f Place stub outlets and bulkheads at elevations and in positions indicated.

.g Install benching: shape base bench to provide a smooth 'U' shaped channel. Side height of channel to be ½ the full diameter of the (smaller) sewer pipe. Slope benching side walls at 10:1. Curve channels smoothly. Slope invert to ensuring there is a minimum of 25 mm difference in elevation between the lowest upstream pipe invert and the downstream pipe invert unless noted otherwise on the drawings or as directed by the Engineer.

.h After base concrete has seven days to cure (three days if high early strength is used), remove formwork and grout around outside of barrel at the slab joint to ensure water tight seal.

.i Continue manhole construction with precast barrels as noted in the "Precast units" clause in this section.

.4 Installing units in existing systems

.a Where new unit is to be installed in existing run of pipe, ensure full support of existing pipe during installation. Carefully remove portion of existing pipe to dimensions required and install new unit as specified.

.b Make joints watertight between new unit and existing pipe.

.c Where deemed expedient to maintain service around existing pipes and when systems constructed under this Project are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes and / or other necessary work.

.5 Manhole Frame and Cover

.a Place manhole frame and cover on top section to an elevation 5 mm below finished asphalt surface elevation or 19 mm to 25 mm below finished gravel lane surface. Make frame watertight using bituminous gasket.

.b If adjustment is required to set the frame to elevation, a concrete adjusting collar shall be used; to a maximum adjustment height of 300 mm. Join and seal the frame and collar(s) with cement mortar. Parge the interior and exterior surfaces between the barrel and collar(s); trowel smooth. Ensure the mortar has made a watertight seal with all adjustment collars and the frame.

.c For adjustments less than 100mm, a maximum of one riser frame ring may be added to the frame. The riser frame ring is not preferred for new construction and shall **not** be used in gravel laneways.

.6 Catch basin Frame and Cover

.a Place one 50 mm adjustment collar on the slab top. (This is to assist with future maintenance.) If more adjustment is required to set the frame to elevation, only concrete rings are to be used; to a maximum adjustment height of 150 mm.

.b Bond the concrete ring(s), gasket and frame, including the joints, with a flexible polyurethane caulking. Ensure the caulking makes a watertight seal.

.c Catch basin leads to Section 33 49 16.

.d Finished placement tolerance: 10 mm below finished surface elevation and 10 mm behind the face of curb. No protrusion above the finished surface or away from the face of curb allowed.

.7 Miscellaneous

Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering sewer system.

3.3 SAFETY STEPS

.1 Manholes are to be oriented so safety steps are on the centerline perpendicular to the main floor channel.

.2 Safety steps shall be aligned so that a person exiting from the manhole would face oncoming traffic, where this does not conflict with the previous requirement.

.3 The safety steps shall be installed in all precast manhole sections, including the neck and in the cast-in-place section to form a continuous ladder, with rungs equally spaced at a maximum of 410 mm, from within 300 mm below the cover, to within 600 mm of the base or benching.

.4 The steps shall be cast firmly in place or secured with a suitable mechanical anchorage to prevent pullout and maintain water tightness.

.5 Install safety steps per drawing 50 30 01.

3.4 SAFETY PLATFORM

.1 Install safety platforms in manholes having a depth of 6 m or greater, as determined by measure from top of frame to inside base elevation of manhole and / or as indicated by drawing.

.2 Platform to be oriented perpendicular to safety step alignment.

.3 Where only one platform is required it may be located at mid-height but must be within the restrictions noted.

.4 Restrictions on platform locations:

.i To be a minimum of 2.2 m above the manhole base.

.ii To be inserted a minimum of 300 mm from a precast barrel joint.

3.5 BACKFILLING

.1 Pipe backfill and compaction in accordance with Section 31 23 33.

.2 Within 1000 mm of the structures exterior or barrel, place backfill material in uniform layers, not exceeding 100 mm in compacted thickness, up to sub-grade elevation or top of trench. Compact each layer before placing succeeding layer.

.3 Small mechanical or hand operated compaction equipment shall be used within the 1000 mm offset from the structure. Hand tamping may be required to be extended beyond this distance due to other fittings, pipes etc. or the inability of roller equipment to operate within this zone.

.4 Compaction equipment used around concrete structure to be capable of achieving density in fill material.

.5 Compact native backfill materials to a minimum density of 95% Standard Proctor Maximum Dry Density.

.6 Compact imported granular backfill material to a minimum density of 95% Standard Proctor Maximum Dry Density.

.7 Where the structure is part of Front Serviced work, the compaction density shall be 98% Standard Proctor Maximum Dry Density.

3.6 ADJUSTMENT OF EXISTING UNITS

Where existing structures require surface adjustment refer to Section 33 05 15.

3.7 ABANDONMENT

Abandon manholes, vaults and catch basins to Section 02 41 16.

1. GENERAL

This Section specifies requirements for adjusting existing manholes, catch basins, hydrants and water valves.

1.1 RELATED WORK

.1 Manholes and Catch-basins — Section 33 05 13

.2 Water Mains — Section 33 11 16

1.2 MEASURE OF PAYMENT

.1 Adjustment of manholes, catch basins, hydrants and water valves to be measured by number adjusted.

.2 In contracts with underground and roadways combined, payment for adjustment of appurtenances shall be considered incidental.

2. PRODUCTS

2.1 MATERIALS

.1 For manholes and catch basins refer to Section 33 05 13.

.2 For hydrants and water valves refer to Section 33 11 16.

3. EXECUTION

3.1 MANHOLES AND CATCH BASINS

.1 General

.a Remove existing grates and frames; store for re-use at location(s) designated by Engineer, if required. Replace damaged frames, grates, and covers per Engineer's direction.

.2 Manhole

.a Sectional Units:

.i Raise or lower straight walled sectional units by removing slab top and adding or removing precast sections as required.

.ii When the amount of raise is less than 300 mm use concrete manhole adjustment collars and / or riser frame rings.

.b Monolithic Units:

.i If slab top and multiple barrels are present, adjust manhole per Sectional Units.

.ii Raise monolithic units by roughing existing top to ensure proper bond and extend to required elevation with concrete collars for 300 mm or less alteration.

.iii Lower monolithic units, with straight walls, by removing concrete to elevation indicated for rebuilding.

.iv When monolithic units, with tapered upper section, are to be lowered more than 150 mm, remove concrete for entire depth of taper plus as much of the straight wall as necessary to desired elevation. Rebuild the upper section to required elevation using cast-in-place method; refer to Section 03 30 00.

.c Install additional manhole ladder rungs in adjusted portion of units as required or as directed by Engineer.

.3 Manhole Frame

.a Place manhole frame and cover on top section to an elevation 5 mm below finished asphalt surface elevation or 19 mm to 25 mm below finished gravel lane surface. Make frame watertight using bituminous gasket.

.b If adjustment is required to set the frame to elevation, a concrete adjusting collar shall be used; to a maximum adjustment height of 300 mm. A maximum number of adjustable units: three concrete rings and one riser frame ring.

.c Join and seal the frame and collar(s) with cement mortar. Parge the interior and exterior surfaces between the barrel and collar(s); trowel smooth. Ensure the mortar has made a watertight seal with all adjustment collars and the frame.

.d For adjustments less than 100mm, a maximum of one riser frame ring may be added to the frame. The riser frame ring shall **not** be used in gravel laneways.

.4 Catch basin Frame

.a Place one 50 mm adjustment collar on the slab top. (This is to assist with future maintenance.) If more adjustment is required to set the frame to elevation, only concrete rings are to be used; to a maximum adjustment height of 150 mm.

.b Bond the concrete ring(s), gasket and frame, including the joints, with a flexible polyurethane caulking. Ensure the caulking makes a watertight seal.

.c Finished placement tolerance: 10 mm below finished surface elevation and 10 mm behind the face of curb. No protrusion above the finished surface or away from the face of curb allowed.

.5 Adjustment Completion

.a Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering sewer system.

3.2 WATER VALVES

.1 Excavate and expose adjustable portion of water valve casing.

.2 Adjust water valve casing to design elevation.

.3 Recess top of water valve 5 mm below finished asphalt surface elevation or to a maximum of 25 mm below finished gravel lane surface.

.4 Backfill excavation. Ensure water valve casing will not settle.

.5 Operate valve in presence of Engineer to verify it is operational.

3.3 HYDRANTS

.1 Excavate and expose top extension section of fire hydrant.

.2 Remove existing extension section and hydrant rod and replace with appropriate unit to place hydrant within 25 mm of design elevation.

.3 Operate hydrant in presence of Engineer to verify it is operational.

1. GENERAL

This section specifies the requirements for the installation of pipes or conduits utilizing a horizontal directional drilling method.

1.1 RELATED WORK

.1	Work Restrictions	Section 01 14 00
.2	Health and Safety Requirements	Section 01 35 29
.3	Environmental Procedures	Section 01 35 43
.4	Traffic Control	Section 01 55 26
.5	Trench Excavation and Backfilling	Section 31 23 33
.6	Topsoil and Finish Grading	Section 32 91 19
.7	Tree and Shrub Preservation	Section 32 93 50
.8	Manholes and catch-basins	Section 33 05 13
.9	Water Mains	Section 33 11 16
.10	Sanitary Sewer Mains	Section 33 31 13
.11	Sewage Force Mains	Section 33 34 00
.12	Storm Sewer Mains	Section 33 41 00
.13	Sewer Cleaning	Section 33 45 00
.14	Inspection of Sewers	Section 33 45 10

1.2 DEFINITIONS

.1 Horizontal Drilling Rig
Mechanical drilling device used to create a horizontal borehole through which a pipe or conduit is installed.

.2 Return and Spoils
Drilling mud and cuttings collected in entry and exit pits, as well as fluid escaping to or from borehole to surface.

.3 Directional Drilling

Installation of pipe by drilling pilot bore from entry pit to pre-determined exit location. Drilling head then replaced with reamer, drilling string is pulled back to entry hole, enlarging hole while simultaneously pulling pipeline product into place.

1.3 MEASURE OF PAYMENT

.1 Measurement for payment for the drilling work and process will be based on linear metres as designated on Issued for Construction drawing(s). This payment includes any work and associated equipment required to:

.a Prepare the site including removal of vegetation, grading site for smooth working area, etc.,

.b Location / exposure of all existing utilities along the proposed path,

.c Excavation of entry, exit, and slurry containment pits following proper trenching / excavation practices,

.d Drilling the pilot hole to grade and alignment per design,

.e Ream the bore hole to final size and pulling the carrier pipe to provide adequate exposure of both pipe ends for ease of attachment to the adjoining pipes,

.f Safely dispose of slurry mud to an approved disposal site as directed by the engineer,

.g Backfill and compaction of all pits to Town requirements,

.h Restoration of all affected surfaces to their pre-construction conditions.

.2 Payment for carrier pipe will be made under other Sections separate from payment for the directional drilling. This will include the fusing of pipe ends together for a continuous line, including but not limited to the fusing equipment, the process and materials required for fusing, cleaning the fused joint, inspection of the fused joints, etc.,

.3 Payment for Testing shall be considered incidental to the work.

.4 No payment will be made for directional drilling deemed unacceptable due to incorrect grade or alignment beyond the tolerances noted in this Section.

.5 Surface heaving or hydraulic fracturing of the soil (“Frac-out”) shall be repaired at the Contractor’s cost.

.6 Any costs associated with clean-up of drilling fluid spillage and / or cutting spoils contamination, including surface and sewer system, shall be at the Contractor's cost.

2. PRODUCT

2.1 EQUIPMENT

The Contractor shall be responsible for the directional drilling method and equipment.

.1 Directional Drilling Equipment

The Contractor shall confirm that the drilling rig and mud mixing system have the capacity required to successfully complete the installation knowing the length of the crossing and product type and diameter, and considering ground and groundwater conditions that can be reasonably foreseen.

.2 Tracking / Steering Equipment

Operating range and degree of accuracy of proposed tracking system shall be adequate to meet project conditions. Tracking/steering equipment shall allow for continuous monitoring of the drilling head along the entire proposed alignment. If a poor contact with sound is expected to occur at any section, this should be communicated to the Engineer prior to commencement of construction.

.3 Drilling Unit

The drilling unit must be equipped with an electrical strike safety package. The package should include grounding mats and protective gear.

.4 Pipe

Only HDPE pipe is to be used for this work. See Section 33 11 16 (water) or 33 34 00 (sewer force main) for HDPE pipe specifications. (Unless approved otherwise by the Town's Engineering Services Department.)

3. EXECUTION

3.1 DRILLING INFORMATION SUBMITTAL

.1 Provide the following information as part of the award of the contract:

.a Complete methodology, specific to each crossing, including:

.i Equipment specifications and capabilities,

.ii Size of pilot hole,

.iii Number and size of pre-reams,

.iv Use of rollers, baskets and side booms to suspend and direct pipe during pull back,

.v Type and capabilities of tracking system, and

.vi The number of sections in which the product is to be installed.

.b Schedule of work.

.c Contractor to verify with Engineer the drawing of work site, including location and footprints of equipment, and the locations of the entry, exit, and slurry containment pits.

.d Contractor to verify with Engineer the drawing of pullback installation showing partial or full closure of roadways and their approximate duration.

.e Drilling fluid management plan, including drilling fluid containment, recycling/transport and approve disposal site.

.f Emergency procedures for inadvertently boring into a live power line, natural gas line, water line, sewer line, or fibre-optic cables. Procedures must comply with regulations.

.g Emergency procedures and management plan in the advent of a surface fracture or ground heaving.

.h Method of dealing with inadvertent returns of surface seepage of drilling fluids and spoils.

.2 At least two weeks prior to commencing work, submit data from the manufacturer regarding the tensile strength and recommended minimum bending radius of the pipe.

3.2 PROCESS

.1 The Contractor is to ensure all necessary permits and / or authorizations have been obtained prior to starting construction activities near or across all buried pipelines and conduits.

.2 The Contractor is to ensure all necessary permits and / or authorizations have been obtained prior to starting construction activities near or across environmentally sensitive areas.

.3 Notify owners of subsurface utilities, on either side of the proposed drill path, of the impending work through the one-call program. All utilities along and on either side of the proposed drill path are to be located.

.4 All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.

.5 The proposed drill path shall be determined and documented, including its horizontal and vertical alignments and the location of buried utilities and substructures along the path.

.6 Schedule work to minimize interruption to existing services and local traffic.

.7 Excavation for entrance and exit pits is to be of sufficient size to avoid a sudden radius change of the pipe and resultant excessive deformation.

.8 Pipe installation should be performed in a manner that minimizes the over-stressing and straining of the pipe.

.9 Where possible, unless otherwise approved by the Engineer, the product pipeline will be fused, welded or connected into one string prior to commencement of the pull-back operation.

.10 Drilling mud may be used during drilling and back-reaming operations, pending the approval of a fluids management plan.

.11 A sufficient number of pre-reams shall be utilized as to avoid heaving while enlarging the hole to the desired diameter.

.12 During back-reaming the conduit must be sealed at either end with a cap or lug to prevent water, drilling fluids and other foreign materials from entering the pipe.

.13 Pipe rollers, skates or other protective devices may be used in the installation of products 150 mm (outside diameter) or larger.

.14 The pilot hole shall be back-reamed to accommodate and permit free sliding of the product inside the borehole. Unless directed otherwise by the Engineer, for pipe sizes up to and including 300 mm, a maximum tolerance of 10% bore enlargement shall be accepted. For pipe sizes greater than 300 mm, a maximum tolerance of 25% bore enlargement shall be accepted.

.15 Trenching shall be used to make connections (if required) or join ends of pipe installed by the directional boring method.

.16 Sufficient pipe length for joining adjacent sections of pipe shall be pulled into the entrance pit. This additional pipe shall not be damaged or interfere with the subsequent drilling of the next section of pipe.

.17 Connections and tie-ins to HDPE pipe shall only be made after a suitable time period has passed in order to allow the pipe to recover and rebound from the insertion forces. Recovery period shall be, minimally, twice the pull-back time used to ream the bore.

3.3 TESTING

Testing of installed carrier pipe shall be to Section 33 31 13 and as directed by the Engineer. If no manholes are present, the pipe ends at the entry and exit location will be used.

3.4 HANDLING

.1 Only operators trained through a certified institute or equipment manufacturers program shall be permitted to operate the drilling equipment. The operator shall be responsible to, minimally, operate the equipment to the manufacturer's operating instructions and safety practices.

.2 Entrance and exit angles of the drill string should range between 8º and 20º and 5º and 10º respectively and meet the pipe manufacturer's pipe bending radius. Any deviation from these values shall first be approved by the Engineer.

.3 Where the pipeline is designed to have a sag curve, the maximum radius for the curvature of the sag should be 100 times the nominal diameter of the pipe.

.4 Drilling mud pressure in the borehole should not exceed that which can be supported by the overburden to prevent heaving or hydraulic fracturing of the soil ("Frac-out").

3.5 TOLERANCE

Installed pipe shall be within 1% (+/-) of design grade and within 150 mm (+/-) of exit elevation. Entry elevation shall be within 50 mm of design. Alignment variation shall be 300 mm (+/-) from design location.

3.6 ENVIRONMENTAL

.1 Drilling Fluid Collection and Disposal Practices

.a Excess drilling mud (slurry) shall be contained in a lined pit or containment pond at exit and entry points until recycled or removed from the site. Entrance and exit pits shall be of sufficient size to contain the expected return of drilling mud and spoils.

.b When working in an area of contaminated ground, the slurry shall be tested for contamination and disposed of in a manner that meets government requirements.

.c Drilling fluids shall not be allowed onto streets, or into manholes, sanitary and storm sewers, and other drainage systems including streams and rivers.

.d Recycling drilling fluids is an acceptable alternative to disposal excepting if the work is being done through contaminated locations.

.e The Contractor shall make a diligent effort to minimize the amount of drilling fluids and cuttings spilled during the drilling operation and shall clean-up all drilling mud overflows or spills. If spillage enters the Town's sanitary or storm system, the spillage is to be contained and the line(s) upstream of the containment site shall be cleaned as per Section 33 45 00.

.2 Tree Root Protection

Refer to Section 32 93 50.

3.7 ABANDONED DRILLING

If a drilled hole beneath an artificial surface must be abandoned the hole shall be filled with grout or bentonite to prevent future subsidence.

3.8 HDPE PIPE BUTT FUSING

.1 General

For additional information regarding the Butt Fusing method for HDPE refer to Plastic Pipe Institute's TR-33 Generic Butt fusion procedure for field joining of PE pipe. If pipe fusing to be done in the trench, allow for extra trench width for fusing equipment.

.2 Secure Pipe Ends

Each component that is to be fused must be held in position so that it will not move. If a component requires adjustment it shall be moved with the clamping device.

.3 "Facing" pipe

The pipe ends must be "Faced" to establish clean, parallel mating surfaces. The pipe faces to be mated shall be planed smooth and true by means of a mechanical rotating planer. Facing is continued until a minimal distance exists between the fixed and movable jaws of the machine and the Facer is locked firmly and squarely between the jaws. This operation provides for a perfectly square face, perpendicular to the pipe centerline on each pipe end and with no detectable gap.

.4 Align

The pipe profiles must be rounded and aligned with each other to minimize mismatch (high - low) of the pipe walls. This shall be accomplished by adjusting the clamping jaws until the outside diameters of the pipe ends match. The jaws must not be loosened or the pipe may slip during fusion. Maintain a minimal distance between the fixed and moveable jaws, as mentioned above, allows the pipe to be rounded as close as possible to the joint area. The closer to the joint area that the pipe can be clamped, the better control the operator has in properly aligning the pipe.

.5 Melt

.a Before heating, the tool faces shall be cleaned; have an oil-free surface and coated with a nonstick coating, as recommended by the manufacturer, to prevent molten plastic from sticking to the heater's surfaces. Remaining molten plastic can interfere with fusion quality and must be removed according to the tool manufacturer's instructions.

.b Use an appropriate heating tool that simultaneously heats both pipe ends. The operator is to ensure the internal heater temperature is being maintained before each joint is made. Due to ambient air temperature and wind conditions a pyrometer or other surface-temperature-measuring device should be used periodically to insure proper temperature of the heating tool face. The heating tool's surface temperature should be in the range of 204-232˚C.

.c Install the heating tool into the Butt fusion machine and bring the pipe ends into full contact with the heater. To ensure that full and proper contact is made between the pipe ends and the heater, the initial contact should be made under moderate pressure. After holding the pressure very briefly, it should be released without breaking contact. Continue to hold the components in place, without

force, while a bead of molten polyethylene develops between the heater and the pipe ends. When the proper bead size (see below) is formed against the heating tool's surfaces, the heating tool should be removed.

Pipe Size (mm)	Bead Size (mm)
150 – 200	3.2 – 4.7
200 – 300	4.7 - 6.0
300 – 600	6.0 - 11.0
600 – 900	11.0
900 – 1600	14.0

.6 Joining

.a After the pipe ends have been heated for the proper time, the heating tool is removed and the molten pipe ends are brought together with sufficient force to form a double rollback bead against the pipe wall. The fusion force is determined by multiplying the interfacial pressure 413 to 621 kPa by the pipe area.

.i For manually operated fusion machines, a torque wrench may be used to accurately apply the proper force. For manual machines without force reading capability the correct fusion joining force is achieved when the melted plastic beads over the pipe surface to the criteria noted in clause 3.4.5 and 3.4.8.

.ii For hydraulically operated fusion machines, the fusion force can be divided by the total effective piston area of the carriage cylinders to give a hydraulic gauge reading in "kPa". The gauge reading is theoretical therefore the internal and external drag forces need to be added to this figure to obtain the actual fusion pressure required by the machine.

.7 Hold

.a The molten joint is to be held immobile and under pressure by the locking device until the joint is cool to the touch.

.b Do not apply water, wet clothes or similar items to shorten cool time.

.c Pulling, installation or rough handling of the pipe should be avoided for an additional 30 minutes after the pipe joint is cool to the touch.

.8 Visual Inspection

.a Visually inspect and compare the joint against a properly made joint.

.b Visually, the width of the butt fusion beads should be approximately 2 to 2½ times the bead height above the pipe and the beads should be rounded and uniformly sized all around the pipe circumference.

.c The v-groove between the beads should not be deeper than half the bead height above the pipe surface.

.d When butt fusing to molded fittings, the fitting-side bead may display shape irregularities such as minor indentations, deflections and non-uniform bead rollover from the molded part cooling and knit lines. In such cases, visual evaluation is based mainly on the size and shape of the pipe-side bead. Visually unacceptable joints should be cut out and re-fused using the correct procedure.

.9 Fusing saddles

To manufacturer's instructions.

3.9 INSTALLATION

.1 When pipe is being installed in long continuous runs, thermal expansion / contraction shall be considered for final placement of pipe. Minor offset of alignment may be required to allow for pipe movement. The contractor may use the formula 25 mm of change per 10˚C per 30 m of length for determining HDPE pipe expansion / contraction.

.2 Do not drag pipe on the ground once formed into a continuous run. Pipe is to be placed on a series of rollers, spaced to maintain the pipe in a relatively horizontal line of travel during the pull.

3.10 BACKFILL

.1 Upon completion of drilling activity (including slurry disposal from pit) and no further utility work to immediate continue, all excavations related to the drilling are to be backfilled to Section 31 23 33.

.2 Place 38 x 89 mm dimensional lumber piece (temporary marker) at ends of pipe; ensure marker extends 500 mm above ground. Marker to be painted per designated colour for utility to be installed.

3.11 RESTORATION

.1 For new subdivision development the surface of backfilled excavations shall be graded smooth and free of obstruction, to a condition prior to installation.

.2 For projects that are in existing developed areas, hard surfaces are to be re-instated to its prior condition and material; landscaped areas are to have topsoil placed and seeded per Sections 32 91 19 and 32 92 21 respectively.

1. GENERAL

This Section specifies requirements for preparation and installation of a pipe through the process of pipe jacking, pipe ramming, tunnel boring, or auguring.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Site Demolition	Section 02 41 16
.3	Cast-In-Place Concrete	Section 03 30 00
.4	Trench Excavation and Backfilling	Section 31 23 33
.5	Tree and Shrub Preservation	Section 32 93 50

1.2 MEASURE OF PAYMENT

.1 Measurement for payment for trenchless installation where the carrier pipe is installed directly shall be per linear meter, as designated on Issued for Construction drawing(s) or the Engineer excepting the carrier pipe cost.

.2 Measurement for payment for trenchless installation where a casing pipe is installed shall be per linear meter, as designated on Issued for Construction drawing(s) or the Engineer. This price shall include the cost of the casing pipe, based on size installed.

.3 The unit price bid shall be full compensation for all the work and equipment involved in supply and installation of the pipe.

.4 Payment for carrier pipe will be made under those Sections specific to the carrier pipe.

.5 Site preparation (clearing, grading, access etc.) shall be considered incidental to work unless bid item included in Unit Price Contract.

.6 No payment will be made if placement deemed unacceptable due to incorrect grade or alignment.

.7 Surface heaving due to shallowing boring shall be repaired at the Contractor's cost.

2. PRODUCTS

2.1 CASING PIPE

.1 Manufactured according to ASTM A53 for seamless or spiral weld pipe.

.2 Hot-dipped galvanized steel pipe

.3 Minimum wall thickness shall be 9.5 mm.

2.2 CARRIER PIPE

.1 C76 concrete pipe shall be the accepted pipe material for trenchless installation where a casing pipe is not used.

.2 Pipe shall be to CSA A257.2 and meet the following minimum requirements:

.a minimum concrete strength of 40 MPa,

.b only circular reinforcing cages can be used,

.c inner cage reinforcement must extend into the spigot,

.d the length of opposite sides of any section of pipe must be within 6 mm of each other, and

.e all other requirements for reinforced concrete pipe specified in CSA A257 must be met.

2.3 JACK STRAPPING

Strapping shall be per pipe manufacturer's guidelines. Steel collars are typical.

2.4 SPACERS

Spacers may be rubber, polyethylene based, or stainless steel strips depending upon carrier pipe material, size and usage.

2.5 CUSHION MATERIAL

During jacking or ramming operation acceptable cushioning material shall be construction grade plywood, hardboard or rubber; material thickness dependent upon pipe size and length of push.

2.6 EQUIPMENT

The Contractor shall ensure the appropriate equipment can met the proposed method and soil conditions required for the work.

.1 Auger and Jack

This equipment will consist of a casing pipe with an auger installed inside (to remove the spoils) attached to a hydraulic piston which is braced to provide the forward excavation. The auger is to be equipped with, or compatible with, guidance technology to ensure grade and alignment.

.2 Ramming

This equipment will consist of a casing pipe attached to a hydraulic piston to provide the forward excavation. The spoils are extracted from the pipe through a secondary method. Ramming may not be acceptable if grade is critical.

.3 Tunnel Boring Machine

This equipment will consist of a guided mechanized drilling head to ensure grade and alignment. The casing pipe is installed as the tunneling machine excavates the bore.

3. EXECUTION

3.1 PREPARATION

.1 Provide the following information as part of the award of the contract:

a. Complete methodology, specific to each crossing, including equipment and the casing specifications showing its load capabilities.

b. Schedule of work.

c. Contractor to verify with Engineer, the drawing of the work site, including location and footprints of equipment and the entry and exit locations.

d. Emergency procedures for inadvertently boring into a live power line, natural gas line, water line, sewer line, or fibre-optic cables. Procedures must comply with regulations.

e. Emergency procedures and management plan in the advent of a surface fracture or ground heaving.

.2 Ensure the work site is acceptable for the machinery and method of work. If the site has not been prepared by others prior to this work the Contractor is to contact the Engineer to determine responsibility of site preparation and payment thereof.

.3 Adhere to Municipal and Provincial requirements relating to safety of trenching work, including shoring and bracing as required.

3.2 PROTECTION

.1 For vehicle and pedestrian, refer to Section 01 55 26

.2 For tree root protection, refer to Section 32 93 50.

3.3 PROCESS

.1 The Contractor is to ensure the Engineer has obtained all crossing permits (railway, pipeline, telecommunications duct, etc.) and provided subsequent requirements prior to starting construction activities near or across from these utilities.

.2 Notify owners of subsurface utilities, on either side of the proposed drill path, of the impending work through the one-call program. All utilities along and on either side of the proposed drill path are to be located.

.3 All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.

.4 The proposed drill path shall be determined and documented including its horizontal and vertical alignment and the location of buried utilities and substructures along the path.

.5 If applicable, schedule work to minimize interruption to existing services and local traffic.

3.4 TRAFFIC CONTROL

Provide adequate warning signage and devices for pedestrian and vehicular traffic per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer, if applicable to work location.

3.5 HANDLING

Only operators trained through a certified institute or equipment manufacturers program shall be permitted to operate the drilling equipment. The operator shall be responsible

to, minimally, operate the equipment to the manufacturer's operating instructions and safety practices.

3.6 TOLERANCE

Installed pipe shall be within 0.5% (+/-) of design grade and within 100 mm (+/-) of exit elevation. Entry elevation shall be within 50 mm of design. Alignment variation shall be 300 mm (+/-) from design location.

3.7 EXCAVATION

.1 General

.a Excavate working pit(s), keeping to minimum dimensions and depths that meet regulation.

.b Excavation shall be kept dewatered during construction of crossing.

.c Install machinery track, counter or back blocking etc.

.2 Casing Pipe

.a Shall not be in tension and joints shall be welded.

.b Shall be installed to line and grade per drawings.

.c Cover ends of casing pipe if carrier pipe is not installed immediately following casing installation.

.3 Carrier Pipe

.a Prior to installation, carrier pipe shall be strapped with approved spacers to ensure that pipe is supported along its entire length.

.b Join carrier pipe one length at a time outside of hole or casing then push carrier pipe into position. Install bracing required to prevent overstressing the pipe and joints during the push process (not required if installation is in a casing pipe).

.c Use a cushion material between adjacent pipe sections to provide a uniform load distribution throughout the entire pipe length being jacked. When pipe with rubber gasket joint sealants is being jacked, it is essential to provide cushioning between the pipe ends to avoid the development of radial gasket pressures which may overstress the pipe sockets or grooves. (This is not required if installation is in a casing pipe)

.d Carrier pipe shall be cradled on fill concrete at each end of casing pipe. Concrete shall be poured in ends of casing pipe to form a watertight seal. Concrete work shall be to Section 03 30 00.

3.8 BACKFILL

.1 Upon completion of drilling activity (including slurry disposal from pit) and no further utility work to immediate continue, all excavations related to the drilling are to be backfilled to Section 31 23 33.

.2 Place 38 x 89 mm dimensional lumber piece (temporary marker) at ends of pipe; ensure marker extends 500 mm above ground. Marker to be painted per designated colour for utility to be installed.

3.9 RESTORATION

.1 For new subdivision development the surface of backfilled excavations shall be graded smooth and free of obstruction, to a condition prior to installation.

.2 For projects that are in existing developed areas, hard surfaces are to be re-instated to its prior condition and material; landscaped areas are to have topsoil placed and seeded per Sections 32 91 19 and 32 92 21 respectively.

3.10 ABANDONMENT

If a drilled hole beneath an artificial surface must be abandoned the hole shall be filled with grout or bentonite to prevent future subsidence or the casing pipe abandon per Section 02 41 16 or as directed by the Engineer.

1. GENERAL

This Section specifies requirements for preparation and installation of a replacement pipe through the process of bursting the existing pipe and replacing with a new pipe.

1.1 RELATED WORK

.1	Traffic Control	Section 01 55 26
.2	Trench Excavation and Backfilling	Section 31 23 33
.3	Tree and Shrub Preservation	Section 32 93 50
.4	Horizontal Directional Drilling	Section 33 05 26
.5	Water Mains	Section 33 11 16
.6	Sanitary Mains	Section 33 31 13
.7	Sewage Force Mains	Section 33 34 00
.8	Storm Sewer Mains	Section 33 41 00
.9	Water, Sanitary, and Storm Service Connections	Section 33 41 16
.10	Sewer Cleaning	Section 33 45 00
.11	Inspection of Sewers	Section 33 45 10

1.2 CONSTRAINTS

.1 The Contractor's rehabilitation scheme shall not shut off the existing services for more than 8 hours. Portable toilets shall be provided by the Contractor at the home-owners request.

.2 The Contractor shall commit to comply with the work schedule.

.3 The rehabilitation scheme shall be executed without any excavation.

1.3 HANDLING

Only operators trained through a certified institute or equipment manufacturers program shall be permitted to operate the equipment. The operator shall be responsible to,

minimally, operate the equipment to the manufacturer's operating instructions and safety practices.

1.4 MEASURE OF PAYMENT

.1 Payment for Pipe Bursting shall be made based on the length of pipe burst, measured horizontally along the centreline of the sewer from the inside face of the upstream manhole to the inside face of the downstream manhole. Unit price bid shall be full compensation for supply, material, equipment and plant, installation, and all incidentals as necessary and required to complete the work as specified in the Contract Documents and as directed by the Engineer.

.2 Payment for the replacement (carrier) pipe will be made under those Sections specific to the carrier pipe.

.3 All work necessary for the diversion and control of flow from existing sewers and services, temporary service connections, and testing shall be considered incidental to the Work.

.4 Re-establishment of service connections to be measured as the number of existing active service connection re-established after installation of the new pipe. Unit price bid shall be full compensation for all work necessary for the re-establishment of existing service connections.

.5 CCTV sewer inspection payment shall be to Section 34 45 10.

.6 Engineering services provided by the contractor shall be considered incidental to the work.

.7 Costs to provide emergency pumping to prevent up-stream system back-up or flooding, clean-up due to spillage or leakage, disposal of contaminated sewage material etc. shall be considered incidental to the work.

.8 Site preparation (clearing, grading, access etc.) shall be considered incidental to work unless bid item included in Unit Price Contract.

.9 No payment will be made if placement deemed unacceptable.

.10 Surface heaving due to bursting shall be repaired at the Contractor's cost.

2. PRODUCTS

2.1 BURSTING HEAD

.1 A conical shaped tool with an outside diameter greater than the maximum inside diameter of the existing sewer pipe.

.2 The tool shall have a front cable attachment, for pulling, and rear attachment for pulling the new pipe through.

.3 The tool shall be of dimensions such that the design maximum diameter of the space created shall not exceed the maximum outside diameter of the new pipe by more than 15%.

2.2 CARRIER PIPE

.1 HDPE pipe is to be used for this work. See Section 33 11 16 (water) or 33 34 00 (sewer force main) for HDPE pipe specifications unless directed otherwise by the Engineer.

.2 Ensure the HDPE pipe has the proper stripped colour code (see the appropriate utility Section).

.3 The pipe dimension specified on the drawing is the inside diameter (I.D.) required for the sewer hydraulics. If the Contractor proposes an alternative pipe material or pipe diameter (I.D. or O.D.), the Contractor shall receive written approval from the Engineer.

.4 If another pipe material is accepted to be used, refer to the specific utility Section for pipe information.

2.3 CLAMPS

.1 At the discretion of the Engineer, where pipe replacement occurs between two manholes, the ends of the new pipe will be cut smooth and square to the axis so that both ends meet and touch uniformly and continuously with the existing pipe. A stainless steel full circle universal clamp coupling with a 6 mm minimum thickness grid type gasket shall be used to join the new pipe to the existing pipe.

.2 Select clamps to fit the outside diameter of the replacement pipe. Minimum clamp widths shall be 750 mm for pipe with outside diameters greater than 300 mm.

.3 Any alternate coupling system must be submitted to the Engineer for approval.

2.4 EQUIPMENT

.1 The Contractor shall ensure the appropriate equipment can meet the requirements of the work.

.2 Provide equipment that will conform to applicable noise bylaws; refer to Section 01 14 00.

3. EXECUTION

3.1 SCHEDULING OF WORK

.1 Provide the Engineer with a schedule detailing each stage of the work.

.2 The work schedule shall be provided a minimum of seven working days in advance of project commencement. No work shall commence without an approved schedule.

.3 If applicable, schedule work to minimize interruption to existing services and local traffic.

3.2 PREPARATION

.1 Provide a complete methodology of the work upon the award of the contract.

.2 Contractor to verify with Engineer, the drawing of the work site, including location and footprints of equipment and the entry and exit locations.

.3 Contractor may review existing CCTV video, sanitary sewer service records, sanitary sewer main and manhole record drawings for additional information.

.4 Emergency procedures and management plan shall be in place in the event of a surface fracture or ground heaving.

.5 Ensure the work site is acceptable for the machinery and method of work.

3.3 SAFETY

.1 Health and safety requirements as per Section 01 35 29.

.2 Operate in strict accordance with Provincial and Town Regulations, refer to 01 41 00.

.3 Observe the Occupation Health and Safety requirements for working and entering confined spaces, manholes and excavations.

3.4 TRAFFIC CONTROL

Provide adequate warning signage and devices for pedestrian and vehicular traffic per Sections 01 55 26 and 01 58 99; and / or as directed by the Engineer, if applicable to work location.

3.5 PERMITS AND CROSSINGS

.1 The Contractor is to ensure the Engineer has obtained all crossing permits (railway, pipeline, telecommunications duct, etc.) and provided subsequent requirements prior to starting construction activities near or across these utilities.

.2 Notify owners of subsurface utilities, on either side of the proposed drill path, of the impending work through the one-call program. All utilities along and on either side of the pipe to be replaced are to be located.

.3 All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.

3.6 CLEANING OF SEWER LINE

.1 Once the work site has been established, the Contractor shall clean the sewer line(s) that are to be replaced. Refer to Section 33 45 00 for cleaning requirements.

.2 Depending upon the amount of bursting and the time to re-establish the new pipe, including connections, the contractor shall schedule the cleaning so they are done shortly before the bursting is scheduled.

3.7 INSPECTION OF SEWER LINE

.1 Contractor to have the cleaned sewer line(s) video inspected, refer to Section 33 45 10 for video inspection requirements.

.2 Extra attention shall be made when inspecting the interior of the sewer line to allow for the careful determination of locating pipe defects and / or conditions which may prevent proper bursting of the pipe.

3.8 BYPASSING SEWAGE

.1 Provide for the flow of sewage around the section or sections of pipe to be replaced, submit details for approval prior to implementation.

.2 Provide bypassing by plugging the line at an existing upstream manhole and pumping the sewage flow into a downstream manhole.

.3 Provide pumps and bypass lines of adequate capacity to handle the flow while ensuring no spillage.

.4 Provide equipment that will conform to applicable noise bylaws; refer to Section 01 14 00.

.5 Ensure that no contamination of basements, ditches, roadways, sidewalks, etc. with raw sewage shall occur. In the event of such contamination, immediate action shall be taken to close the source of contamination. Proper clean-up of the affected area shall be followed and no work shall recommence until a re-evaluation of the complete process has been carried out by the Environmental Services, Construction and Maintenance Superintendent. No rehabilitation work shall commence unless authorized by the Environmental Services, Construction and Maintenance Superintendent. No extra payment will be made for decontamination, clean up or down time.

.6 The rehabilitation scheme shall ensure that no upstream flooding occurs during construction. The Contractor shall allow in his bid price for monitoring of water levels in manholes and for emergency pumping.

3.9 LINE OBSTRUCTION

.1 Clean the line of obstructions such as solids, roots, sediments, protruding service connection, encrustation, or collapsed pipe that will prevent the completion of the pipe bursting process.

.2 If sewer cleaning or obstacle removal methods cannot remove an obstruction, a point repair excavation shall be made to uncover and remove or repair the obstruction. The contractor shall obtain written approval from the Engineer prior to undertaking this work.

.3 Make every effort to identify such locations during tender time after reviewing available CCTV tapes and record plans. No extra payment will be made for removal of obstructions that in the opinion of the Engineer were adequately identified at tender time.

3.10 SAGS IN LINE

.1 If the CCTV inspection reveals a sag in the existing sewer, the contractor shall define the degree to which the sag may or may not be reduced by the pipe bursting process.

.2 Undertake the necessary measures to reduce existing sags by the pipe bursting process or locate the insertion / access pits such that the sag location is exposed

and the bottom of the pipe trench is raised to provide a uniform grade in line with the new pipe invert.

.3 No new sags or accentuation of existing sags will be accepted.

.4 Take all measures required to repair new sags deemed as unacceptable, including, if necessary, excavating a pit and bringing the bottom of the trench up to a uniform grade in line with the invert of the adjacent pipe.

3.11 INSERTION OR ACCESS PITS

.1 The location and number of insertion or access pits shall be outlined by the Contractor and submitted, in writing, for approval by the Engineer prior to commencement of work.

.2 Unless otherwise stipulated, the pits shall be located such that their total number shall be minimized and the length of replacement pipe installed in a single pull is maximized.

.3 Locations of damaged pipe or sags shall be used for insertion / access pits if directed by the Engineer.

3.12 TOLERANCE

The installation procedure shall make the invert of the new pipe lower than the original invert by half the difference between the inside diameters of the old pipe and the replacement pipe.

3.13 BURSTING AND INSTALLATION

.1 Prior to installation, the new pipe is to be visually checked and shall be free from visual defects such as foreign inclusions, concentrated ridges, pitting, discoloration, varying wall thickness and other deformities.

.2 Excavate the access pits, if applicable, keeping to minimum dimensions and depths.

.3 Fuse the HDPE pipe per Section 33 05 25. The installed replacement pipe shall be continuous over the entire length, from manhole to manhole (or access point to access point).

.4 Draw the bursting head through the existing pipe, breaking it into small fragments, forcing the broken pieces into the surrounding soil, and simultaneously pulling the new pipe into place.

.5 When pipe is being installed in long continuous runs, thermal expansion / contraction shall be considered for final placement of pipe. Minor offset of alignment may be required to allow for pipe movement. The contractor may use the formula 25 mm of change per 10˚C per 30 m of length for determining HDPE pipe expansion / contraction.

.6 Do not drag pipe on the ground once formed into a continuous run. Pipe is to be placed on a series of rollers, spaced to maintain the pipe in a relatively horizontal line of travel during the pull.

.7 If, during the process of bursting or installing the new pipe, other underground utilities in the vicinity are damaged, the Contractor shall be responsible for making good any damage incurred.

3.14 CAMERA INSPECTION AND TESTING

Upon completion of the installation work, the Contractor shall provide a video inspection of the new pipe and perform a performance test of the pipe. The camera inspection shall be to Section 33 45 10 and testing shall be to the specific utility Section within this Division.

3.15 SERVICE CONNECTIONS

.1 After the pipe inspection and testing has been accepted and the pipe system is placed into service, the existing active services shall be re-established.

.2 Reconnection of services shall be done with open-trench excavation to Section 33 41 16.

.3 Upon completion of the service connections, a video inspection shall be done to ensure the connection work is satisfactory.

3.16 MANHOLE CONNECTIONS

Ensure the new pipe is connected to the manhole creating a sealed joint between the pipe and the barrel.

3.17 RESTORATION

.1 Upon completion of the installation of a designated section, all excavations related to that section are to be backfilled to Section 31 23 33.

.2 For projects that are in existing developed areas, hard surfaces are to be re-instated to its prior condition and material; landscaped areas are to have topsoil placed and seeded per Sections 32 91 19 and 32 92 21 respectively.

3.18 CONSTRUCTION COMPLETION INSPECTION

.1 Upon completion of the sewer line work, including but not limited to rehabilitation of the manholes and service connections, the contractor shall clean the new pipe, to Section 33 45 00, and re-camera, to Section 33 45 10, the pipe to ensure the work is acceptable.

.2 At locations where any protruding services have been removed include in the video inspection a view of the service lateral, from the main (minimally) 2 m into the service lead. Video inspection of services from private property to the new pipe may be required if ordered by the Engineer.

.3 Should the video inspection reveal defects in the new pipe or service connections the Contractor shall repair or replace these defects, as ordered by the Engineer, at no cost to the Town.

3.19 CLEAN UP

Upon acceptance of the work, clean and restore the affected area to the condition that existed prior to commencement of the work; refer to Section 01 74 11.

3.20 ABANDONMENT

If a pipe burst must be abandoned refer to Section 02 41 16 or seek direction of the Engineer.

1. GENERAL

This Section specifies requirements for supplying and installing pressure water main pipe and appurtenances.

1.1 RELATED WORK

.1	Work Restrictions	Section 01 14 00
.2	Construction Progress Documentation	Section 01 32 00
.3	Site Demolition	Section 02 41 16
.4	Cast-In-Place Concrete	Section 03 30 00
.5	Trench Excavation and Backfilling	Section 31 23 33
.6	Manholes and Catch basins	Section 33 05 13
.7	Directional Drilling	Section 33 05 25
.8	Boring, Jacking and Ramming Pipe	Section 33 05 26
.9	Water, Sanitary and Storm Service Connections	Section 33 41 16
.10	Construction Specification Drawings	Division 50 20 00

1.2 SCHEDULING OF WORK

.1 Maintenance

.a Schedule work to minimize interruptions to existing services.

.b Submit schedule of expected interruptions for approval by Engineer.

.c Notify Engineer and affected consumers, a minimum of 24 hours in advance, of any interruption in service.

.d Notify The Town of Olds Emergency Services Department (403.346.5511) of any planned or accidental interruption of water supply to hydrants.

.2 New Construction

.a Refer to Section 01 32 00.

1.3 PROTECTION

.1 Disruption of Water Supply

Notify all consumers in writing at least 24 hours prior to any anticipated interruptions in their water service; where possible schedule interruptions to occur in non-peak hours. If interruption is to last longer than eight hours, provide temporary water service to each house via surface hoses connected to outside taps of each house. Care must be taken with temporary water lines to prevent contamination.

.2 Boundary Valve Operation during Construction

Boundary valves are valves that isolate new water main construction from existing water mains serving people with potable water. These valves protect the public from contamination of their drinking water caused by backflow from un-disinfected water mains, excessive chlorine concentrations and excessive hydrostatic pressure. Extreme care must be taken when opening and closing boundary valves to ensure that the water serving consumers remains safe for consumption and that the consumer is not inconvenienced.

.a Operation of all boundary valves is restricted to Environmental Services personnel; the cost of which shall be borne by the contractor.

.b At the discretion of the Environmental Services manager, operation of the boundary valve may be given to the contractor.

.c The Engineer must be notified and Environmental Services must be provided with a drawing indicating all of the boundary valves that will be required for the project, before the construction begins on any new water main.

.d It will remain the responsibility of the Contractor to ensure that boundary valves are kept closed and secured until Construction Completion Certificates are issued.

1.4 MEASURE OF PAYMENT

.1 Trench excavation, backfill, bedding, initial backfill and compaction to be measured under Section 31 23 33.

.2 Supply and installation of water main pipe in open trench shall be paid for at unit price bid per lineal metre, including hydrant leads, measured in place, through all valves and fittings. Price shall be full compensation for all work necessary for the supply and installation of water mains, including pipe laying, jointing, thrust blocking, testing, flushing and disinfection. Fusion of HDPE / FPVC pipe shall be considered incidental to the work.

.3 Supply and installation of hydrants, including extensions, to be measured in units installed. Hydrant barrel lengths shall be supplied for depth of bury specified on the Drawings for each hydrant. Depth of bury shall be measured from invert elevation of elbow to ground flange. Tendered price shall include bracing, backfilling, thrust blocking, painting and all other work and material required to install hydrants.

.4 Valves to be measured in units supplied and installed, including valve boxes.

.5 Bends, tees, crosses and other fittings to be measured in units supplied and installed. Tendered price shall include supply and installation of the fitting, gaskets, couplers, thrust blocks and all other work and material required to install fitting.

.6 Air relief valve or parks service box from standpipe to enclosure, including fittings, enclosure, cover, etc., shall be paid for on a lump sum basis. Trench and service pipe from main to standpipe to be paid under Sections 31 23 33 and 33 41 16 respectively.

.7 Valve chambers to be measured in units supplied and installed.

.8 For trenchless installation, payment shall be to Section 33 05 25.

2. PRODUCTS

2.1 PIPE

.1 **Polyvinyl Chloride pipe (PVC)**

.a Polyvinyl chloride pressure pipe to CAN3-B.137.3 (AWWA C900 for 100 mm to 300 mm diameter pipe and AWWA C905 for 350 mm to 1,200 mm diameter pipe).

.b All pipes shall be sized to cast iron outside diameter (CI-OD) and coloured blue.

.c 100 mm to 300 mm pipe sizes to be designated DR 18, pressure class 150.

.d 350 mm or greater pipe sizes to be designated DR 18, pressure class 235.

.2 **High Density Polyethylene (HDPE)**

.a High Density Polyethylene pressure pipe to AWWA C906, PE 3408 to be designated DR 11, pressure class 160 psi.

.b Shall have a blue, longitudinal strip.

.c Caution when handling at a temperature below 4˚C.

.d All pipes shall be sized to cast iron outside diameter (CI-OD). Pipe sizing shall be selected according to internal diameter.

.e During visual inspection of pipe upon delivery and a scratch is detected; if the scratch depth is 10% or greater than wall thickness either the pipe is not used, or the area of the scratch is removed (if less than half a pipe length) or repair per manufacturer's warranty.

.f HDPE pipe is the only pipe material to be used for trenchless installations.

.g HDPE fusing to Section 33 05 25.

2.2 PIPE JOINTS

.1 PVC

Polyvinyl chloride pipe joints shall be bell and spigot joints with gaskets conforming to AWWA C111. Mechanical and flange joints with gaskets conforming to AWWA C111 to be used when specified or approved by Engineer. Denso tape or approved equal to be applied to all mechanical joint fittings.

.2 HDPE

Flanged fittings and connections shall be used on the branch side of the pipe at tees, wyes, valves etc. Corrosion protection measures to be incorporated.

2.3 FITTINGS

.1 Polyvinyl chloride fittings to CAN 3-B.137.3, pressure class 150, with bell-end joints and gaskets conforming to AWWA C111. Fittings to be DR 18, size range up to 900 mm, conforming to AWWA C900, C905 and C907.

.2 Ductile iron cast fittings to AWWA C110 with bell-end joints, with gaskets conforming to AWWA C111. Mechanical and flange joints as specified or approved by Engineer, with gaskets conforming to AWWA C111 and ANSI 303 stainless steel bolts, hex head nuts and washers conforming to ASTM A-3200.

.3 Ductile iron cast couplings to be Robar 1506, epoxy coated couplings or approved equal, complete with T304 (ASTM A743) stainless steel nuts and bolts, compatible with outside diameters of pipes to be joined in locations approved or specified by Engineer.

.4 HDPE fittings to AWWA C906, PE 4710 to be designated DR 11, pressure class 200 psi (alternate: PE 3408, pressure class 160 psi).

2.4 VALVES AND VALVE BOXES

.1 Valves - General

a. Working pressure 1034 kPa.

b. Valve interior and exterior to be epoxy coated for corrosion protection,

c. Non-rising stem with O-ring seals,

d. 50 mm square operating nut,

e. Valves to open counter-clockwise,

f. All exterior bolts and nuts must be T304 stainless steel.

.2 Gate valve

.a Shall be resilient seat gate valves conforming to AWWA C509 and approved for potable water service.

.b Cast iron body, double disc or solid wedge with full 360E rubber to cast iron resilient seat

.c Resilient seat to be bonded or mechanically attached to gate and valve body

.3 Butterfly valve

.a Shall be rubber seat valves conforming to AWWA C504

.b Side-mounted, travelling nut on non-rising stem for direct bury operation

.c ***ONLY to be used on 350 mm and large diameter mains when specified by Engineer.***

.4 Valve Boxes

.a Type “B” valve is preferred; Type “A’ is optional

.b For Type “B” all connections shall be thread fitting (screw down)

.c For Type “A” the cap shall be thread fit with the top and extension parts being slip fit

.d All parts shall be grey cast iron to ASTM A48, Class 20 excepting Type “A” which may use a Schedule 40 PVC pipe (or equivalent) for the extension and bottom sections.

2.5 HYDRANTS

.1 Hydrant to be post type, dry top design, with compression shut-off conforming to AWWA C502 and listed with Underwriter's Laboratories of Canada and Factory Mutual.

.2 Minimum flow 60 litres per second.

.3 Minimum working pressure of 1034 kPa (150 psi).

.4 Main valve opening of 133.3 mm (5 1/4 in.).

.5 "O" ring positive type seals.

.6 Grease lubricated operating mechanism.

.7 360° rotation of upper body.

.8 Hose connection:

.a Two hose connections at 180° with 65 mm I.D., 75 mm thread O.D. with Alberta Mutual Thread.

.b One pumper connection with 114 mm I.D., 125mm Storz connector O.D. and 4 threads per 25 mm.

.9 32 mm pentagonal shaped operating nut and hose nozzle caps.

.10 Counter clockwise opening.

.11 Four, six or eight bolt connection flanges.

.12 Bury of 2.75 m overall including a 450 mm top extension.

.13 Hydrant rod to be coupled at the top and bottom of extension.

.14 Ground line breakaway system.

.15 All exterior bolts, nuts and washers to be 18-8, type T304 stainless steel.

.16 Drain holes are to be operational at time of installation (unless requested by the Engineer), and to have to option of being plugged externally by means of threaded plugs.

.17 Inlet elbow connection to be 150 mm "push on", bell end complete with gasket for PVC DR 18, C-900, water pipe.

.18 Dimension from top of operating nut to bottom of base flange to a minimum of 660 mm.

.19 Upper body colour - fire engine Red (Cloverdale alkyd metal primer 71309 grey. Finish coat - Cloverdale modified alkyd gloss speed enamel 76002, PG-8, MY-2Y, 0Y-6Y, TW-2Y, YO-2I, BG-per 01, lead free paint).

.20 Approved hydrants are Canada Valve Century and Clow Brigadier M-67.

2.6 SUBSURFACE PROTECTION

Denso tape or approved equal.

2.7 VALVE CHAMBERS

Refer to Section 33 05 13.

2.8 PIPE DISINFECTION

For pipe disinfection, sodium hypochlorite, calcium hypochlorite or liquid chlorine to AWWA B300 or AWWA B301 shall be used.

3. EXECUTION

3.1 PREPARATION

Clean pipes, fittings, valves, hydrants and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects. Remove defective materials from site.

3.2 TRENCHING, BEDDING AND BACKFILL

.1 Do trenching, bedding and backfill work in accordance with Section 31 23 33.

.2 Trench alignment and depth as established by Engineer.

.3 Do not backfill trenches until installed work has been inspected by the Engineer.

3.3 PIPE INSTALLATION

.1 General

.a Lay pipes to manufacturer's standard instructions and specifications.

.b Join pipes in accordance with manufacturer's recommendations. Apply a minimum amount of pipe lubricant only to the bevelled end of the pipe spigot.

.c Handle pipe by approved methods. Do not use chains or cables, passed through the pipe bore, so that the weight of pipe bears on the pipe ends.

.d Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed through out its full length. Remove and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows undue settlement after installation.

.e Face socket ends of pipe in direction of layout. For mains on a grade of 2% or greater, face socket ends up-grade.

.f Do not exceed permissible deflection at joints or bending through length of pipe as recommended by pipe manufacturer.

.g Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.h Position and join pipes with equipment and methods approved by Engineer.

.i Cut pipes in an approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.j Align pipes carefully before jointing.

.k Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required, to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.l Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.

.m Complete each joint before laying next length of pipe.

.n Minimize deflection after joint has been made.

.o Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.p Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Engineer.

.q When work stoppage occurs, block pipes in an approved manner to prevent creep during down time.

.r Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.

.s Do not lay pipe on frozen bedding.

.t Protect hydrants, valves and appurtenances from freezing.

.u Upon completion of pipe laying and after the Engineer has inspected the work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated or directed by Engineer.

.2 **HDPE Pipe**

.a For HDPE pipe being installed in long continuous runs, thermal expansion / contraction shall be considered in final placement of pipe. Minor offset of alignment may be required to allow for pipe movement. The contractor may use the formula 25 mm of change per 10˚C per 30 m of length for determining HDPE pipe expansion / contraction.

.b Do not drag pipe on the ground once formed into a continuous run. Pipe is to be placed on a series of rollers, spaced to maintain the pipe in a relatively horizontal line of travel during the pull.

.c If pipe fusing to be done in the trench, allow for extra trench width for fusing equipment.

.d Refer to Section 33 05 25 for pipe fusion information.

3.4 VALVE AND FITTING INSTALLATION

.1 Install valves and fittings to manufacturer's recommendations at locations indicated.

.2 Support valves located in valve boxes or valve chambers by means of wood blocks, located between valve and solid ground.

.3 All subsurface bolted connections in contact with the soil shall be wrapped in denso tape.

3.5 VALVE CHAMBERS

Refer to Section 33 05 13.

3.6 BORING OR JACKING

Refer to Section 33 05 26.

3.7 DIRECTIONAL DRILLING

Refer to Section 33 05 25.

3.8 SERVICE CONNECTIONS

Refer to Section 33 41 16.

3.9 HYDRANTS

.1 Install hydrants at locations indicated or directed.

.2 Install hydrants in accordance with AWWA Manual of Practice M-17.

.3 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated.

.4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 100 mm above final sidewalk grade.

.5 Ensure drain plug is installed, and operational.

.6 Hydrants may be used for pressure testing, disinfection and flushing of water mains. They must be operated in full open position only. To restrict flow, attach a secondary valve to hydrant nozzle. All hydrants to be pumped dry to prevent freezing.

.7 Install an “Out of Service” disk on one of the hose connections. The disk will be removed by Town Forces as outlined in Clause 3.10 of this Section.

.a "Out of Service" disks will be supplied by The Town of Olds and may be obtained by contacting Operational Services.

3.10 THRUST BLOCKS

.1 Do concrete work in accordance with Section 03 30 00.

.2 Place concrete thrust blocks between undisturbed ground, tees, plugs, caps, bends, reducers, hydrants and fittings as indicated in Division 50 or Specific Drawings.

.3 Keep joints and couplings free of concrete.

.4 Do not backfill over concrete within 24 hours after placing.

3.11 HYDROSTATIC AND LEAKAGE TESTING

.1 General

.a Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.b Clean pipe, with a water flush, to remove debris prior to pressurizing. This is **not** considered disinfecting the water line.

.c Notify Engineer at least 48 hours in advance of all proposed tests. Perform tests in presence of Engineer.

.d Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least five days after placing concrete or two days if high early strength concrete is used.

.e The length of test section shall not have any appurtenances within the test length that has a pressure rating less than the testing pressure.

.f Open valves within test section.

.g Expel air from main by slowly filling main with potable water. Install corporation stops where required to expel air at high points or to flush dead ends in main, as directed by Engineer. Close stops after satisfactory completion of test. **Air pressure testing of installed P.V.C. pressure pipe is expressly prohibited for safety reasons.**

.h The flow velocity of the fill water shall not exceed the capacities of the air release measures.

.i The flow velocity of the fill water shall not exceed the design velocity of the pipe.

.j Allow the test section (pipe) and fill water temperature to equalize to a common temperature.

.k Relieve hydrostatic pressure on each section of pipeline segment at the end of the test period.

.2 **PVC Pipe**

.a Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Engineer.

.b Test pipeline, including service connections after all backfilling is complete.

.c Apply hydrostatic test pressure of 1035 kPa or 1.5 times the normal operating pressure based on elevation of lowest point in main and corrected to elevation of test gauge, for a period of two hours.

.d Define leakage as amount of water supplied in order to maintain test pressure for two hours.

.e Do not exceed allowable leakage as defined in AWWA C600 using the following formula:

$$\text{For PVC: } L = \frac{NxDxP^{0.5}}{128{,}320}$$

P - test pressure (kPa) (1.0 PSI = 6.9 kPa)
D - nominal diameter (mm)
N - number of mechanical joints
L - leakage (l)

.f Locate and repair defects if leakage is greater than amount specified.

.g Repeat test until leakage is within specified allowance for full length of water main.

.3 **HDPE Pipe**

.a Test pipeline in sections not exceeding 800 m in length, unless authorized otherwise, by the Engineer.

.b If testing is conducted in open trench, prior to pressurizing pipe, ensure pipe is restrained by backfilling at mid-sections between fused joints. This is to allow for a visual check of the joints for leaks.

.c Apply hydrostatic test pressure to 1.5 times the normal operating pressure based on elevation of lowest point in main and corrected to elevation of test gauge.

.d No leakage allowed at fused pipe joints. If seepage found at a fused joint the pressure is to be released, the joint removed and a new joint created.

.e Add make-up water as necessary to maintain maximum test pressure for 4 hours.

.f After four hours reduce test pressure by 1.45 KPa and monitor pressure for one hour (test phase). Do not increase pressure or add make-up water.

.g If no visual leakage is observed and the pressure, during the one hour test phase, remains steady (within 5% of the test phase pressure) the pipe section has passed the test.

.h The total testing time, from initial pressurization, initial expansion, and time at test pressure, shall not exceed 8 hours. If failure occurs 8 hours is required to “relax” the pipe before another test may be done.

3.12 FLUSHING AND DISINFECTING

.1 A drawing detailing the proposed flushing sequence and valves required is to be approved and signed by the Engineer and the Water Superintendent before commencement of flushing. This drawing shall be provided to The Town of Olds Engineering Services inspector prior to the flushing.

.2 Prior to any flushing operations, a Wastewater Discharge Dewater Permit or a Storm Water Discharge Dewater Permit must be obtained from Environmental Services through the Source Control Section. The Source Control Section can be reached at 403.342.8750. Upon acceptance of disinfection by the Engineer, flushing may proceed. Notify Water Town Hall at 403-556-6981 at least 48 hours prior to proposed date when flushing with distribution system water is scheduled to commence. Flushing may be limited to off-peak hours.

.3 Flushing and disinfecting operations shall be witnessed by the Engineer. Notify the Engineer at least 48 hours before the proposed date when disinfection will commence.

.4 Provide connections and pumps as required.

.5 Flush and disinfect all water mains, stubs longer than 12.2 m and services greater than 50 mm in diameter to AWWA C651-86. The point of application shall be at or near the beginning of the pipe extension and the discharge shall be at or near the end of the line being treated. Hydrants shall not be used for point of application of sodium hypochlorite or liquid chlorine.

.6 Flushing is to be directed to the sanitary sewer and continue until all chlorinated water, pipe lubricant or other materials that may have entered the main during construction have been expelled.

.7 De-chlorination of the chlorinated water will be required in the event a sanitary manhole is not available for receiving this water in order to meet the regulatory requirements of The Town of Olds or Environmental protection. De-chlorination, if required, is to be performed by adding neutralizing chemicals (AWWA C651-86, Appendix B) to the chlorinated water as it is flushed from the system and before it enters the receiving environment.

.8 After final flushing, the Engineer will allow 12 hours to pass before collecting water samples for bacteriological testing. The water main is to be flushed for not more than five minutes before taking the sample as per AWWA C651-14. One sample is to be taken from each leg of the water main, stubs longer than 12.2 m and services greater than 50 mm in diameter.

.9 Bacteriological samples are to be collected by the Engineer in approved sample bottles obtained from the Provincial Laboratory of Public Health or the local Health Unit. The sample bottles are sterilized and contain a de-chlorination reagent. Never rinse sample bottle before testing. The locations where each sample is taken must be clearly identified on the Provincial Laboratory Public Health form, PH 108, provided with each sample bottle. **Indicate the sample is from a newly constructed water main and use Access #9010253.**

.10 If the samples are from **new subdivision development**, a drawing showing the main tested, the location of each sample drawn on that main and the corresponding identification number from the Public Health Form PH 108. This drawing and test results are to be provided to the Engineering Services Development Coordinator.

.11 If the samples are from replacement of main due to maintenance, new service connection(s), private systems (e.g. mall complex), etc. a drawing showing the pipe(s) tested, the location of each sample drawn and the corresponding identification number from the Public Health Form PH 108 is to be provided to Environmental Services, Water Distribution Lead Operator.

.12 No new water main will be put into service until all excess pipe lubricant has been flushed from the main and the results of the bacteriological tests have been provided to:

.a For new subdivision development: Engineering Services Development Coordinator, stating the water is free from contamination.

.b For other on-site or re-development or maintenance related work the results may be delivered to Engineering Services, 4512 - 46 Street or faxed to 403-556-6537. To the attention of the Water Distribution Lead Operator.

.13 Once satisfactory bacteriological test results have been confirmed and water quality is found to be free of pipe lubricant, have a chlorine residual between 0.5mg/L and 3.0mg/L and turbidity of less than 5.0 NTU. Out of service disks will be removed from all fire hydrants in the approved zone and the Emergency Services Department will be notified.

.14 If the initial disinfection fails to produce satisfactory bacteriological samples, the mains may be re-flushed and resampled. If check samples show the presence of coliform organisms, then the water main shall be re-chlorinated and flushed until satisfactory results are obtained.

.15 All satisfactory bacteriological test results must be current within 2 weeks of the inspection for Construction Completion Certificate.

.16 Water mains to be flushed again after streets are constructed and before issuance of building permits.

3.13 ABANDONMENT

Abandon water pipe, hydrants valves and appurtenances to Section 02 41 16.

1. GENERAL

This Section specifies requirements for supplying and installing gravity sanitary sewer pipe and service connections.

1.1 RELATED WORK

.1	Site Demolition	Section 02 41 16
.2	Basic Concrete Materials and Test Methods	Section 03 05 13
.3	Trench Excavation and Backfilling	Section 31 23 33
.4	Manholes and Catch basins	Section 33 05 13
.5	Directional Drilling	Section 33 05 25
.6	Boring, Jacking and Ramming Pipe	Section 33 05 26
.7	Water, Sanitary and Storm Service Connections	Section 33 41 16
.8	Sewer Cleaning	Section 33 45 00
.9	Inspection of Sewers	Section 33 45 10
.10	Construction Specifications Drawings	Division 50 03 xx

1.2 SCHEDULING OF WORK

.1 Schedule work to minimize interruptions to existing services.

.2 Maintain existing sewage flows during construction.

.3 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.3 MEASURE OF PAYMENT

.1 Sanitary sewer will be measured horizontally from centre line of manhole to centre line of manhole in metres of each size and class of pipe supplied and installed.

.2 The unit price bid shall be full compensation for all work necessary for supply and installation of sanitary sewer, including pipe laying, jointing, connections to existing

pipes, connections to manholes, and testing of the system, including costs associated with camera testing.

.3 Trench excavation, bedding, initial backfill, backfill and compaction will be measured under Section 31 23 33.

.4 For trenchless installation, payment shall be to Section 33 05 25.

2. PRODUCTS

2.1 CONCRETE PIPE

.1 Sulphate resistant (Type HS) pipe.

.2 Reinforced circular concrete pipe: CSA A257 or ASTM C76 and designed for flexible rubber gasket joints.

.3 Rubber gaskets to be confined "O" ring and shall meet the specification of CSA A257 or ASTM C443M.

.4 Lifting Holes:

.a Pipe 900 mm and less in diameter, no lift holes.

.b Pipe greater than 900 mm in diameter, lift holes not to exceed two in a piece of pipe.

.c Provide prefabricated plugs to effectively seal lift holes after installation of pipe.

2.2 POLYVINYL CHLORIDE PIPE (PVC)

.1 All 200 mm sanitary sewer pipe to be PVC SDR 35, or approved equivalent.

.2 PVC pipe to meet specification(s) ASTM D3034, CSA B182.1, B182.2, and ASTM F679 depending upon pipe structure.

.3 PVC pipe to meet these minimum standards:

.a Standard dimensional ratio (SDR): 35

.b Minimum pipe stiffness to be 320 kPa as measured in accordance with ASTM Standard D2412.

.c Separate gasket and integral bell system.

.d Pipe sizes acceptable to a maximum size of 1200 mm.

.4 PVC fittings to meet CSA B182.4 and ASTM F794.

.a Joints shall be flexible elastomeric seals to ASTM D3212.

.b Gaskets shall meet the requirements of ASTM F477.

.5 May be any colour except blue.

2.3 HIGH DENSITY POLYETHYLENE (HDPE)

.1 HDPE pipe shall not be used for gravity sewer main.

.2 HDPE pipe is the only pipe material to be used for trenchless installations. Refer to Section 33 34 00 for force main installations.

2.4 CEMENT MORTAR

.1 The Portland cement shall be sulphate resistant (Type 50).

.2 Mix mortar one part by volume of cement to two parts of clean, sharp sand mixed dry. Add only sufficient water after mixing to give optimum consistency for placement. Do not use additives.

.3 Refer to Section 03 05 13.

2.5 INSULATION

If required, in locations as shown on drawings, pipe shall be field insulated with extruded polystyrene board, Type H1-40 or Foamular 400 or approved equivalent.

3. EXECUTION

3.1 PREPARATION

Clean pipes and fittings of debris and water before installation. Inspect materials for defects before installing. Remove defective materials from site.

3.2 TRENCHING, BEDDING AND BACKFILLING

Do trenching, bedding and backfill work in accordance with Section 31 23 33.

3.3 INSTALLATION

.1 Lay and join pipe in accordance with manufacturer's recommendations.

.2 Handle pipe by approved manufacturer’s methods. For rigid pipe, do not use chains or cables passed through the pipe bore so that the weight of the pipe bears upon the pipes end.

.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Do not exceed maximum joint deflection or maximum bending radius recommended by pipe manufacturer.

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

.7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes by approved methods. Do not use excavating equipment to force pipe sections together.

.9 Pipe Jointing:

.a Install gaskets as recommended by manufacturer.

.b Support pipes with hand slings or crane, as required, to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.c Align pipes carefully before joining.

.d Maintain pipe joints free from mud, silt, gravel and other foreign material.

.e Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.f Complete each joint before laying next length of pipe.

.g Minimize joint deflection after joint has been made to avoid joint damage.

.h Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.i At rigid structures, install pipe joints no more than 1.2 m from side of structure.

.10 When any work stoppage occurs, block pipes as directed to prevent “creep” during down time.

.11 Plug lifting holes with approved prefabricated plugs set in non-shrink grout.

.12 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.

.13 Make watertight connections to manholes. Use non-shrink grout when suitable gaskets are not available.

.14 Use prefabricated saddles, tees or approved field connections for connecting pipes to existing sewer pipes. Joint of saddle to pipe shall be structurally sound and watertight.

3.4 BORING, JACKING, OR RAMMING

Refer to Section 33 05 26.

3.5 DIRECTIONAL DRILLING

Refer to Section 33 05 25.

3.6 SERVICE CONNECTIONS

Refer to Section 33 41 16.

3.7 ALIGNMENT AND GRADE TOLERANCE

.1 Sewer main will be checked for alignment during construction. Acceptable deviation from design alignment (based on pipe run between manholes or stub end) shall be:

.a For pipe sizes up to 900 mm: 150 mm

.b For pipe sizes over 900 mm: 50 mm per 300 mm of pipe size

.2 Sewer main design grade to be maintained as directed by Engineer. Maximum pipe grade variance determined from the formula below.

Tolerance (mm) = 6 + (.02 x D)
D = pipe diameter (mm)

.3 Invert elevation shall be within 25 mm of design elevation at manholes.

.4 Refer to Section 33 05 13 for grade requirements through a manhole.

3.8 SEWER CLEANING

Prior to inspection, sewer lines shall be cleaned per Section 33 45 00.

3.9 CAMERA INSPECTION

.1 The Contractor will carry out closed circuit television inspection to Section 33 45 10.

.2 The Construction Completion Certificate for sanitary mains will not be issued until the camera inspection report is complete and approved by the Engineer.

.3 The Final Acceptance Certificate for sanitary mains will not be issued until the camera inspection report is complete and approved by the Engineer.

.4 Any defects identified at the time of the respective inspection shall be corrected at Contractor's expense.

3.10 LEAKAGE TESTING

.1 Introduction

When initial camera inspection has identified leakages and corrective measures have been taken and were not successful, at the discretion of the Engineer further testing of the pipe shall be done. These tests are to supplement a camera inspection and are not intended to be the primary testing method.

For purposes of these tests, a pipe section shall be the total pipe length between two manholes or a manhole and a stub end.

For testing of a sewer force main refer to Section 33 34 00.

.2 General

.a The Engineer will select the sewer sections to be tested after the construction is complete.

.b The Engineer will select the type of leakage test to be performed for the sewer section, either Exfiltration testing or Infiltration testing. The type of testing the Engineer requests will need to consider pipe size and material.

.c The Engineer reserves the right to request leakage testing of ALL sections of a sewer pipe in a project deemed to be in an environmentally sensitive or critical operational area.

.d Perform tests in presence of the Engineer. Notify the Engineer 48 hours in advance of proposed tests. The Contractor shall perform and record testing.

.e Damage resulting from testing shall be repaired by the Contractor at the Contractor's expense.

.f Depending upon the sewer lines purpose leakage testing shall be conducted **after** the service connections to the sewer has been installed, if services are applicable to the pipe section in question. Service connections include in-line tees, wyes, saddles, etc.

.3 Preparation

.a Provide labour, equipment and materials required to perform the leakage test.

.b If required, re-clean the pipe section.

.c Plug pipe section ends. (e.g. inflatable [balloon] plug)

.d Fill test section with water in such a manner as to allow displacement of air in pipe.

.e The flow velocity of the fill water shall not exceed the capacities of the air release measures.

.f Generally, the flow velocity of the fill water shall not exceed the design velocity of the pipe.

.g Allow the pipe test section and fill water temperature to equalize to a common temperature.

.h Maintain pressure under nominal head for 24 hours to ensure absorption in pipe wall and manhole barrels is complete before test measurements are commenced.

.4 Exfiltration Test

.a Immediately prior to the test period add water to pipeline until there is an adequate head of water. The Engineer will determine the water head height. The head height will be 1 meter (minimum) to 3 meters (maximum) above the interior crown of the pipe, measured at the highest point of the test section.

.b The duration of the exfiltration test shall be 2 hours.

.c In the event that an exfiltration test fails, the line shall be drained and left for a period of 4 days before attempting any further tests.

.d The Contractor shall replace or repair the failed section(s) of sewer. Testing and remedial work shall be repeated until leakage is within the allowance specified in this section.

.5 Infiltration Test

.a Discontinue trench dewatering operations for at least three days prior to testing.

.b Prevent damage to pipe and bedding material due to flotation and erosion.

.c Place 90^{o} V-notch weir, or other measuring device approved by the Engineer in the invert of the sewer at each manhole.

.d Measure rate of flow for 1 hour (minimum), with recorded flows for each 5 minute interval.

.6 Leakage Formula

Rate (L / hr) x duration (hr) x pipe size (mm) x length (km) = allowable leakage
R x D x S x L = allowable leakage

R = rate based on pipe type

D = Duration of test
S = pipe size (mm)
L = length (km)

Rating for Concrete Pipe: 0.833 L / hr (20.0 liters per day)
Rating for PVC Pipe: 0.208 L / hr (5.0 liters per day)

.a The above leakage limit shall constitute the overall leakage allowance for the test section, inclusive of leakage from manholes and other appurtenances.

.b Where service connections exist along the test section, the allowable leakage from the service connections can be included in addition to the main sewer leakage allowance to arrive at a total allowable leakage. Service connection allowance shall be calculated by use of the above formula where the length of service connection shall exclude the length above a 1000 mm head.

.7 PVC

Air pressure testing of installed P.V.C. pipe is expressly prohibited for safety reasons.

.8 Submittals

.a Submit reports of testing at the completion of the project. The report shall contain test forms signed by the recorder and the supervisor.

.b In the report, each instrument used for testing shall be identified and the date of latest calibration noted.

3.11 ABANDONMENT

Refer to Section 02 41 16.

1. GENERAL

This Section specifies requirements for supplying and installing sewage force main pipe and appurtenances.

1.1 RELATED WORK

.1	Site Demolition	Section 02 41 16
.2	Trench Excavation and Backfilling	Section 31 23 33
.3	Directional Drilling	Section 33 05 25
.4	Boring, Jacking and Ramming Pipe	Section 33 05 26

1.2 SCHEDULING OF WORK

.1 Schedule work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions and adhere to approved schedule.

.3 Notify Engineer a minimum of 24 hours in advance of any interruption in service.

1.3 MEASURE OF PAYMENT

.1 Supply and installation of sewage force main to be measured in linear metres of each type and size of pipe incorporated into work. Measurement will be made of horizontal in place pipe, through valves and fittings, after work has been completed. Price bid shall be full compensation for all work necessary for supply and installation of force main including laying, jointing, thrust blocks and any testing or flushing required.

.2 Supply and installation of fittings to be measured in units installed.

.3 Trench excavation, bedding, initial backfill and compaction will be measured under Section 31 23 33.

.4 For trenchless installation, payment shall be to Section 33 05 25.

2. PRODUCTS

2.1 MATERIALS

.1 Polyvinyl chloride pressure pipe (PVC)

.a Series 160 (SDR 26) conforming to CSA B137.3.

.b Pipe joints shall be bell and spigot with rubber gaskets, solvent welded joints, or mechanical joints to CSA B131.10 with transition gaskets to pipe manufacturer's specifications.

.c Cast iron fittings to CAN3-B131.9.

.d PVC fittings to CAN3-B137.3, pressure class 150.

.2 High Density Polyethylene (HDPE)

.1 High Density Polyethylene pressure pipe to AWWA C906, PE 3408 to be designated DR 11, pressure class 160 psi.

.2 Caution when handling at a temperature below 4˚C.

.3 All pipes shall be sized to cast iron outside diameter (CI-OD). Pipe sizing shall be selected according to internal diameter.

.4 For a sanitary sewer force main the pipe shall have a red, longitudinal strip.

.5 For a storm sewer force main the pipe shall have a green, longitudinal strip.

.6 During visual inspection of pipe upon delivery and a scratch is detected; if the scratch depth is 10% or greater than wall thickness either the pipe is not used, or the area of the scratch is removed (if less than half a pipe length) or repair per manufacturer’s warranty.

.7 HDPE pipe is the only pipe material to be used for trenchless installations, unless otherwise approved by Engineering Services.

.8 HDPE fusing to Section 33 05 25.

3. EXECUTION

3.1 PREPARATION

Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 TRENCHING, BEDDING AND BACKFILL

Do trenching, bedding and backfill in accordance with Section 31 23 33.

3.3 BORING, JACKING AND RAMMING

Refer to Section 33 05 26.

3.4 DIRECTIONAL DRILLING

Refer to Section 33 05 25.

3.5 INSTALLATION

.1 General

.a Lay pipes in accordance with manufacturer's recommendations. Do not use blocks to support pipe.

.b Join pipes in accordance with manufacturer's recommendations.

.c Avoid damage to machined ends of pipes in handling and moving pipe.

.d Maintain grade and alignment of pipes.

.e Align pipes carefully before jointing.

.f Support pipe firmly over entire length, allowing for clearance necessary at joints.

.g Keep pipe and pipe joints free from foreign material.

.h Avoid bumping gasket and knocking it out of position or contaminating with dirt or other foreign material. Gaskets so disturbed to be removed, cleaned, lubricated and replaced before jointing is attempted.

.i Support pipes by means of hand slings or crane, as required, to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.j Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.

.k Apply restraint to force main to ensure that joints when completed are held in place, by tamping fill material under and alongside pipe or otherwise as approved by Engineer.

.l Block pipe as directed when any stoppage of work occurs to prevent creep during downtime.

.2 HDPE Pipe

.a For HDPE pipe being installed in long continuous runs, thermal expansion / contraction shall be considered when final placement of pipe. Minor offset of alignment may be required to allow for pipe movement. The contractor may use the formula 25 mm of change per 10˚C per 30 m of length for determining HDPE pipe expansion / contraction.

.b Do not drag pipe on the ground once formed into a continuous run. Pipe is to be placed on a series of rollers, spaced to maintain the pipe in a relatively horizontal line of travel during the pull.

.c If pipe fusing to be done in the trench, allow for extra trench width for fusing equipment.

.d Refer to Section 33 05 25 for pipe fusion information.

3.6 THRUST BLOCKS

.1 Place concrete thrust blocks between bends, tees and fittings and undisturbed ground.

.2 Keep pipe couplings free of concrete.

.3 Bearing area of thrust blocks to be as indicated on drawings.

3.7 FIELD TESTING OF FORCE MAIN

.1 General

.a Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.b Clean pipe to Section 33 45 00.

.c Notify Engineer at least 24 hours in advance of all proposed tests. Perform tests in presence of Engineer.

.d Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least five days after placing concrete or two days if high early strength concrete is used.

.e Before testing, bed and cover pipe between joints to prevent movement of force main when test pressure is applied.

.f Expel air from force main by slowly filling main with water. High points to be drilled and tapped and suitable cocks installed to vent air and to be shut when pressure is applied. Remove cocks after satisfactory completion of test and seal holes with tight fittings plugs.

.2 PVC Pipe

.a Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Engineer.

.b Apply a hydrostatic test pressure of 1035 kPa based on elevation of lowest point in line and corrected to elevation of test gauge for two hours.

.c Define leakage as amount of water supplied in order to maintain test pressure for two hours.

.d Do not exceed allowable leakage as defined in AWWA C600 using the following formula:

$$\text{For PVC: } L = \frac{NxDxP^{0.5}}{128{,}320}$$

P - test pressure (kPa) (1.0 PSI = 6.9 kPa)
D - nominal diameter (mm)
N - number of mechanical joints
L - leakage (l)

.e Locate and repair defects if leakage is greater than amount specified by the formula above.

.f Repeat test until leakage is within specified allowance for full length of the force main.

.3 HDPE Pipe

.a Test pipeline in sections not exceeding 800 m in length, unless authorized otherwise, by the Engineer.

.b Apply hydrostatic test pressure to 1.5 times the normal operating pressure based on elevation of lowest point in main and corrected to elevation of test gauge.

.c No leakage allowed at fused pipe joints. If seepage found at a fused joint the pressure is to be released, the joint removed and a new joint created.

.d Add make-up water as necessary to maintain maximum test pressure for 4 hours.

.e After four hours reduce test pressure by 1.45 Kpa and monitor pressure for one hour (test phase). Do not increase pressure or add make-up water.

.f If no visual leakage is observed and the pressure, during the one hour test phase, remains steady (within 5% of the test phase pressure) the pipe section has passed the test.

.g The total testing time, from initial pressurization, initial expansion, and time at test pressure, shall not exceed 8 hours. If failure occurs 8 hours is required to “relax” the pipe before another test may be done.

3.8 ABANDONMENT

Refer to Section 02 41 16.

1. GENERAL

This Section specifies requirements for supplying and installing gravity storm sewer pipe and service connections.

1.1 RELATED WORK

.1	Site Demolition	Section 02 41 16
.2	Basic Concrete Materials and Test Methods	Section 03 05 13
.3	Trench Excavation and Backfilling	Section 31 23 33
.4	Manholes and Catch basins	Section 33 05 13
.5	Directional Drilling	Section 33 05 25
.6	Boring, Jacking or Ramming Pipe	Section 33 05 26
.7	Water, Sanitary and Storm Service Connections	Section 33 41 16
.8	Sewer Cleaning	Section 33 45 00
.9	Inspection of Sewers	Section 33 45 10
.10	Construction Specification Drawings	Division 50 03 xx

1.2 SCHEDULING OF WORK

.1 Schedule work to minimize interruptions to existing services.

.2 Maintain existing flow during construction.

.3 Submit schedule of expected interruptions to Engineer for approval and adhere to approved schedule.

1.3 MEASURE OF PAYMENT

.1 Storm sewer will be measured horizontally in field from centre line of manhole to centre line of manhole in metres of each size and class of pipe supplied and installed.

.2 The unit price bid shall be full compensation for all work necessary for supply and installation of storm sewer including pipe laying, jointing, connections to existing

pipes, connections to manholes and catch basins, and testing of the system, including costs associated with camera testing.

.3 Trench excavation, bedding, initial backfill and compaction will be measured under Section 31 23 33.

.4 For trenchless installation, payment shall be to Section 33 05 25.

2. PRODUCTS

2.1 CONCRETE PIPE

.1 Sulphate resistant (Type HS) pipe.

.2 Non-reinforced circular concrete pipe and fittings to CSA-A257 and ASTM C14 designed for flexible rubber gasket joints to ASTM C443.

.3 Reinforced circular concrete pipe and fittings to CSA-A257 and ASTM C76 designed for flexible rubber gasket joints to ASTM C443.

.4 Lifting Holes:

.a Pipe 900 mm and less in diameter, no lift holes.

.b Pipe greater than 900 mm in diameter, lift holes not to exceed two in a piece of pipe.

.c Provide prefabricated plugs to effectively seal lift holes after installation of pipe.

2.2 POLYVINYL CHLORIDE PIPE (PVC)

.1 All 200 mm storm sewer pipe shall be PVC SDR35, or approved equivalent.

.2 PVC pipe to meet specification(s) ASTM D3034, CSA-B182.1, CSA-B182.2, and ASTM F679 depending upon pipe structure.

.3 PVC pipe to meet these minimum standards:

.a Standard dimensional ratio (SDR): 35

.b Minimum pipe stiffness to be 320 kPa as measured in accordance with ASTM Standard D2412.

.c Separate gasket and integral bell system.

.d PVC pipe accepted to maximum size of 1200 mm.

.4 PVC fittings to meet CSA B182.4 and ASTM F794.

.a Joints shall be flexible elastomeric seals to ASTM D3212.

.b Gaskets shall meet the requirements of ASTM F477.

.5 May be any colour except blue.

2.3 HIGH DENSITY POLYETHYLENE (HDPE)

.1 HDPE pipe shall not be used for gravity sewer main.

.2 HDPE is the only pipe material to be used for trenchless installations. Refer to Section 33 34 00 for force main installations.

2.4 CEMENT MORTAR

.1 The Portland cement shall be sulphate resistant (Type 50).

.2 Mortar to consist of one part Portland cement to two parts clean, sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

.3 Refer to Section 03 05 13.

3. EXECUTION

3.1 PREPARATION

Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 TRENCHING, BEDDING AND BACKFILLING

Do trenching, bedding and backfill work in accordance with Section 31 23 33.

3.3 INSTALLATION

.1 Lay and join pipe in accordance with manufacturer's recommendations.

.2 Handle pipe by approved manufacturer's methods. For rigid pipes, do not use chains or cables passed through the pipe bore so that the weight of the pipe bears upon the pipes end.

.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Do not exceed maximum joint deflection or maximum bending radius recommended by pipe manufacturer.

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

.7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes by approved methods. Do not use excavating equipment to force pipe sections together.

.9 Pipe Jointing:

.a Install gaskets as recommended by manufacturer.

.b Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.c Align pipes carefully before joining.

.d Maintain pipe joints free from mud, silt, gravel and other foreign material.

.e Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.f Complete each joint before laying next length of pipe.

.g Minimize joint deflection after joint has been made to avoid joint damage.

.h Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.i At rigid structures, install pipe joints no more than 1.2 m from side of structure.

.10 When any work stoppage occurs, block pipes as directed to prevent "creep" during down time.

.11 Plug lifting holes with approved prefabricated plugs set in non-shrink grout.

.12 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.

.13 Make watertight connections to manholes and catch basins. Use non-shrink grout when suitable gaskets are not available.

3.4 BORING, JACKING, OR RAMMING

Refer to Section 33 05 26

3.5 DIRECTIONAL DRILLING

Refer to Section 33 05 25.

3.6 SERVICE CONNECTIONS

Refer to Section 33 41 16

3.7 ALIGNMENT AND GRADE TOLERANCE

.1 Sewer main will be checked for alignment during construction. Acceptable deviation from design alignment (based on pipe run between manholes or stub end) shall be:

.a For pipe sizes up to 900 mm: 150 mm

.b For pipe sizes over 900 mm: 50 mm per 300 mm of pipe size

.2 Sewer main design grade to be maintained as directed by Engineer. Maximum pipe grade variance determined from the formula below.

Tolerance (mm) = 6 + (.02 x D)
D = pipe diameter (mm)

.3 Invert elevation shall be within 25 mm of design elevation at manholes.

.4 Refer to Section 33 05 13 for grade requirements through a manhole.

3.8 SEWER CLEANING

Prior to inspection sewer lines shall be cleaned per Section 33 45 00.

3.9 CAMERA INSPECTION

.1 The Contractor will carry out closed circuit television inspection to Section 33 45 10.

.2 The Construction Completion Certificate for storm mains will not be issued until the camera inspection report is complete and approved.

.3 The Final Acceptance Certificate for storm mains will not be issued until the camera inspection report is complete and approved.

.4 Any defects identified at the time of the respective inspection shall be corrected at Contractor's expense.

3.10 LEAKAGE TESTING

When initial camera inspection has identified leakages and corrective measures have been taken and were not successful, at the discretion of the Engineer further testing of the pipe shall be done. Refer to Section 33 31 13 (Sanitary Sewer) for requirements of alternative test methods.

3.11 ABANDONMENT

Refer to Section 02 41 16.

1. GENERAL

This Section specifies requirements for supplying and installing water, sanitary and storm service connections.

1.1 RELATED WORK

.1	Site Demolition	Section 02 41 16
.2	Cast-In-Place Concrete	Section 03 30 00
.3	Trench Excavation and Backfilling	Section 31 23 33
.4	Construction Specification Drawings	Division 50 04 xx

1.2 SCHEDULING OF WORK

.1 Schedule work to minimize interruptions to existing services.

.2 Maintain existing flow during construction.

.3 Submit schedule of expected interruptions to Engineer for approval and adhere to approved schedule.

1.3 MEASURE OF PAYMENT

.1 Trench excavation, backfill, initial backfill and compaction will be in accordance with Section 31 23 33 and will be measured based on length of longest service measured from centre of main to point of termination of services. All ranges of trench depths will be paid at same unit rate. Unit price bid shall be full compensation for all work involved in constructing the joint trench to install all specified service connections.

.2 Supply and placement of sand bedding and screened rock bedding will be in accordance with Section 31 23 33 and will be measured based on the length of longest service measured from centre of main to point of termination of services or portions installed thereof.

.3 Service connections to be measured in metres of each size, type and class of pipe supplied and installed. Unit price bid shall be full compensation for all work necessary for supply and installation of service lines, including pipe laying, initial backfill, jointing and testing of system.

.4 Curb and corporation stops will be measured in units installed. Unit price bid shall be full compensation for all work necessary for supply and installation of curb and corporation stops as shown in Division 50.

.5 Connections to existing mains are considered incidental to this Section.

.6 Water, sanitary and storm service saddles will be measured in units installed. Unit price bid shall be full compensation for all work necessary for supply and installation of service saddles including jointing, sealing and bedding.

.7 Service boxes shall be measured in units supplied and shall be full compensation for supplying and installing.

.8 Supply and installation of miscellaneous fittings, bends, long radius bends, couplers, etc. shall be incidental to this Section.

.9 Reducer fittings and plugs to be paid in units supplied and installed.

.10 Sanitary Service Inspection/Sampling Chamber to be measured in units installed. Unit price bid shall be full compensation for all work necessary for the supply and installation of the Inspection/Sampling Chamber as shown in Division 50.

.11 Removal or “making flush” of service connection pipe inside a main will be at the Contractor’s cost.

2. PRODUCTS

2.1 WATER SERVICE CONNECTIONS

.1 Copper Tubing

.a Copper tubing to ASTM B88M, Type K, annealed. Copper tubing is to be avoided for all new construction, and rehabilitation work.

.b Copper pipe joints to be of compression type suitable for 1035 kPa working pressure.

.2 Polyethylene municipal tubing

.a Polyethylene municipal tubing, PE 3406, Series 160 to CAN3-B137.1.

.b Polyethylene joints to be thermal butt fusion welded or by use of compression fittings.

.3 Brass components

a. Brass components in contact with potable water must be made from either CDA/UNS Brass Alloys C89520 or C89833 with a maximum lead content of 0.25% by weight. These fittings may also be referred to as lead free.

b. Brass Corporation stops: ball valve, to AWWA C-800, red brass to ASTM B 62, Having AWWA inlet threads and compression outlet for use with copper or copper size polyethylene. AY MacDonald 4701 B-22, Cambridge Brass 301 AxHx, Ford FB 1000, Mueller B-25008 or approved equal.

c. Brass curb stops: ball valve, to AWWA C-800, red brass to ASTM B-62, compression type, AY MacDonald 6100-22, Cambridge Brass 202 HxHx, Ford B 4-xxx, Mueller B-25209 or approved equal. Inlet and outlet to have compression joint fittings for use with copper or copper size polyethylene. To be supplied complete with compatible curb stop chair.

.4 Service Saddle

.a Water service saddles: AWWA C-800 thread, nylon coated, ductile iron body, double stainless steel strap for 38 mm and 50 mm.

.5 Service Box Cap

.a Threaded cap (grey cast iron) with slotted top

.b “WATER” cast into top of cap

.c 19 mm pentagon brass plug

.6 Service Box Casing

.a Galvanized, grey cast iron Schedule 40 pipe, 33.4 mm O. D.

.b Adjustable sliding top section, with threaded top

.c Top section to be 610 mm in length, have a minimum 35.1 mm I.D. and a 10 mm set screw.

.d 2.44 m to 2.74 m for depth of bury

.7 Service Rod

.a T-304 stainless steel rod, 12.7 mm diameter by 2.15 m long, complete with standard pigtail for 25 mm I.D. pipe and welded bottom bracket with an 8 mm cored hole.

.b Rod to be complete with a 6 mm diameter, stainless steel, cotter pin a minimum of 55.2 mm long.

.8 Boot

.a For a 25.4 mm or smaller curb stops,

.i Box bottom boot (grey cast iron), epoxy coated for corrosion protection, with a clear opening of a minimum of 90 mm wide x 90 mm deep, to allow curb stop access.

.b For curb stops either 38 mm or 50 mm in size,

.i Box bottom boot (grey cast iron), epoxy coated for corrosion protection, with a clear opening of a minimum of 129 mm wide x 115 mm deep, to allow curb stop access.

.c The boot shall attach to the casing by means of a threaded joint.

.9 Material

.a All grey cast iron shall be to ASTM A48, Class 20.

2.2 SANITARY AND STORM SERVICE CONNECTIONS

.1 Pipe: Polyvinyl chloride SDR28 to CSA B182.1 with push-on joints. Sanitary and storm services shall be any colour except blue.

.2 Service saddles: manufactured tee saddles, gasket type joints, secured with double stainless steel straps.

.3 Inline polyvinyl chloride gasket fittings to CAN-B182.1.

.4 Inserta Tees: P.V.C Hub to CAN-B182.1, rubber sleeve and gasket to ASTM F477.

.5 Unless noted otherwise, sanitary services shall be 150 mm diameter with a 150 mm to 100 mm reducer installed at property line, storm services shall be 100 mm diameter with a 75 mm reducer installed at property line.

.6 Where a new service connection joins an existing main aftermarket (e.g. site re-development in the downtown), a polyurethane based fitting with the ability to create a sealed joint at the connection may be used (e.g. IPEX Uni-T fitting). This type of fitting will not be allowed in new subdivision construction. This connection is not to be used with concrete pipe.

2.3 INSULATION

If required, in locations as shown on drawings pipe shall be field insulated with extruded polystyrene board, Type H1-40 or “Foamular 400” or approved equivalent.

3. EXECUTION

3.1 PREPARATION

.1 Notify all consumers in writing at least 24 hours prior to any anticipated interruptions in their water service. Where possible, schedule interruptions to occur in non-peak hours. If interruption is to last longer than eight hours provide temporary water service to each house using surface hoses connected to outside taps of each house.

.2 Clean pipes and fittings of accumulated debris and water before installation. Carefully inspect materials for defects. Remove defective materials from site.

3.2 TRENCHING, BEDDING AND BACKFILL

.1 Do trenching, bedding and backfill work to Section 31 23 33.

.2 Trench alignment and depth as indicated by the Engineer.

.3 Do not backfill trenches until installed work has been inspected by the Engineer.

3.3 WATER SERVICE CONNECTIONS

.1 Building water service to terminate at location shown on drawings opposite point of connection to main. Install coupling necessary for connection to building plumbing. If plumbing is already installed, make connection, otherwise cap or seal end of pipe and place temporary marker to locate pipe end.

.2 Construct service connections at right angles to water main unless otherwise directed. Locate curb stops at location shown on drawings.

.3 Employ only competent works equipped with suitable tools to carry out tapping of mains.

.4 Tap main at 10:00 o'clock or 2:00 o'clock position only, not closer to a joint or closer to adjacent service connections than recommended by manufacturer or 1 m, whichever is greater.

.5 Leave corporation stop valves fully open.

.6 In order to relieve strain on connections, install service pipe in "goose neck" form "laid over" into horizontal position to the right facing the main. Pipe at the “goose neck” shall be placed between sand bags to hold temporary service in place, Service to be "snaked" in trench.

.7 Install curb stop on services 50 mm or less in diameter. Leave curb stop valves fully closed.

.8 Install service box, adjust to design elevation and tighten set screw securely.

.9 Place temporary markers at ends of service lines as shown on Drawing 50 04 01.

3.4 SANITARY AND STORM SERVICE CONNECTIONS

.1 Install pipe to CSA B182.1 and manufacturer's standard instructions and specifications.

.2 Use saddles or tees approved by Engineer for service connections to main sewer. Do not use break-in and mortar patch-type joints.

.3 For 200 mm or larger service connections a manhole may be required as noted on the drawing or as directed by the Engineer. Refer to the Design Guidelines, Section 17, Part 4.

.4 Service connection pipe shall not extend into the interior of sewer main.

.5 Make up required horizontal and vertical bends from 45° bends or less, separated by a straight section of pipe with a minimum length of four pipe diameters. Use long sweep bends where possible.

.6 Plug service laterals with watertight caps or plugs as approved. Paint last 1 m of sanitary red and storm green.

.7 Pipe shall be laid straight and true at a minimum grade of 2%. No horizontal bends will be allowed unless approved by Engineer.

.8 Lay sanitary and/or storm services in same trench with water service. Install sanitary service on left side of water and storm on right side as viewed from main towards property line.

.9 Install sanitary service inspection manhole at locations shown on the Drawings and in compliance with Town bylaws.

3.5 INSPECTION

All service connections must be inspected and as-built by the Engineer prior to backfilling.

3.6 ABANDONMENT

Abandon services and appurtenances to Section 02 41 16.

1. GENERAL

This Section specifies requirements for supplying and installing corrugated steel pipe culverts.

1.1 RELATED WORK

.1	Site Demolition	Section 02 41 16
.2	Protective Metal Railing	Section 05 52 00
.3	Trench Excavation and Backfilling	Section 31 23 33
.4	Rip-Rap	Section 31 37 00
.5	Manholes and Catch-basins	Section 33 05 13

1.2 MEASURE OF PAYMENT

.1 Corrugated steel pipe culvert to be measured in lineal metres for each size, type and class of pipe. Price shall be full compensation for all work necessary for the supply and installation of the culvert.

.2 Corrugated flume end treatment shall be paid per unit installed for each size, type and class of flume. Due to pipe size and usage a grate may be applicable, it shall be considered incidental to the work.

.3 Measure for precast or cast-in-place flared outfall shall be in units installed. Grate shall be considered incidental.

.4 Rip-rap material shall be paid to Section 31 37 00.

.5 If a protective railing is required, it shall be paid to Section 05 52 00.

.6 Trench excavation, bedding, initial backfill, backfill and compaction to be measured under Section 31 23 33.

2. PRODUCTS

2.1 CORRUGATED STEEL PIPE

.1 Corrugated steel pipe (CSP) and structural plate corrugated steel pipe (SPCSP) to CSA G401.

.2 Provide watertight cut-off collars as indicated.

.3 Prefabricated end sections as indicated.

3. EXECUTION

3.1 TRENCHING, BEDDING AND BACKFILL

.1 Do trenching, bedding and backfill work to Section 31 23 33.

.2 Trench line and grade as established by Engineer.

.3 Do not backfill until pipe grade and alignment is inspected by Engineer.

3.2 LAYING CORRUGATED STEEL PIPE CULVERTS

.1 Commence pipe placing at downstream end.

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

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

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

3.3 JOINTS

.1 Corrugated Steel Pipe

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

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

.c Insert and tighten bolts.

.2 Structural Plate

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

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

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

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

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

.3 End Treatment

Depending upon the culvert size and purpose of the culvert the culvert ends may be shaped to be flush to existing ground, have a flume attached, or a pre-cast flared end per drawing or as directed by the Engineer. Regardless of end treatment, rip-rap shall be used to protect the ends from erosion. For more information on rip-rap refer to Section 31 37 00.

3.4 ABANDONMENT

Refer to Section 02 41 16.

1. GENERAL

This section specifies the requirements for cleaning of sanitary and storm sewer mains for the removal of foreign materials to facilitate inspections and rehabilitation of sewer mains.

1.1 RELATED WORK

.1 Health and Safety Requirements Section 01 35 29

1.2 GENERAL

.1 The contractor's cleaning methods shall be performed without any disruption to services. The contractor shall provide acceptable alternatives to services that are temporarily disrupted.

.2 All cleaning of sewers shall be undertaken without any excavation, except as noted in this Section.

1.3 SAFETY

.1 For operational sanitary sewer mains safety considerations are to be taken per Section 33 01 31 (Relining Underground Pipeline).

.2 Refer to Section 01 35 29.

1.4 MEASURE OF PAYMENT

.1 Sewer main cleaning will be measured horizontally from center line of manhole to center line of manhole in meters. Unit price bid shall be full compensation for all the work necessary to clean sewer mains including the removal and hauling of debris to an approved disposal site.

.2 Damage, additional cleaning and / or repairing service connections or other infrastructure and appurtenances caused due to the cleaning (e.g. over-pressurization of spray) shall be repaired at the contractor's cost.

2. PRODUCT

2.1 PRESSURIZED WATER DELIVERY UNIT (JETTING)

.1 A mechanical unit to provide a steady pressure and stream(s) of sprayed water to push and forcibly remove debris and sediment from and through the pipe to a manhole or pond; where it will be removed and disposed of.

.2 The jetting pressure shall be such to move the debris with consideration for service connections. The jetting equipment shall have a regulator whereby the pressure may be reduced so debris and sediment is not forced back up service connections.

3. EXECUTION

3.1 LINE CLEANING

.1 The contractor shall clean the line of obstructions such as solids, roots, sediments, protruding service connections or encrustation to at least 98% of the original capacity.

.2 The contractor shall clean all sewer mains in such a way that all debris is collected and removed from the system, typically at the downstream manhole of the line being cleaned. No debris shall be permitted to enter the existing sewer system downstream of the main(s) being cleaned.

.3 If the sewer cleaning method noted above cannot remove an obstruction a point repair excavation will be required. The Town's prior approval must be obtained before excavation. Excavation and backfill shall be to Section 31 23 33.

.4 The contractor shall clean up and restore externally affected areas to the condition that existed prior to the commencement of the work. All debris is to be removed and hauled to an approved disposal site.

.5 If the downstream barrier (system) fails and allows debris to past the downstream manhole and into the existing Town system, the Contractor may be required to clean all pipes that are downstream and in the flow path of the main that was cleaned. The extent of the cleaning will be at the discretion of the Engineer.

.6 No debris and sediment from a cleaned line is to enter a water body.

.7 If a storm water pond, existing or new, is used as a termination point for cleaning a storm main, the debris and/or excess sediment is to be removed and the outfall and surround are to be restored to a better condition than existed prior to the commencement of the work.

.8 If a storm treatment unit is part of a cleaned line it is to be cleaned of debris and sediment also, to a "like new" state.

1. GENERAL

This section specifies requirements for closed circuit television (CCTV) inspections of sewers required prior to the issuance of a construction completion certificate (C.C.C.), a final acceptance certificate (F.A.C.), or for other reasons that the Town may specify.

1.1 RELATED WORK

.1 Sewer Cleaning — Section 33 45 00

1.2 GENERAL

.1 The contractor shall perform all CCTV inspections without any disruptions to services. The contractor shall provide acceptable alternatives to services that are temporarily disrupted.

.2 The contractor shall perform work during non-peak hours. If peak flows are anticipated during normal working hours temporary flow controls may be used with prior approval from the Town.

.3 Camera operator's to be trained in visually identifying pipe breaks, defects, grade changes, deformation, service connections, etc.

1.3 MEASURE OF PAYMENT

CCTV inspections will be measured horizontally from center line of manhole to center line of manhole in meters. Unit price bid shall be full compensation for all the work necessary to inspect sewers including any traffic accommodations that may be required.

2. PRODUCT

2.1 CLOSED CIRCUIT TELEVISION INSPECTION EQUIPMENT

.1 CCTV equipment shall consist of a self-contained camera and a monitoring unit connected by coaxial cable. The camera shall be mounted on adjustable skids, or wheels, or have a height adjustment to facilitate the positioning of the lens to the center of the pipe. The camera shall have a self-contained lighting system capable of lighting the entire periphery of the pipe.

.2 The camera used for sewer inspections is to have full 360^{o} panning and 270^{o} tilting capabilities.

.3 CCTV equipment shall be equipped with a distance measurement system having a proven accuracy of plus or minus 1.5% or two (2) meters, whichever is greater. The

contractor is to regularly calibrate the distance measuring system to ensure its accuracy.

2.2 CCTV INSPECTION REPORTS

.1 The inspection report is to consist of a digital copy of the CCTV video accompanied by a PDF copy of the report. The report is to contain condition ratings for each section of pipe inspected using Pipeline Assessment & Certification Program (PACP) coding.

.2 The video shall be compatible to PipeLogix software in mpeg2 format (or higher) with a 640 x 480 resolution (minimum) and a data rate of 6000 kbps.

.3 Each video shall be numbered and cross-indexed to the written report. Each video and report shall contain, at a minimum, the date and time, subdivision, street name or location, type of sewer (SAN or STM), manhole to manhole segment being inspected, pipe size, pipe material and direction of travel.

.4 The reports shall record the exact location of each leak, fault or defect noted by the operator (e.g. Open joints, broken, cracked, deformed or collapsed pipe, presence of roots, debris, obstructions, infiltration, sags, water depths, and any others points of significances).

.5 The report shall include the location of all service connections. Protrusions of service connections into the main line shall be noted along with any infiltration or any other points of significances.

.6 The contractor shall be responsible for the survey of the sewer and accuracy of information obtained.

3. EXECUTION

3.1 SEWER CLEANING

Prior to the inspection, the pipe is to be cleaned per Section 33 45 00.

3.2 PREPARATION

.1 Prior to the inspection, the Contractor shall contact the Town's Engineering Services to request a download of the Town's piping database. When contacting, mention this is for a utility camera inspection and the project. Engineering Services main phone number is 403-507-4812.

.2 Once the inspection has been completed and all the data collected and recorded per this Section, the contractor shall download the file to the website / transfer file previously set-up by Engineering Services for this purpose.

3.3 CLOSED CIRCUIT TELEVISION INSPECTION

.1 The CCTV inspection shall document a complete visual survey of the pipes, manholes, and appurtenances along a designated section of sewer.

.2 The contractor shall not attempt a CCTV inspection if flows in the pipe obstruct the cameras view.

.3 The camera advance rate shall not exceed 9 meters per minute to allow adequate time for operator interpretation. The camera should be stopped while the operator views defects and features.

.4 If during the inspection procedure the camera will not pass through the entire pipe section between manholes, the contractor will reset the equipment in such a manner so that the inspection can be performed from the manhole at the opposite end of the pipe line under inspection.

.5 The camera operator shall, during the inspection, pan the camera to focus on all services and observable deficiencies in the pipe that may be located off-center to the direction of camera travel. This shall include all services, tees, stubs, cracks, fractures, surface deterioration, or any other points of significances.

3.4 PVC DEFLECTION TESTING

.1 Deflection testing shall be carried out at the discretion of the Engineer to confirm that installed pipes meet the requirements for short-term and/or long-term deflection limits.

.2 Deflection testing for all PVC pipe, up to and including 900mm diameter, shall be conducted by a “go/no-go” Mandrel device that is cylindrical in shape.

.3 The Mandrel shall be pulled through the pipe in such a manner to ensure that excessive force is not used to advance the device through any deflected portion of the pipe.

.4 The maximum allowable deflection for short-term testing is 5.0% and 7.5% for long-term testing. Short-term deflection shall be deemed to be any deflection measured between one month and one year after backfilling. Long-term deflection shall be deemed to be any deflection measured at least one year after backfilling and prior to Final Acceptance Certificate.

1. GENERAL

This Section specifies requirements for supplying and installing sub-drain systems for roadways or other specified applications.

1.1 RELATED WORK

.1	Site Demolition	Section 02 41 16
.2	Aggregate Materials	Section 31 05 16
.3	Trench Excavation and Backfilling	Section 31 23 33
.4	Geotextiles	Section 31 32 21
.5	Manholes and Catch-basins	Section 33 05 13

1.2 MEASURE OF PAYMENT

.1 Sub-drains to be measured in lineal metres, per pipe size, including drainage pipe, filter fabric sock, filter rock and surrounding filter fabric. Price shall be full compensation for all work necessary for the supply and installation of the sub-drain. Connection to an existing catch basin or manhole shall be considered incidental to the work.

.2 Trenching and backfilling shall be paid under Section 31 23 33.

.3 If a new manhole or catch basin is required as part of the work, it shall be paid to 33 05 13.

2. PRODUCTS

2.1 PIPE

.1 Perforated PVC pipe PERF SDR35 or approved equal and shall meet the following requirements:

.a CAN3-B182.8 and ASTM D3034.

.b Perforations shall consist of two rows of 14 mm holes positioned at 120° radially and spaced to provide a minimum total cross sectional hole area of 3000 mm^2 per metre of length.

.c Pipes shall be fit with friction fit bell ends.

.2 Perforated corrugated steel pipe to meet following requirements:

.a CAN3-G-401,

.b Galvanized,

.c Metal thickness unless otherwise indicated:

Diameter	Thickness of Metal
150 to 200 mm	1.2 mm
250 to 300 mm	1.6 mm

2.2 GRANULAR FILTER MATERIAL

Screened rock to Section 31 05 16.

2.3 GEOTEXTILE FABRIC

.1 Geotextile fabric to Section 31 32 21.

.2 Geotextile fabric sleeve: Nilex Nu-Drain Type A; or approval equal.

3. EXECUTION

3.1 TRENCHING

.1 Trenching excavation to Section 31 23 33.

.2 Trench line and depth as established by Engineer.

3.2 BEDDING

.1 Trim drain bed to given elevations.

.2 Correct over excavation with approved material compacted to 100% Standard Proctor Maximum Dry Density.

3.3 INSTALLATION

.1 Drape filter cloth material in trench.

.2 Place minimum of 75 mm of screened rock on trench bottom.

.3 Lay drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with bed throughout full length.

.4 Commence laying at outlet and proceed in upstream direction.

.5 Wrap pipe with geotextile fabric or insert pipe in geotextile sleeve as shown on the drawings as directed by the Engineer.

.6 Lay perforated pipes with perforations downwards.

.7 Make joints in accordance with manufacturer's instructions.

.8 Do not allow water to flow through pipes during construction except as approved.

.9 Place filter rock over drainage pipe to the depth shown in contract drawings.

.10 Wrap filter material around top of filter rock. Ensure ends overlap a minimum of 300 mm.

.11 Protect sub-drains against flotation during installation.

.12 Connect sub-drains to manhole or catch-basin as indicated.

3.4 BACKFILLING

.1 Do not backfill until system is inspected by the Engineer.

.2 Backfill, with specified material using hand tampers, to Section 31 23 33.

3.5 ABANDONMENT

Abandon sub-drainage to Section 02 41 16.

1. GENERAL

This Section specifies requirements for supplying and installing catch basin leads.

1.1 RELATED WORK

.1 Site Demolition — Section 02 41 16

.2 Trench Excavation and Backfilling — Section 31 23 33

.3 Manholes and Catch-basins — Section 33 05 13

1.2 MEASURE OF PAYMENT

.1 Trench excavation, bedding, initial backfill, backfill and compaction to Section 31 23 33.

.2 Catch basin leads will be measured horizontally from centre line of manhole to centre line of catch basin in metres for each size and type of pipe supplied and installed. Unit price bid shall be full compensation for all work necessary for supply and installation of catch basin leads including pipe laying and jointing.

.3 Connections to manholes and catch basin to be incidental to this Section. No separate payment to be made.

2. PRODUCTS

2.1 PLASTIC PIPE

.1 To meet the requirements of Section 33 41 00 with the following exceptions:

.a Pipe diameter to be 250 mm or greater, and

.b Any colour except blue.

2.2 CORRUGATED METAL PIPE

.1 Corrugated steel pipe: 1.6 mm wall thickness conforming to CAN3-G401 having a minimum diameter of 250 mm.

.2 Provide watertight couplers, with rubber gasket conforming to ASTM C361M.

2.3 CONCRETE PIPE

.1 To meet the requirements of Section 33 41 00 with the following exception:

.a Pipe diameter to be 250 mm or greater, non-reinforced.

3. EXECUTION

3.1 TRENCHING, BEDDING AND BACKFILL

.1 Trenching, bedding and backfill to Section 31 23 33.

.2 Trench line to be straight between the catch basin and the receiving manhole.

.3 Pipe grade shall be a minimum of 2%.

.4 Do not backfill until pipe grade and alignment have been inspected by the Engineer.

3.2 LAYING CATCH BASIN LEAD

.1 Commence laying at manhole.

.2 Lay and join pipe in accordance with manufacturer's recommendations.

.3 Ensure bottom of pipe is in contact with shaped bed throughout its length.

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

.5 Maximum length of a catch basin lead shall be 30 m.

3.3 JOINTS

Install rubber gaskets and couplers in accordance with manufacturer's instructions.

3.4 CONNECTION TO CATCH BASINS AND MANHOLES

.1 Break out opening to suit pipe diameter.

.2 Cut pipe to conform to inside wall of manhole or catch basin.

.3 Grout pipe in place.

.4 Encase first 0.5 m of pipe in concrete. Thickness of encasement to be one half pipe diameter or 150 mm, whichever is greater.

3.5 ABANDONMENT

Refer to Section 02 41 16.

1. GENERAL

This Section specifies requirements for concrete encased cable duct banks, precast concrete vaults and precast concrete manholes used in the installation of shallow utility cables.

Note: This Section may also refer to “Pull box”. A pull box is for intermediate alignment control or used in light overhead loading situations (e.g. landscape area, median etc.). They are not designed for vehicle loads. Where heavy loads exist, a manhole, with a conical top may be used in lieu of a standard manhole at the discretion of the Engineer.

1.1 RELATED WORK

.1	Submittal Procedures	Section 01 33 00
.2	Site Demolition	Section 02 41 16
.3	Concrete Form Work	Section 03 11 00
.4	Basic Concrete Material and Test Methods	Section 03 15 13
.5	Concrete Reinforcement	Section 03 20 00
.6	Cast-In-Place Concrete	Section 03 30 00
.7	Aggregate Materials	Section 31 05 16
.8	Trench Excavation and Backfilling	Section 31 23 33

1.2 MEASURE OF PAYMENT

.1 Trench excavation, compaction and backfill will be measured under Section 31 23 33.

.2 Supply and installation of duct will be measured in lineal metres of material installed as measured in a horizontal line from designated start to end of installation, excluding length through manholes.

.3 Supply and installation of vaults and manholes will be measured as the number of units installed.

1.3 SHOP DRAWINGS

Submit shop drawings for precast duct banks, vaults and manholes in accordance with Section 01 33 00.

2. PRODUCTS

2.1 DUCT MATERIAL

.1 PVC Duct and fittings, size as specified:

a. Type DB2,

b. 6.1 m lengths,

c. One end belled,

d. Conforming to CSA C22.2 No. 211.1

.2 PVC primer:

a. Approved for cleaning PVC-DB2 electrical duct surfaces in preparation of duct interface.

.3 PVC cement:

a. Approved for solvent welding for PVC-DB2 components.

2.2 PULL ROPE

1. 6 mm diameter,

2. 100% stranded nylon or polypropylene, graded jacket complete with twisted nylon core,

3. To be rated for a minimum tensile strength of 5 kN, and

4. Length equal to run plus 3 m spare rope at each end.

2.3 PRECAST CONCRETE MANHOLES, VAULTS AND DUCTS

.1 General

.a Precast concrete manholes, vaults and ducts fabricated in steel forms and as indicated.

.b Aggregates to Section 31 05 16.

.c Concrete to Section 03 05 13.

.d Steel welded wire fabric mesh reinforcing and reinforcing bars to Section 03 20 00.

.e Pulling inserts and bolts for racks integrally cast in concrete to ACI-347-68.

.f Neoprene gasket seals between manhole or vault sections to ASTM D1056-78.

.2 Drainage

.a Floor drain fittings in each manhole or vault consisting of floor drain, backwater valve, trap and pipe connection to drainage system. Dry sump as indicated.

.b Sump pit 300 mm x 300 mm x 125 mm and as indicated.

.3 Manhole Necks

.a Concrete manhole neck to bring cover flush with finished grade in paved areas and 40 mm above grade in unpaved areas.

.b Build up neck with concrete brick and mortar to achieve above if necessary.

.4 Manhole Frames and Covers

Cast iron manhole frames and covers as shown on the drawings.

.5 Cable Racks

.a Hot dipped galvanized cable racks and supports as indicated.

.b 12 x 100 mm pre-set inserts for rack mounting as indicated.

.6 Cable Pulling Equipment

Pulling iron made of galvanized steel rods, size and shape as indicated.

3. EXECUTION

3.1 STORAGE AND HANDLING

Store and handle materials in accordance with manufacturer's instructions.

3.2 PREPARATION

.1 Duct and fittings to be clean and dry before installation.

.2 Prior to installation, obtain Engineer's approval of pipe and fittings.

3.3 INSTALLATION

.1 Do trench excavation, backfill and compaction in accordance with Section 31 23 33.

.2 Open trench completely between manholes to be connected before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.

.3 Construct trench at elevations and with slopes as indicated or at a minimum slope of 1 to 400.

.4 Place native or sand bedding to a minimum depth of 150 mm, compacted to 100% Standard Proctor Maximum Dry Density.

.5 Construct concrete "mud slab" not less than 75 mm thick.

.6 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of ducts.

.7 Lay PVC ducts to configuration shown on the drawings with reinforcing as indicated. Install preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 75 mm horizontally and vertically. Stagger joints in adjacent layers at least 150 mm and make joints watertight. Use galvanized steel conduit for sections extending above finished grade level.

.8 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory made ends.

.9 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.

.10 Make transpositions, offsets and changes in direction using 5° bend sections, do not exceed a total of 20° with duct offset.

.11 Use bell ends at duct terminations in manholes or buildings.

.12 Use conduit to duct adapters when connecting to conduits.

.13 Terminate duct runs with a duct coupling set flush with the end of the concrete envelope when dead ending duct bank for future extension.

.14 Construct form work to provide duct bank with a minimum of 75 mm concrete cover along top and sides.

.15 Install four 3 m lengths of 15M reinforcing rods, one in each corner of duct bank when connecting duct to manholes or buildings. Wire rods to 15M dowels at manhole or building and support from duct spacers. Protect existing cables and equipment when breaking into existing manholes.

.16 Use anchors, ties and trench jacks as required, to secure ducts and formwork to prevent movement during pouring of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.

.17 Place concrete down sides of duct bank filling space under and around ducts. Rod concrete with flat bar between vertical rows filling voids.

.18 Immediately after placing of concrete, pull through each duct a wooden mandrel not less than 300 mm long and of a diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Avoid disturbing or damaging ducts where concrete has not set completely. Pull stiff bristle brush through each duct immediately before pulling in cables.

.19 Allow concrete to attain 50% of its specified strength before removing form work and backfilling.

3.4 MANHOLES

.1 Install precast manholes as indicated.

.2 Drain floor towards sump with 1 to 48 slope minimum and install drainage fittings as indicated.

.3 Install cable racks, anchor bolts and pulling irons as indicated.

.4 Install manhole frames and covers. Set frames in grout. Grout to consist of two parts sand and one part cement and sufficient water to form plastic slurry.

.5 Ensure filling of voids in joint being sealed. Plaster with cement grout, walls, ceiling and neck.

.6 Spray paint an "x" on ceiling of manhole above floor drain or sump pit.

3.5 INSPECTIONS

Advise Engineer so that he may inspect ducts prior to placing and be present during placement of concrete and clean out.

3.6 ABANDONMENT

Abandon ducts and manholes per Section 02 41 16.

1. GENERAL

This Section specifies requirements for direct burying of underground cable ducts under roadways and boulevards.

1.1 RELATED WORK

.1	Basic Concrete Materials and Test Method	Section 03 05 13
.2	Aggregate Materials	Section 31 05 16
.3	Trench Excavation and Backfilling	Section 31 23 33
.4	Topsoil and Finish Grading	Section 32 91 19
.5	Mechanical Seeding	Section 32 92 19

1.2 MEASURE OF PAYMENT

.1 Trench, excavation, compaction and backfill will be measured to Section 31 23 33.

.2 Supply and installation of duct will be measured in lineal metres of installed materials as measured in a horizontal line from the designated start to the end of installation. Unit price bid shall be full compensation for all work required to supply and install ducts including laying, jointing, fittings, and plugs.

1.3 CONNECTION POINTS

.1 Supply and installation of connections from the main duct to streetlight base, secondary voltage service vault and other connections shown on the drawings shall be measured as the number installed.

.2 Supply and installation of connections to include all trenching, compaction and backfill from main duct trench to connection location and for the supply of all duct, bends, couplings and concrete required to make the connection.

2. PRODUCTS

2.1 MATERIALS

The following is a list of materials approved for use:

.1 Duct, 50 mm PVC Type DB2, 6.1 m length, 1 end belled
CSA 22.2 - 211.1 - M1984

Scepter Catalogue Number 34-020-21-200 or equal

.2 Duct, 100 mm PVC, Type DB2, 6.1 m length, 1 end belled
CSA C22.2 - 211.1 - M1984
Scepter Catalogue Number 34-040-21-200 or equal

.3 Cap, 50 mm PVC, Type DB2
Solvent Weld
CSA C22.2 - 211.1 - M1984
Scepter Catalogue Number 83-0425-0020 or equal

.4 Cap, 100 mm PVC, Type DB2
Solvent Weld
CSA C22.2 - 211.1 - M1984
Scepter Catalogue Number 83-0425-0040 or equal

.5 Coupling, 50 mm PVC, Type DB2
Solvent Weld
CSA C22.2 - 211.1 - M1984
Scepter Catalogue Number 83-0435-0020 or equal

.6 Coupling, 100 mm PVC, Type DB2
Solvent Weld
CSA C22.2 - 211.1 - M1984
Scepter Catalogue Number 83-0435-0040 or equal

.7 Bend, 50 mm PVC, Type DB2, 24" Radius
Solvent Weld
CSA C22.2 - 211.1 - M1984
Scepter Catalogue Number 83-0404-0020 or equal

.8 Bend, 50 mm PVC, Type DB2, 12" Radius
Solvent Weld
CSA C22.2 - 211.1 - M1984
Scepter Quote Number MJ5549

.9 Bend, 100 mm PVC, Type DB2, 48" Radius
Solvent Weld
CSA C22.2 - 211.1 - M1984
Scepter Quote Number MJ5569

.10 PVC Cleaner
Scepter 100 T PVC Cleaner or equal

.11 PVC Solvent Cement

Must be CSA approved
Must meet ASTM D2564 standard
Scepter Catalogue Number 79-0100-0473 or equal

2.2 CONCRETE

For 25 MPa concrete refer to Section 03 05 13.

2.3 BEDDING MATERIAL

For clean sand refer to Section 31 05 16.

3. EXECUTION

3.1 PREPARATION

.1 Duct and fittings to be clean and dry before installation.

.2 Prior to installation, obtain Engineer's approval of duct and fittings.

3.2 ALIGNMENT

Ensure alignment is parallel to the right-of-way, or back of curb, or back of sidewalk.

3.3 TRENCH EXCAVATION

.1 Do trenching work in accordance with Section 31 23 33.

.2 Trench alignment and depth require approval prior to placing bedding material and duct.

.3 Trench width to be determined by the number of ducts placed horizontally in trench with 50 mm separation between ducts or width of compaction equipment, whichever is greater.

.4 Depth of bury beyond back of walk or back of curb may be decreased to 900 mm using 5° angle coupling to provide for gradual sloping of duct.

.5 Trench depth to be as follows (if depths other than those listed are required, obtain Engineer's approval):

.a Road crossing 1000 mm below top of pavement elevation.

.b Under concrete or paving stone sidewalks, 750 mm.

.c Landscaped areas, 900 mm.

.6 Trench excavation to extend beyond paved surfaces and curbs by a minimum of 2 m and/or back of sidewalk by a minimum of 1 m to ensure that ends of ducts are clear of hard surface and for ease of access in the future.

3.4 INSTALLATION

.1 Lay and join duct in accordance with manufacturer's instructions.

.2 Lay duct on prepared bed true to line and grade, with duct invert smooth and free of sags or high points. Ensure duct is in contact with bed throughout its full length.

.3 Place parallel lengths of duct in a horizontal layer across bottom of trench with 50 mm spacing. Vertical stacking of duct will not be permitted.

.4 Pipe Jointing:

.a Prepare joints in accordance with manufacturer's recommendations by removing all sharp edges and burrs from inside of conduit.

.b Clean all joints with approved pipe cleaner.

.c Apply solvent cement in accordance with manufacturer's recommendations and complete joint. Do not disturb joint for 24 hours to allow for proper curing of joint solvent.

.d Install end caps or plugs on the end of all ducts.

3.5 CROSSINGS

.1 Duct

.a When required to cross existing ducts place sufficient bedding material to provide a minimum separation of 150 mm between the duct banks.

.2 Roadway, Sidewalk, Lane

.a Ensure alignment is perpendicular to the surface infrastructure.

3.6 CONCRETE ENCASEMENT

Place concrete encasement to a minimum thickness of 150 mm at all bends 45° or greater.

3.7 MARKER POSTS

.1 Install 38 mm x 89 mm board from invert to 1.0 m above ground at each end of the duct installation.

.2 Install a 1200 mm x 15 mm diameter steel marker pin at end of duct. Set top of pin flush with existing surface.

3.8 BACKFILL

.1 Upon completion of laying the duct, the Engineer is to inspect the duct, duct joints and connections prior to backfilling.

.2 Bed and backfill duct to Class B as specified in Section 31 23 33.

.3 Place clean sand bedding material to a minimum depth of 75 mm.

.4 Shape bed true to grade to provide a continuous uniform bearing surface for the duct.

.5 Compact bedding to 100% Standard Proctor Maximum Dry Density.

.6 After ducts have been laid, place backfill material, above bedding material, in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Backfill material to meet 31 23 16.

.7 Under hard surfaced areas (e.g. pavement, sidewalks) and laneways, compact backfill material to 100% Standard Proctor Maximum Dry Density.

.8 In other areas (e.g. boulevards), compact backfill material to 95% Standard Proctor Maximum Dry Density.

.9 Compact using approved mechanical tamping devices, or by hand tamping to achieve specified compaction.

.10 During backfilling and compacting ensure that ducts are not disturbed or damaged. Repairs to damaged duct at contractor's expense.

3.9 RESTORATION

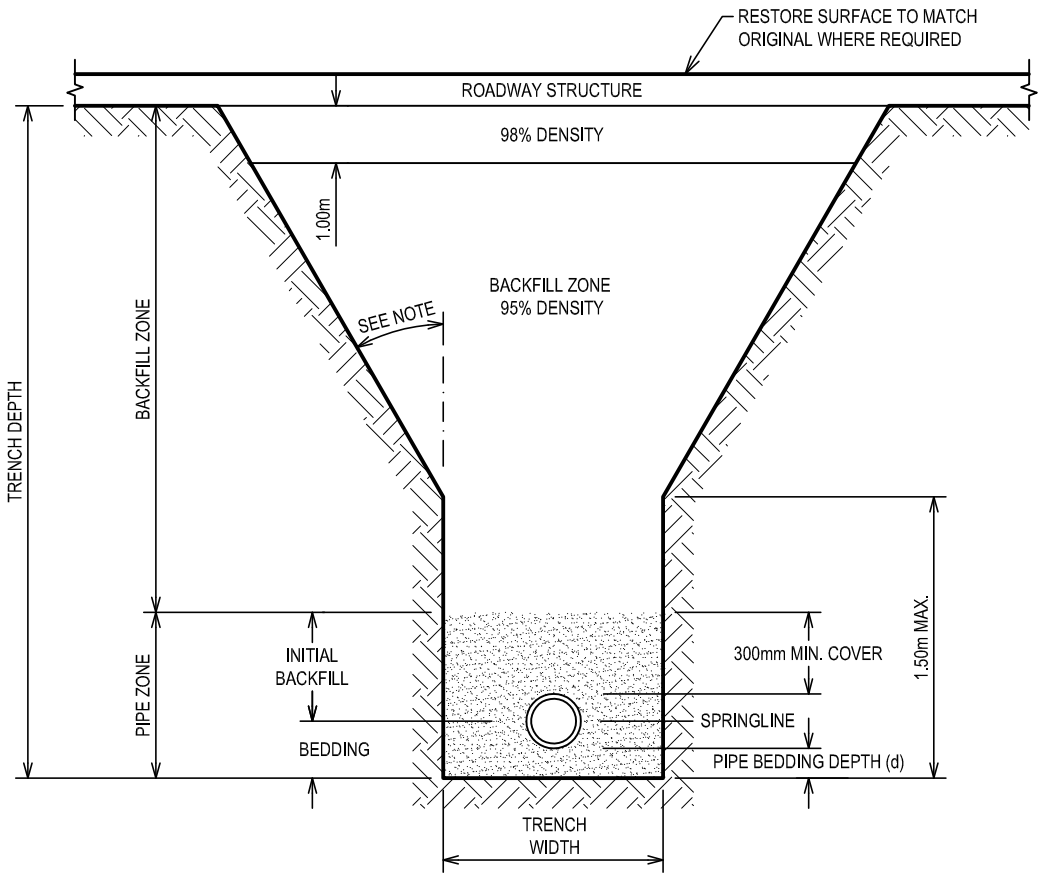
.1 For new subdivision development the surface of the trench is to be graded smooth and free of obstruction, to a condition prior to installation.

.2 For projects that are in existing developed areas, hard surfaces are to be re-instated to its prior condition and material; landscaped areas are to have topsoil placed and seeded per Sections 32 91 19 and 32 92 21 respectively.

Sections within this Division have been intentionally removed.

Contractor's requiring information regarding Vehicle Guard Rails installation shall refer to Alberta Transportation's Standard Specifications for Highway Construction (current edition, Specification 2.19) unless directed otherwise by the Engineer.

Measure of Payment will be per the (Town's) Contract document unless noted otherwise under the Supplementary Conditions.



NOTE:
REFER TO SECTION 31 23 33 - TRENCH EXCAVATION FOR DETAILED SPECIFICATIONS.
REFER TO DRAWING 50 01 03 FOR CLASS 'B' PIPE BEDDING MATERIAL.

TRENCH EXCAVATION
- TRENCH TO BE SLOPED AS PER OCCUPATIONAL HEALTH & SAFETY ACT.
- IN HARD & COMPACT SOIL, TO NOT LESS THAN 30° FROM THE VERTICAL.
- IN OTHER SOILS TO NOT LESS THAN 45° FROM THE VERTICAL.

BACKFILL ZONE
- MAXIMUM MATERIAL LIFTS SHALL BE 200mm LAYERS (COMPACTED).

INITIAL BACKFILL
- COMPACTION DENSITY SHALL BE (MINIMALLY) 100% STANDARD PROCTOR MAXIMUM DRY DENSITY OF THE SOIL PLACED.
- PLACE IN 150mm LAYERS AND COMPACT BOTH SIDES SIMULTANEOUSLY.

PIPE BEDDING
- COMPACTION DENSITY SHALL BE (MINIMALLY) 100% STANDARD PROCTOR MAXIMUM DRY DENSITY OF THE SOIL PLACED.

TRENCH WIDTH	
FLEXIBLE (PVC) PIPE AS PER PVC HANDBOOK	
NOMINAL PIPE DIA. (mm)	MIN. TRENCH WIDTH (mm)
200	700
300	800
400	900
500	950
600 & LARGER	O.D. x 1.5
MAX. TRENCH WIDTH (mm)	
350 & LARGER	O.D. x 2.5
RIGID (CONCRETE) PIPE AS PER CONCRETE HANDBOOK	
MINIMUM TRENCH WIDTH = O.D. + 600mm MAXIMUM TRENCH WIDTH AS SPECIFIED BY THE ENGINEER (CLASS OF PIPE DETERMINED BY DEPTH)	
O.D. = OUTSIDE DIAMETER (mm)	

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-13

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
TRENCH EXCAVATION and BACKFILL

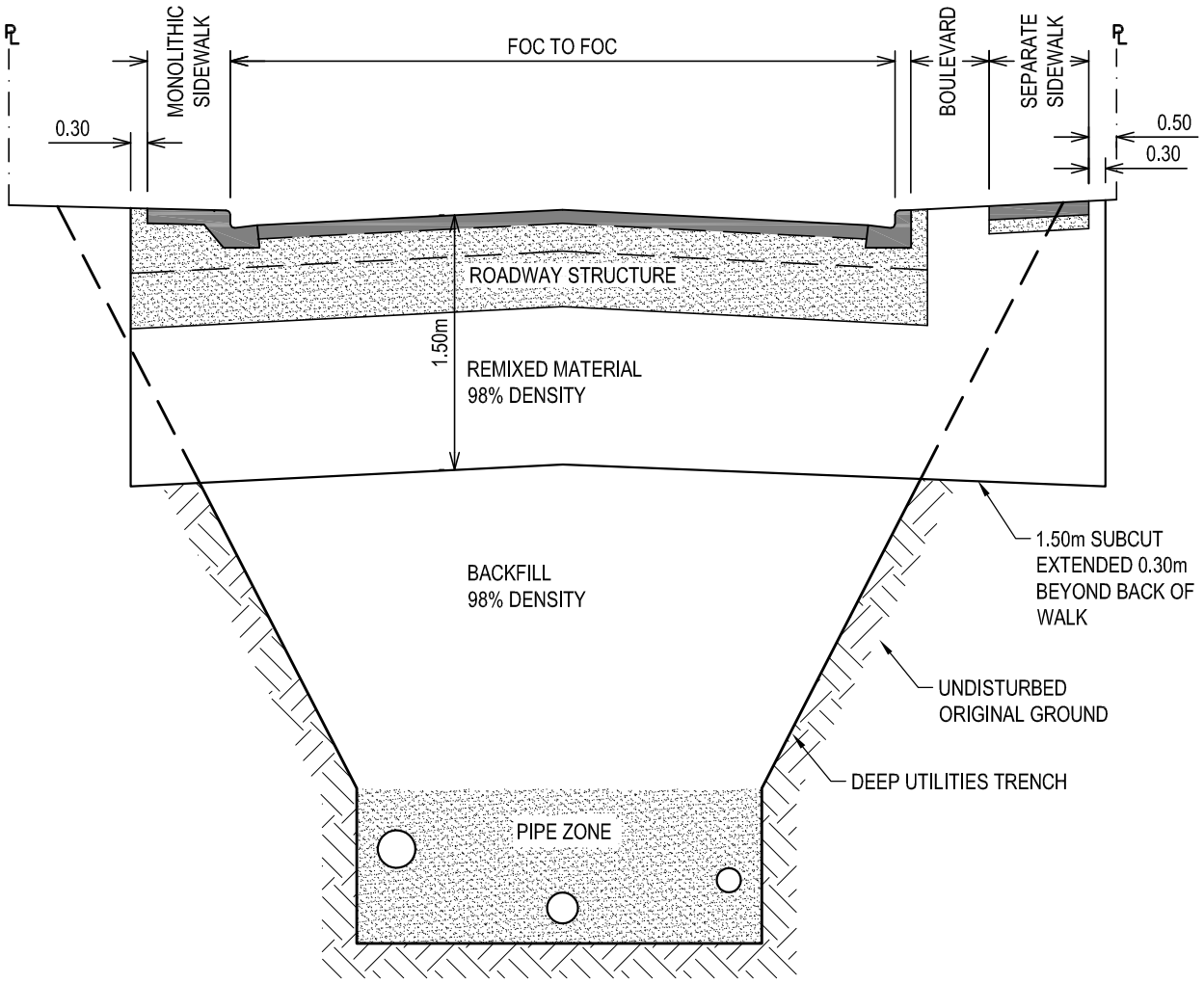
CLASS 'B' BEDDING BACKFILL REQUIREMENTS

APPROVED BY:

ENGINEER

DRAWING NO.

50 01 01



NOTE :
TRENCH EXCAVATION TO SECTION 31 23 33 & DRAWING 50 01 01

BACKFILL ZONE
- COMPACTION DENSITY SHALL BE MINIMUM 98% STD. PROCTOR DRY DENSITY OF THE SOIL PLACED.
- MATERIAL SHALL BE PLACED IN A MAXIMUM OF 200mm LAYERS.
- UNIFORM BACKFILL FROM B.o.C. TO B.o.C., FOR 1.5m BELOW TOP OF FINISHED GRADE.
- A SINGLE POINT PROCTOR WILL **NOT** BE ACCEPTABLE.

PIPE ZONE
- REFER TO DRAWING 50 01 01 FOR OTHER TRENCH DETAILS.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

CONSTRUCTION SPECIFICATION DRAWINGS
TRENCH EXCAVATION and BACKFILL

APPROVED BY:

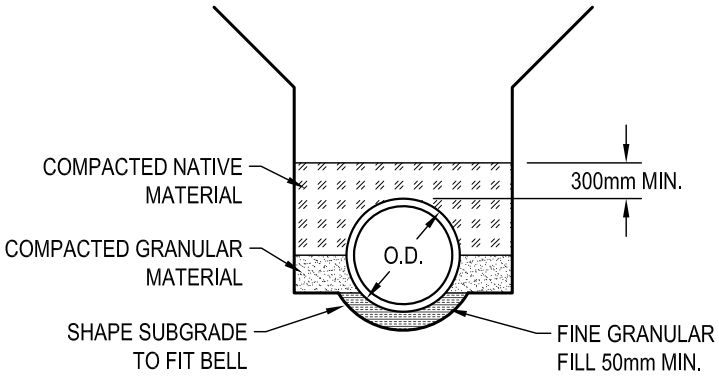
ENGINEER

DATE: 2018-02-13

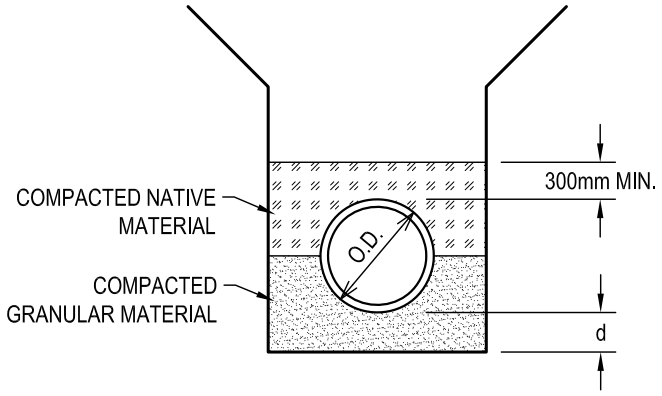
SCALE: N.T.S.

BACKFILLING FOR FRONT SERVICED LOTS

DRAWING NO.
50 01 02



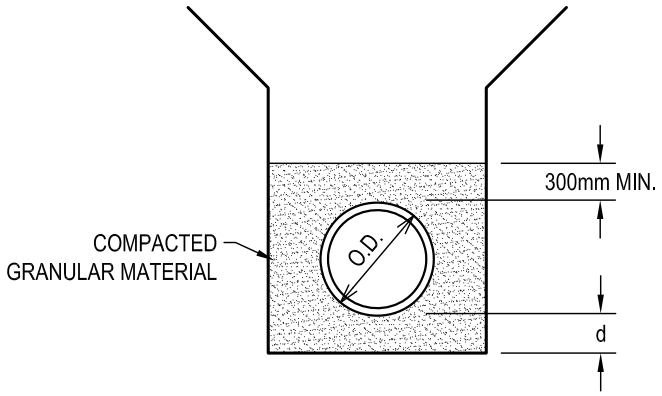
SHAPED SUBGRADE WITH GRANULAR FOUNDATION



GRANULAR FOUNDATION

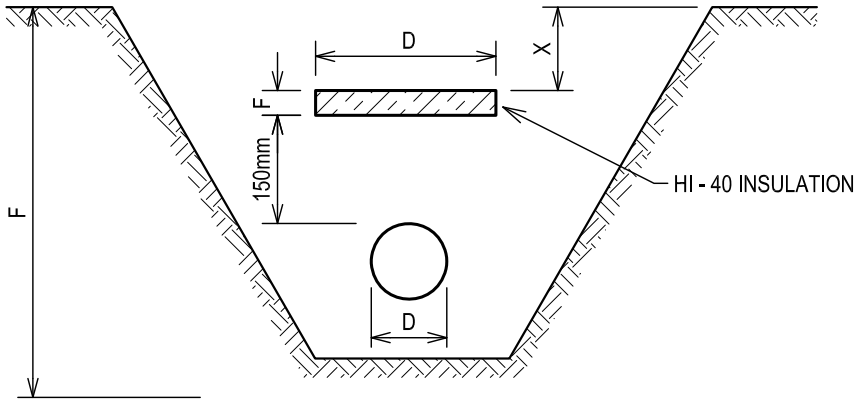
NOTE :
SUBGRADE SHOULD BE EXCAVATED OR OVER EXCAVATED SO A UNIFORM FOUNDATION MAY BE PROVIDED, FREE OF PROTRUDING ROCKS.

DEPTH OF MATERIAL BELOW PIPE	
PIPE DIAMETER D (mm)	BEDDING DISTANCE d (min.)
675 or SMALLER	75
750 to 1500	100
1650 or LARGER	150



GRANULAR SURROUND

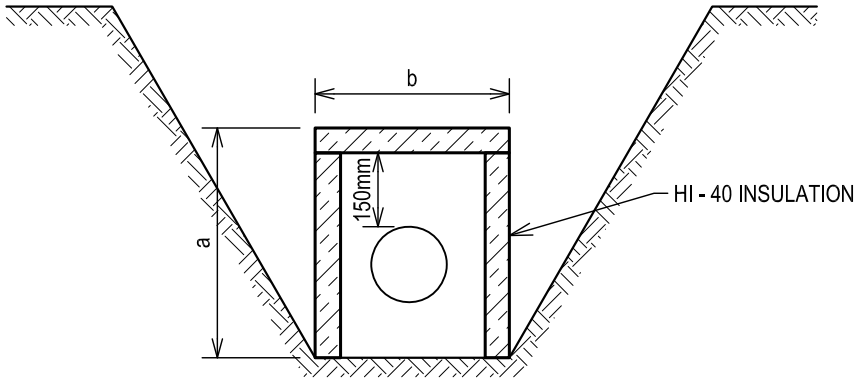
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS TRENCH EXCAVATION AND BACKFILL	APPROVED BY: ENGINEER
			DATE: 2018-02-13	CLASS B TRENCH BEDDING DETAILS	
			SCALE: N.T.S.		DRAWING NO. 50 01 03



$w = D + (F - X) - 0.3$

HORIZONTAL LAYER

T = INSULATION THICKNESS (mm)
W = INSULATION WIDTH (m)
D = PIPE DIAMENTER (m)
X = INSULATION DEPTH (m)
F = ESTIMATED FROST DEPTH (2.70m)



$w = 2a + b$

INVERTED U

DEPTH FROM FINISHED GRADE TO THE TOP OF INSULATION "X" (METERS)	0 - 1	1 - 1.25	1.25 - 1.50	1.50 - 1.80	1.80 - 2.40	2.40 or Greater
INSULATION THICKNESS "T" (mm)	N/A	65	50	40	25	0

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

CONSTRUCTION SPECIFICATION DRAWINGS
TRENCH EXCAVATION AND BACKFILL

APPROVED BY:

ENGINEER

DATE: 2018-02-13

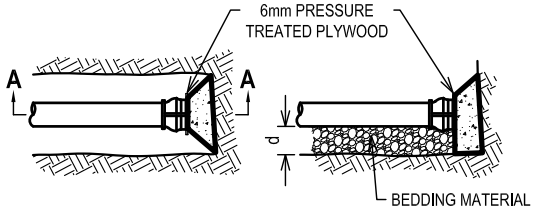
INSULATION DETAIL

SCALE: N.T.S.

DRAWING NO.

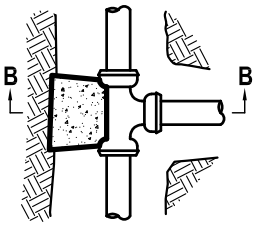
50 01 04

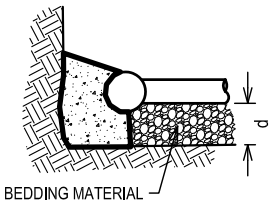
1. DEAD END MAIN



SECTION 'A - A'

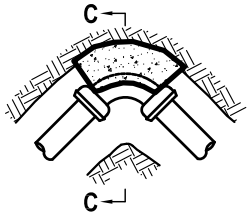
2. TEE



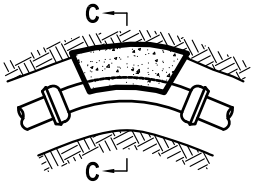


SECTION 'B - B'

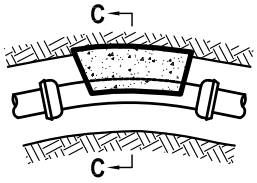
3. 90 DEGREE BEND

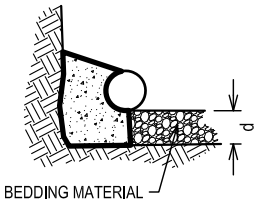


4. 45 DEGREE BEND



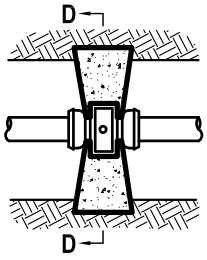
5. 22 1/2 DEGREE BEND & 11 1/4 DEGREE BEND



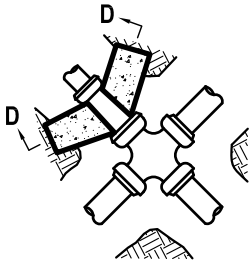


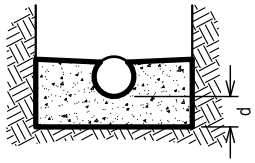
SECTION 'C - C'

6. VALVE



7. REDUCER





SECTION 'D - D'

HOIZONTAL THRUST BLOCK BEARING AREA							
MINIMUM CONCRETE AREA IN CONTACT WITH UNDISTURBED SOIL (sq. m)							
FITTING	SIZE OF MAIN (mm)						
	150	200	250	300	350	400	500
Dead End Main & Tee	0.35	0.62	0.97	1.40	1.91	2.49	3.90
11 1/4 Degree Bend	0.07	0.12	0.20	0.28	0.38	0.50	0.78
22 1/2 Degree Bend	0.14	0.24	0.38	0.55	0.75	0.97	1.52
45 Degree Bend	0.27	0.48	0.75	1.07	1.46	1.91	2.98
90 Degree Bend	0.50	0.88	1.38	1.98	2.70	3.53	5.51
Valve & Reducer	0.35	0.62	0.97	1.40	1.91	2.49	3.90

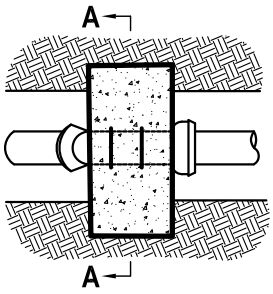
NOTE :

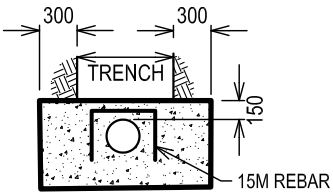
- BEARING AREA CALCULATED USING THE FOLLOWING:
  (a) HYDRAULIC PRESSURE 1380 kPa..
  (b) SOIL BEARING CAPACITY 72 kPa..
- CONCRETE STRENGTH TO BE 25 MPa., TYPE HS CEMENT
- CONCRETE TO BE CLEAR OF BELLS & PIPE.
- PLACE 6 ml POLYETHYLENE BETWEEN CONCRETE AND PIPE.
- SEE DWG. 50 01 03 FOR BEDDING DEPTH (d).
- **BOLD LINE** REPRESENTS THE BEARING SURFACE.

NO.	DATE	REVISION

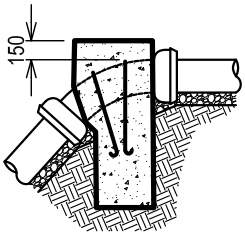
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS WATER MAINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**HORIZONTAL THRUST BLOCK**	DRAWING NO. **50 02 01**
SCALE: N.T.S.		



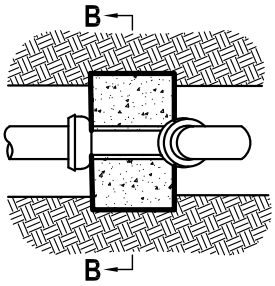


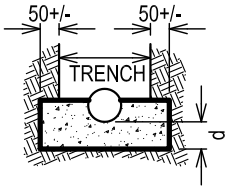
SECTION 'A - A'



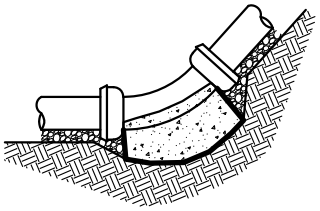
VERTICAL DEAD WEIGHT THRUST BLOCK							
VOLUME OF CONCRETE (cu m)							
DEGREE OF BEND	SIZE OF BEND (mm)						
	150	200	250	300	350	400	500
11 1/4	0.2	0.4	0.6	0.9	1.2	1.6	2.4
22 1/2	0.4	0.8	1.2	1.7	2.3		
45	0.8	1.5	2.3				
90							

SPECIFIC DESIGN REQUIRED BY ENGINEER





SECTION 'B - B'



THRUST BLOCK BEARING AREA							
MINIMUM CONCRETE AREA IN CONTACT WITH UNDISTURBED SOIL (sq. m)							
DEGREE OF BEND	SIZE OF MAIN (mm)						
	150	200	250	300	350	400	500
11 1/4	0.07	0.12	0.20	0.28	0.38	0.50	0.78
22 1/2	0.14	0.24	0.38	0.55	0.75		
45	0.27	0.48	0.75				
90							

SPECIFIC DESIGN REQUIRED BY ENGINEER

NOTES:

- BEARING AREA CALCULATED USING THE FOLLOWING:
  - (a) HYDRAULIC PRESSURE 1380 kPa.
  - (b) SOIL BEARING CAPACITY 72 kPa.
- CONCRETE STRENGTH TO BE 25 MPa , TYPE HS CEMENT.
- CONCRETE TO BE CLEAR OF BELLS & PIPE.
- PLACE 6 ml POLYETHYLENE BETWEEN CONCRETE AND PIPE.
- SEE DWG. 50 01 03 FOR BEDDING DEPTH (d).
- **BOLD LINE** REPRESENTS THE BEARING SURFACE.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-13

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
WATER MAINS

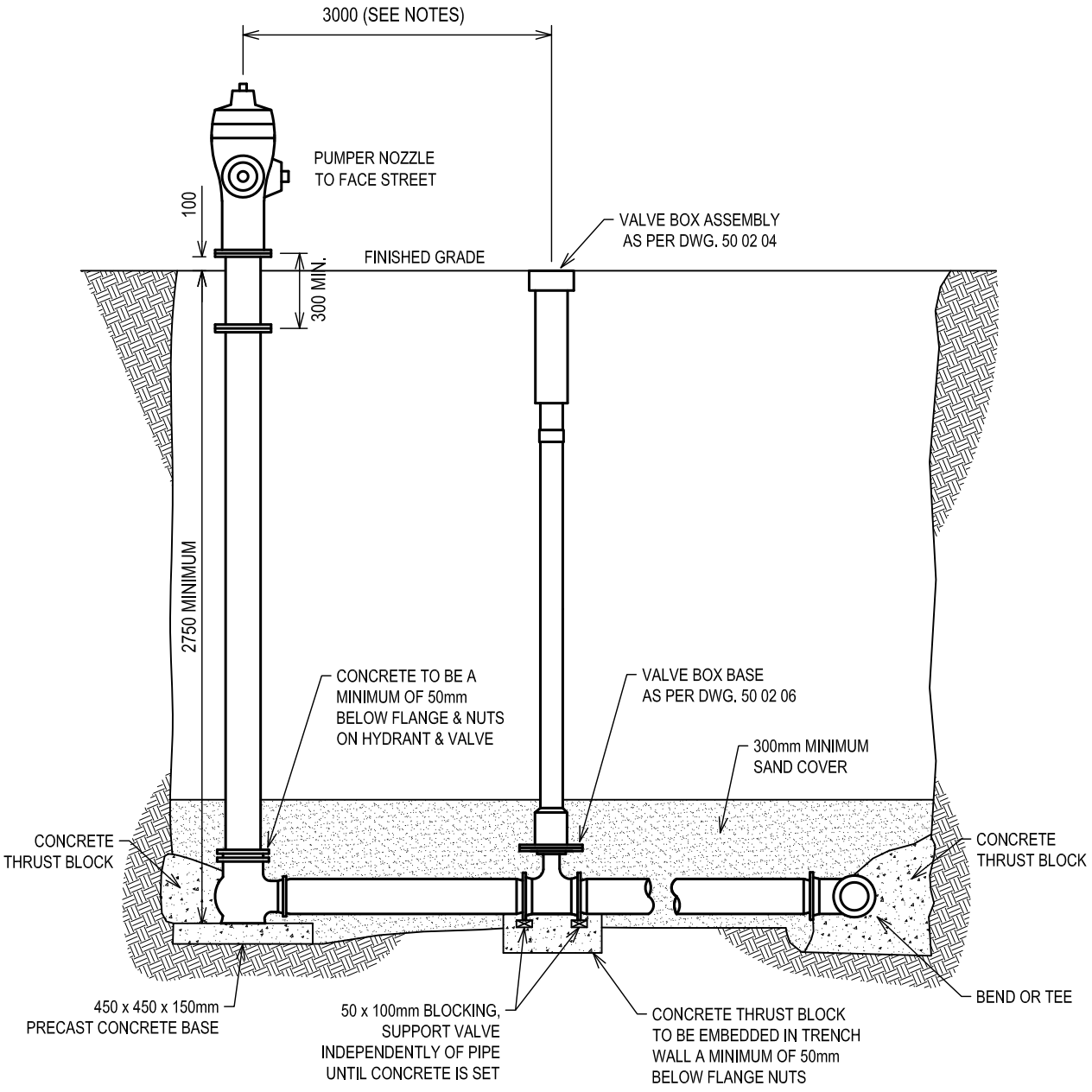
VERTICAL BEND THRUST BLOCKS

APPROVED BY:

ENGINEER

DRAWING NO.

50 02 02



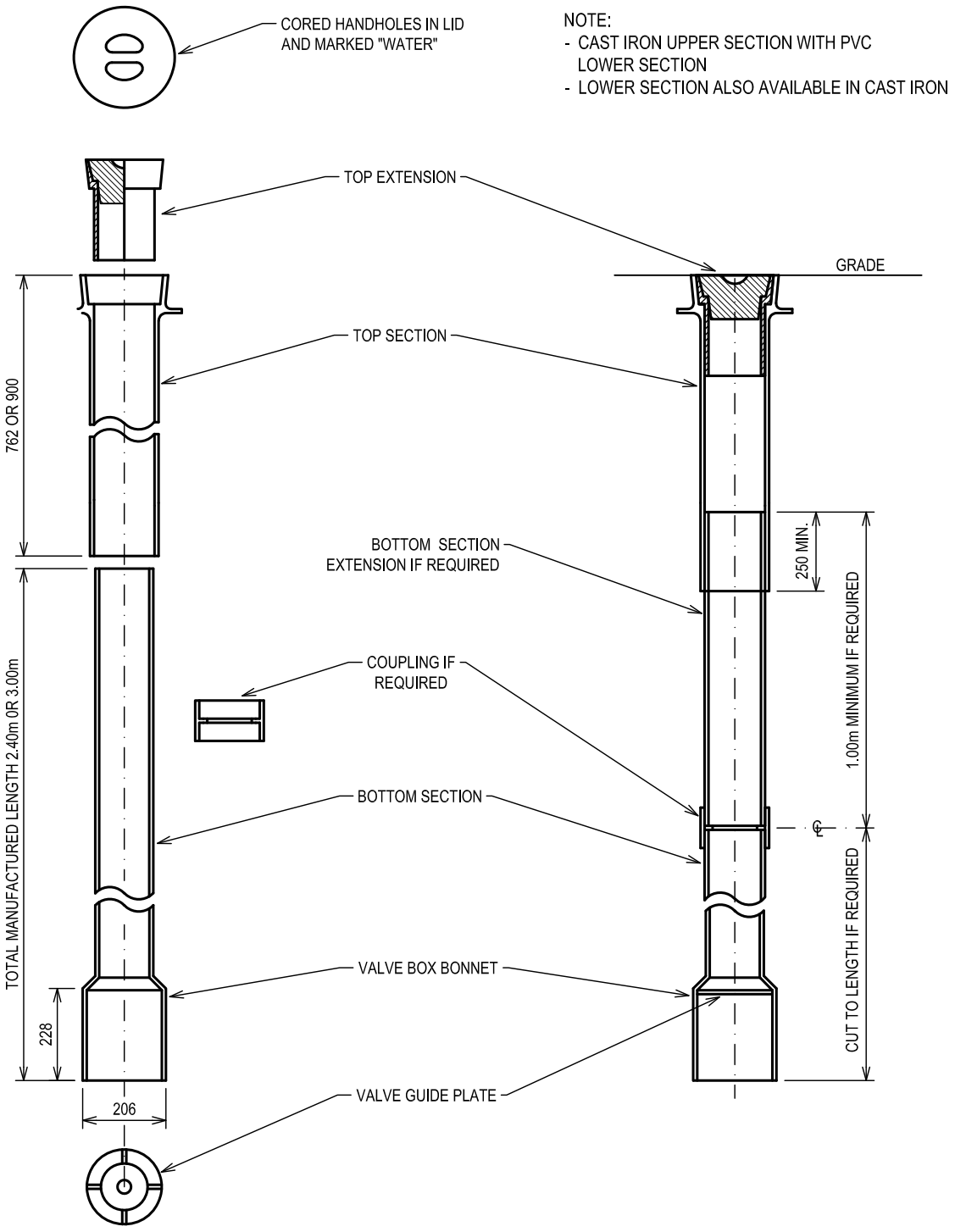
NOTES:
HYDRANT FINISH PER SECTION 33 11 16

ENSURE THE VALVE LOCATION DOES NOT FALL WITHIN THE SIDEWALK OR C&G. ALTERNATE LOCATIONS SHALL BE:
- 1.0m FROM FACE OF CURB ON HYDRANT LEAD ALIGNMENT (HYDRANT TO NEAREST BEND OR TEE (IN ROADWAY) OR
- LOCATED IN LANDSCAPED BOULEVARD

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

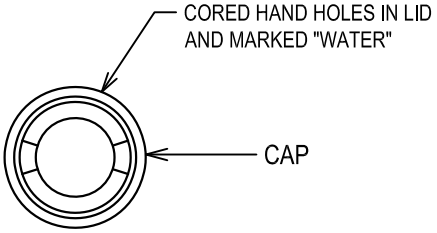
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS WATER MAINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**HYDRANT INSTALLATION DETAIL**	DRAWING NO. **50 02 03**
SCALE: N.T.S.		

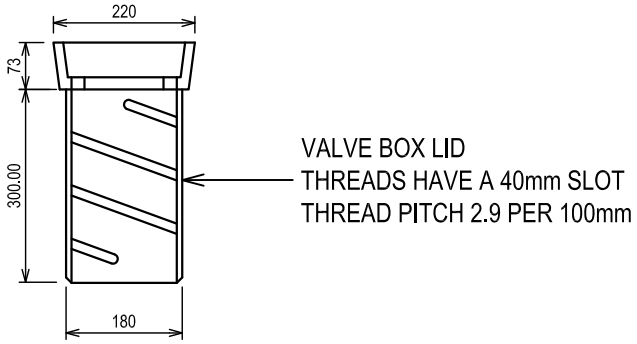


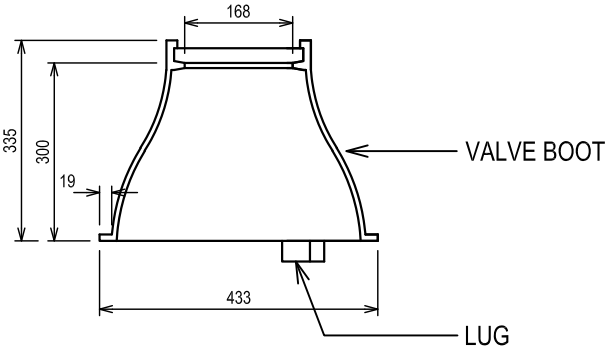
NO.	DATE	REVISION

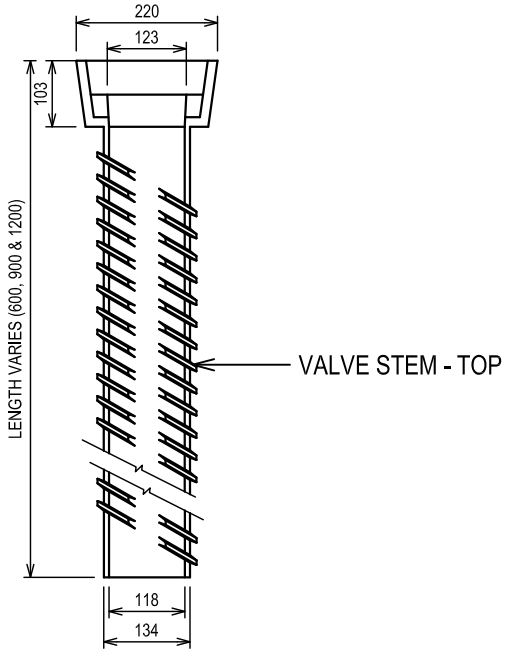
THE TOWN OF OLDS ENGINEERING DEPARTMENT

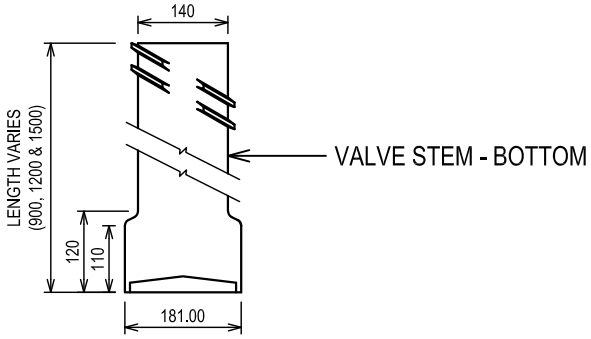
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS WATER MAINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**TYPE 'A' (PVC) VALVE BOX ASSEMBLY**	
SCALE: N.T.S.		DRAWING NO. **50 02 04**







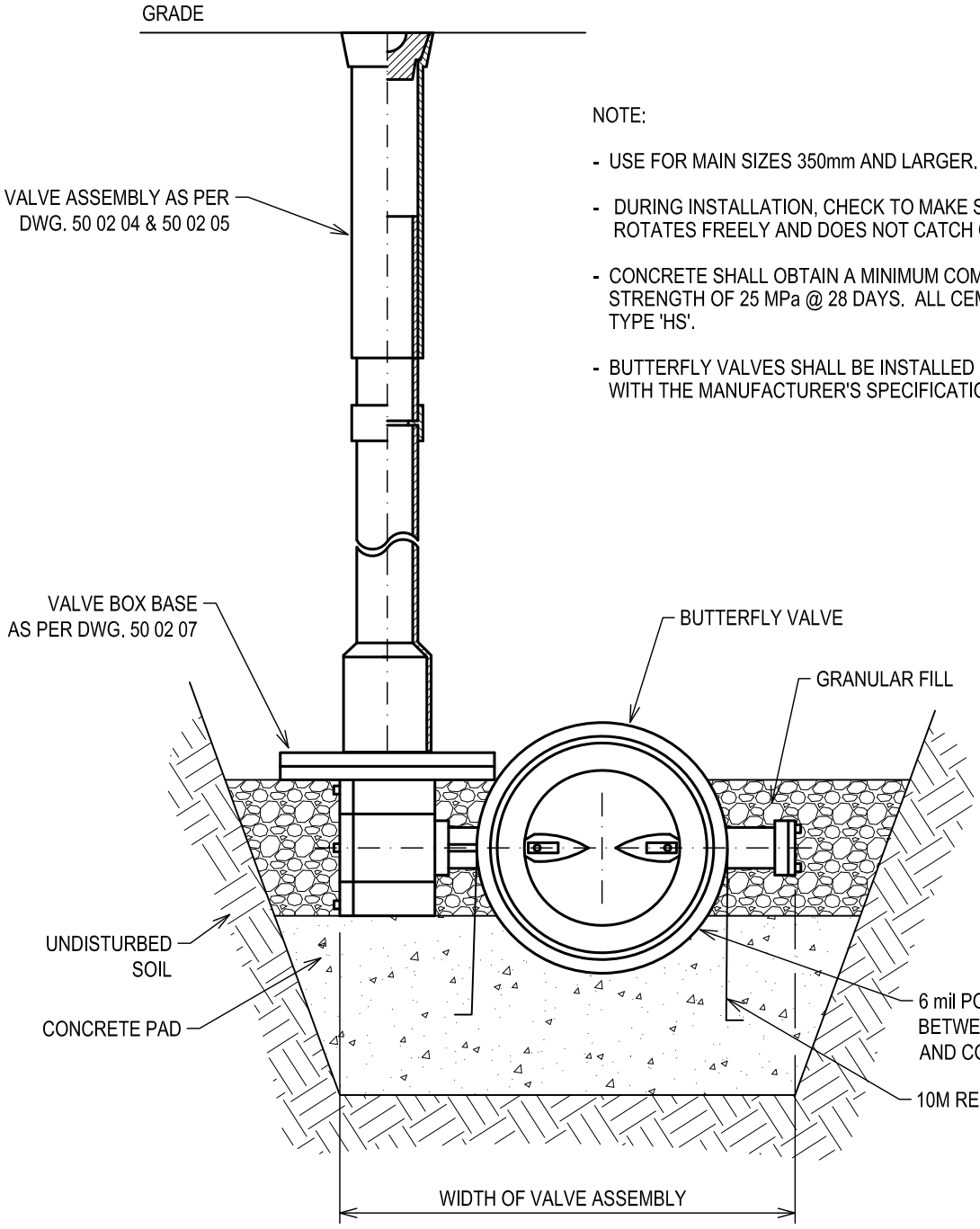




NOTE:

- GRAY CAST IRON TO ASTM A48

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS WATER MAINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	TYPE 'B' VALVE BOX ASSEMBLY	DRAWING NO. 50 02 05
			SCALE: N.T.S.		



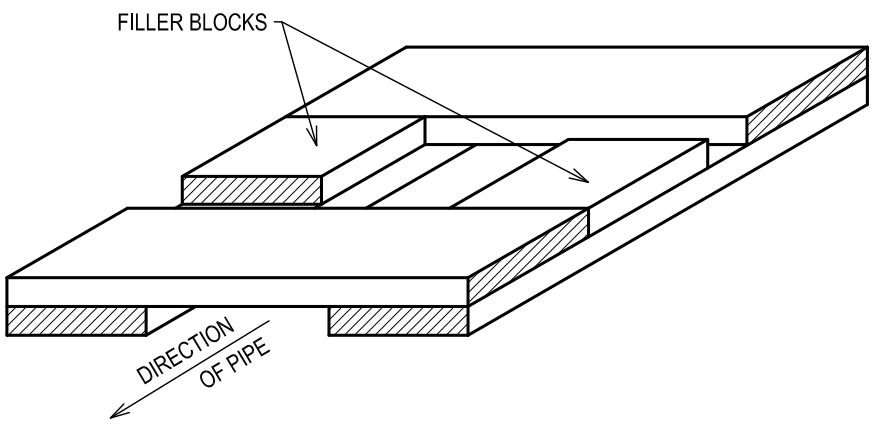
NOTE:

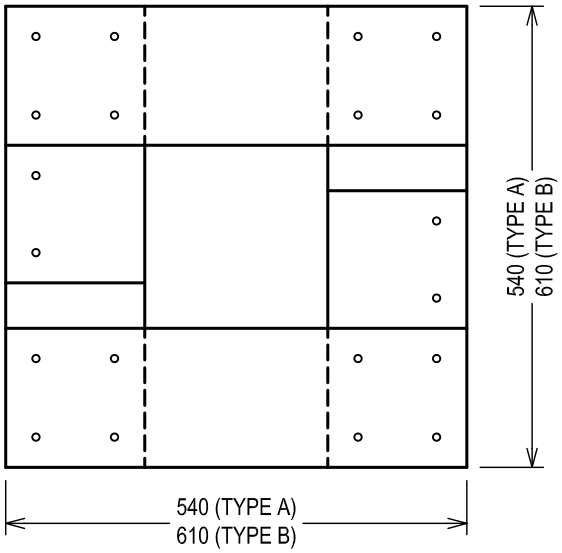
- USE FOR MAIN SIZES 350mm AND LARGER.
- DURING INSTALLATION, CHECK TO MAKE SURE DISC ROTATES FREELY AND DOES NOT CATCH ON PIPE.
- CONCRETE SHALL OBTAIN A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa @ 28 DAYS. ALL CEMENT TO BE TYPE 'HS'.
- BUTTERFLY VALVES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS WATER MAINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**STANDARD BUTTERFLY VALVE INSTALLATION**	
SCALE: N.T.S.		DRAWING NO. **50 02 06**

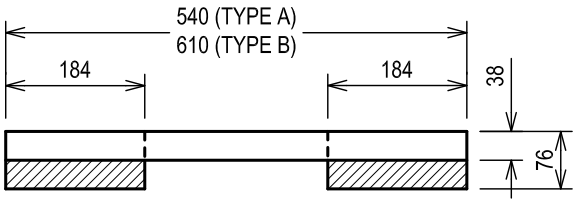




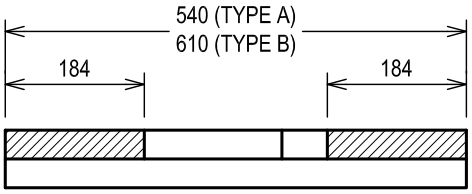
PLAN VIEW

NOTES:

- TO BE CONSTRUCTED FROM 38mm x 184mm CONSTRUCTION GRADE LUMBER (SPRUCE, PINE, FIR)
- ALL WOOD MEMBERS ARE TO BE TREATED WITH GREEN "COPPERWOOD PERSERVATIVE" # 580025
- USE 89mm COATED NAILS (3 1/2")



FRONT VIEW

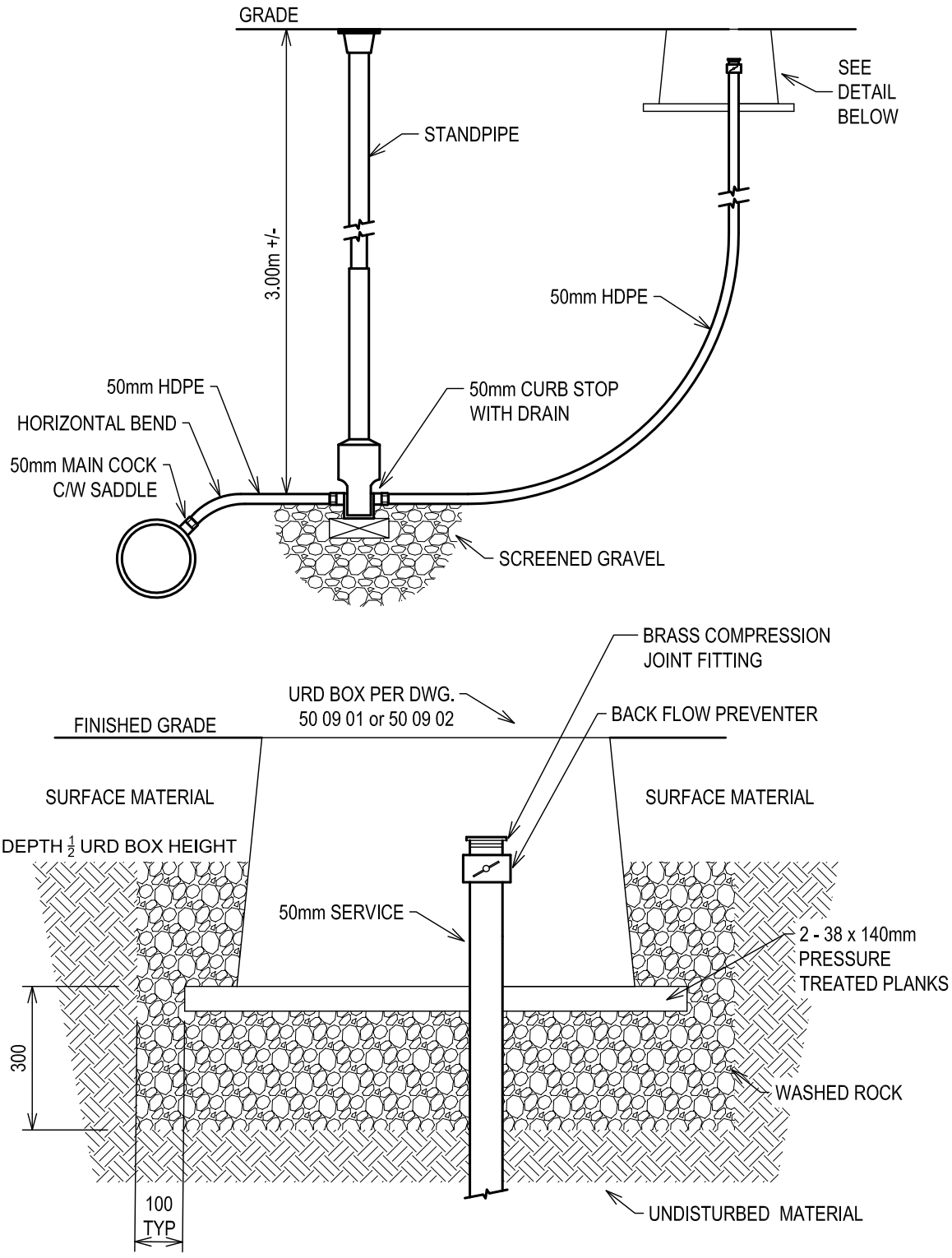


RIGHT SIDE VIEW

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

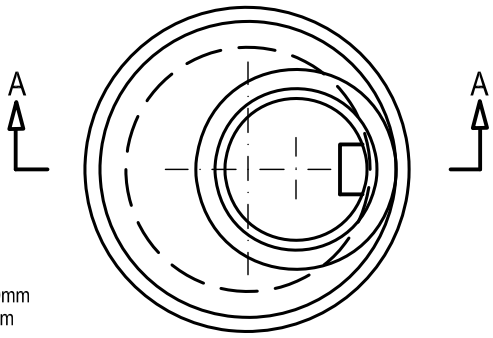
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS WATER MAINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**VALVE BOX BASE DETAIL**	
SCALE: N.T.S.		DRAWING NO. **50 02 07**



NO.	DATE	REVISION

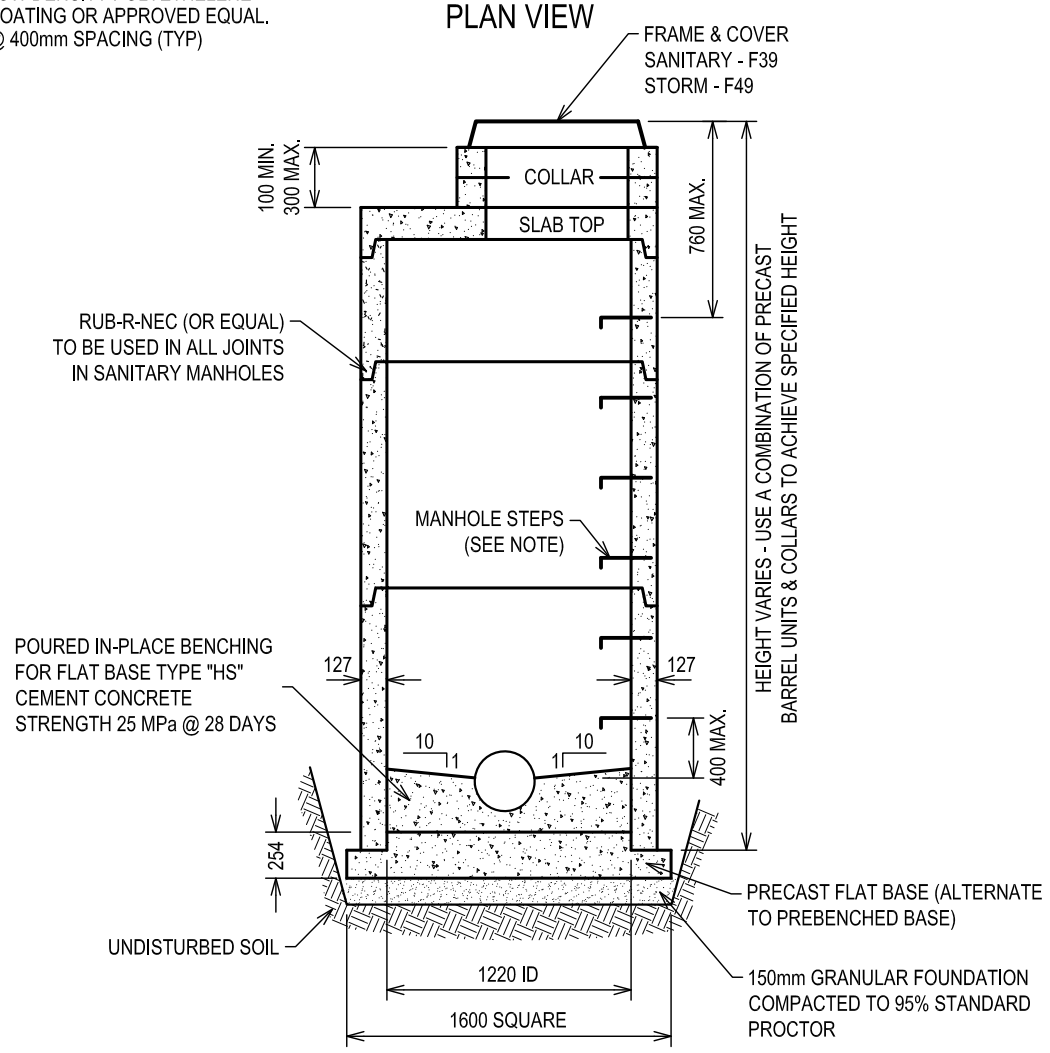
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS WATER MAINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**AIR RELIEF VALVE**	
SCALE: N.T.S.		DRAWING NO. **50 02 08**



PLAN VIEW

NOTE :
- MANHOLE STEPS TO BE MSU 20mm O.D. ALUMINUM TUBING C/W 3mm LOW DENSITY POLYETHELENE COATING OR APPROVED EQUAL.
- @ 400mm SPACING (TYP)

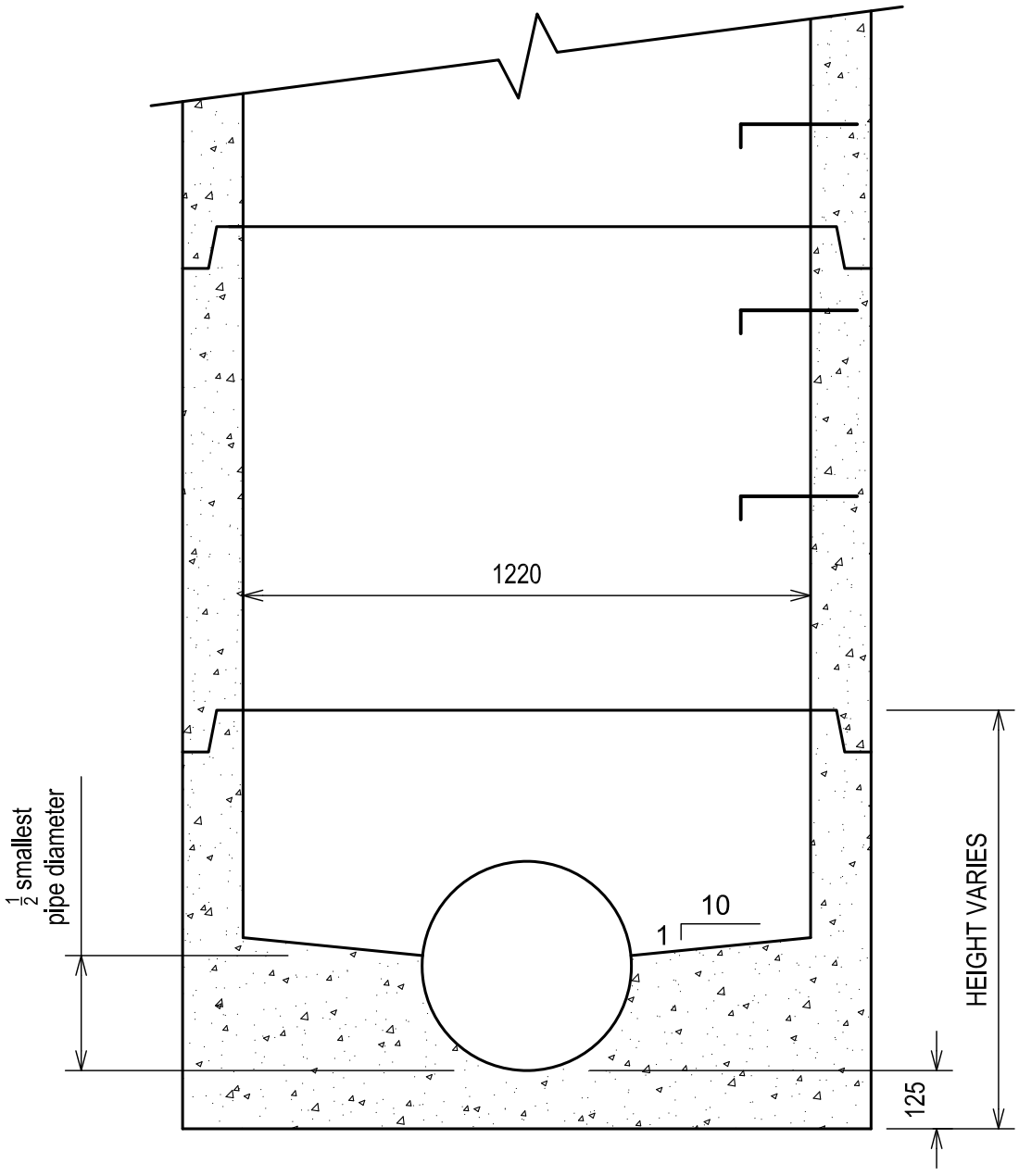


SECTION 'A - A'

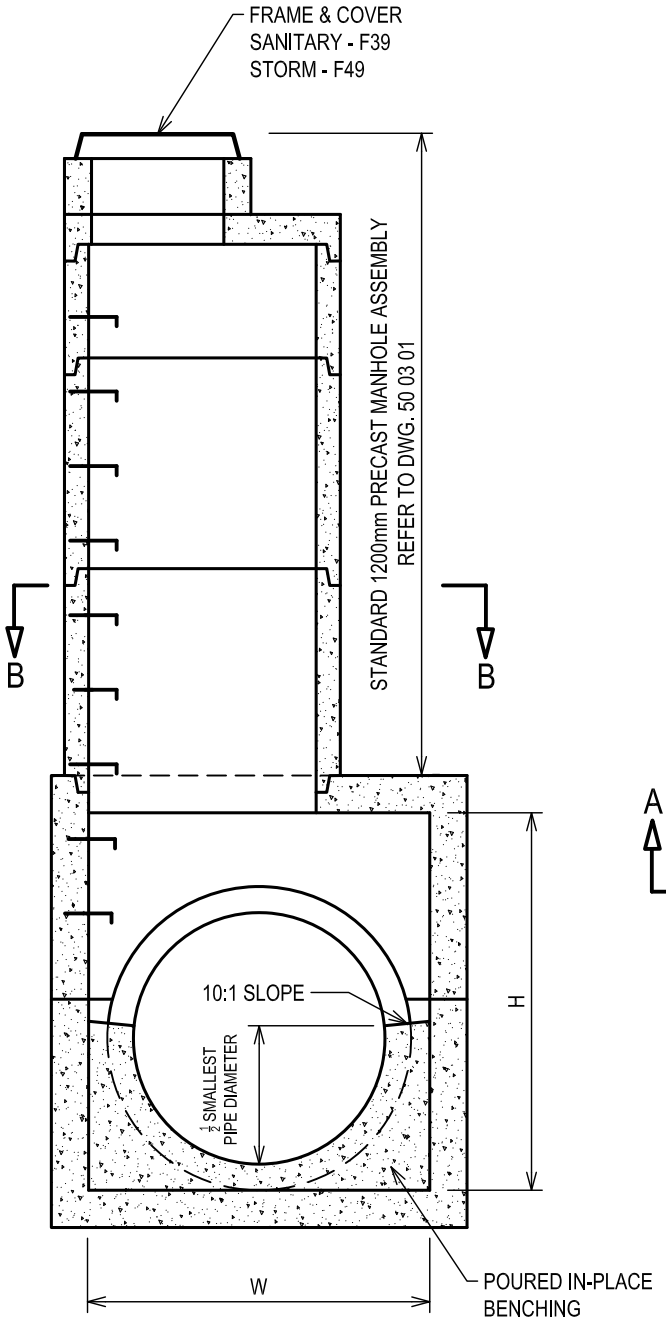
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES and CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**1200mm TYPE 5A PRECAST MANHOLE ASSEMBLY**	
SCALE: N.T.S.		DRAWING NO. **50 03 01**

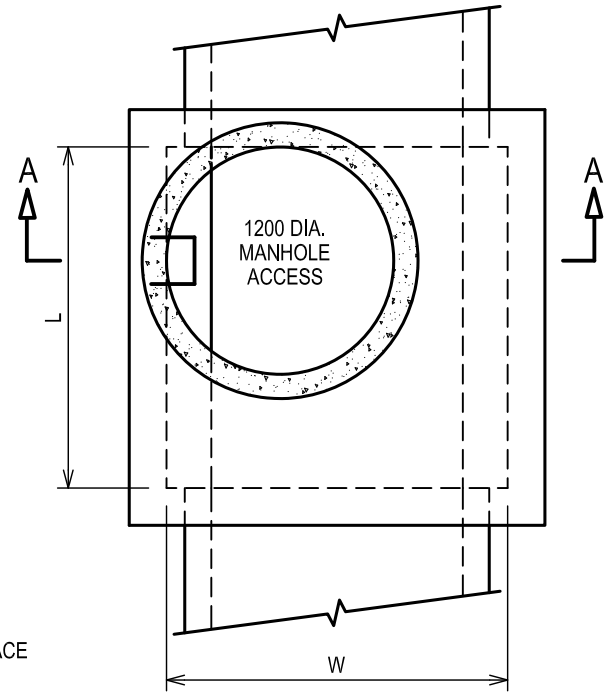


NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	PRECAST AND PREBENCHED BASE FOR 1200mm TYPE 5A MANHOLE ASSEMBLY	
			SCALE: N.T.S.		DRAWING NO. 50 03 02



SECTION 'A - A'

VAULT NOMINAL INSIDE DIMENSIONS (mm)		
LENGTH L	WIDTH W	HEIGHT H
1200	1200	2020
1500	1500	2020
1800	1800	2020
2400	2400	2400
2800	2800	2800

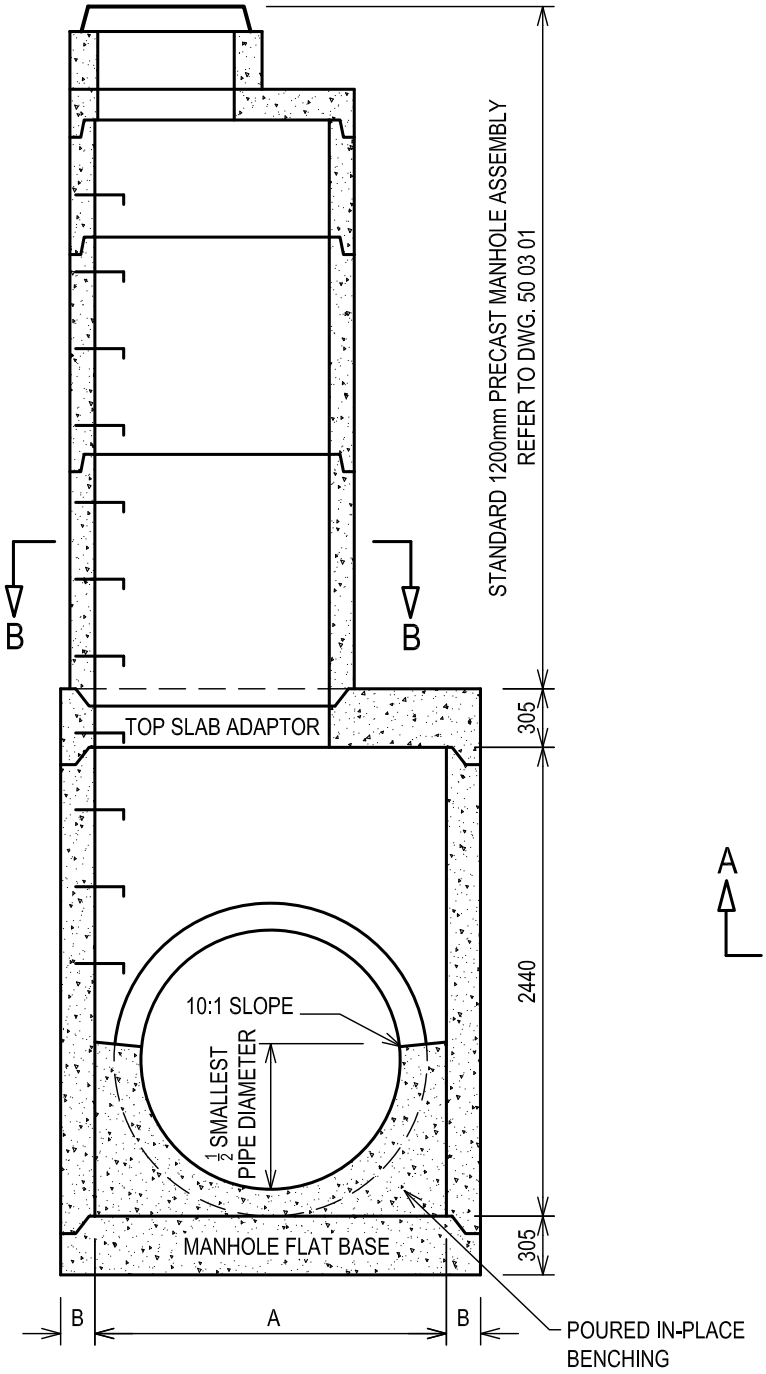


SECTION 'B - B'
PLAN VIEW

NO.	DATE	REVISION

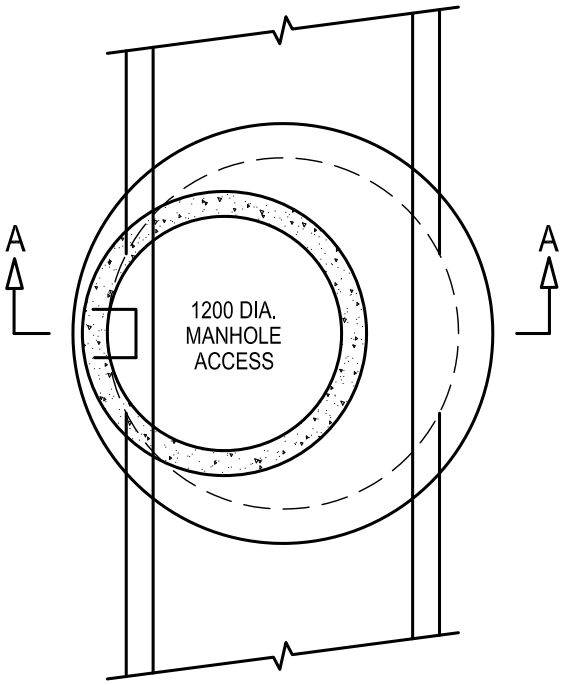
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES and CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**1-S PRECAST MANHOLE ASSEMBLY**	
SCALE: N.T.S.		DRAWING NO. **50 03 03**



SECTION 'A - A'

DIMENSIONS (mm)	
A	B
INSIDE DIAMETER	WALL THICKNESS
1372	140
1524	155
1676	165
1829	178
2134	203
2438	229
3048	279

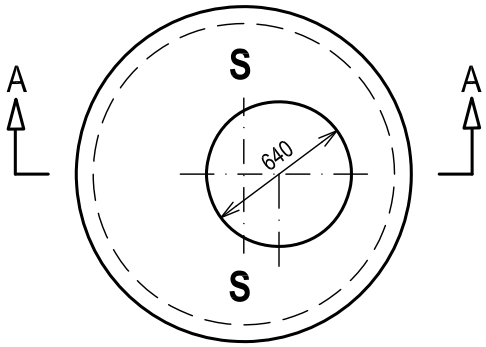


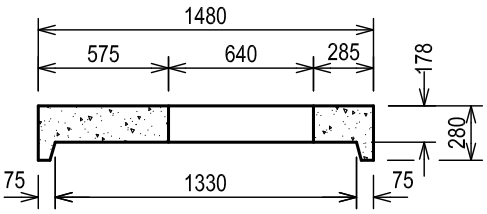
SECTION 'B - B'
PLAN VIEW

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

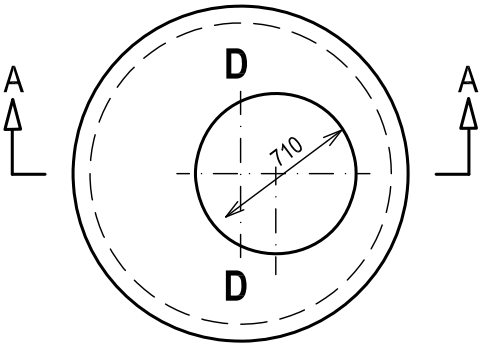
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**1500 - 3000mm LARGE DIAMETER MANHOLE ASSEMBLY**	
SCALE: N.T.S.		DRAWING NO. **50 03 04**

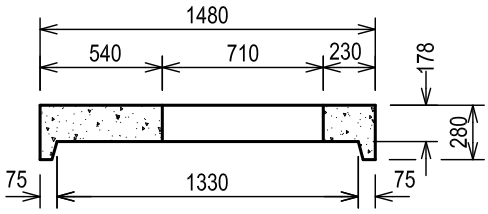




SANITARY MANHOLE

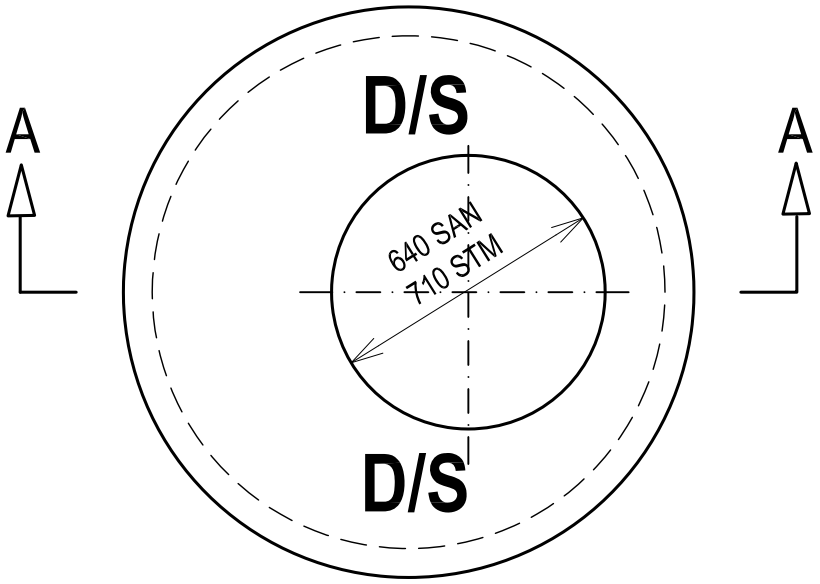
NOTE :
IMPRINT "S" ON SANITARY SLAB
TOP AND "D" ON STORM SLAB TOP.

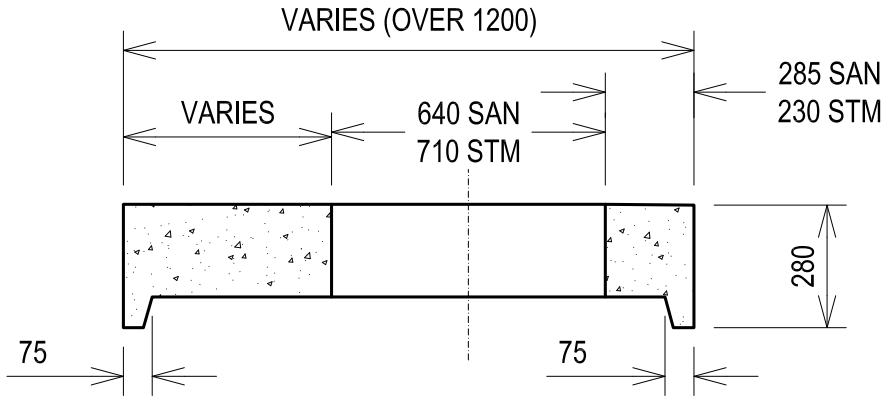




STORM MANHOLE

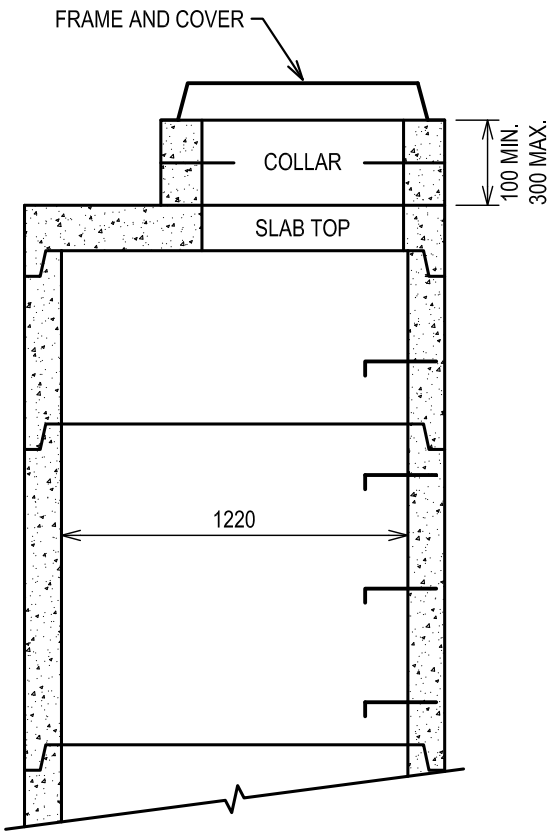
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	PRECAST SLAB TOPS FOR 1200mm MANHOLES	
			SCALE: N.T.S.		DRAWING NO. 50 03 05

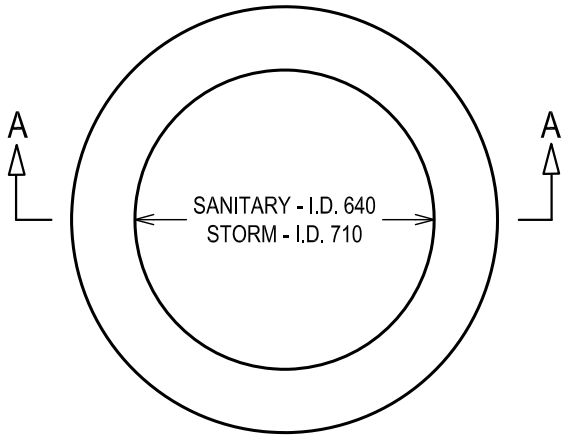


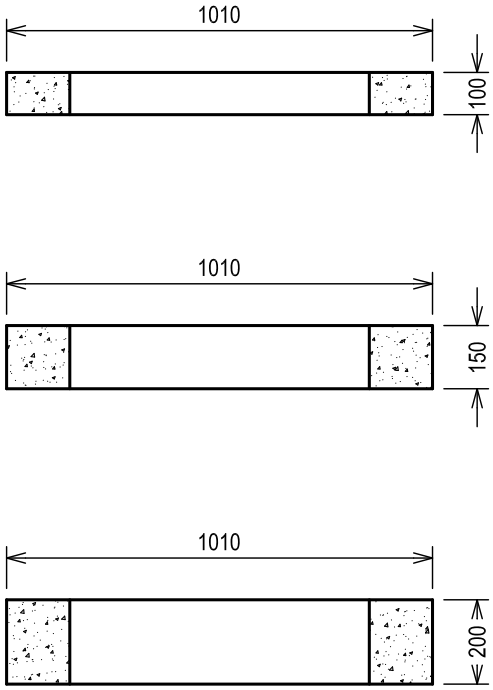


NOTE :
IMPRINT "S" ON SANITARY SLAB
TOP AND "D" ON STORM SLAB TOP.

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	PRECAST SLAB TOP FOR LARGER THAN 1200mm MANHOLES	DRAWING NO. 50 03 06
			SCALE: N.T.S.		







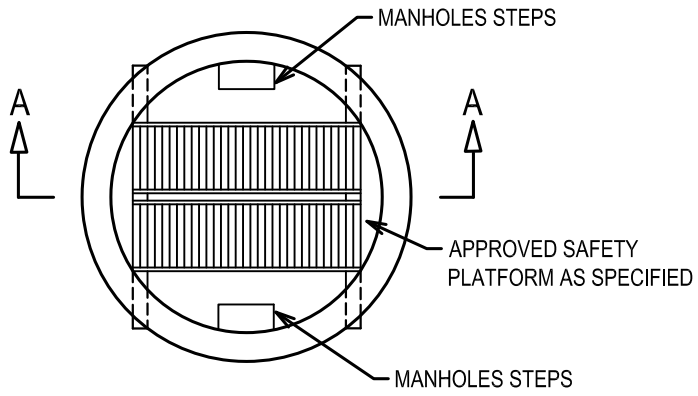
SECTION 'A - A'

NOTE:
IMPRINT AN "S" ON SANITARY COLLARS
AND A "D" ON STORM COLLARS

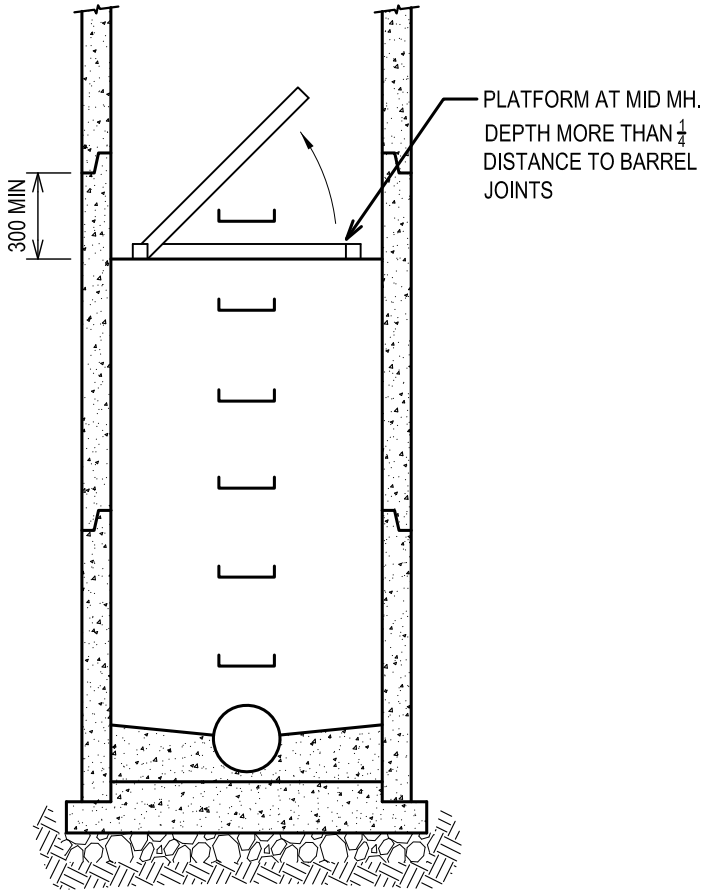
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

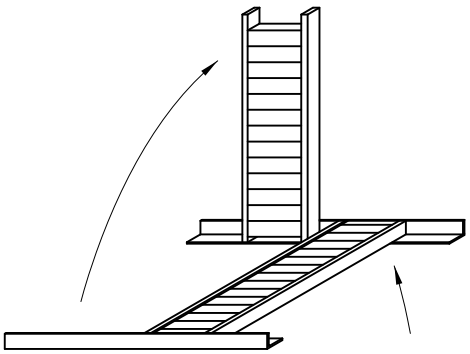
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLE AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**MANHOLE ADJUSTING COLLAR**	
SCALE: N.T.S.		DRAWING NO. **50 03 07**



PLAN VIEW



SECTION 'A - A'



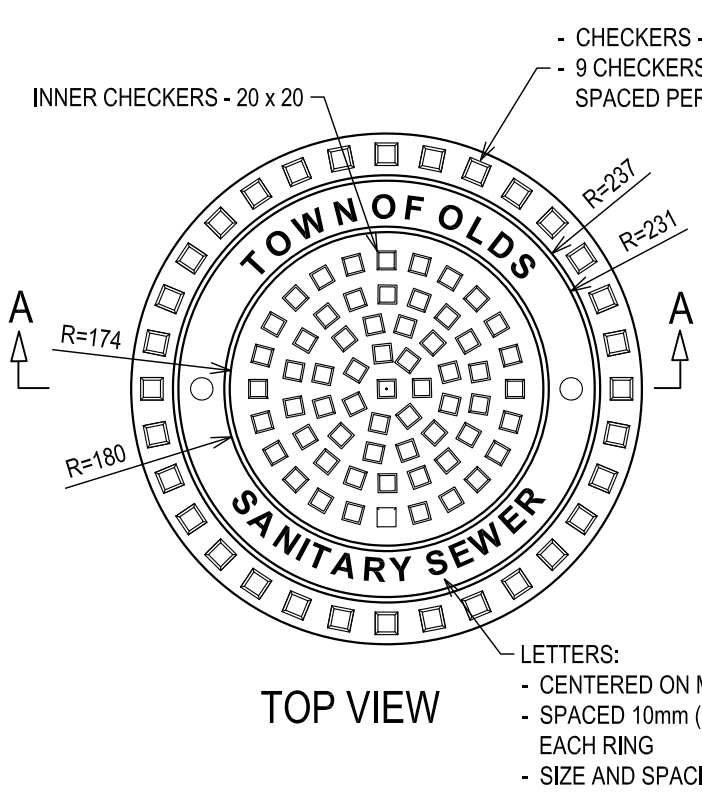
NOTE :

- TO BE INSTALLED ON MANHOLES GREATER THAN 6.0 m DEEP.
- MAXIMUM SPACING BETWEEN PLATFORMS TO BE 6.0 m.
- ALUMINUM GRATES TO BE MSU MISSISSAUGA OR APPROVED EQUAL.
- TO BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

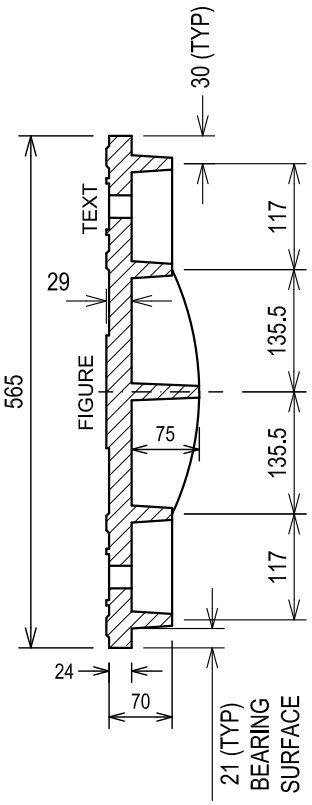
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

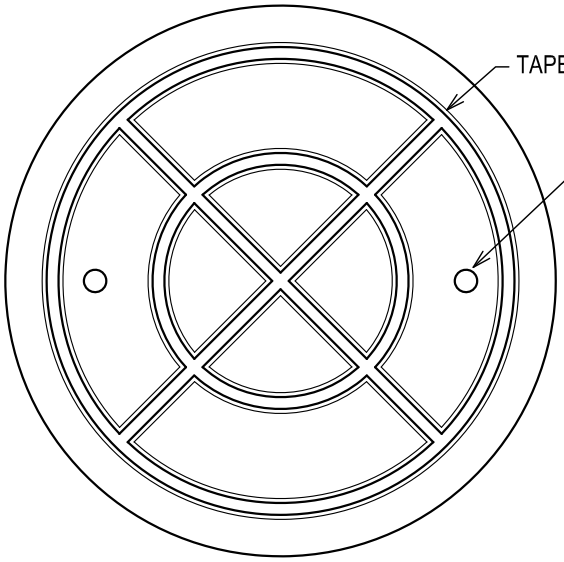
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**MANHOLE SAFETY PLATFORM**	DRAWING NO. **50 03 08**
SCALE: N.T.S.		



TOP VIEW



SECTION 'A - A'



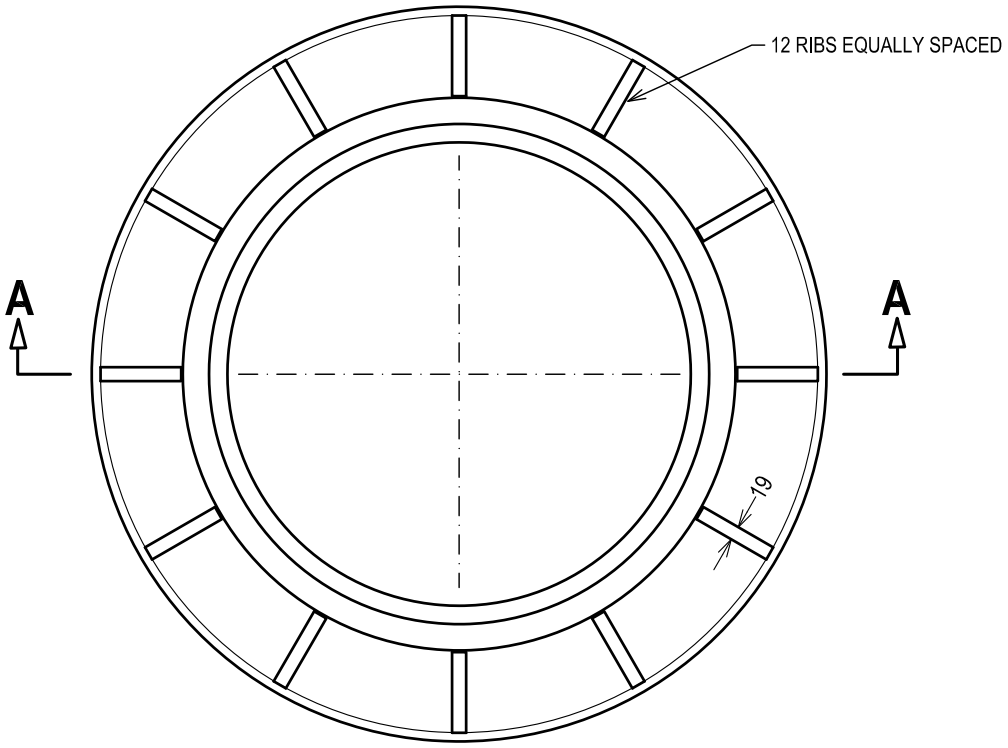
BOTTOM VIEW

MATERIAL SPECIFICATION:
- GREY CAST IRON TO CONFORM TO A.S.T.M. A48, CLASS 20 (LATEST EDITION)
- DIMENSIONS IN MILLIMETERS

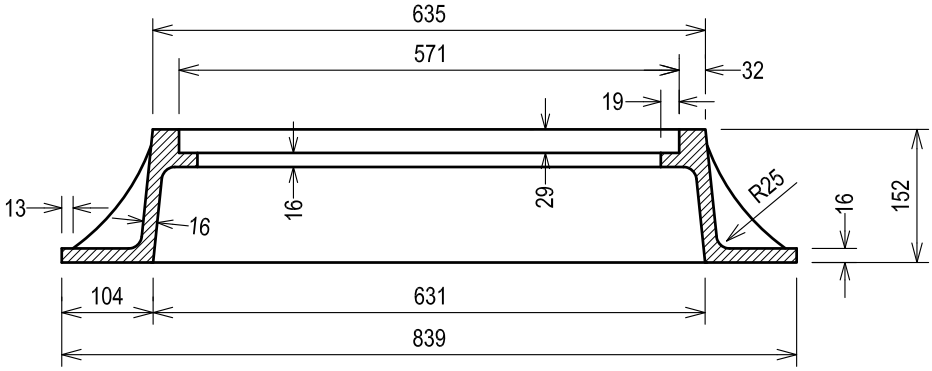
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**F-39 STANDARD SANITARY SEWER MANHOLE COVER**	
SCALE: N.T.S.		DRAWING NO. **50 03 20**



PLAN



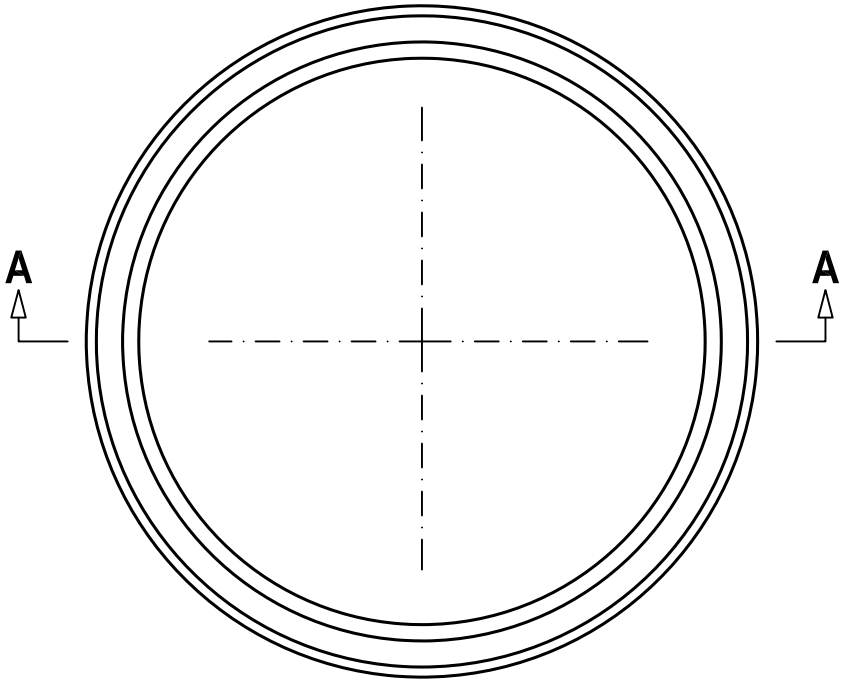
SECTION 'A - A'

MATERIAL SPECIFICATION:
- GREY CAST IRON TO CONFORM TO A.S.T.M. A48, CLASS 20 (LATEST EDITION)
- DIMENSIONS IN MILLIMETERS

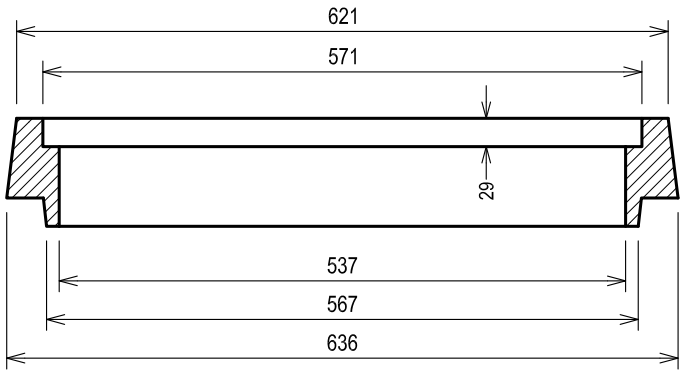
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**F-39 STANDARD SANITARY SEWER MANHOLE FRAME**	
SCALE: N.T.S.		DRAWING NO. **50 03 21**

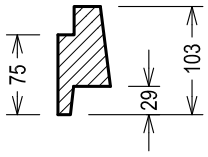


PLAN

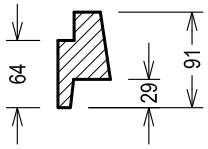


SECTION 'A - A'

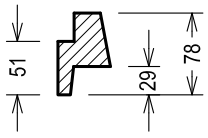
RISER RINGS DETAILS



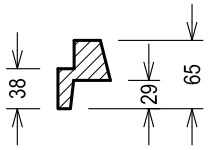
76mm RING



64mm RING



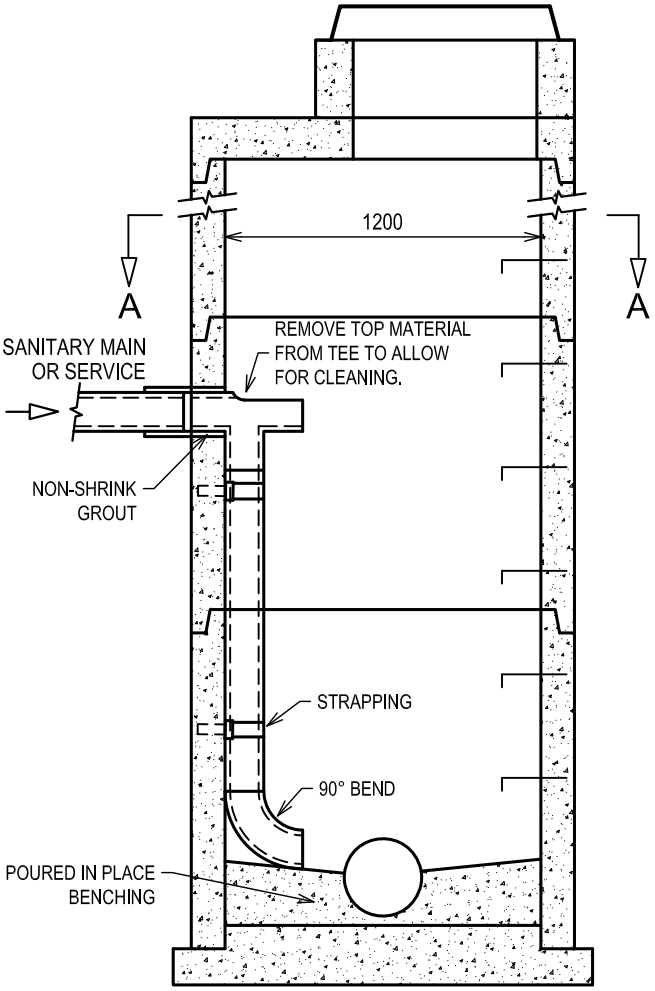
51mm RING

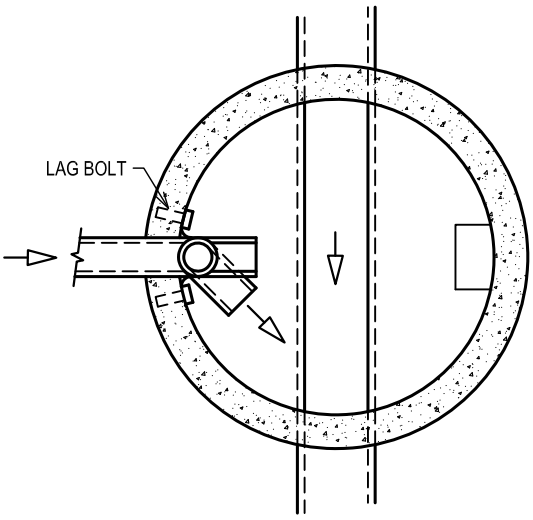


38mm RING

MATERIAL SPECIFICATION:
- GREY CAST IRON TO CONFORM TO A.S.T.M. A48, CLASS 20 (LATEST EDITION)
- DIMENSIONS IN MILLIMETERS

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-39 SANITARY SEWER MANHOLE RISER FRAME and ADJUSTMENT RINGS	DRAWING NO. 50 03 22
			SCALE: N.T.S.		





SECTION 'A - A'

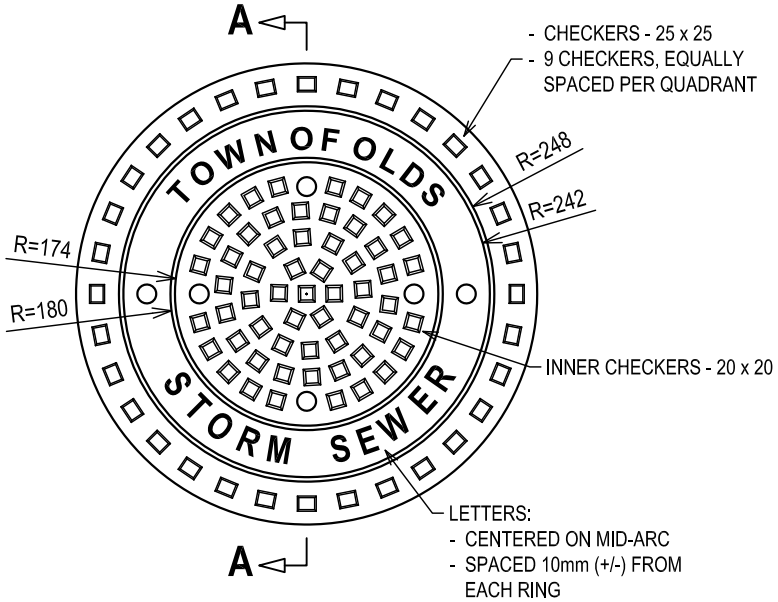
NOTE :

- LAG BOLTS AND STRAPPING ARE TO BE INSTALLED IMMEDIATELY BELOW THE TEE AND A CONTINUAL 1000mm VERTICAL SPACING TO THE BASE.
- BOLTS & STRAPS TO BE STAINLESS STEEL
- DIAMETER, SIZE AND TYPE OF VERTICAL PIPE TO MATCH INLET PIPE.
- DROP PIPE SIZES GREATER THAN 450mm WILL REQUIRE A CUSTOM BUILT TYPE '1-S' MANHOLE.

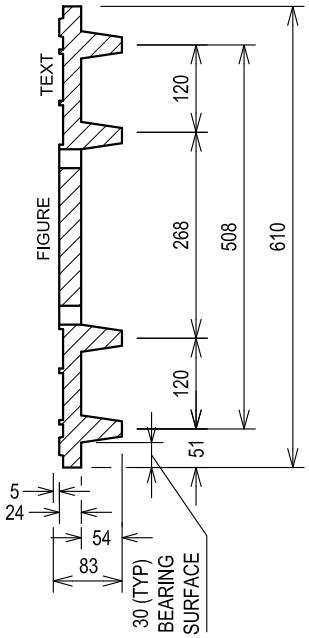
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

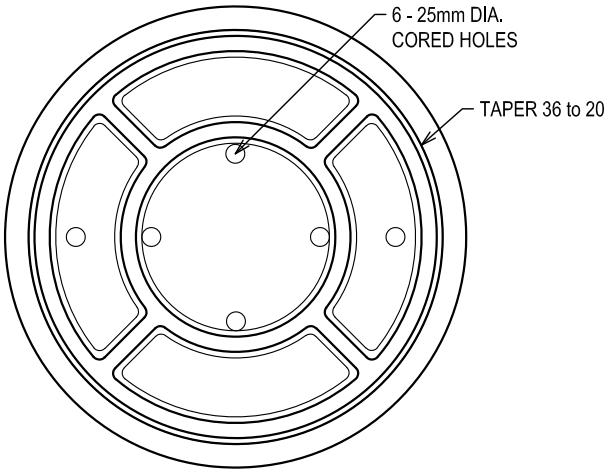
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**INTERIOR DROP SANITARY MANHOLE**	DRAWING NO. **50 03 23**
SCALE: N.T.S.		



TOP VIEW



SECTION 'A - A'



BOTTOM VIEW

MATERIAL SPECIFICATION:
- GREY CAST IRON TO CONFORM TO A.S.T.M. A48, CLASS 20 (LATEST EDITION)
- DIMENSIONS IN MILLIMETERS

NO.	DATE	REVISION
5	June 2017	Geometry & material checked / Re-issued
4	April 2011	Bearing Surface Updated From 20mm to 26mm
3	July 2007	Deleted Optional Notch
2	Jan. 2005	Revised to Include "Deer" Logo
1	Oct. 2005	Re-numbered

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: D.W.K.

DATE: 25-Jan-02

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
MANHOLES AND CATCH BASINS

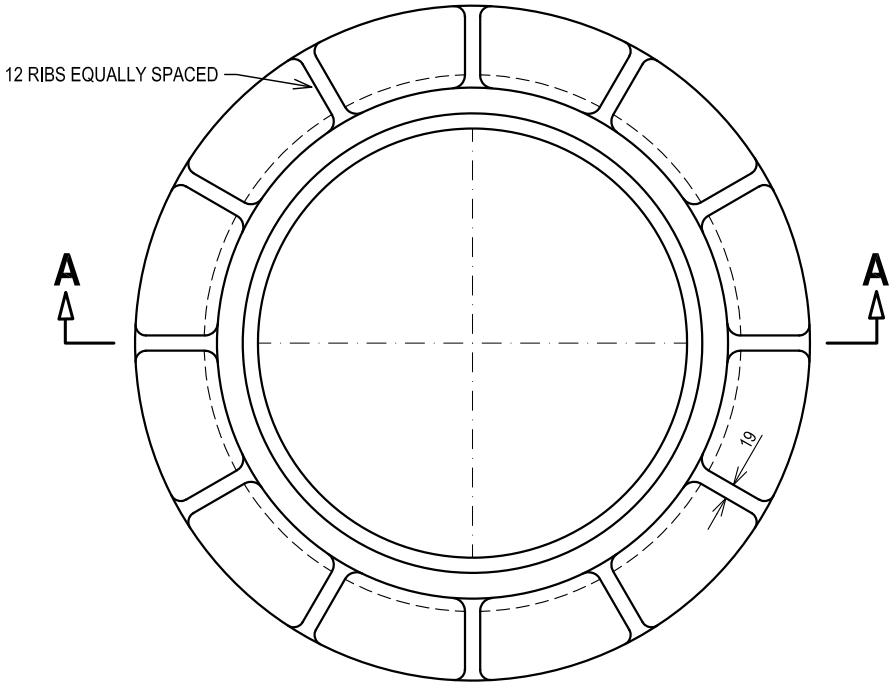
F-49 STANDARD STORM SEWER SOLID MANHOLE COVER

APPROVED BY:

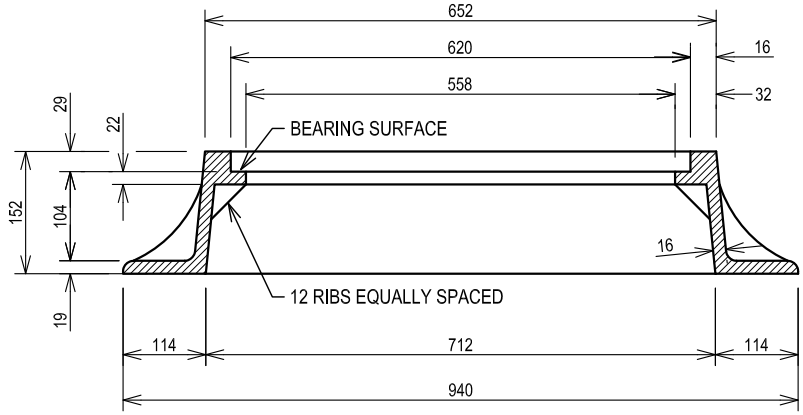
ENGINEER

DRAWING NO.

50 03 30



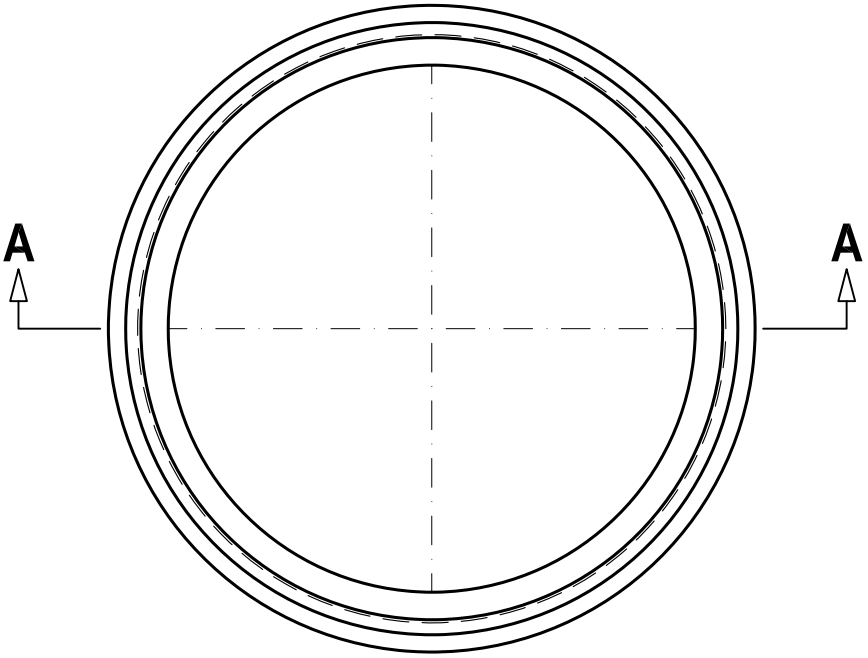
PLAN



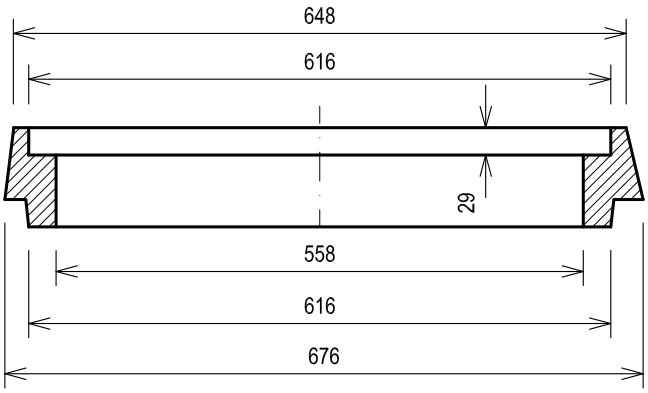
SECTION 'A - A'

MATERIAL SPECIFICATION:
- GREY CAST IRON TO CONFORM TO A.S.T.M. A48, CLASS 20 (LATEST EDITION)
- DIMENSIONS IN MILLIMETERS

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-49 STANDARD STORM SEWER MANHOLE FRAME	DRAWING NO. 50 03 31
			SCALE: N.T.S.		

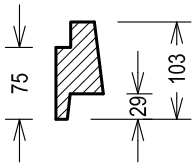


PLAN

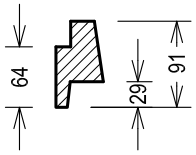


SECTION 'A - A'

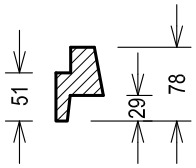
RISER RINGS DETAILS



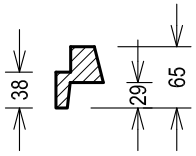
76mm RING



64mm RING



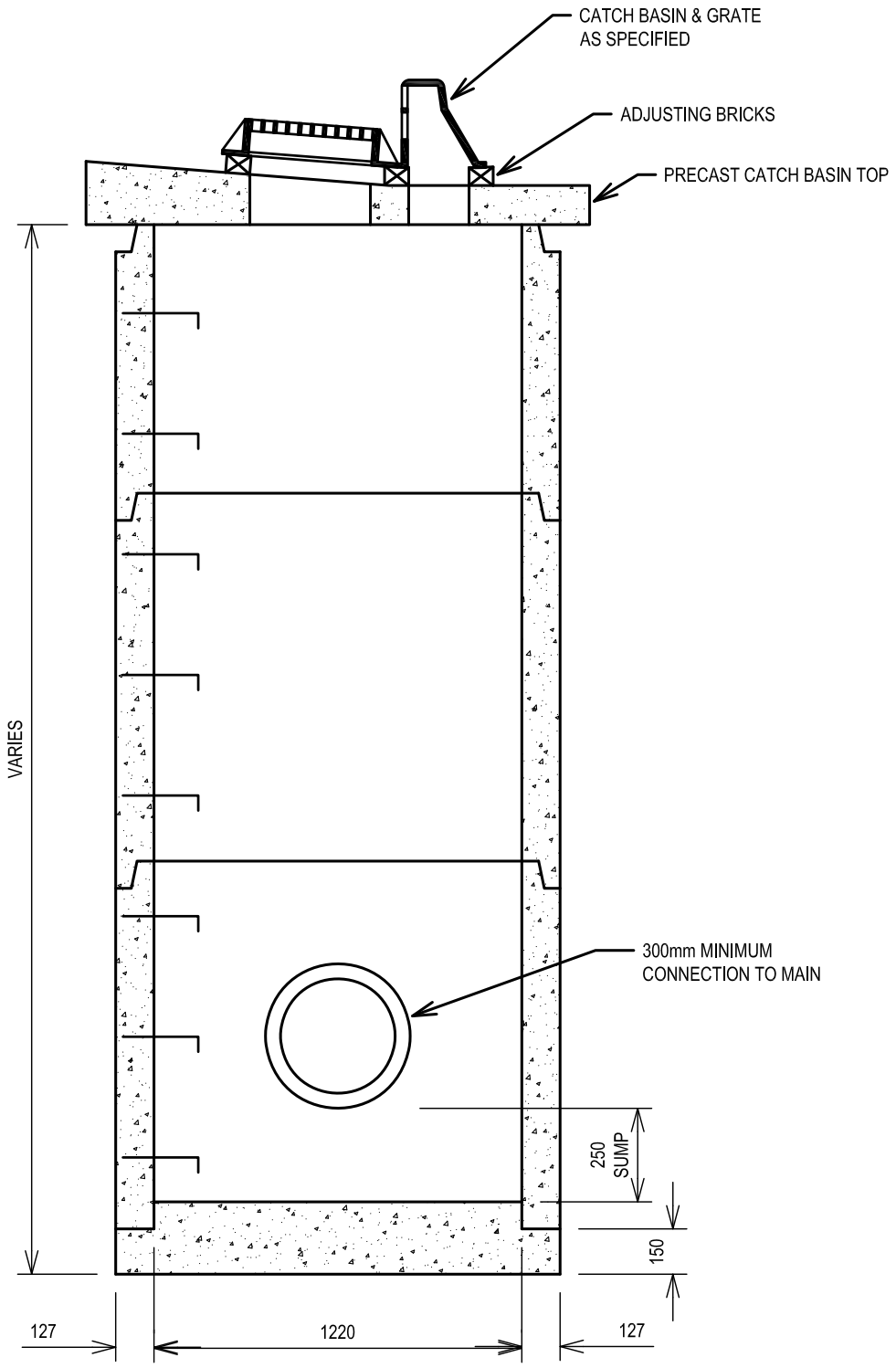
51mm RING



38mm RING

MATERIAL SPECIFICATION:
- GREY CAST IRON TO CONFORM TO A.S.T.M. A48, CLASS 20 (LATEST EDITION)
- DIMENSIONS IN MILLIMETERS

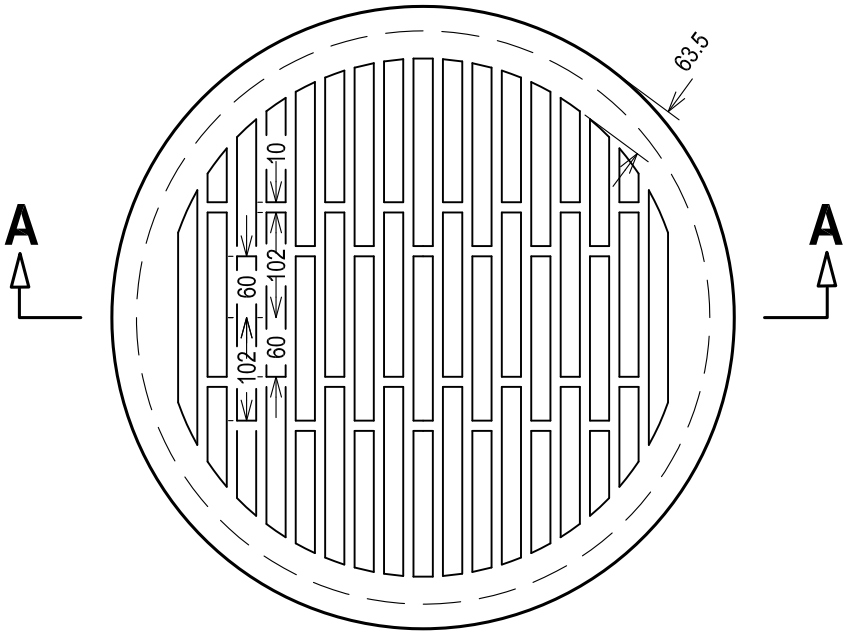
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-49 STORM SEWER MANHOLE RISER FRAME AND ADJUSTMENT RINGS	DRAWING NO. 50 03 32
			SCALE: N.T.S.		



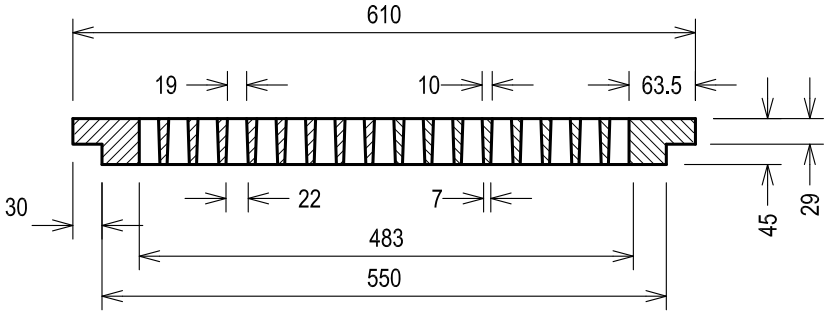
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**1200mm CATCH BASIN MANHOLE ASSEMBLY**	
SCALE: N.T.S.		DRAWING NO. **50 03 40**



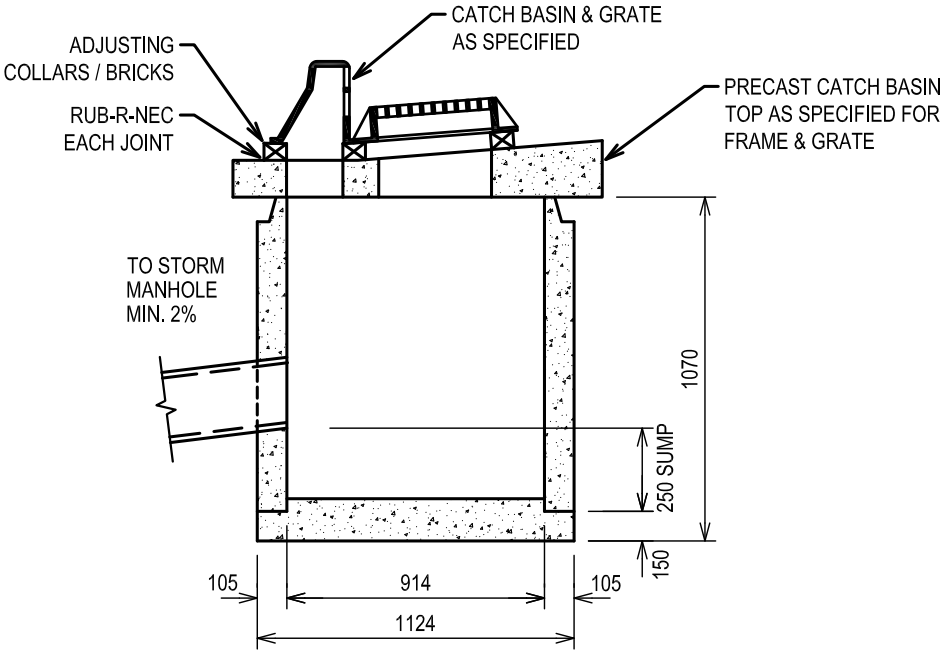
PLAN



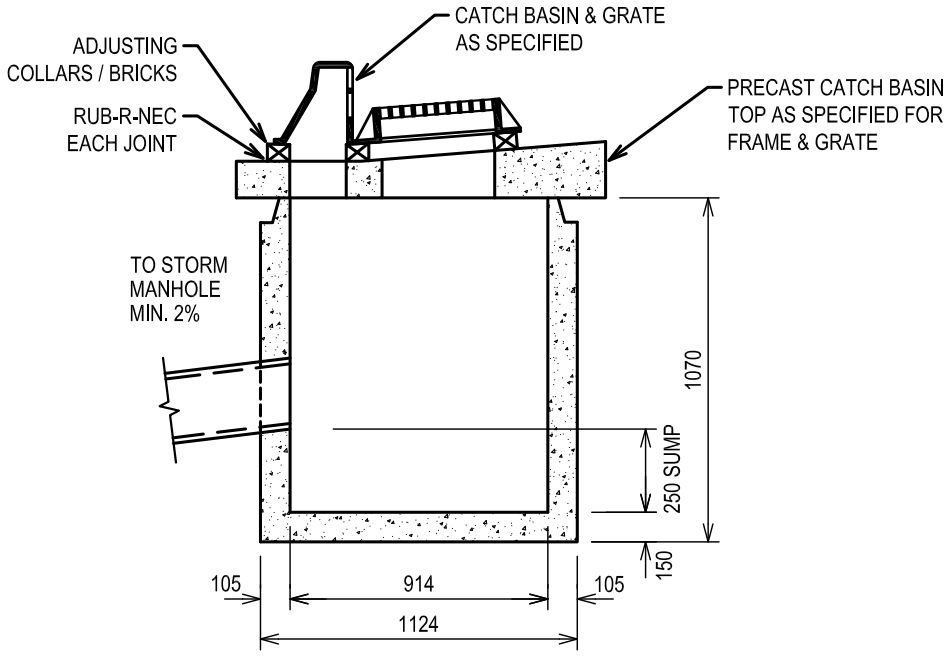
SECTION 'A - A'

MATERIAL SPECIFICATIONS:
- DUCTILE IRON TO CONFORM TO ASTM A536 (LATEST EDITION) GRADE 60 - 40 - 18

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-50 STANDARD STORM SEWER CATCH BASIN MANHOLE COVER	DRAWING NO. 50 03 41
			SCALE: N.T.S.		



SEPARATE BASE CATCHBASIN

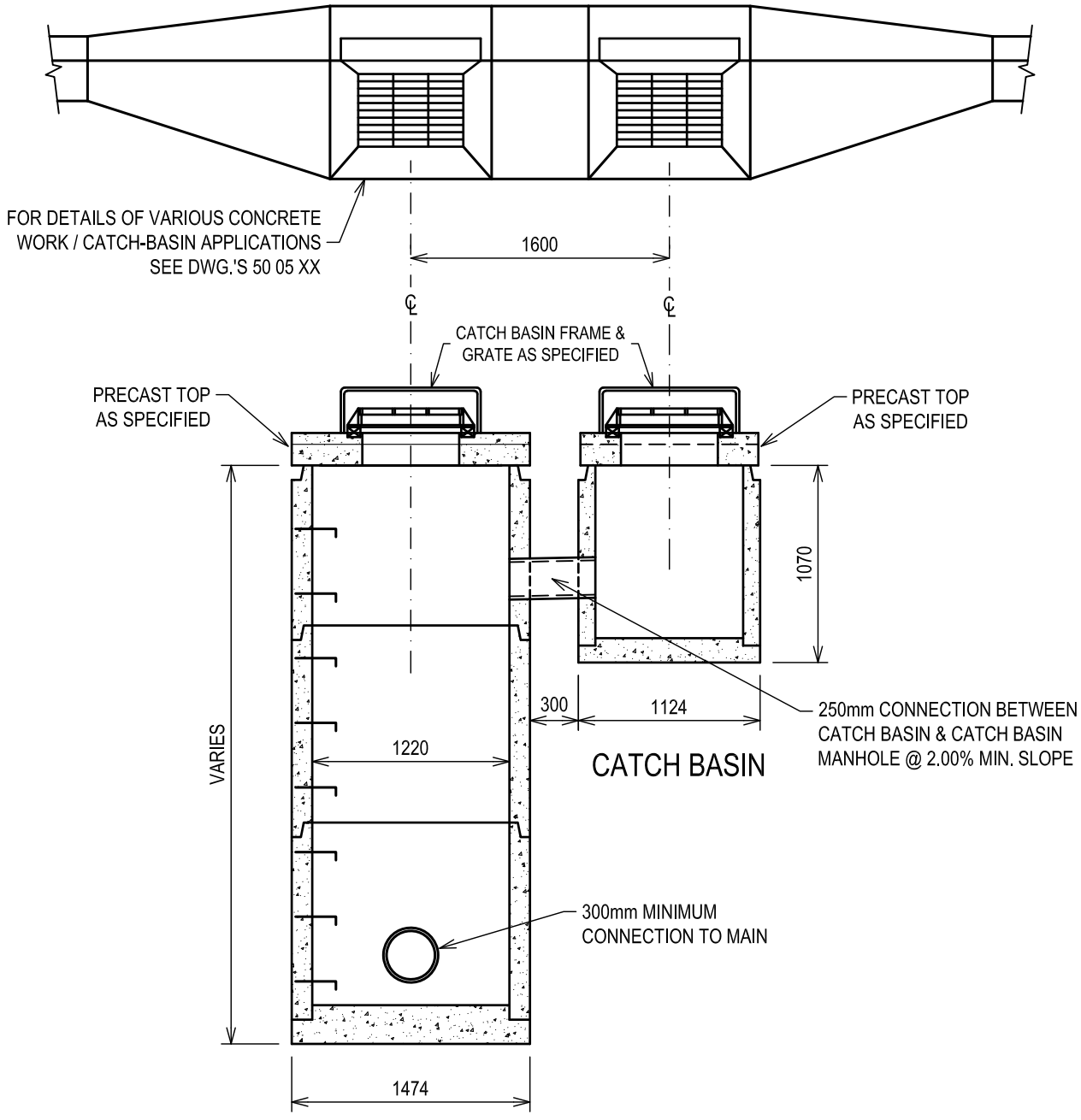


MONOLITHIC BASE CATCHBASIN

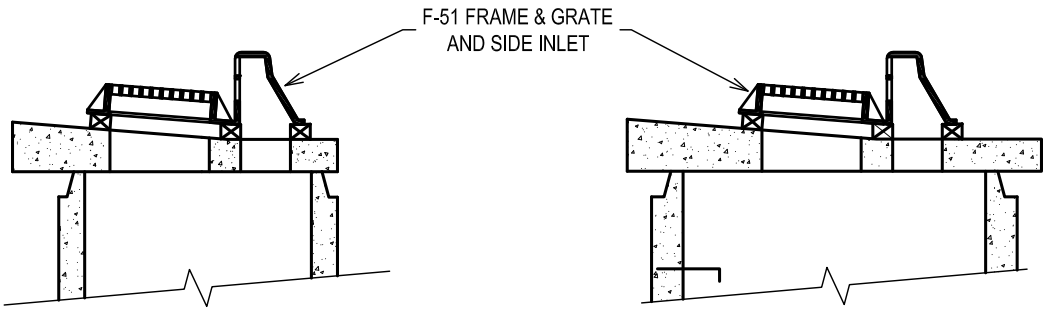
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**PRECAST CATCH BASIN ASSEMBLY**	
SCALE: N.T.S.		DRAWING NO. **50 03 50**

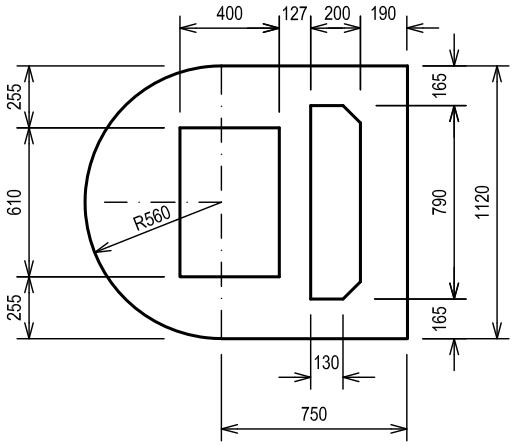


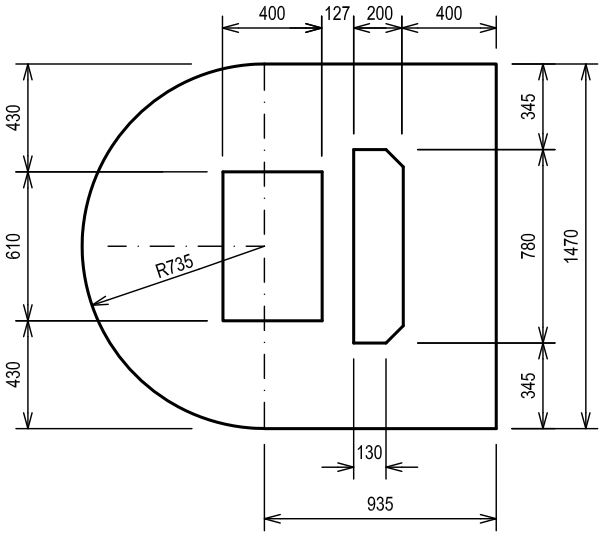
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	TWIN CATCH BASIN / CATCH BASIN MANHOLE ASSEMBLY	DRAWING NO. 50 03 51
			SCALE: N.T.S.		

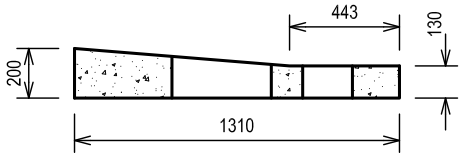


K1 CATCH BASIN

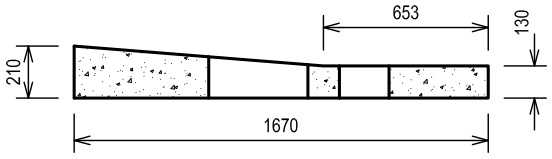
K1 CATCH BASIN MANHOLE





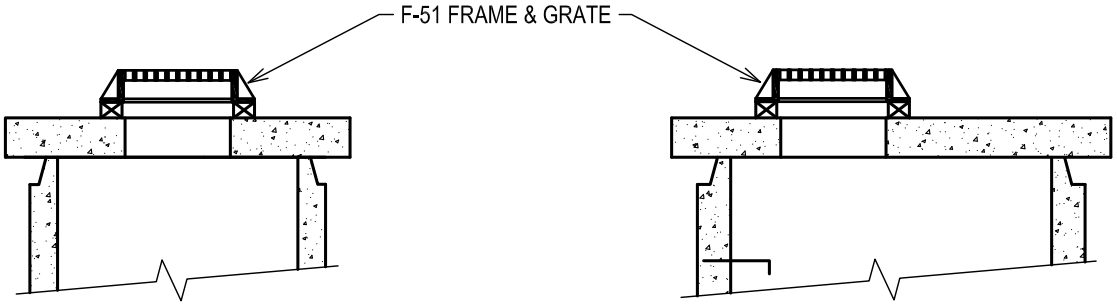


PRECAST K-1 TOP FOR F-51 CB
FRAME, GRATE, AND SIDE INLET



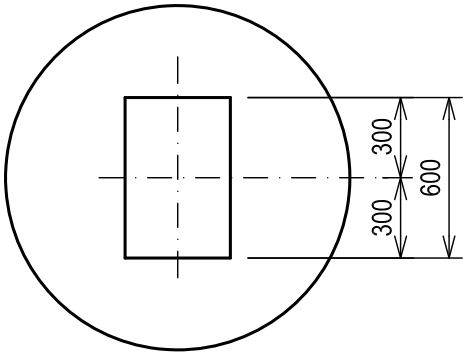
PRECAST K-1 TOP FOR F-51 CBMH
FRAME, GRATE, AND SIDE INLET

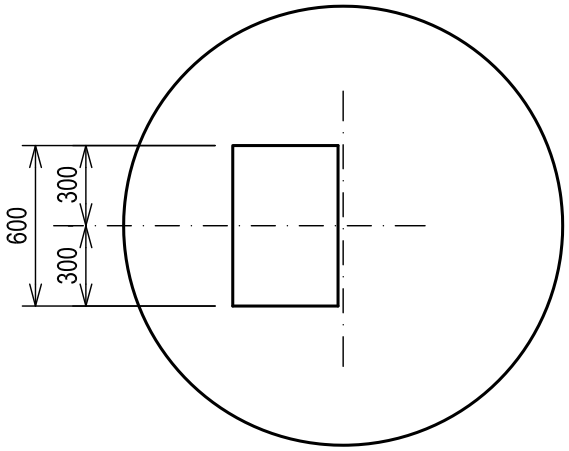
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	TYPE K-1 CATCH BASIN and CATCH BASIN MANHOLE TOP SECTION	DRAWING NO. 50 03 52
			SCALE: N.T.S.		

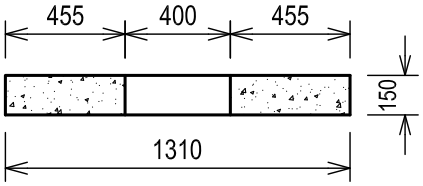


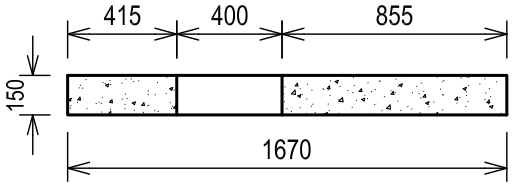
K-3 CATCH BASIN

K-3 CATCH BASIN MANHOLE





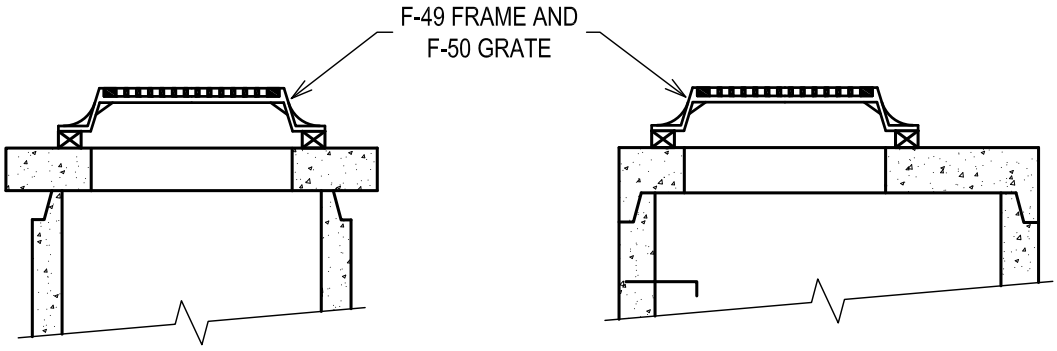




PRECAST K-3 CATCH BASIN TOP
FOR F-51 CB FRAME AND GRATE

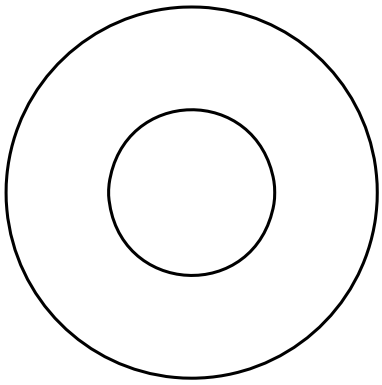
PRECAST K-3 CATCH BASIN MANHOLE
TOP FOR F-51 CB FRAME AND GRATE

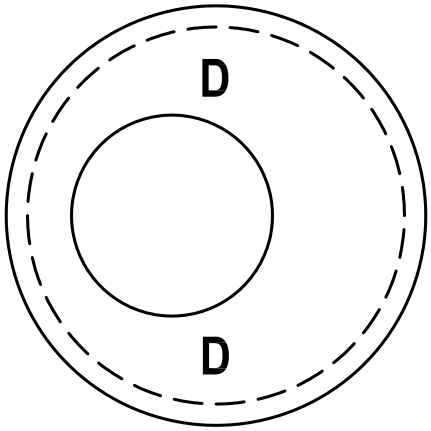
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLE AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	TYPE K-3 CATCH BASIN and CATCH BASIN MANHOLE TOP SECTION	DRAWING NO. 50 03 53
			SCALE: N.T.S.		

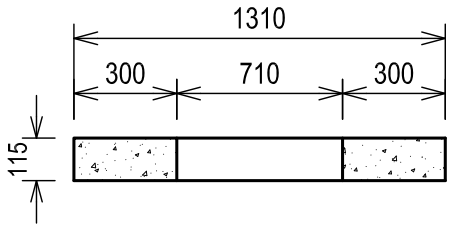


K-6 CATCH BASIN

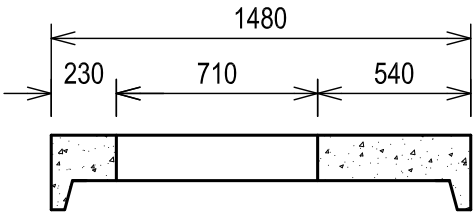
K-6 CATCH BASIN MANHOLE





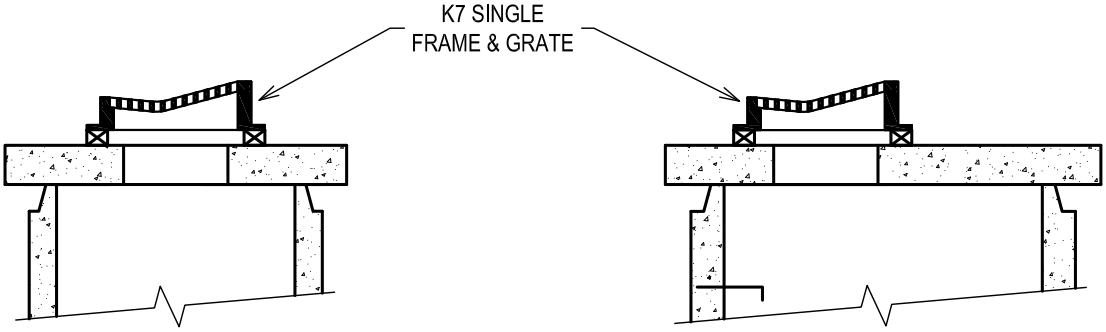


PRECAST CATCH BASIN TOP



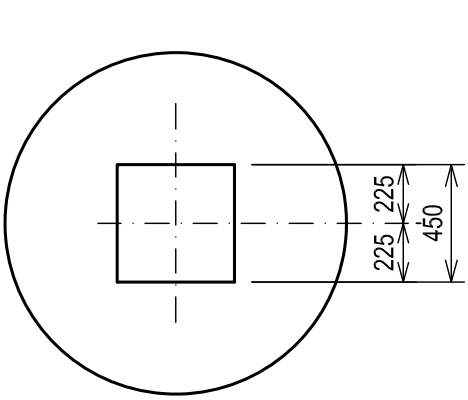
PRECAST STORM MANHOLE TOP
(AS PER DWG. 50 03 05)

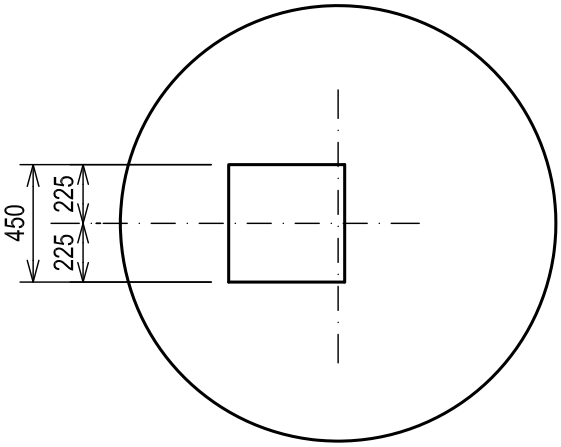
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	TYPE K-6 CATCH BASIN AND CATCH BASIN MANHOLE TOP SECTION	DRAWING NO. 50 03 54
			SCALE: N.T.S.		

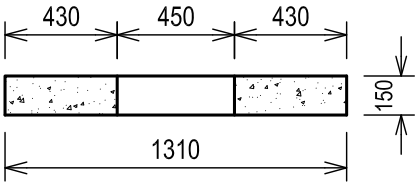


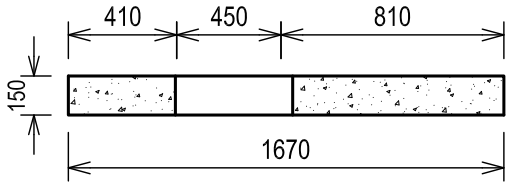
SK-7 CATCH BASIN

SK-7 CATCH BASIN MANHOLE





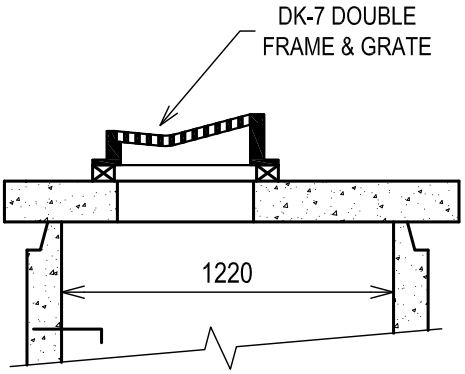




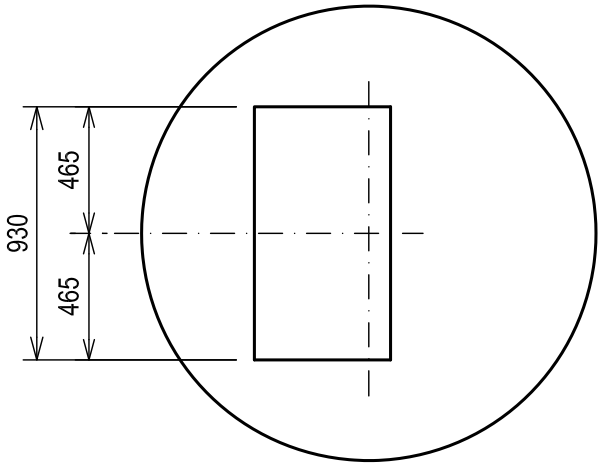
PRECAST SK-7 CATCH BASIN TOP
FOR SK-7 CB FRAME AND GRATE

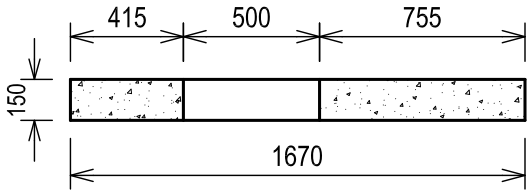
PRECAST SK-7 CATCH BASIN MANHOLE
TOP FOR SK-7 CB FRAME AND GRATE

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	TYPE SK-7 CATCH BASIN AND CATCH BASIN MANHOLE TOP SECTION	DRAWING NO. 50 03 55
			SCALE: N.T.S.		



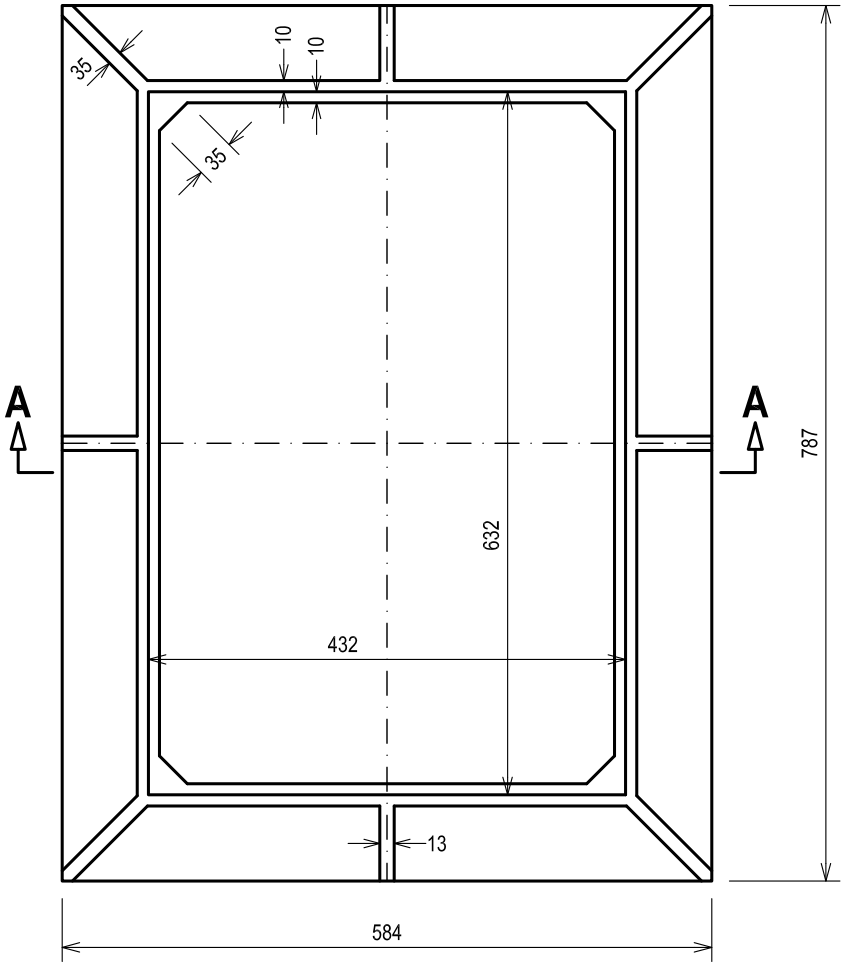
DK-7 CATCH BASIN MANHOLE





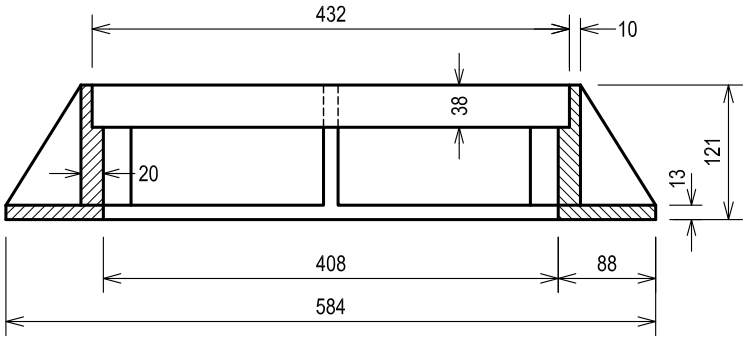
PRECAST DK-7 CATCH BASIN MANHOLE
TOP FOR DK-7 DOUBLE FRAME AND GRATE

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLE and CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	TYPE DK-7 CATCH BASIN MANHOLE TOP SECTION	DRAWING NO. 50 03 56
			SCALE: N.T.S.		



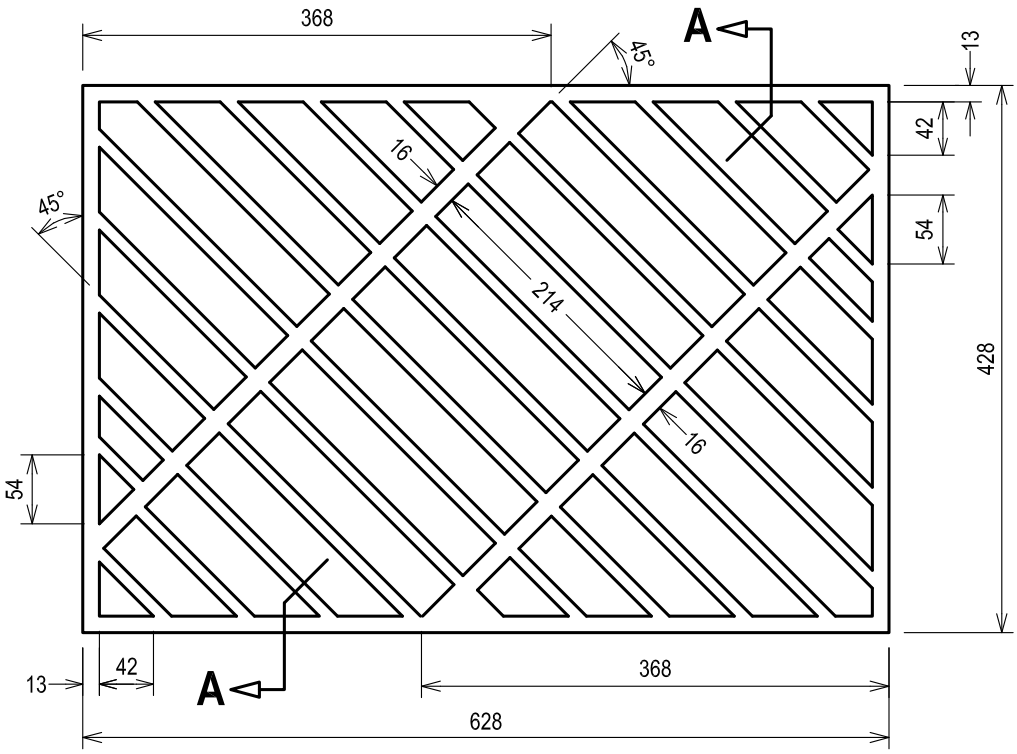
PLAN

MATERIAL SPECIFICATION :
- GREY CAST IRON TO CONFORM TO ASTM A48, CLASS 20 (LATEST EDITION)

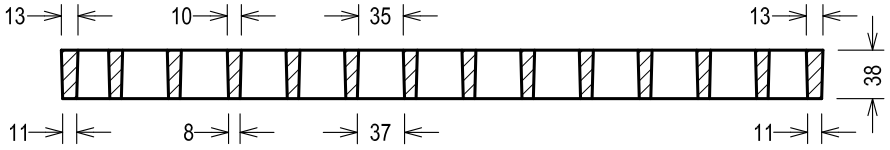


SECTION 'A - A'

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-51 CATCH BASIN FRAME	DRAWING NO. 50 03 57
			SCALE: N.T.S.		



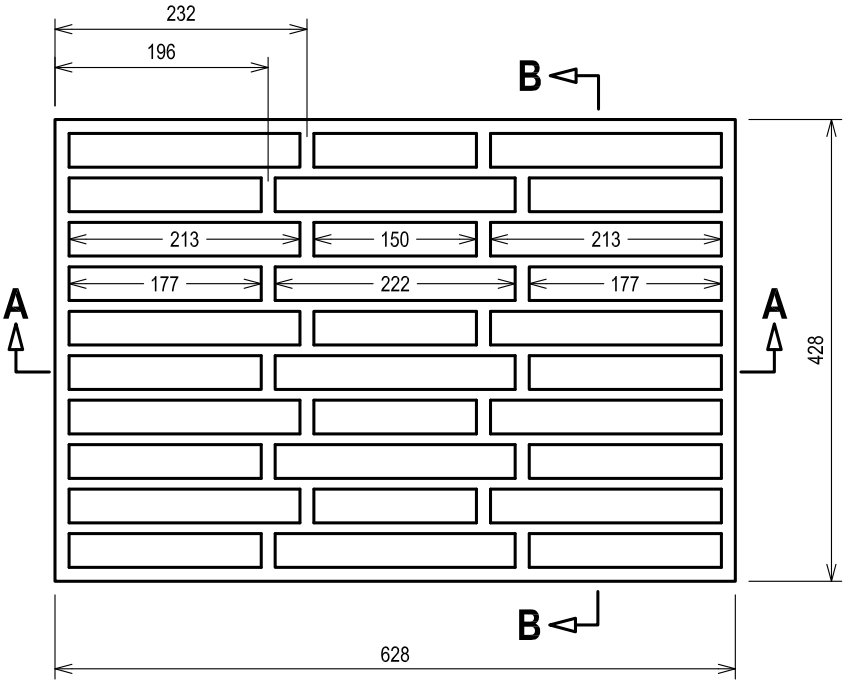
PLAN



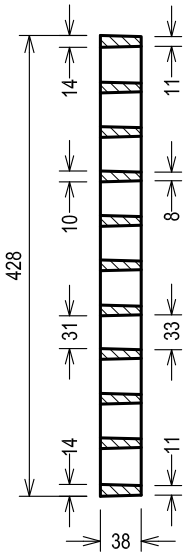
SECTION 'A - A'

MATERIAL SPECIFICATION:
- DUCTILE IRON TO CONFORM TO ASTM A536 (LATEST EDITION) GRADE 60-40-18

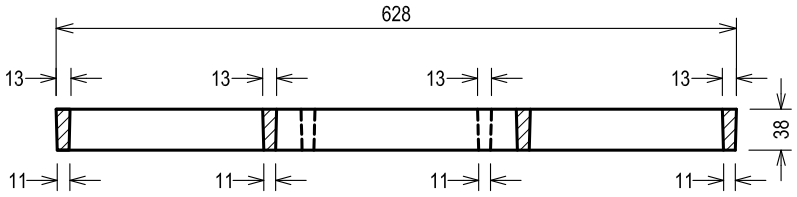
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-51 CATCH BASIN GRATE (OPTION 1)	DRAWING NO. 50 03 58
			SCALE: N.T.S.		



PLAN



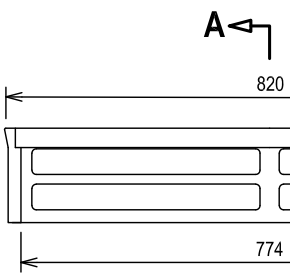
SECTION 'B - B'

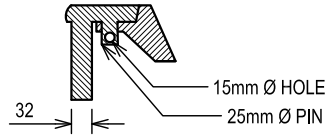


SECTION 'A - A'

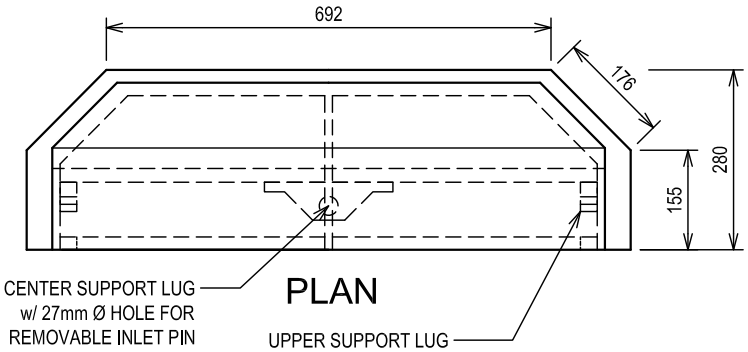
MATERIAL SPECIFICATION:
- DUCTILE IRON TO CONFORM TO ASTM A536 (LATEST EDITION) GRADE 60-40-18

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-51 CATCH BASIN GRATE (OPTION 2)	DRAWING NO. 50 03 59
			SCALE: N.T.S.		





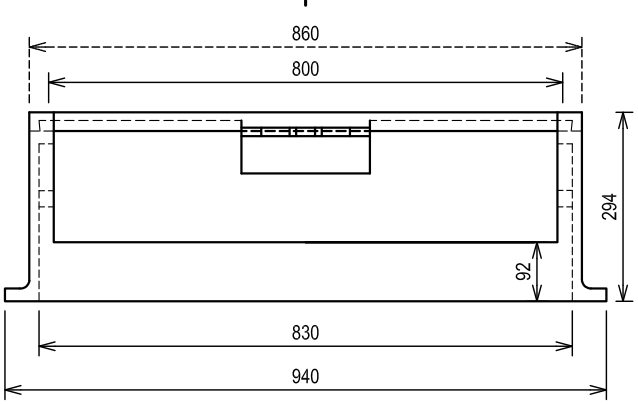
SECTION 'A - A'



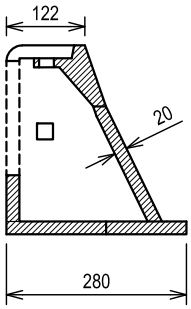
PLAN

MATERIAL SPECIFICATION:
- DUCTILE IRON TO CONFORM TO ASTM A536 GRADE 60-40-18

NOTE:
- 5mm Ø COTTER PIN TO BE USED TO LOCK REMOVABLE GRATE TO FRAME.



FRONT VIEW

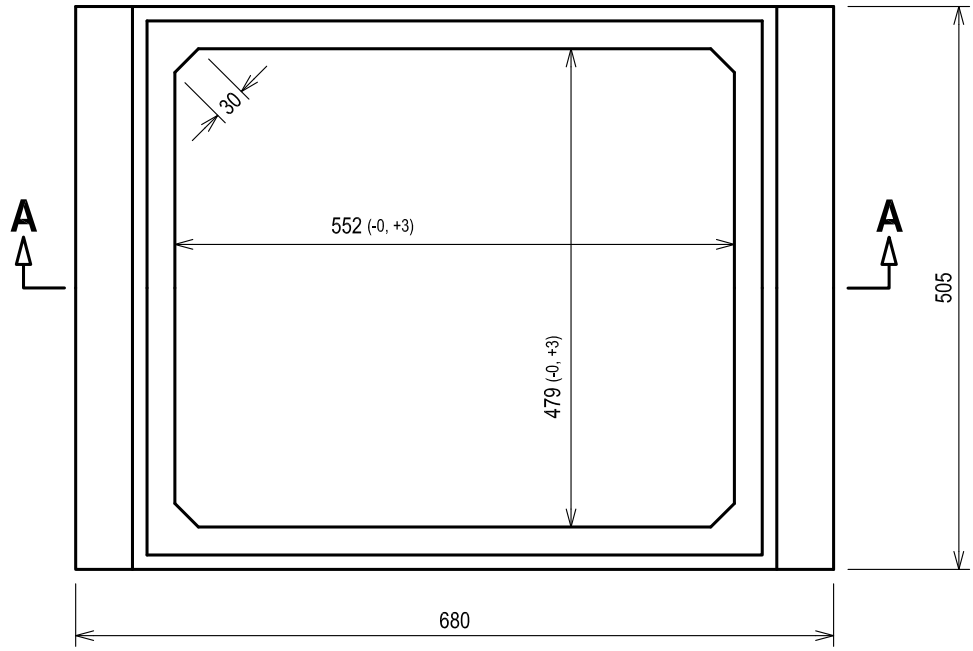


SECTION 'B - B'

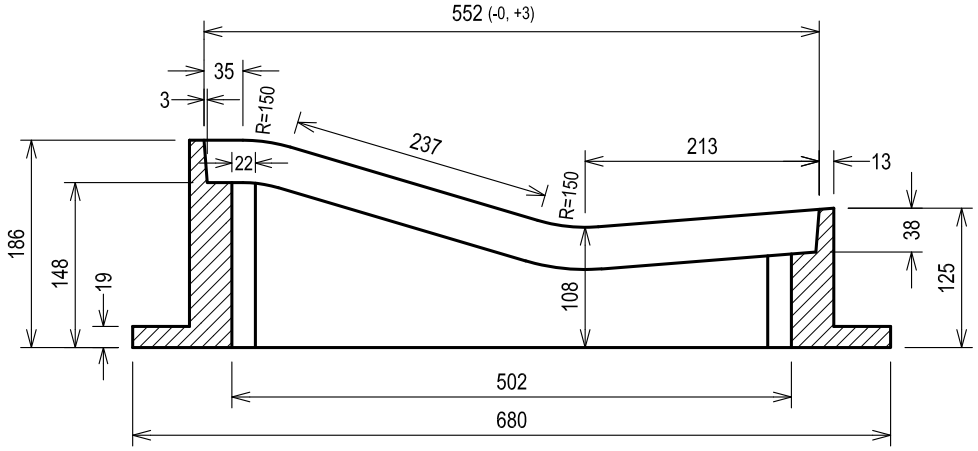
TO BE CAST ON TOP OF SIDE INLET

DUMP NO POLLUTANTS
DRAINS TO RIVERS & STREAMS

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-51 SIDE INLET TWO PIECE	DRAWING NO. 50 03 60
			SCALE: N.T.S.		



PLAN



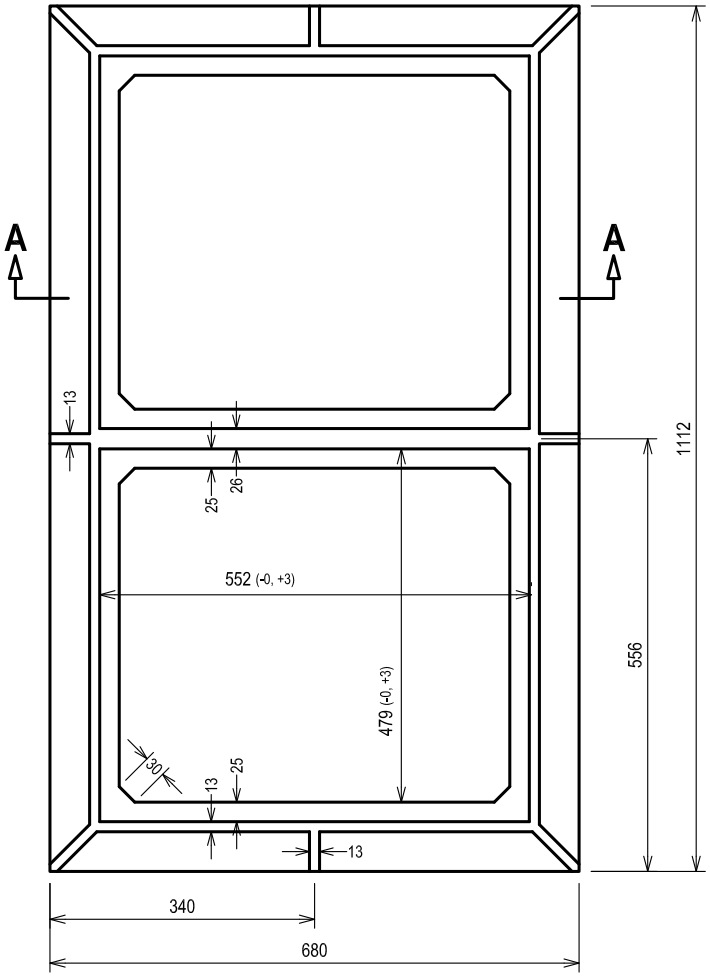
SECTION 'A - A'

MATERIAL SPECIFICATIONS:
- GREY CAST IRON TO CONFORM TO TO ASTM A48, CLASS 20 (LATEST EDITION)

NO.	DATE	REVISION

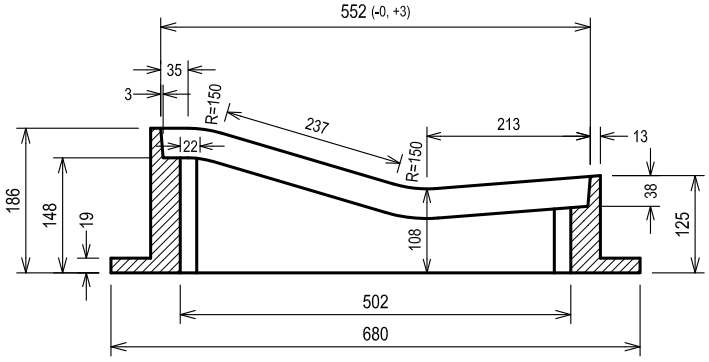
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**SK-7 CATCH BASIN SINGLE GRATE FRAME**	DRAWING NO. **50 03 61**
SCALE: N.T.S.		



PLAN

MATERIAL SPECIFICATIONS:
- GREYCAST IRON TO CONFORM TO ASTM A48, CLASS 20 (LATEST EDITION)

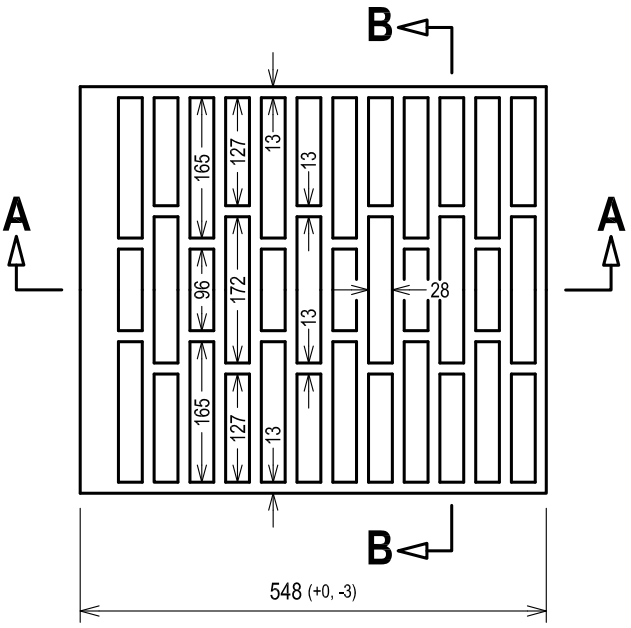


SECTION 'A - A'

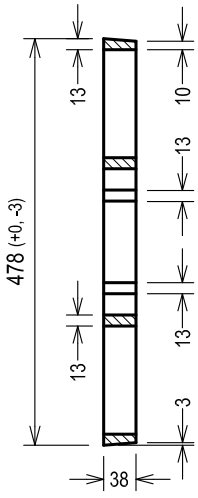
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

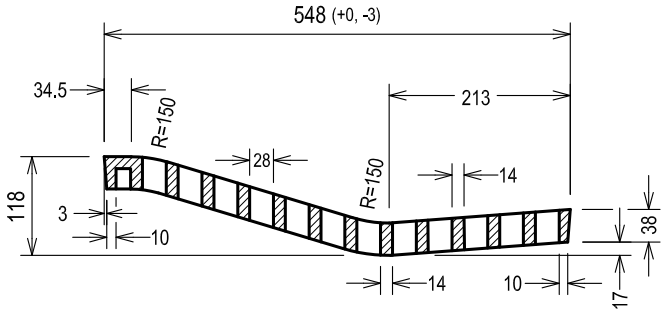
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**DK-7 CATCH BASIN DOUBLE FRAME**	DRAWING NO. **50 03 62**
SCALE: N.T.S.		



PLAN



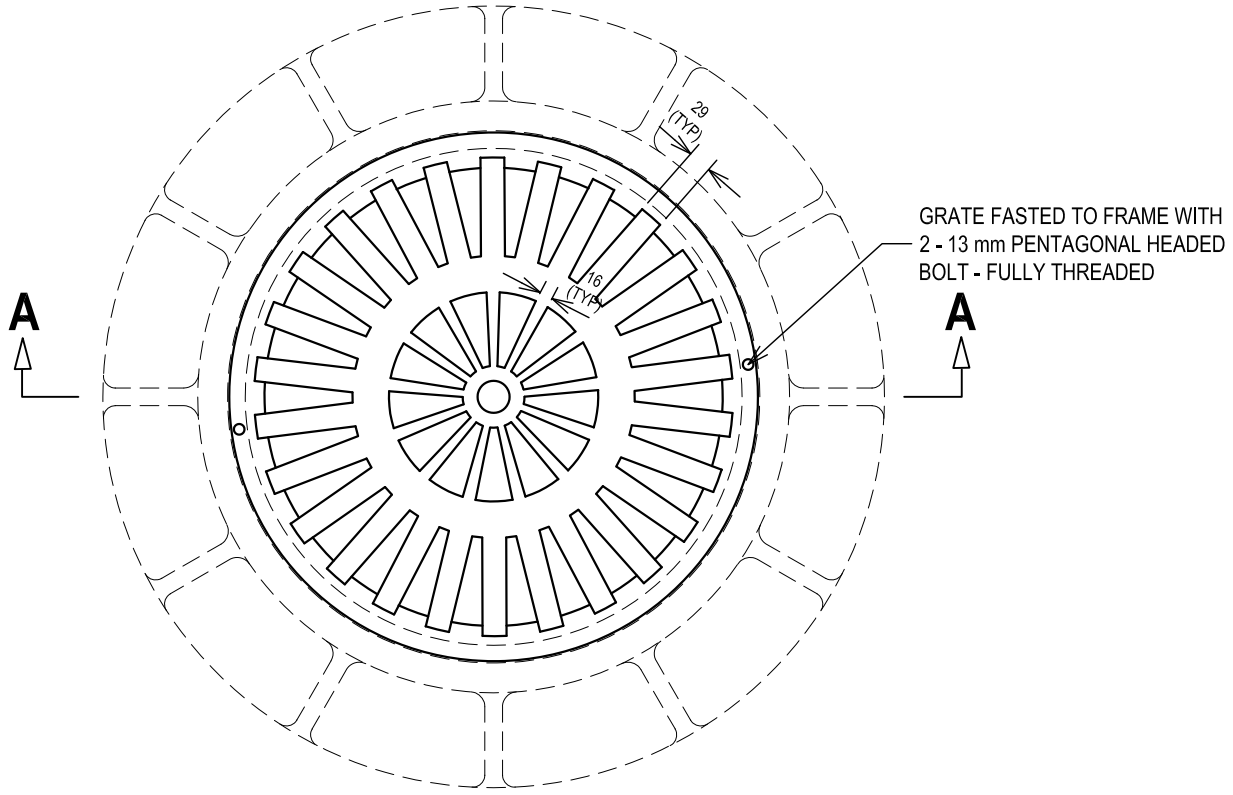
SECTION 'B - B'



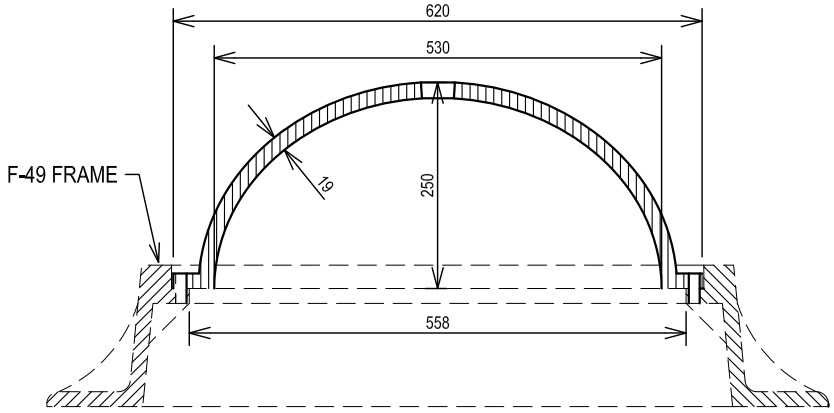
SECTION 'A - A'

MATERIAL SPECIFICATION:
- DUCTILE IRON TO CONFORM TO ASTM A536 (LATEST EDITION), GRADE 60-40-18

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	K-7 CATCH BASIN GRATE FOR SINGLE OR DOUBLE FRAME	DRAWING NO. 50 03 63
			SCALE: N.T.S.		

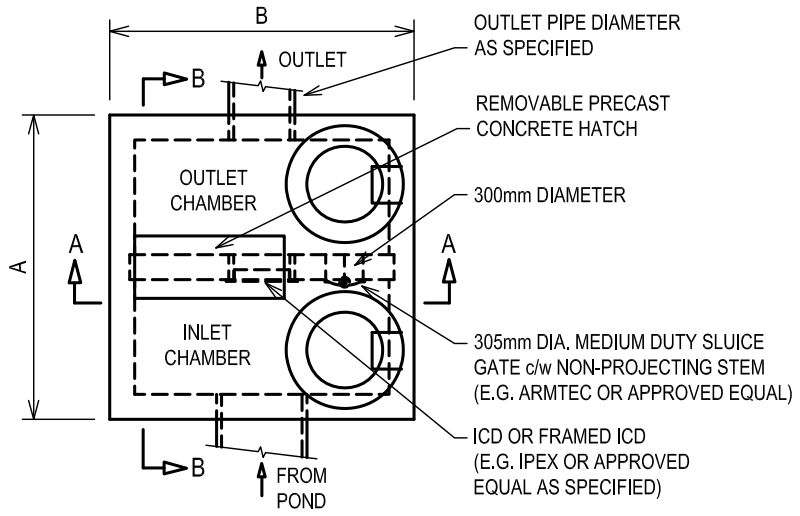


PLAN



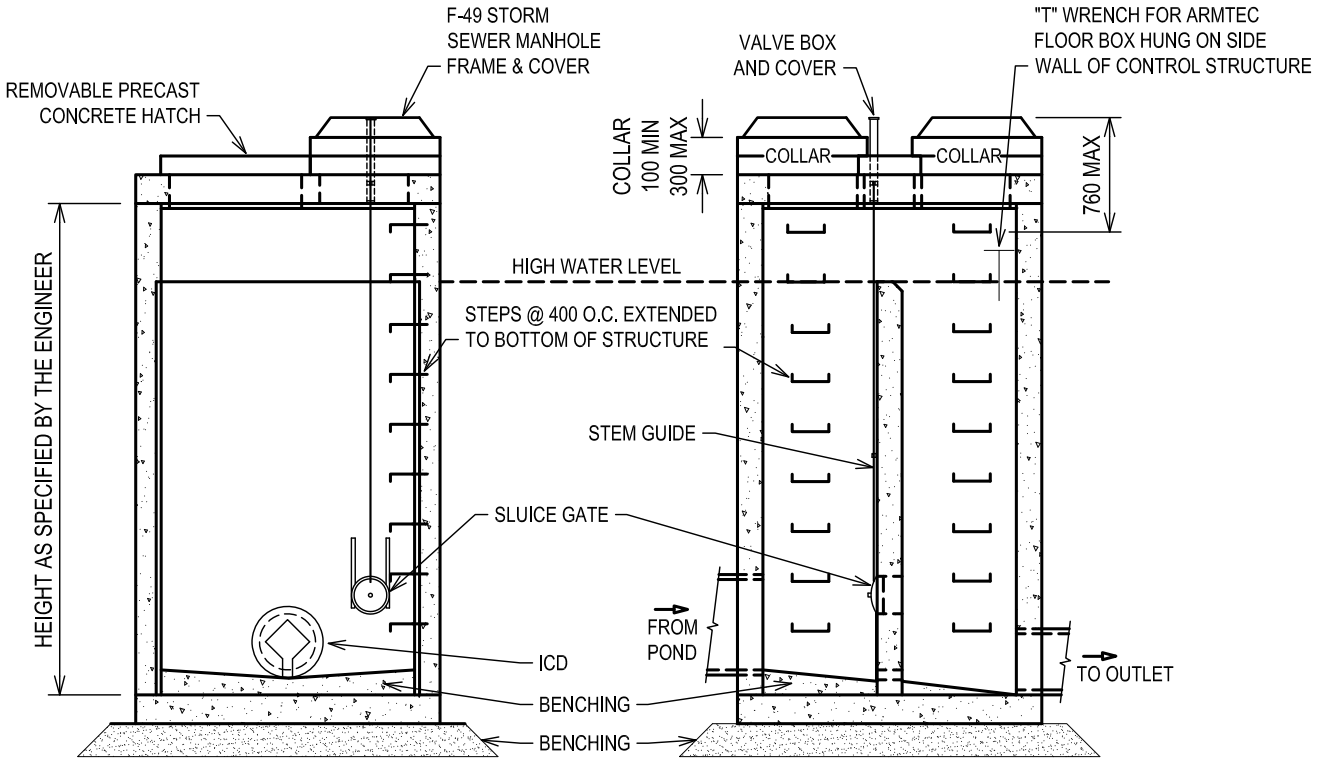
SECTION 'A - A'

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	F-50 BEEHIVE TRASH GRATE	DRAWING NO. 50 03 70
			SCALE: N.T.S.		



CONTROL STRUCTURES		
STRUCTURE TYPE	A	B
2020	2000	2000
2025	2000	2500
2030	2000	3000
2035	2000	3500
2040	2000	4000
2525	2500	2500
2530	2500	3000
2535	2500	3500
2540	2500	4000
3030	3000	3000
3035	3000	3500
3040	3000	4000

PLAN VIEW



SECTION "A - A"

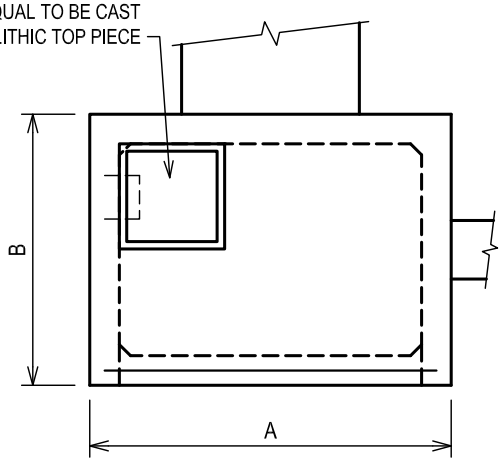
SECTION "B - B"

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**TYPICAL OUTLET CONTROL STRUCTURE**	DRAWING NO. **50 03 71**
SCALE: N.T.S.		

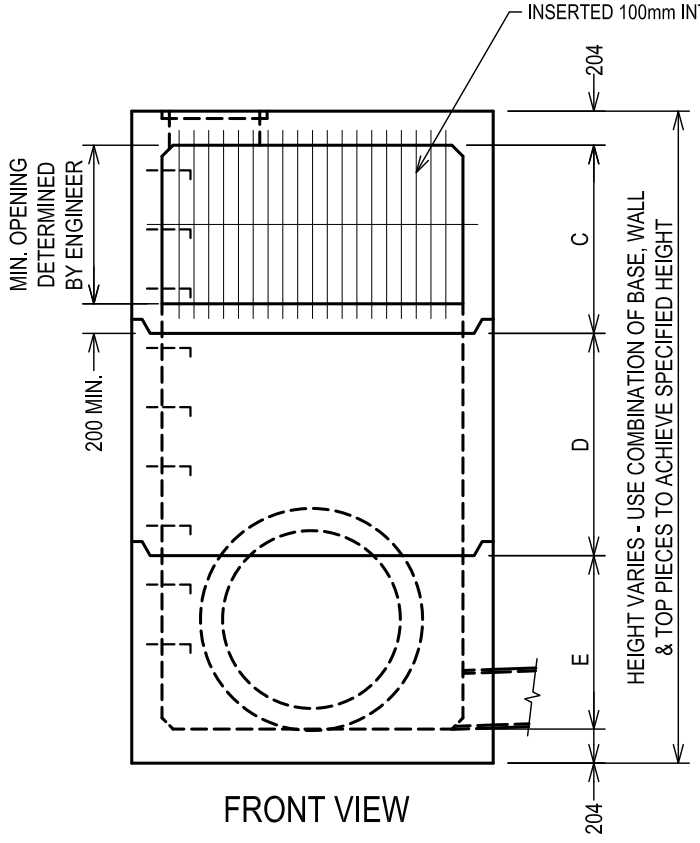
MSU (MISSISSAUGA LTD.) MODEL M1 - (610mm x 610mm) ACCESS HATCH OR EQUAL TO BE CAST INTO MONOLITHIC TOP PIECE



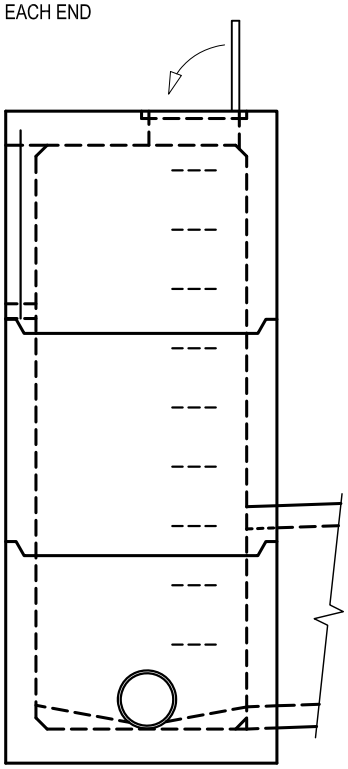
TOP VIEW

MONOLITHIC VAULT PIECES		
VAULT TYPE	LENGTH A	WIDTH B
1212	1220	1220
1515	1525	1525
1818	1830	1830
1824	2440	1830
TOP HEIGHT C	WALL HEIGHT D	BOTTOM HEIGHT E
500	500	400
750	750	650
1000	1000	900
1250	1250	1250
1500	1500	1400

16mm DIA. GALVANIZED STEEL GRATE WITH VERTICAL BARS SPACED @ 100mm O.C. HORIZONTAL BAR @ MID-POINT OF OPENING AND INSERTED 100mm INTO CONCRETE AT EACH END



FRONT VIEW



RIGHT SIDE VIEW

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-13

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
MANHOLES AND CATCH BASINS

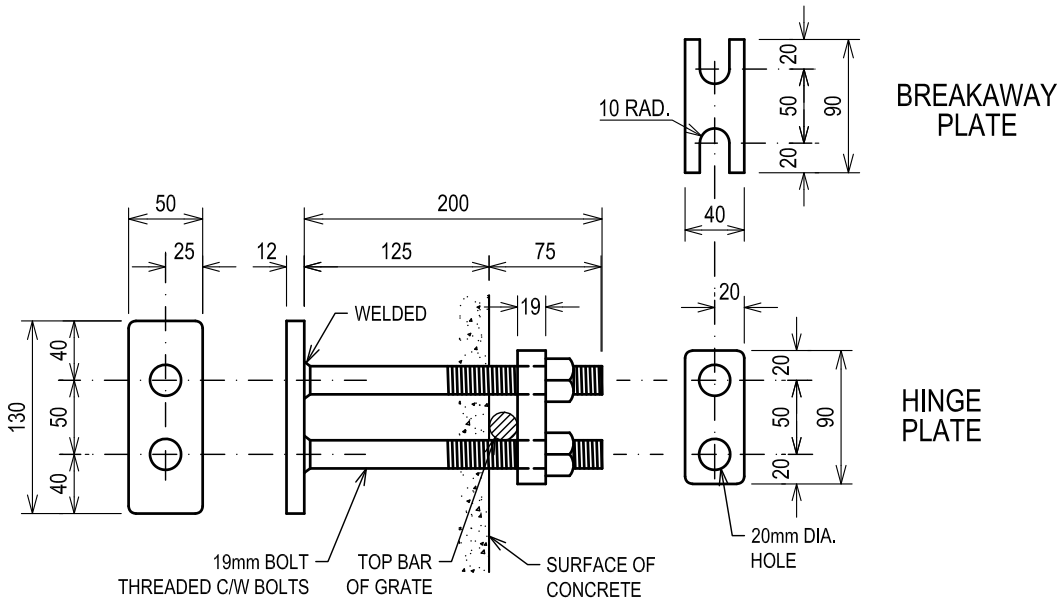
PRECAST INLET / OUTLET STRUCTURE

APPROVED BY:

ENGINEER

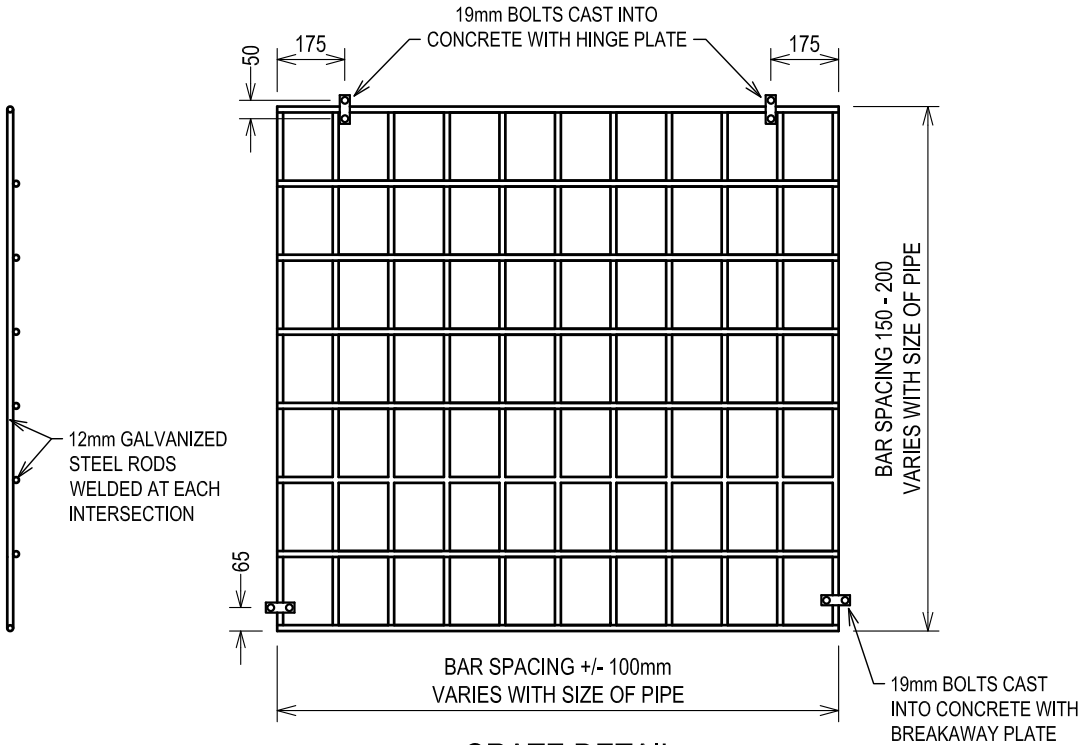
DRAWING NO.

50 03 72



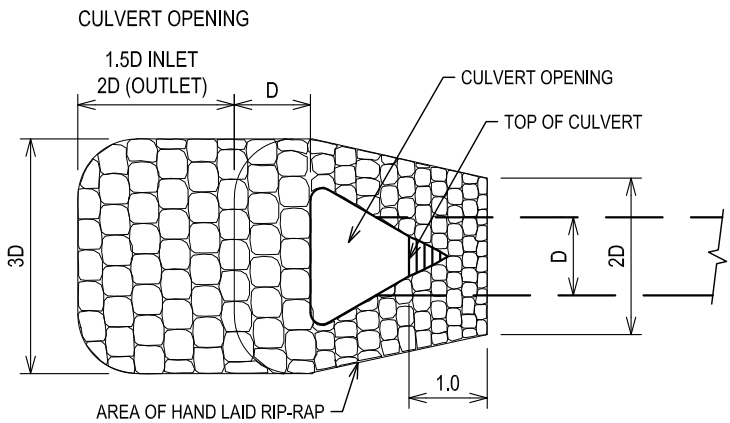
GRATE FASTENER DETAIL

NOTE :
ALL BOLTS & FASTENERS TO BE STAINLESS STEEL

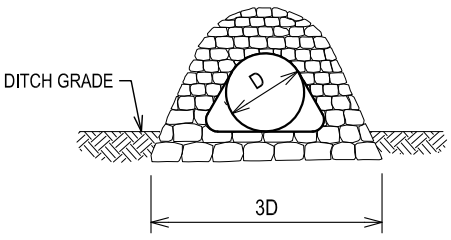


GRATE DETAIL

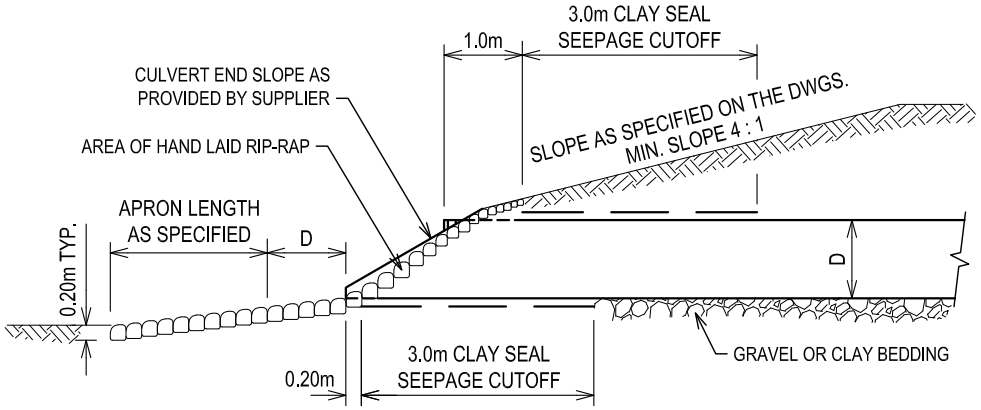
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS MANHOLES AND CATCH BASINS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	STORM OUTFALL STRUCTURE GRATE	DRAWING NO. 50 03 73
			SCALE: N.T.S.		



PLAN VIEW



ELEVATION



SECTION

NOTE :
- PLACE ROCKS AND BOULDERS AS DETAILED IN SECTION 31 37 00.
- A CLAY SEAL IS TO BE PLACED AT BOTH ENDS OF THE CULVERT FOR A LENGTH OF 3.0m TO CUT OFF SEEPAGE.
- THE CLAY SEAL SHALL EXTEND FROM THE BOTTOM OF THE EXCAVATION TO 300mm ABOVE THE CROWN OF THE PIPE AND FOR THE FULL WIDTH OF THE EXCAVATION.
- WHERE APRONS ARE REQUIRED DUE TO HIGH VELOCITY FLOW OR EROSION PRONE SOIL, TYPICALLY THE MINIMUM
  - INLET APRON IS 1.5 x DIAMETER LONG
  - OUTLET APRON IS 2.0m LONG

ESTIMATED RIP-RAP SURFACE AREAS (BASED ON A 4:1 SIDESLOPE)			
PIPE DIAMETER (mm)	AREA OF ONE END EXCLUDING APRON (sq. m)	AREA OF ONE END INCLUDING INLET APRON (sq. m)	AREA OF ONE END INCLUDING OUTLET APRON (sq. m)
400	1	1.5	2
500	2	3	4
600	3	5	6
700	4	6	7
800	5	8	9
900	6	10	11
1000	7	12	13
1100	9	14	16
1200	10	16	19
1400	13	22	25

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-13

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
MANHOLES AND CATCH BASINS

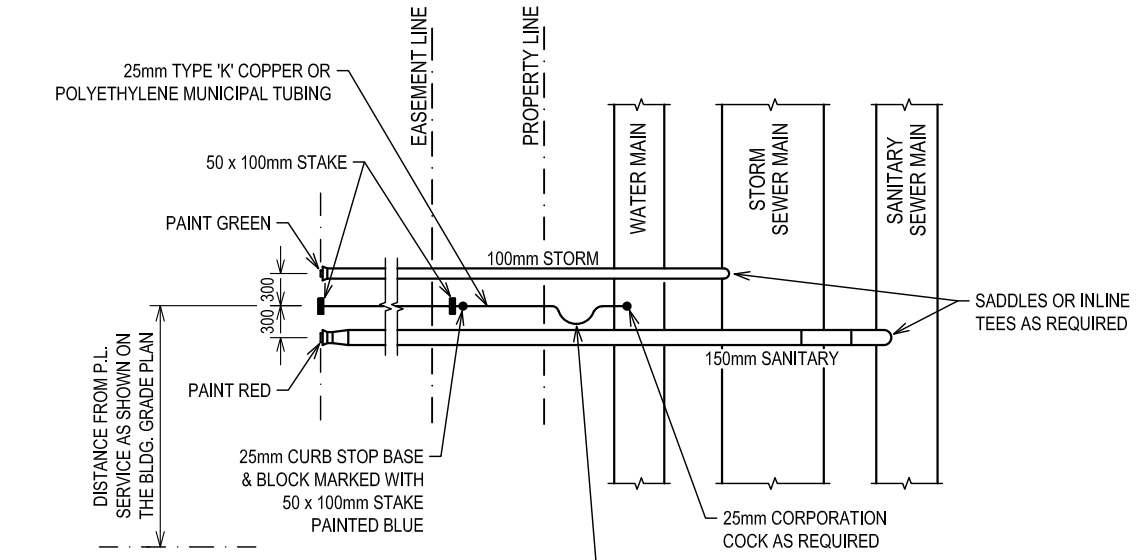
CULVERT END RIP-RAP TREATMENT

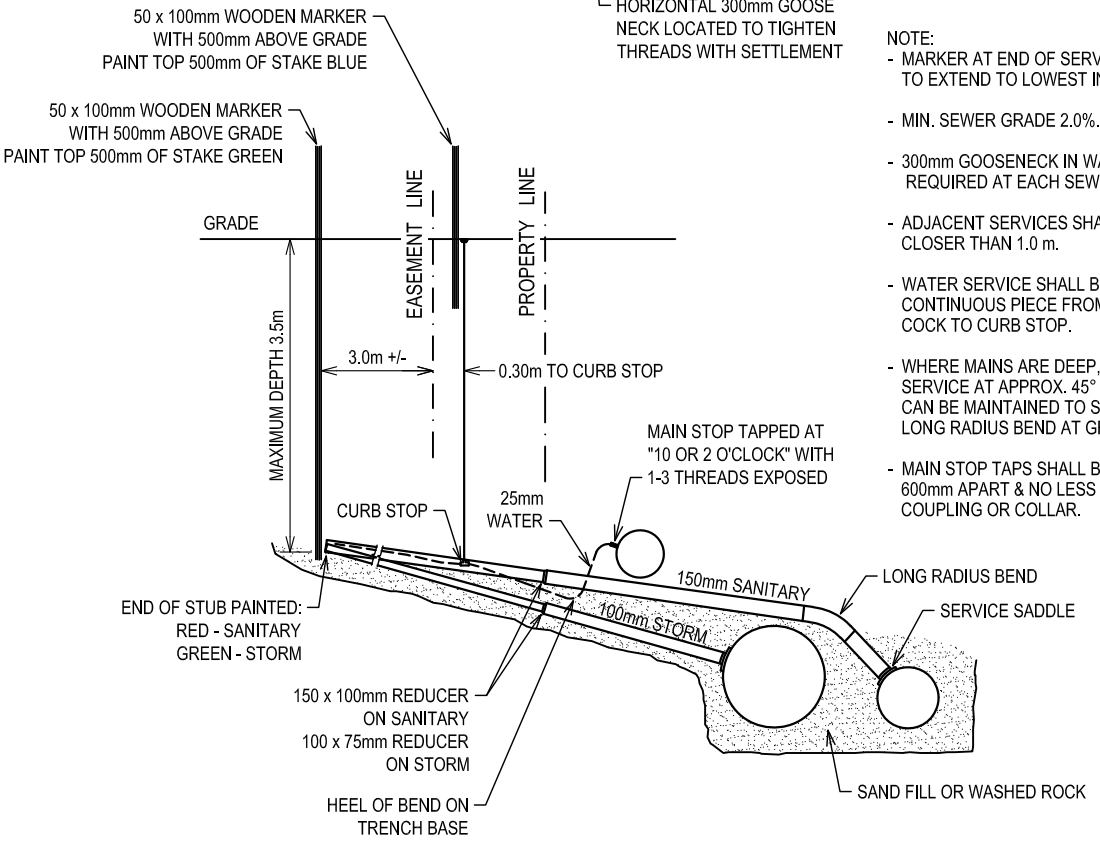
APPROVED BY:

ENGINEER

DRAWING NO.

50 03 74



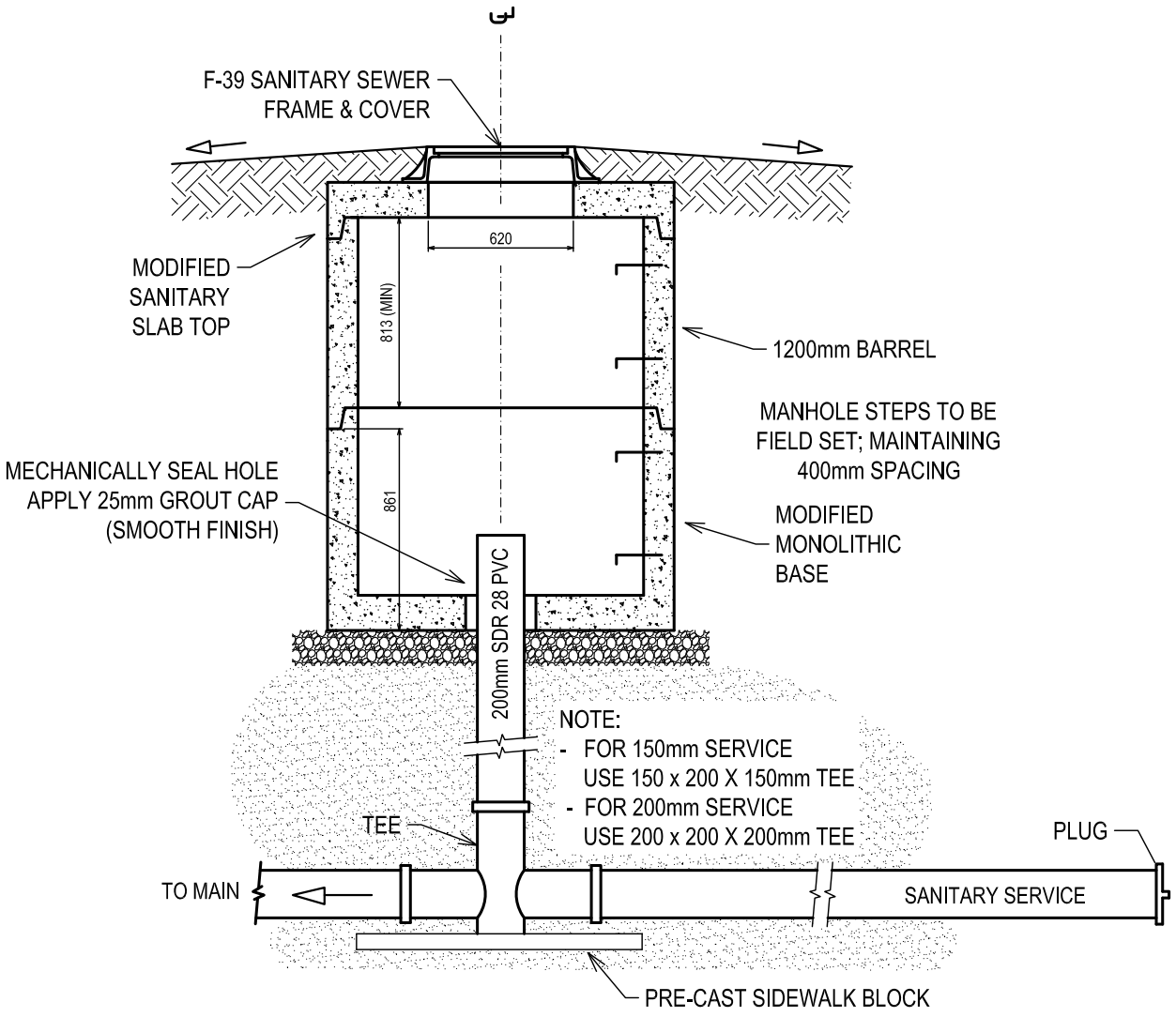


NOTE:
- MARKER AT END OF SERVICE TO EXTEND TO LOWEST INVERT.
- MIN. SEWER GRADE 2.0%.
- 300mm GOOSENECK IN WATER SERVICE REQUIRED AT EACH SEWER CROSSING.
- ADJACENT SERVICES SHALL BE NO CLOSER THAN 1.0 m.
- WATER SERVICE SHALL BE ONE CONTINUOUS PIECE FROM CORPORATION COCK TO CURB STOP.
- WHERE MAINS ARE DEEP, CONSTRUCT SERVICE AT APPROX. 45° GRADE UNTIL 2 - 5% CAN BE MAINTAINED TO STUB, INSTALL LONG RADIUS BEND AT GRADE TRANSITION.
- MAIN STOP TAPS SHALL BE A MINIMUM OF 600mm APART & NO LESS THAN 300mm TO A COUPLING OR COLLAR.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

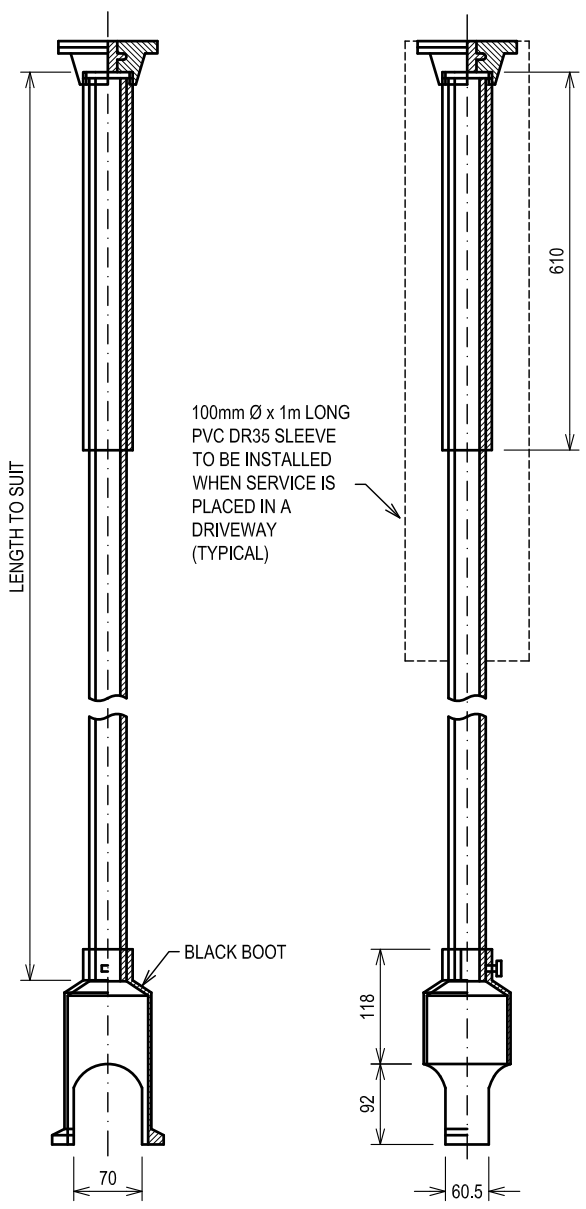
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS SERVICE CONNECTIONS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**TYPICAL RESIDENTIAL SERVICE CONNECTION**	
SCALE: N.T.S.		DRAWING NO. **50 04 01**



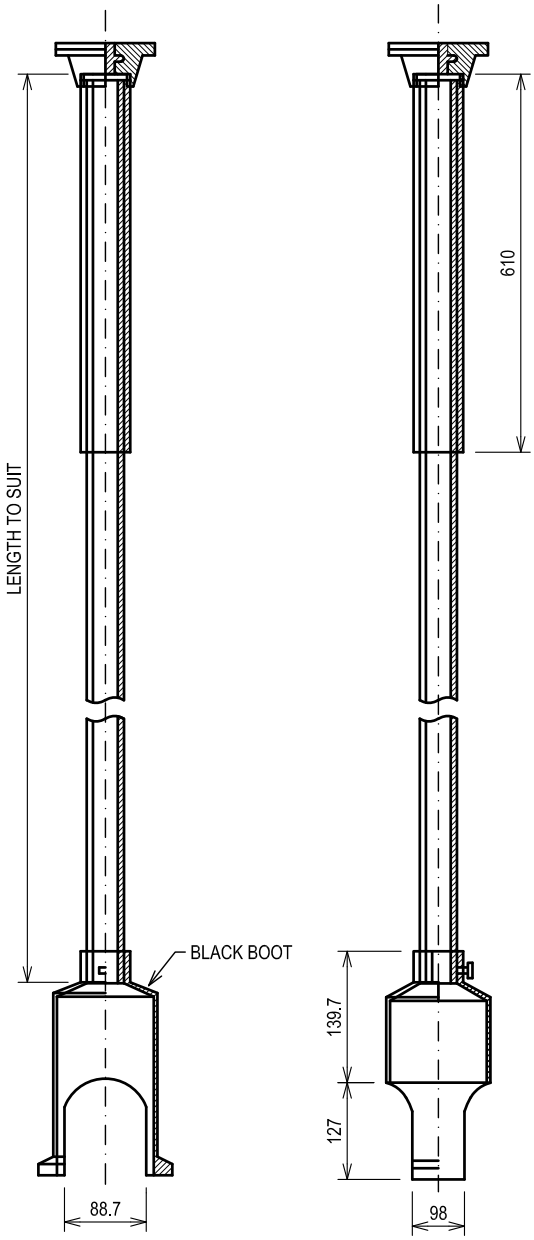
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS SERVICE CONNECTIONS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**SANITARY SEWER SERVICE INSPECTION / SAMPLING MANHOLE**	
SCALE: N.T.S.		DRAWING NO. **50 04 02**



SMALL BOOT FOR
25mm SERVICE



LARGE BOOT FOR
38mm & 50mm SERVICE

MATERIAL SPECIFICATION:

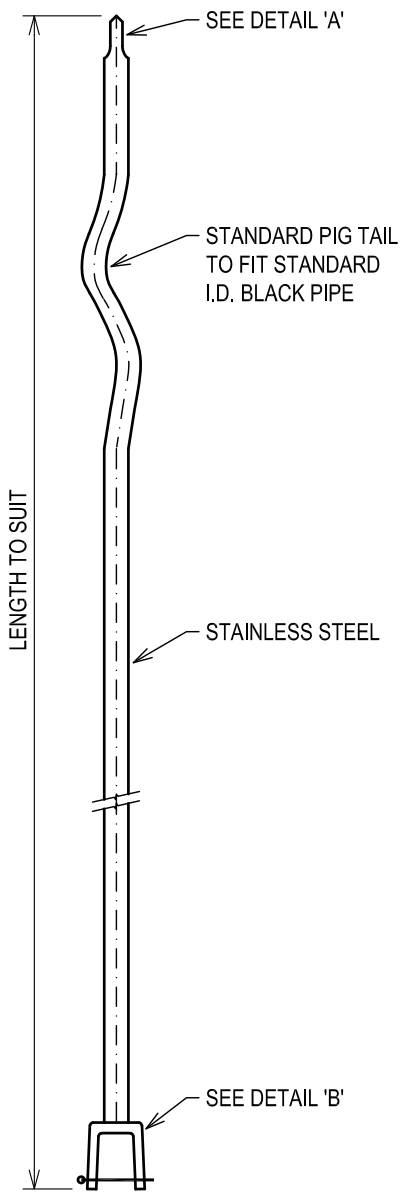
TUBING TO BE SCHEDULE 40 PIPE; GALVANIZED
- 1.66 O.D. UPPER SECTION
- 1.315 O.D.CASING

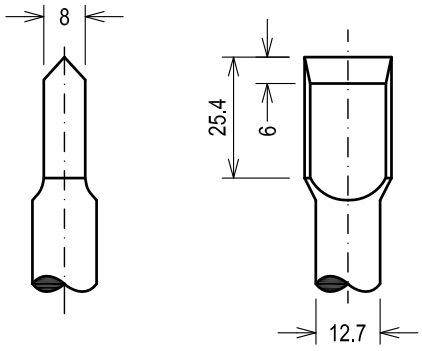
- GREY CAST IRON TO CONFORM TO ASTM A48, CLASS 20 (LATEST EDITION)
- BOOT TO BE EPOXY COATED
- BRASS PENTAGON PLUG - CDA 60-40 YELLOW BRASS

NO.	DATE	REVISION

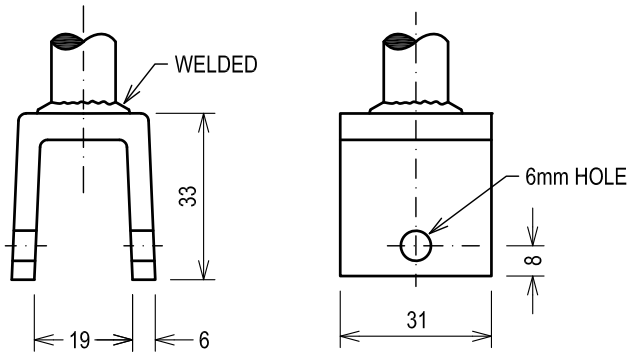
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS SERVICE CONNECTIONS**	APPROVED BY: ENGINEER
DATE: 2018-02-13	**STANDARD TOP ADJUSTMENT SERVICE BOX AND BOOT FOR 25mm, 38mm & 50mm SERVICE**	DRAWING NO. **50 04 03**
SCALE: N.T.S.		





DETAIL 'A'

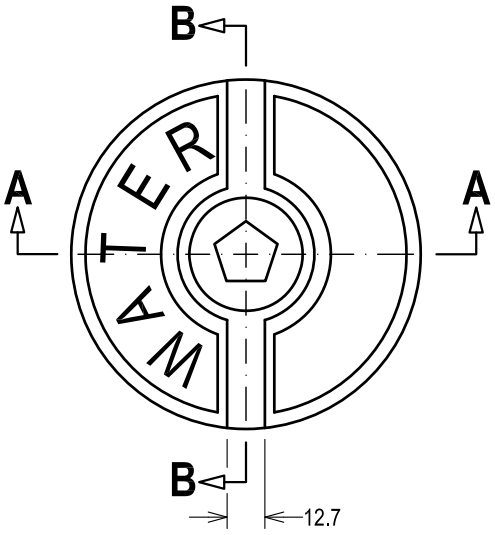


DETAIL 'B'

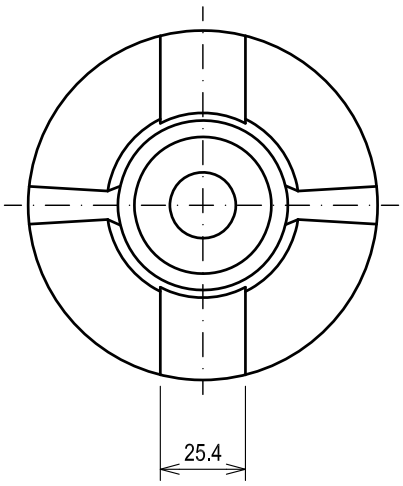
MATERIAL SPECIFICATION :

- DIN 50.049 / 2.3 TYPE 304 HRR STAINLESS ROD

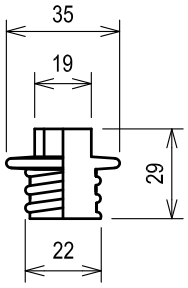
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS SERVICE CONNECTIONS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	12.7mm STAINLESS STEEL SERVICE BOX ROD	DRAWING NO. 50 04 04
			SCALE: N.T.S.		



TOP

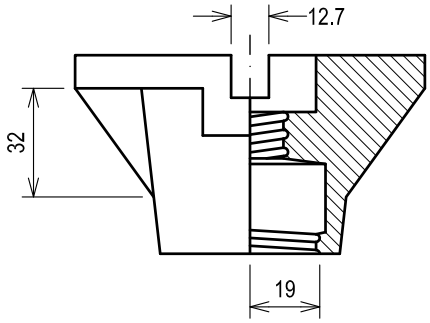


BOTTOM

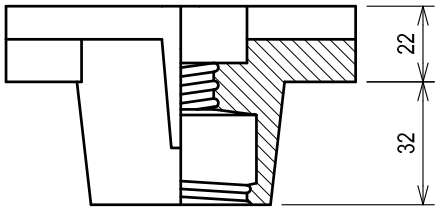


CAP BOLT

MATERIAL SPECIFICATION:
GREY CAST IRON TO CONFORM TO
ASTM A48, CLASS 20 (LATEST EDITION)

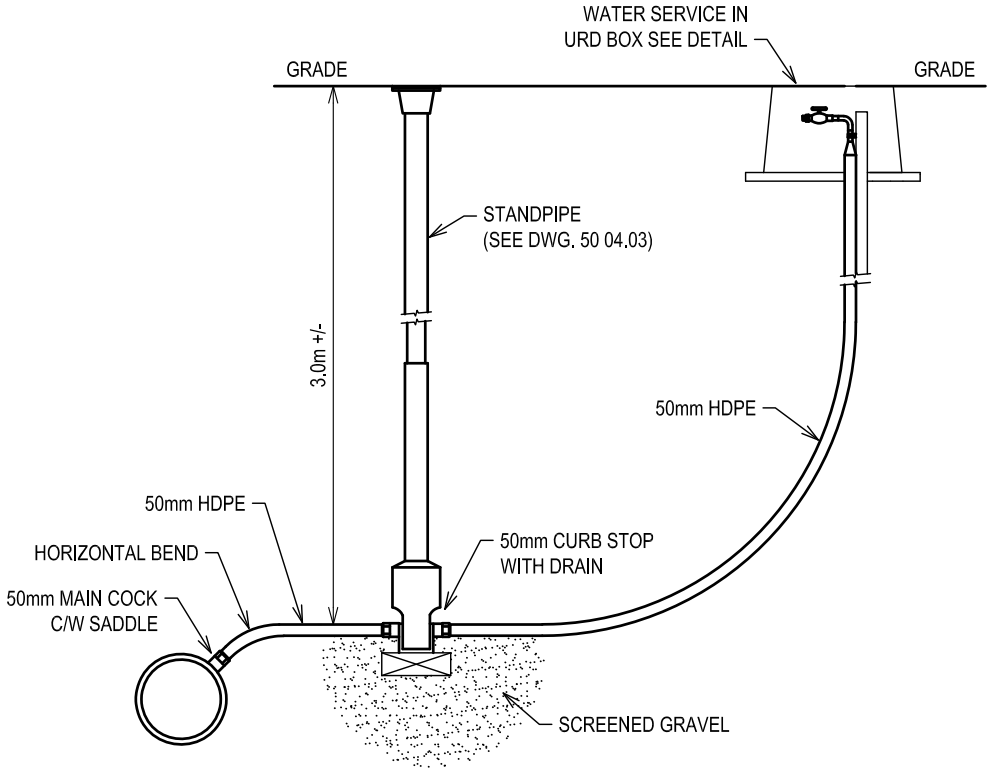


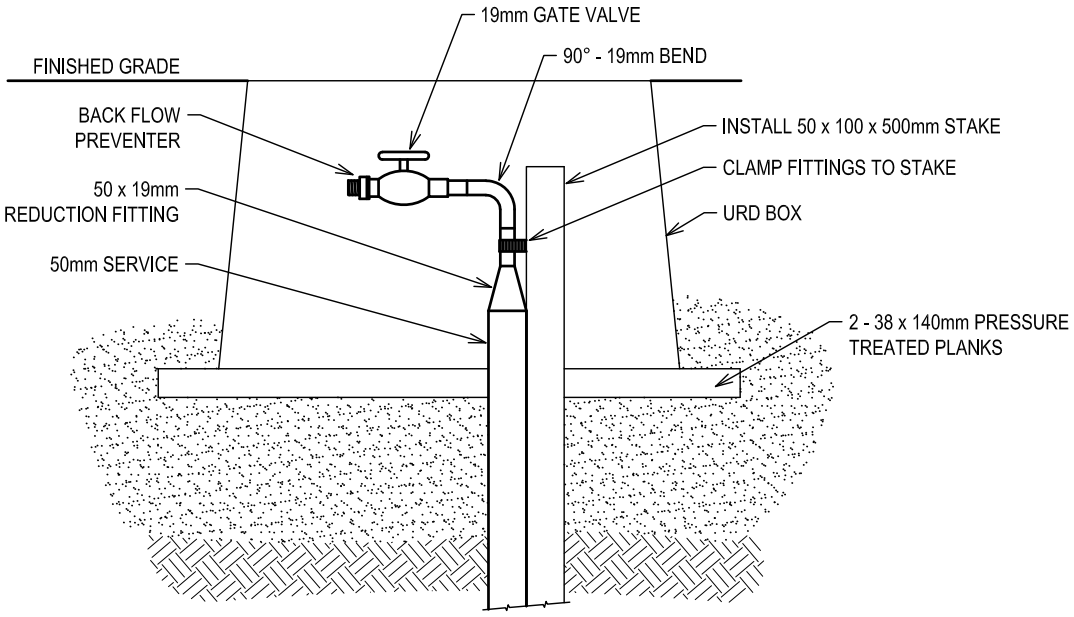
SECTION 'A - A'



SECTION 'B - B'

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS SERVICE CONNECTIONS	APPROVED BY: ENGINEER
			DATE: 2018-02-13	SERVICE BOX CAP	DRAWING NO. 50 04 05
			SCALE: N.T.S.		

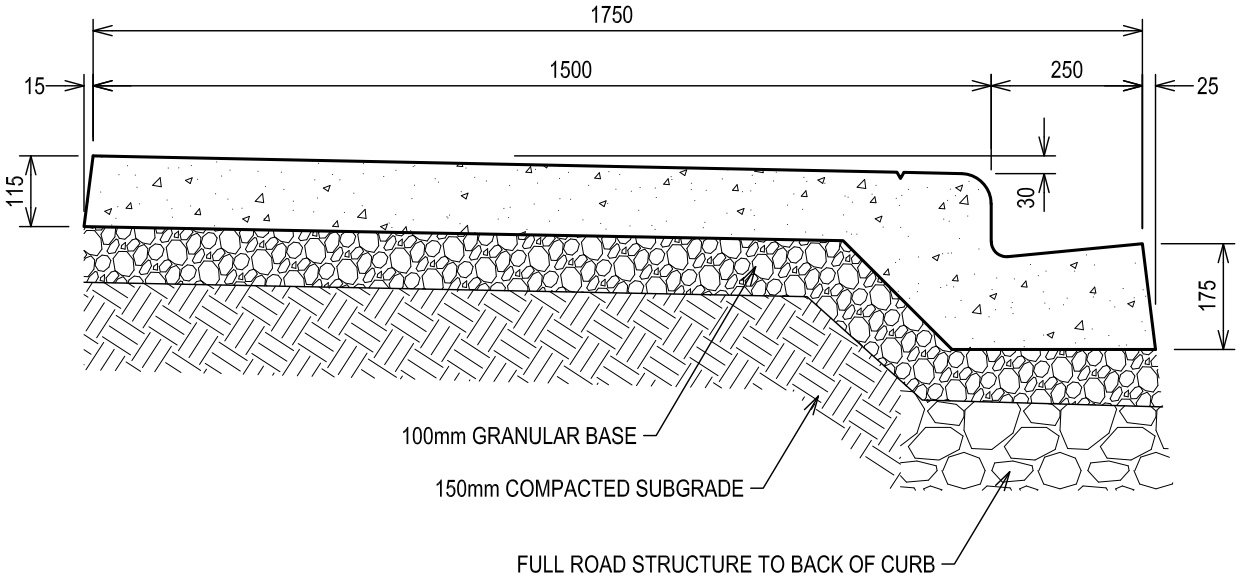


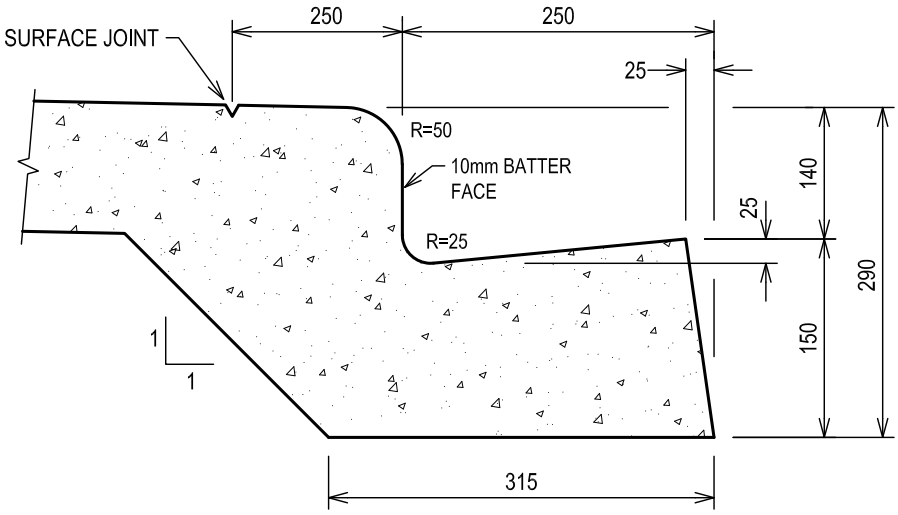


NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS SERVICE CONNECTIONS**	APPROVED BY: ENGINEER
DATE: 2018-02-14	**PARKS WATER SERVICE**	
SCALE: N.T.S.		DRAWING NO. **50 04 06**



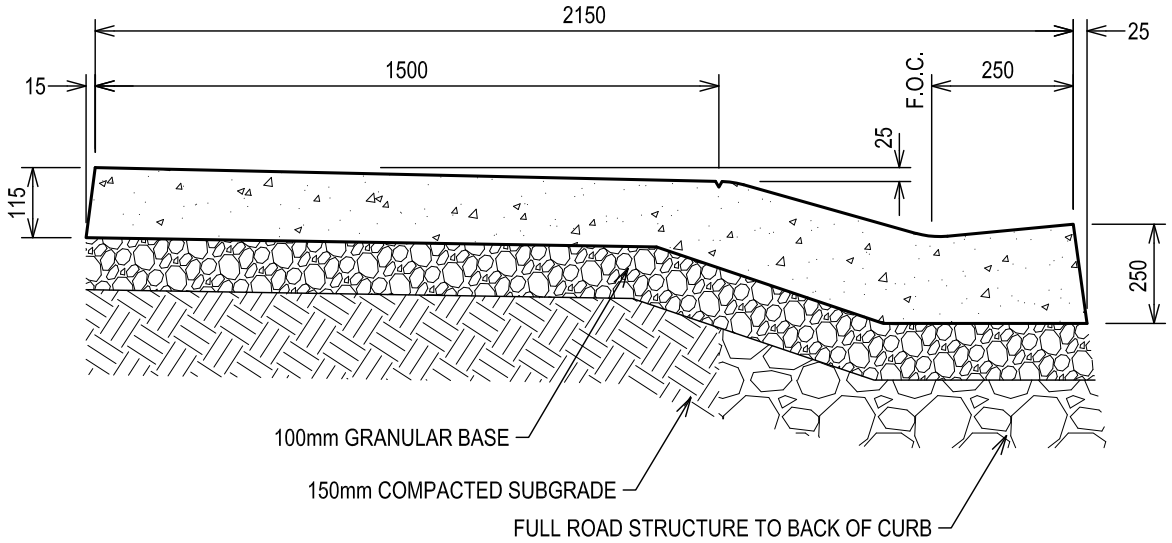


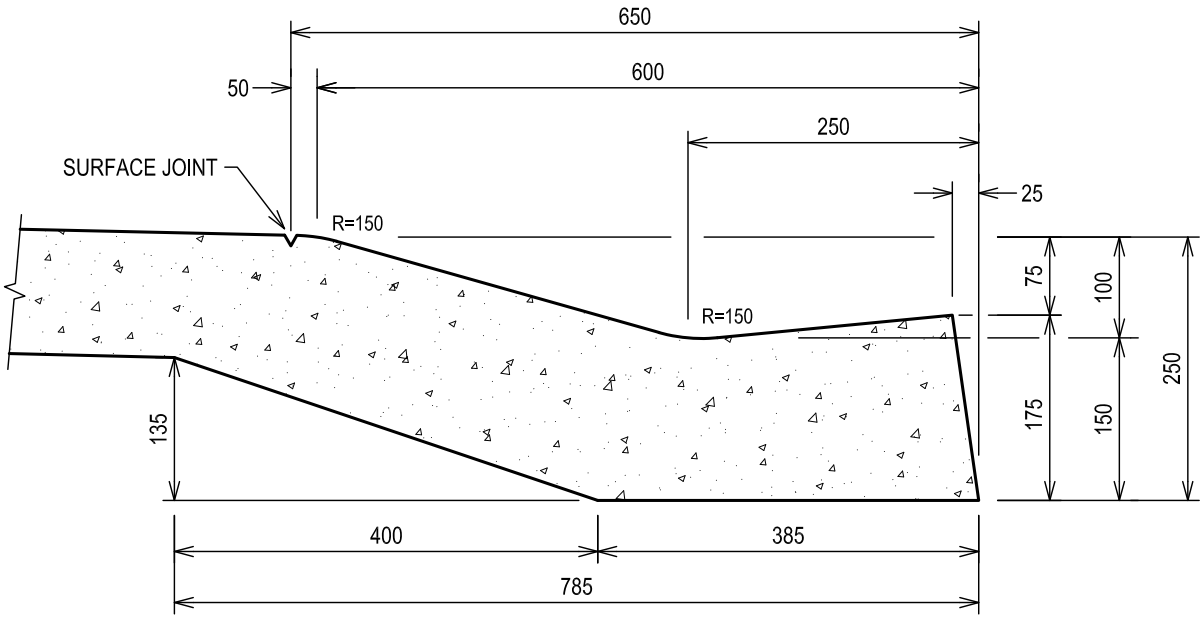
*NOTE : BATTER NOT REQUIRED FOR HANDFORMED.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

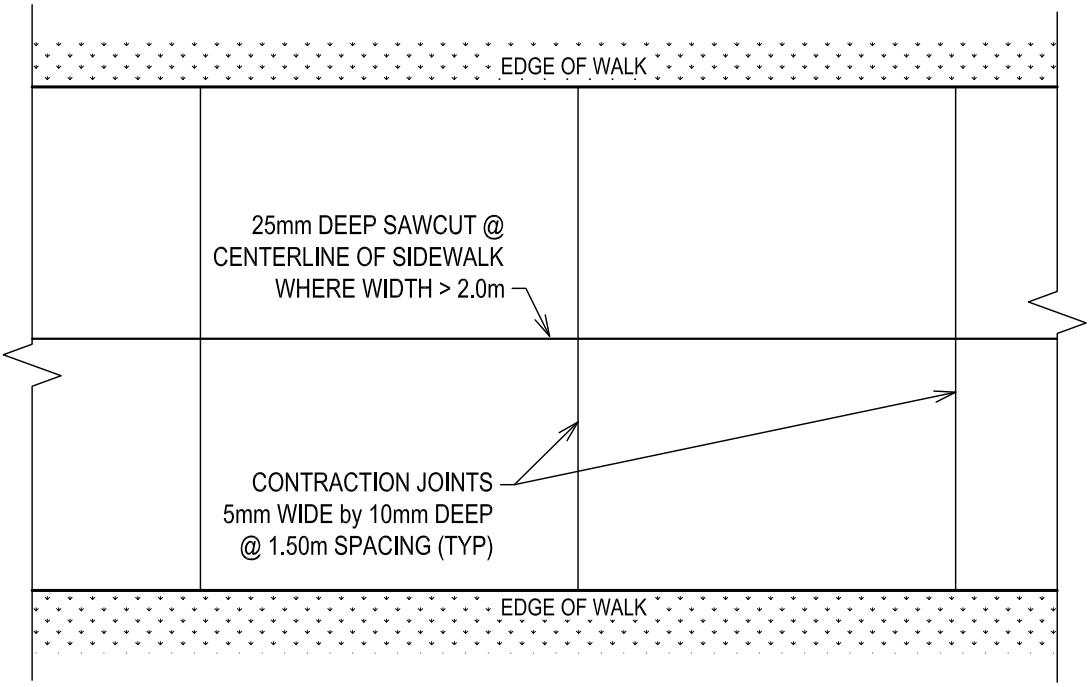
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-14	**1.50m STANDARD MONOLITHIC SIDEWALK**	
SCALE: N.T.S.		DRAWING NO. **50 05 01**

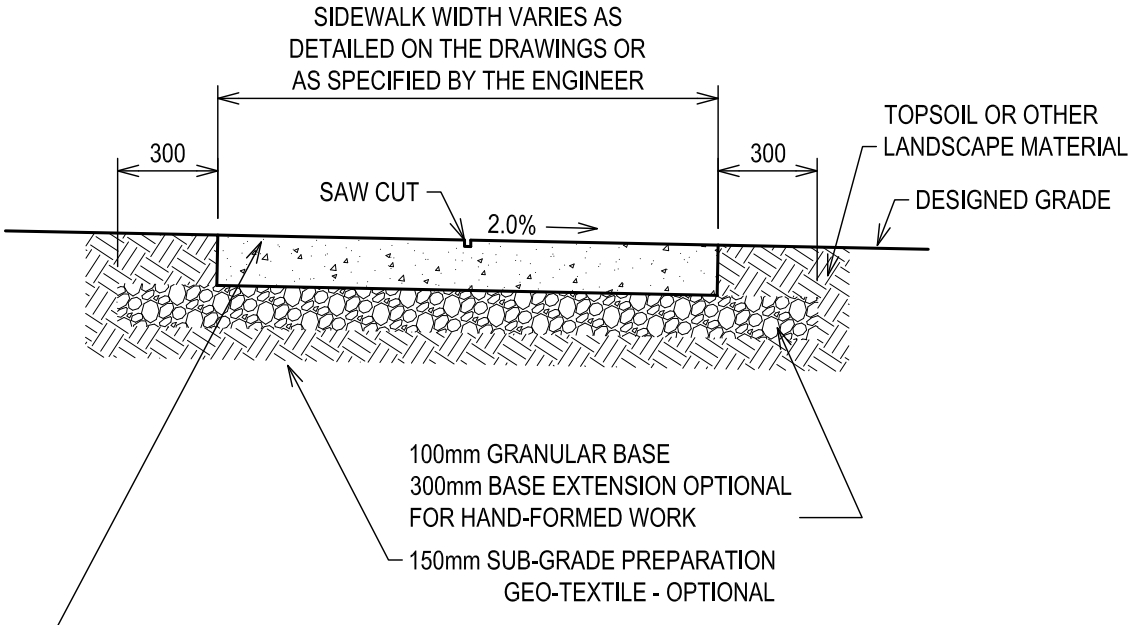




*NOTE : BATTER NOT REQUIRED FOR HANDFORMED

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-14	1.50m ROLLED MONOLITHIC SIDEWALK	
			SCALE: N.T.S.		DRAWING NO. 50 05 02



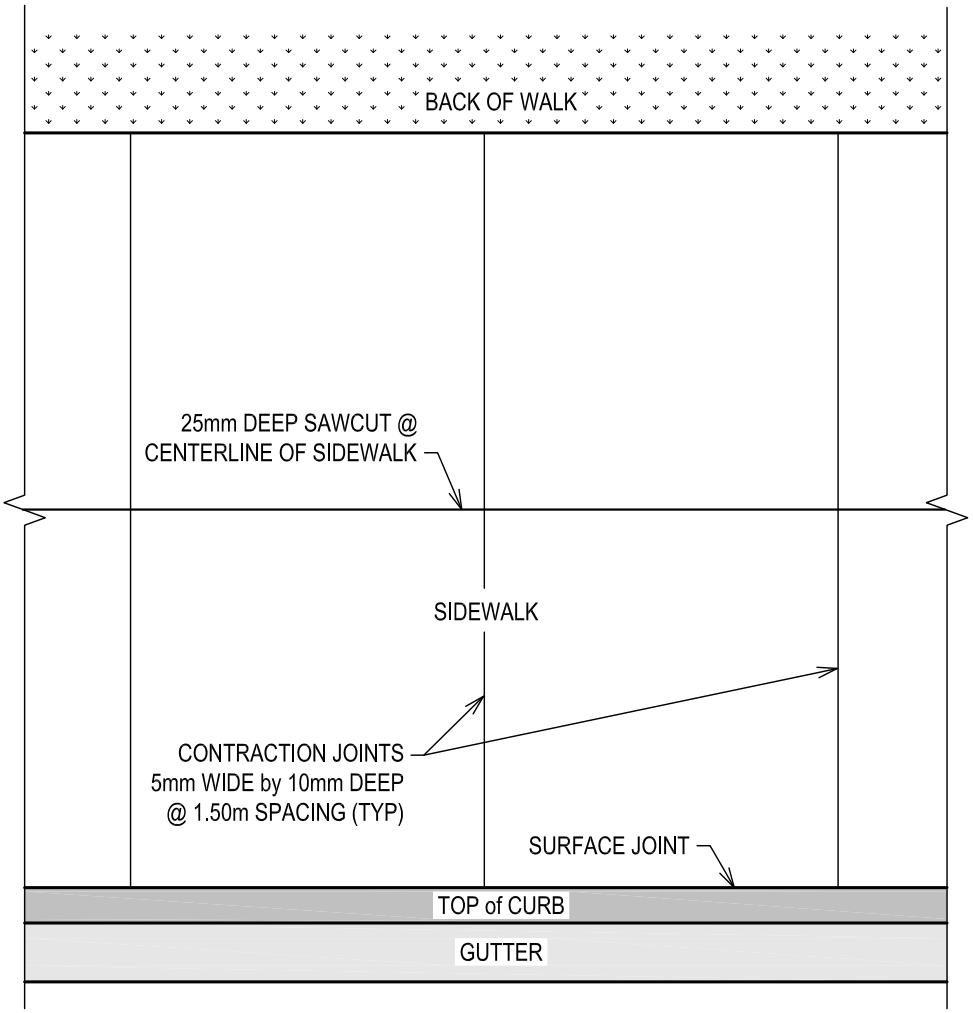


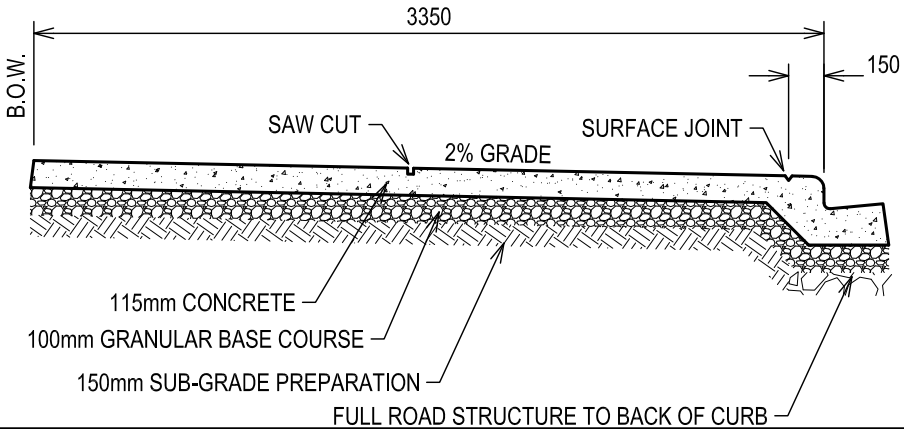
- 115mm CONCRETE SIDEWALK - OR - 150mm REINFORCED CONCRETE SIDEWALK WHERE COMMERCIAL DRIVEWAY IS CROSSING. REINFORCEMENT PER DWG.'S 50 05 15 OR 50 05 16.
- CONCRETE - 32 MPa

NO.	DATE	REVISION

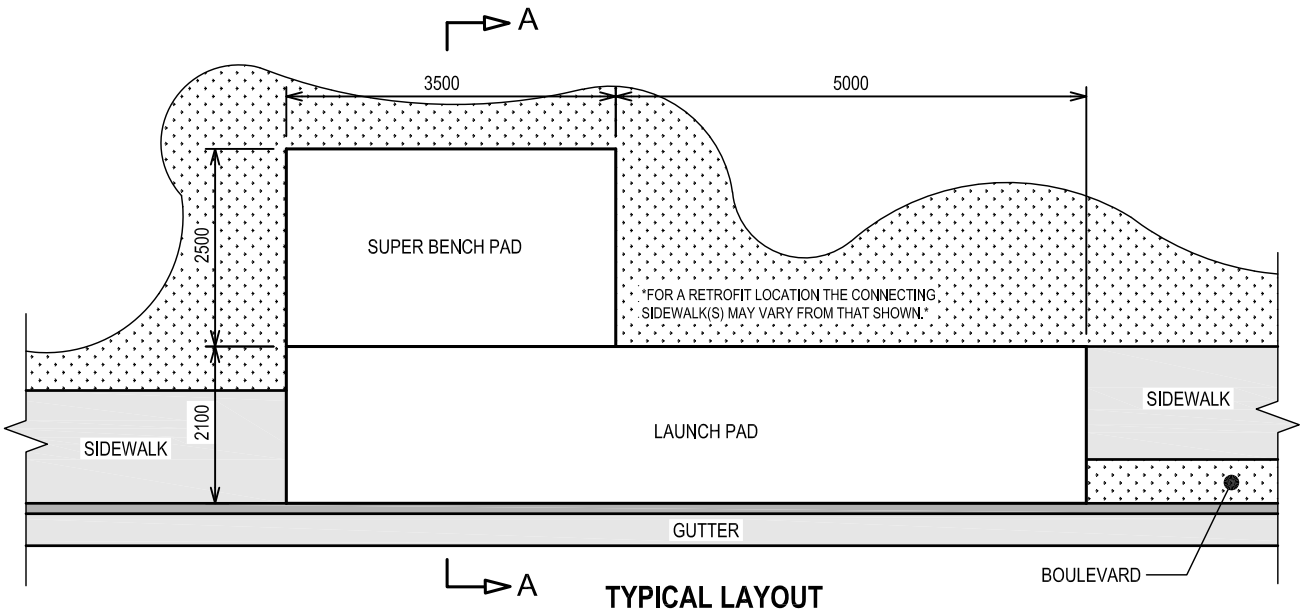
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-14	**SEPARATE SIDEWALK HANDFORMED OR EXTRUDED**	
SCALE: N.T.S.		DRAWING NO. **50 05 03**

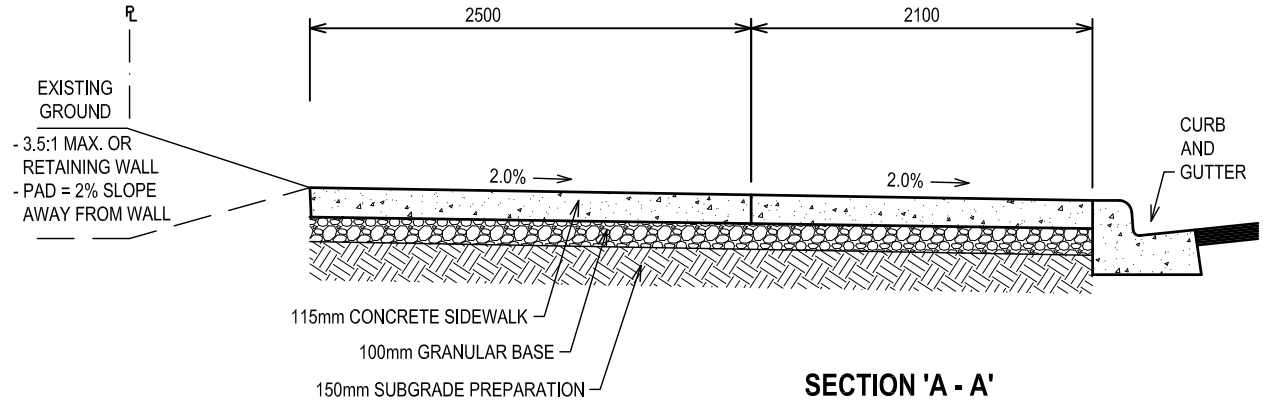




NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-14	3.35m MONOLITHIC SIDEWALK DOWNTOWN BUSINESS DISTRICT	DRAWING NO. 50 05 04
			SCALE: N.T.S.		



TYPICAL LAYOUT



SECTION 'A - A'

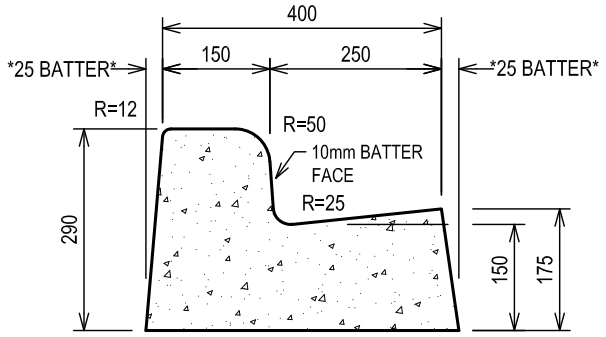
NOTE :

- PAD SIZES TO BE ADJUSTED TO FIT EXISTING CONDITIONS IN A RETROFIT SITUATION, SUBJECT TO ENGINEER APPROVAL.
- AVOID SMALL REMNANT GRASS AREAS DUE TO PAD DESIGN.
- WHERE A NEW BUS PAD TIES TO AN EXISTING SIDEWALK OR BACK OF CURB, THE PAD IS TO BE DOWELED PER DWG. 50 05 21.
- FOR NEW CONSTRUCTION, STANDARD MONOLITHIC CURB SHALL BE USED.
- CONCRETE TO BE 32 MPa.

NO.	DATE	REVISION

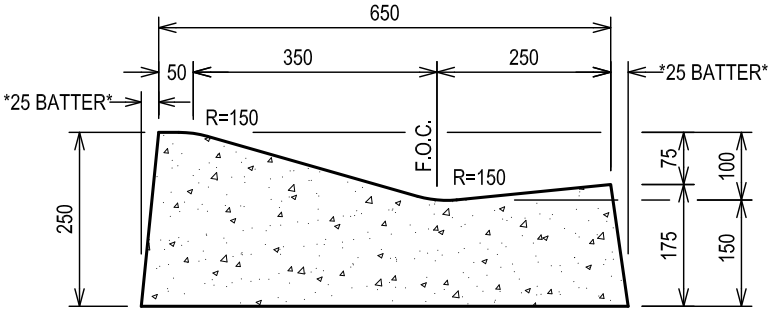
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**TRANSIT STOP TYPICAL DETAIL**	
SCALE: N.T.S.		DRAWING NO. **50 05 05**



STANDARD CURB & GUTTER

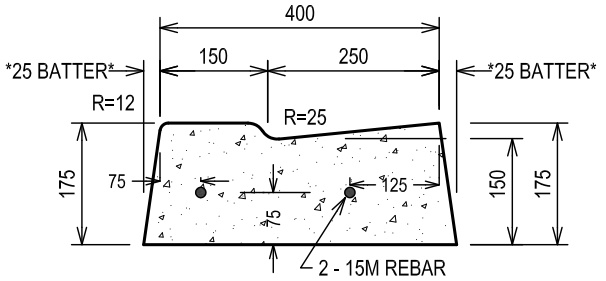
(WHERE PARKING IS / MAY BE RESTRICTED ON LOCAL & COLLECTOR ROADWAYS.)



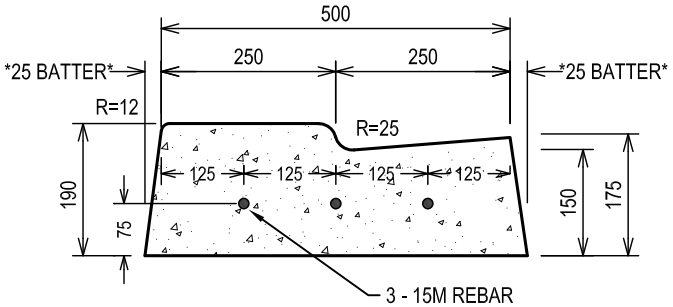
ROLLED CURB & GUTTER

(ADJACENT TO RESIDENTIAL AREAS ON LOCAL & COLLECTOR ROADWAYS.)

NOTE :
BATTER NOT REQUIRED FOR HAND-FORMED C&G.

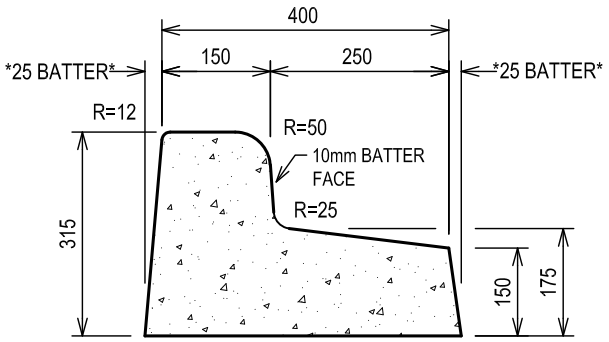


RESIDENTIAL CURB & GUTTER DRIVEWAY CROSSING



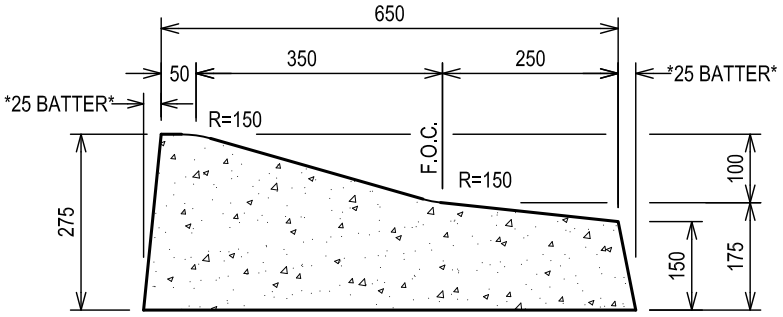
COMMERCIAL / INDUSTRIAL CURB & GUTTER DRIVEWAY CROSSING

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	250mm CURB AND GUTTER	DRAWING NO. 50 05 06
			SCALE: N.T.S.		



STANDARD CURB & GUTTER

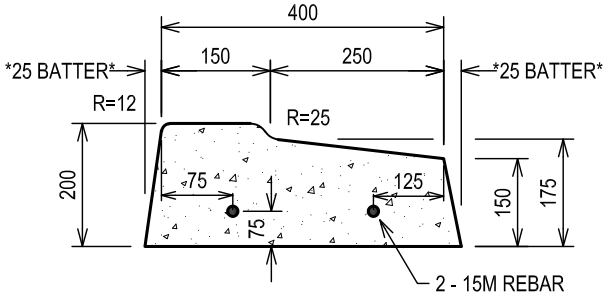
(WHERE PARKING IS / MAY BE RESTRICTED ON LOCAL & COLLECTOR ROADWAYS.)



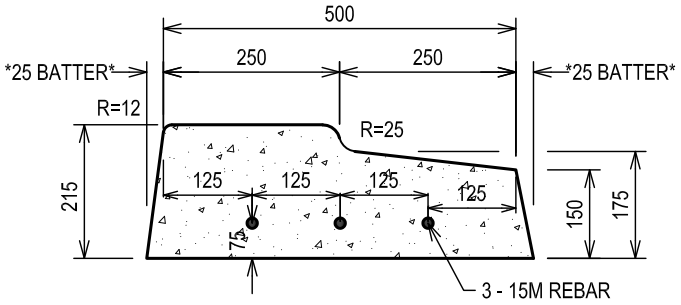
ROLLED CURB & GUTTER

(ADJACENT TO RESIDENTIAL AREAS ON LOCAL & COLLECTOR ROADWAYS.)

*NOTE:
BATTER NOT REQUIRED FOR HAND-FORMED C&G.

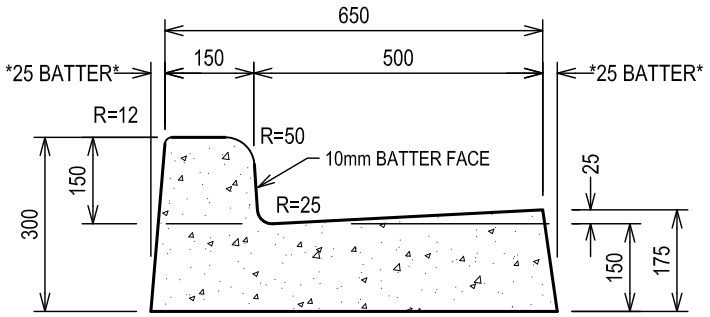


RESIDENTIAL CURB & GUTTER CROSSING (REINFORCED)

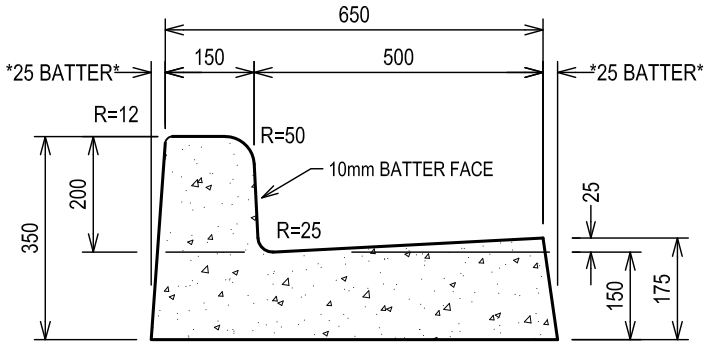


COMMERCIAL / INDUSTRIAL CURB & GUTTER CROSSING (REINFORCED)

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	250mm REVERSE CURB & GUTTER	DRAWING NO. 50 05 07
			SCALE: N.T.S.		



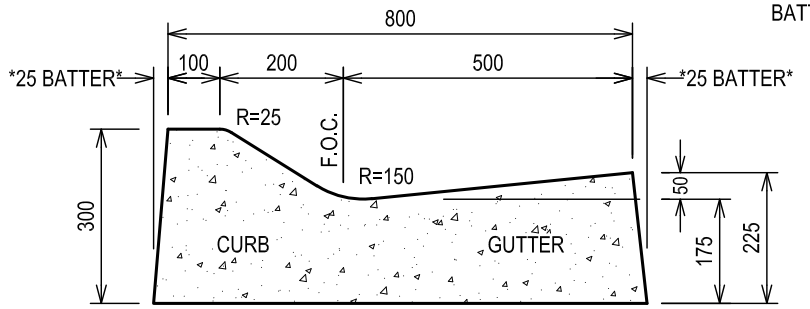
150mm BARRIER CURB & GUTTER



200mm BARRIER CURB & GUTTER

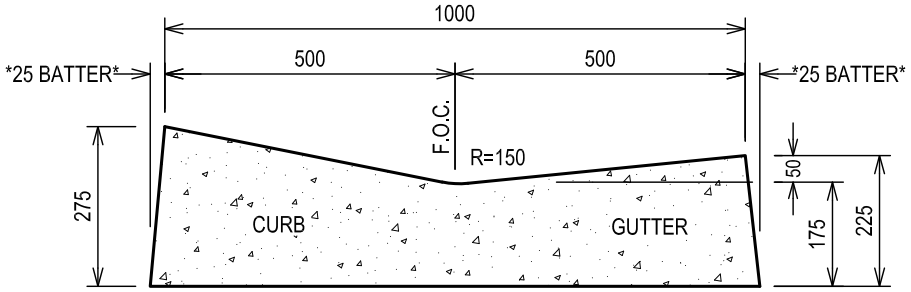
(FOR MEDIANS, ISLANDS AND TURNING BAYS AT INTERSECTIONS)

*NOTE:
BATTER NOT REQUIRED FOR HAND-FORMED C&G.



SEMI-MOUNTABLE CURB & GUTTER

(WHEN POSTED SPEED > 70km/hr)



MOUNTABLE CURB & GUTTER

(WHEN LONGITUDINAL BARRIERS ARE PRESENT)

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

CONSTRUCTION SPECIFICATION DRAWINGS
CONCRETE WORK

APPROVED BY:

ENGINEER

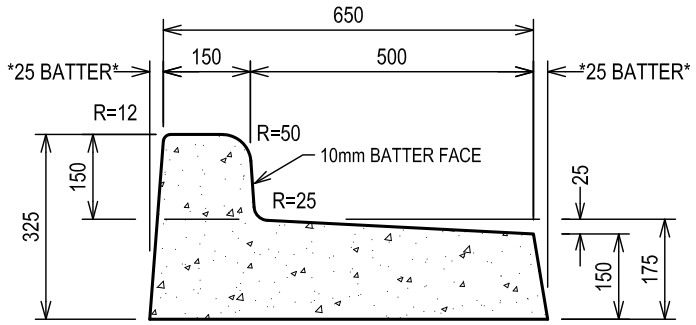
DATE: 2018-02-15

SCALE: N.T.S.

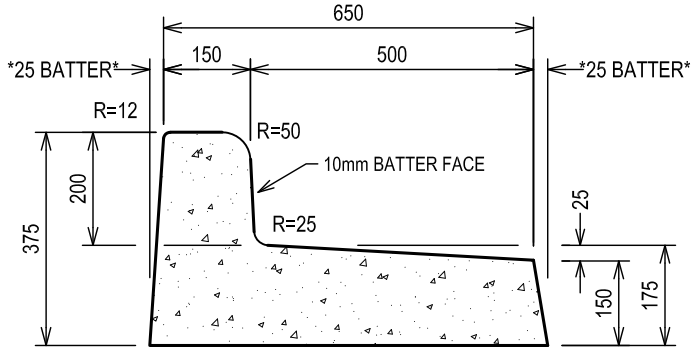
500mm CURB AND GUTTER FOR ARTERIAL ROADWAYS

DRAWING NO.

50 05 08



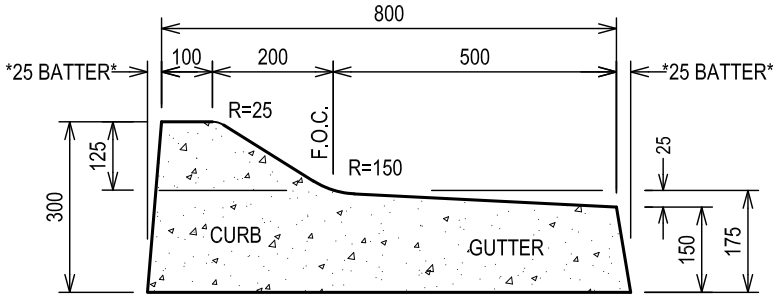
150mm BARRIER CURB AND GUTTER



200mm BARRIER CURB & GUTTER

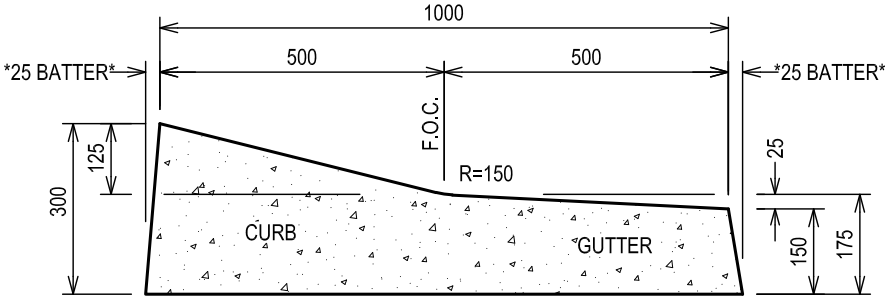
(FOR MEDIANS, ISLANDS AND TURNING BAYS AT INTERSECTIONS)

*NOTE:
BATTER NOT REQUIRED FOR HAND-FORMED C&G.



SEMI-MOUNTABLE CURB & GUTTER

(WHEN POSTED SPEED > 70km/hr)



MOUNTABLE CURB & GUTTER

(WHEN LONGITUDINAL BARRIERS ARE PRESENT)

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-15

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
CONCRETE WORK

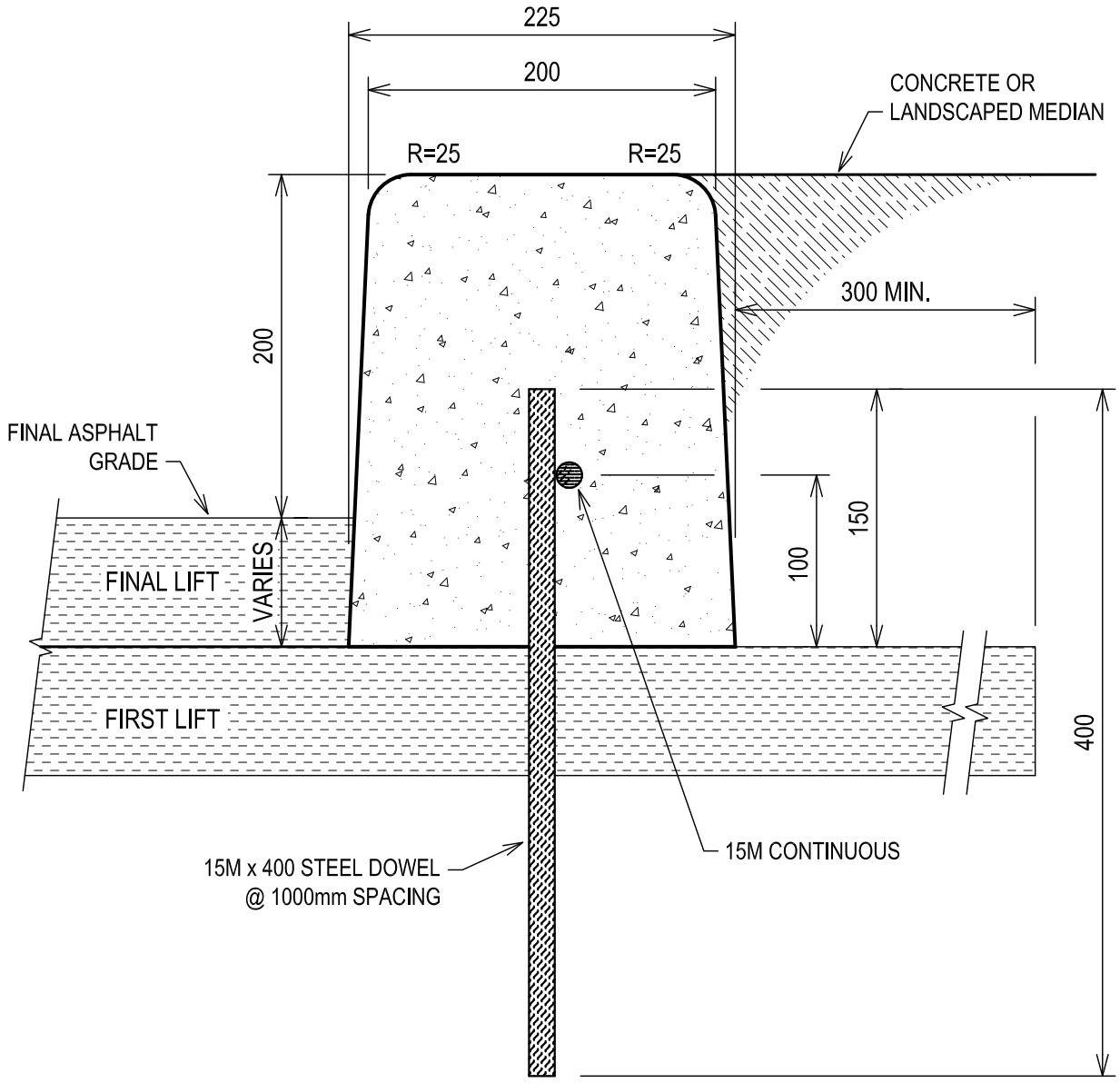
500mm REVERSED CURB AND GUTTER FOR ARTERIAL ROADWAYS

APPROVED BY:

ENGINEER

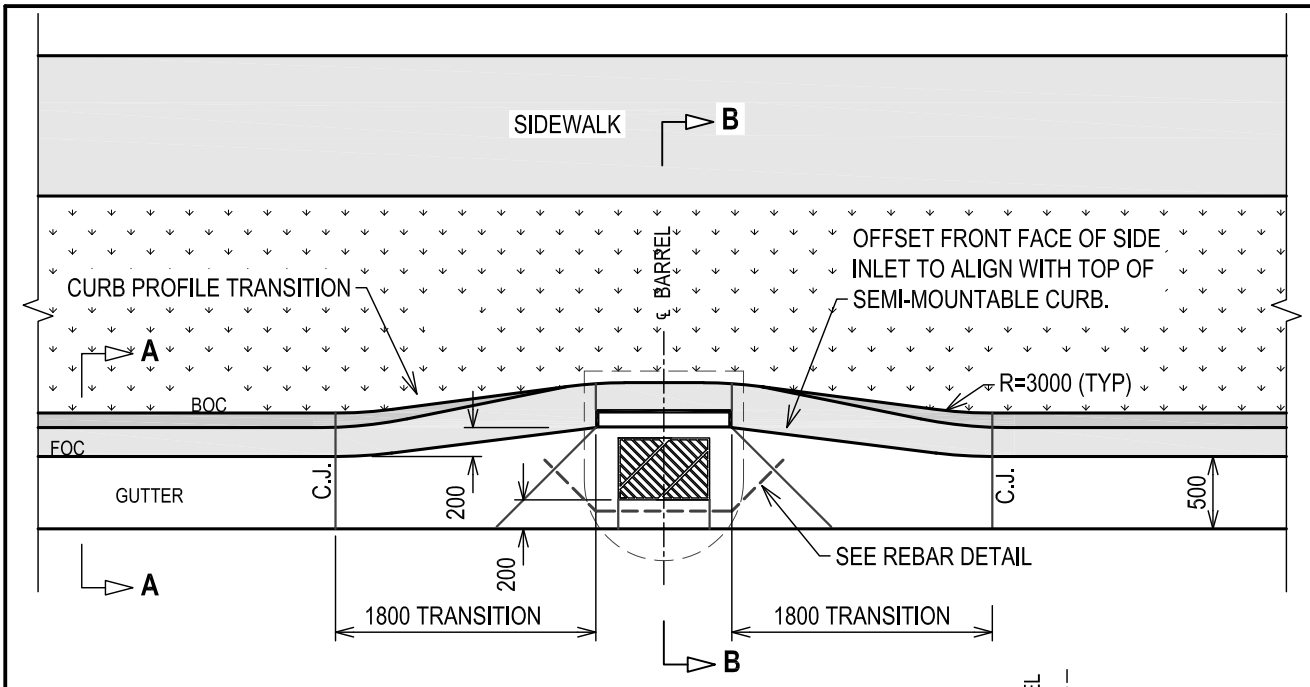
DRAWING NO.

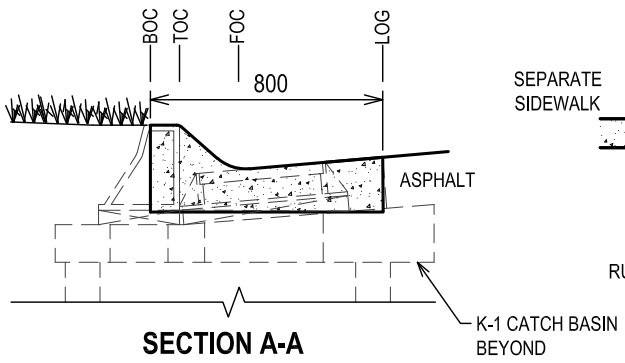
50 05 09



NOTE:
200mm MINIMUM CURB HEIGHT ABOVE FINAL PAVEMENT ELEVATION.

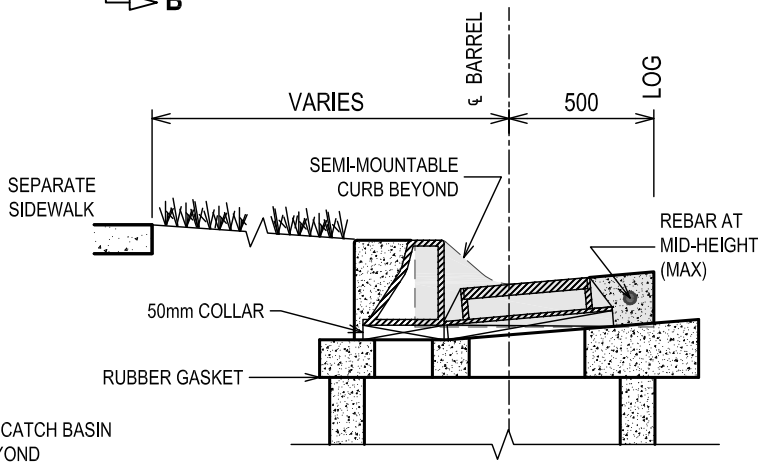
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	PINNED CONCRETE CURB	DRAWING NO. 50 05 10
			SCALE: N.T.S.		





SECTION A-A

SEMI-MOUNTABLE C&G
PER DWG. 50 05 08

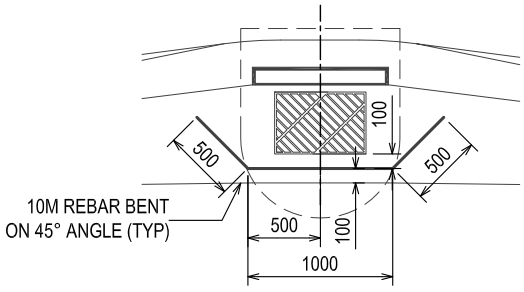


SECTION B-B

F-51 CATCH BASIN ALIGNMENT
RELATIVE TO LIP OF 500mm GUTTER

NOTES:

- F-51 FRAME WITH SIDE INLET AND "OPTION 1" GRATE ONLY.
- MINIMUM 50mm ADJUSTMENT COLLAR TO BE INSTALLED.
- FLEXIBLE RUBBER GASKET TO BE INSTALLED BETWEEN THE BARREL AND SLAB TOP.
- FRAME, COLLAR AND GASKET JOINTS TO BE CAULKED, ENSURING A WATER TIGHT SEAL.
- THIS DETAIL SHALL NOT BE USED WITH MONOLITHIC CURB, GUTTER AND SIDEWALK.
- C.J. = CONSTRUCTION JOINT

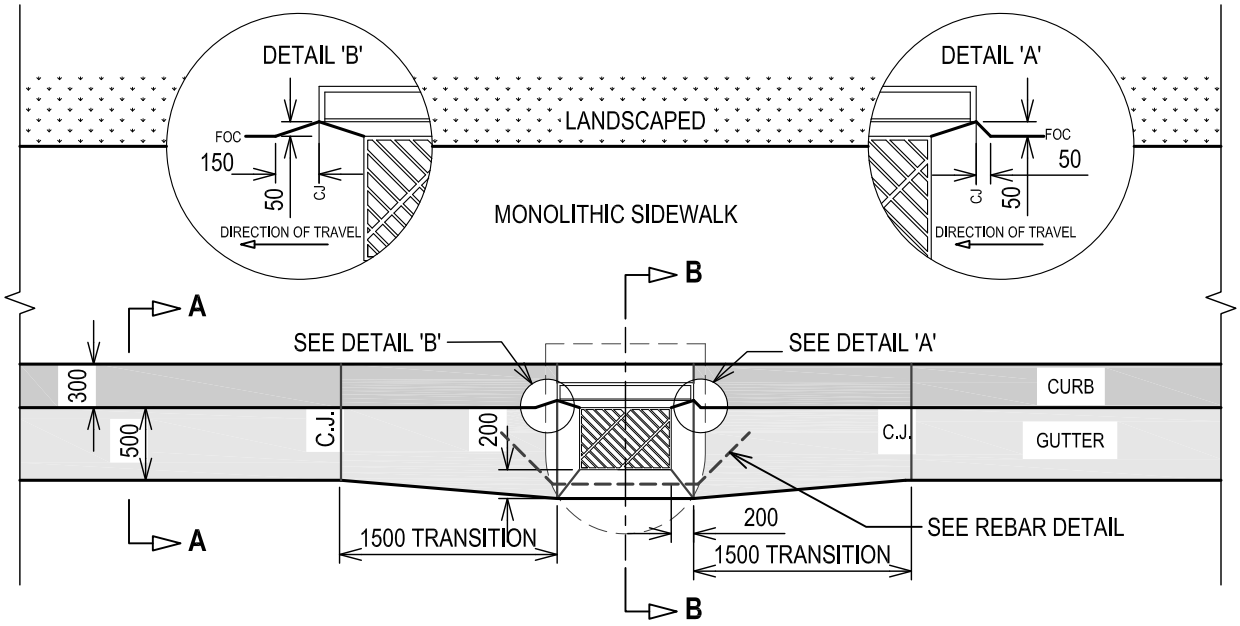


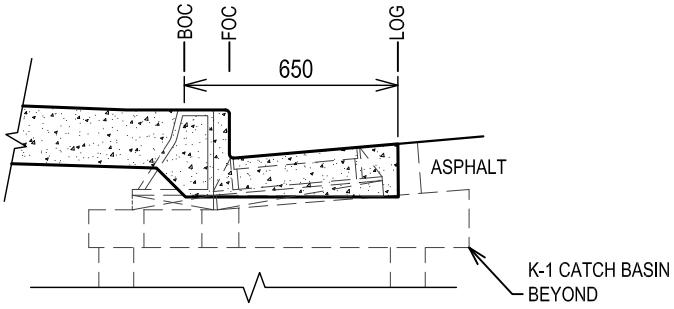
REBAR PLACEMENT

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

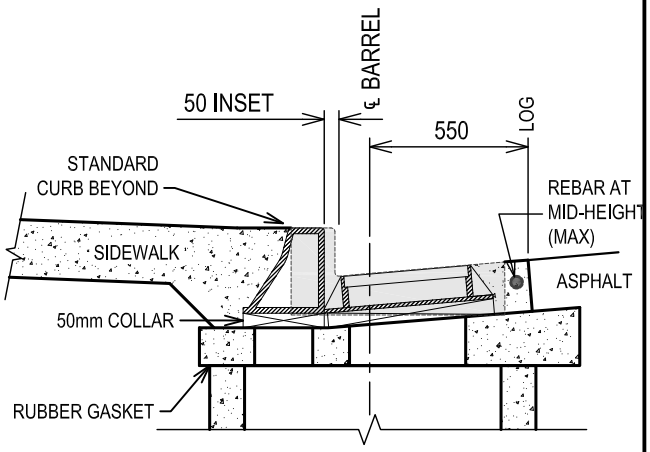
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**TYPE K-1 CATCH BASIN CURB TRANSITION FOR ARTERIAL ROADWAY**	
SCALE: N.T.S.		DRAWING NO. **50 05 11**





SECTION A-A

BARRIER C&G PER DWG. 50 05 08

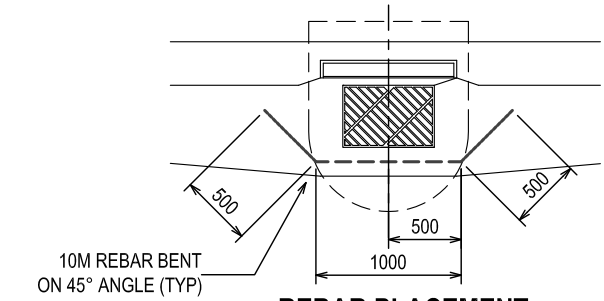


SECTION B-B

F-51 CATCH BASIN ALIGNMENT
RELATIVE TO LIP OF 500mm GUTTER

NOTES:

- F-51 FRAME WITH SIDE INLET AND "OPTION 1" GRATE ONLY.
- MINIMUM 50mm ADJUSTMENT COLLAR TO BE INSTALLED.
- A FLEXIBLE RUBBER GASKET TO BE INSTALLED BETWEEN THE BARREL AND SLAB TOP.
- FRAME, COLLAR AND GASKET JOINTS TO BE CAULKED, ENSURING A WATER TIGHT SEAL.
- THIS DETAIL SHALL NOT BE USED WITH ROLLED CURB, GUTTER AND SIDEWALK.
- C.J. = CONSTRUCTION JOINT

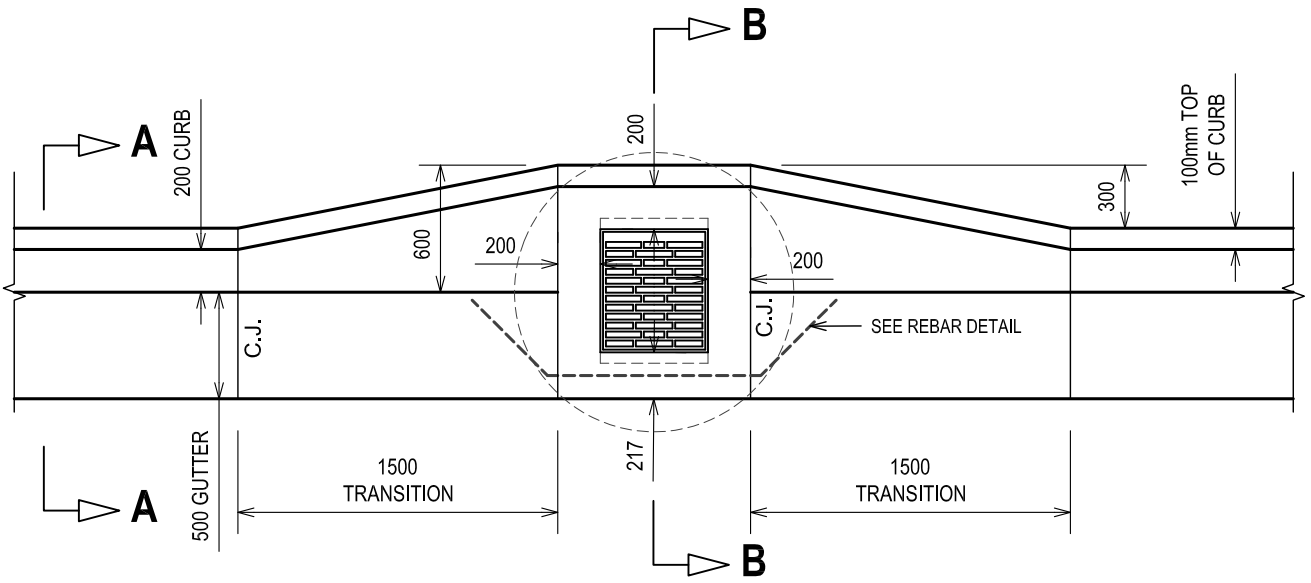


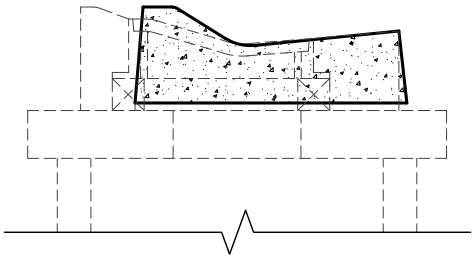
REBAR PLACEMENT

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

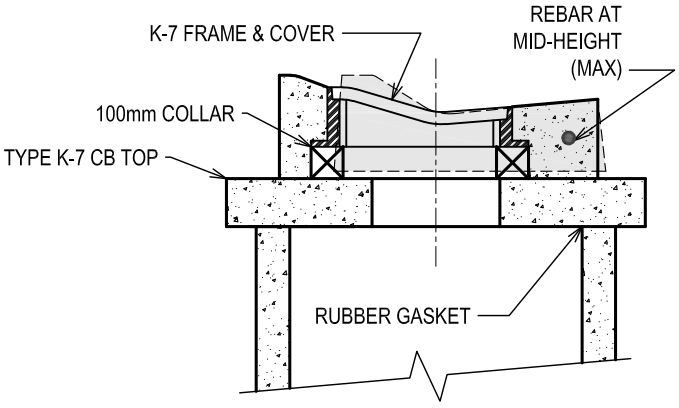
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**TYPE K-1 CATCH BASIN RECESSED SIDE INLET FOR ARTERIAL ROADWAY**	
SCALE: N.T.S.		DRAWING NO. **50 05 12**





SECTION A-A

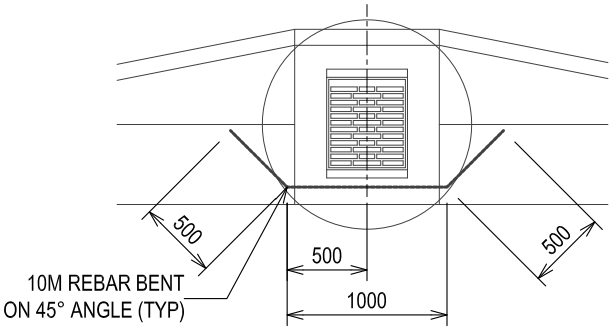
SEMI-MOUNTABLE C&G PER DWG. 50 05 08



SECTION B-B

NOTE:

- MINIMUM 100mm ADJUSTMENT COLLAR TO BE INSTALLED.
- FLEXIBLE RUBBER GASKET TO BE PLACED BETWEEN THE BARREL AND SLAB TOP.
- FRAME, COLLAR, AND GASKET JOINTS TO BE CAULKED, ENSURING A WATER TIGHT SEAL.
- GUTTER TO BE SHAPED TO ENSURE DRAINAGE AND SMOOTH CONCRETE SURFACE THROUGH-OUT THE TRANSITION AREA.
- LENGTH BETWEEN TRANSITION SECTIONS WILL DOUBLE TO ACCOMMODATE A DK-7 (DOUBLE GRATE).
- C.J. = CONSTRUCTION JOINT

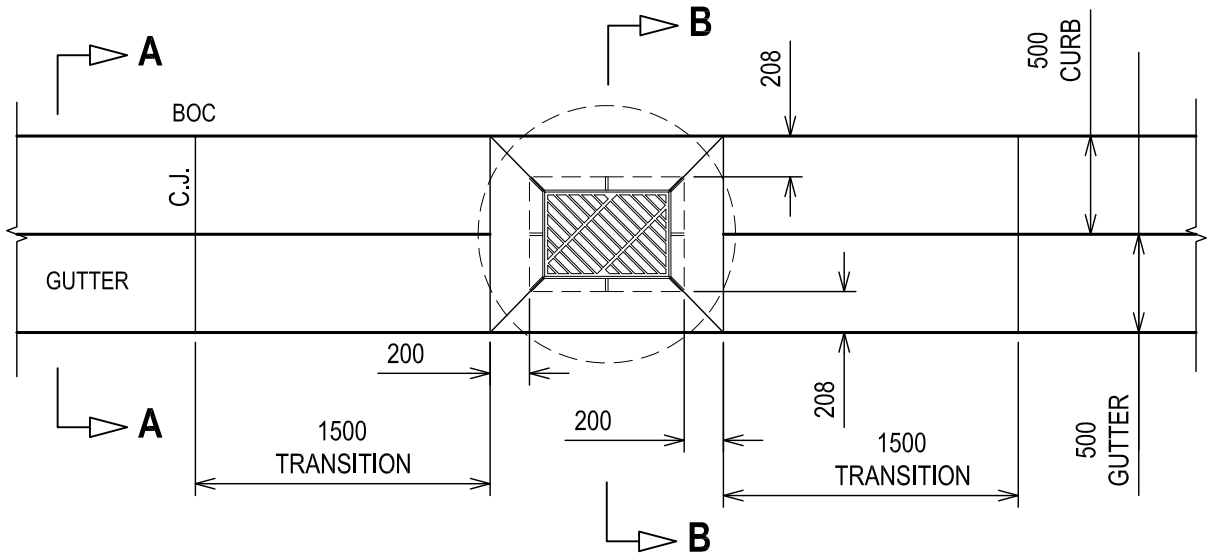


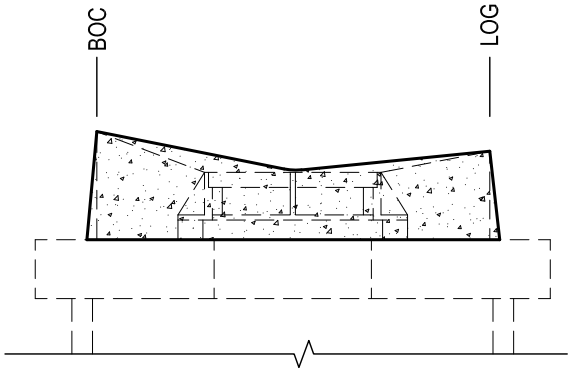
REBAR PLACEMENT

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

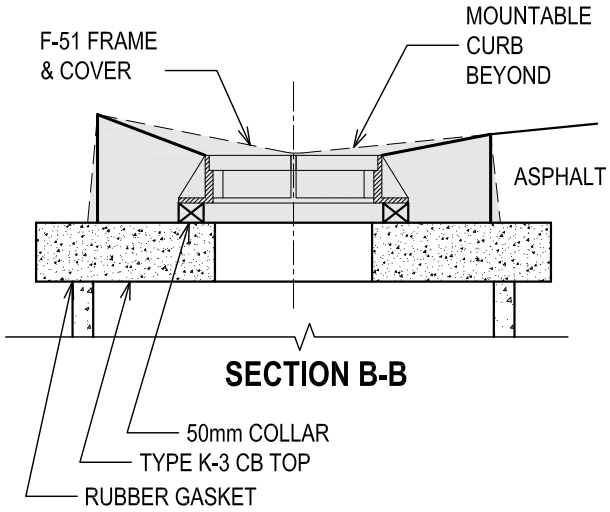
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**TYPE K-7 CATCH BASIN FOR SEMI-MOUNTABLE CURB**	DRAWING NO. **50 05 13**
SCALE: N.T.S.		





SECTION A-A

MOUNTABLE C&G PER DWG. 50 05 08



SECTION B-B

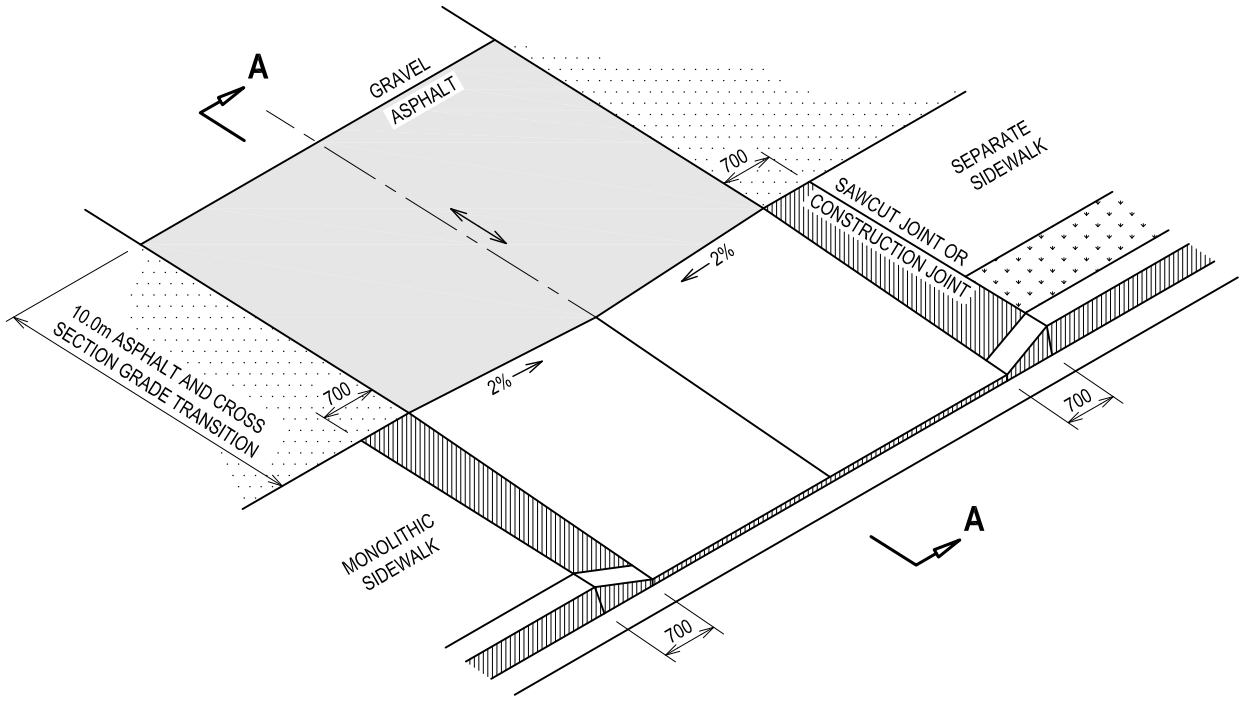
NOTES:

- F-51 FRAME WITH "OPTION 1" GRATE ONLY.
- MINIMUM 50mm ADJUSTMENT COLLAR TO BE INSTALLED.
- FLEXIBLE RUBBER GASKET TO BE INSTALLED BETWEEN THE BARREL AND SLAB TOP.
- FRAME, COLLAR AND GASKET JOINTS TO BE CAULKED, ENSURING A WATER TIGHT SEAL.
- C.J. = CONSTRUCTION JOINT

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**TYPE K-3 CATCH BASIN F-51 FRAME AND GRATE MOUNTABLE CURB AND GUTTER**	DRAWING NO. **50 05 14**
SCALE: N.T.S.		

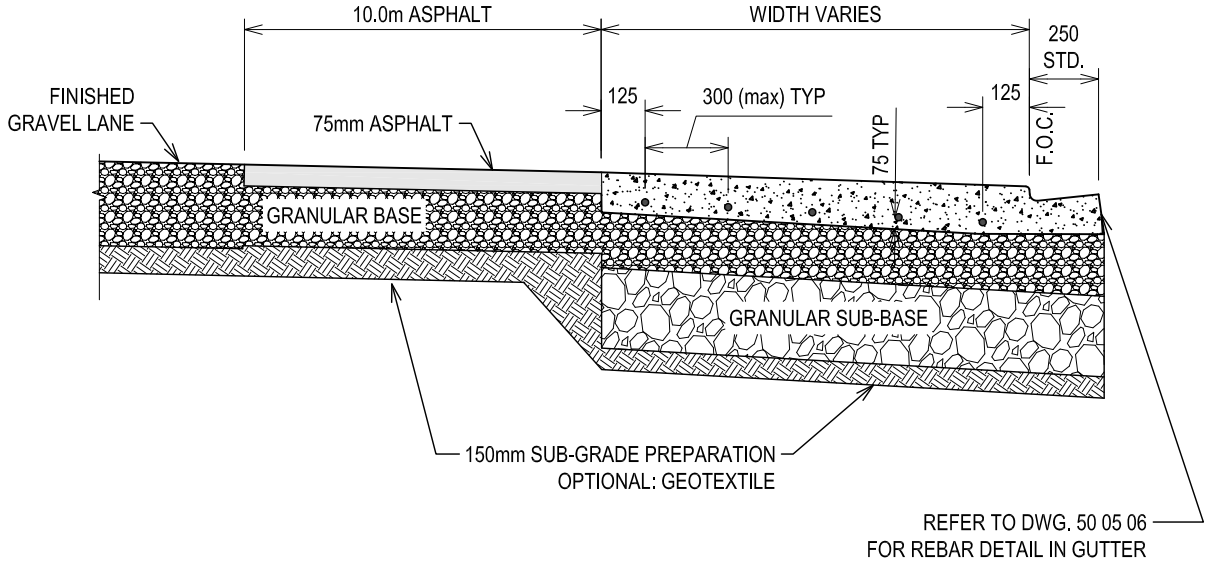


NOTE :

- ALL LANEWAY CROSSINGS TO BE REINFORCED.
- BASE MATERIAL DEPTHS UNDER CONCRETE PER ROAD DESIGN.
- BASE MATERIAL DEPTHS UNDER ASPHALT AND GRAVEL LANEWAY PER GUIDELINES UNLESS NOTED OTHERWISE.

NOTE :

- 32 MPa CONCRETE
- 15M REBAR THROUGHOUT
- 150mm CONCRETE

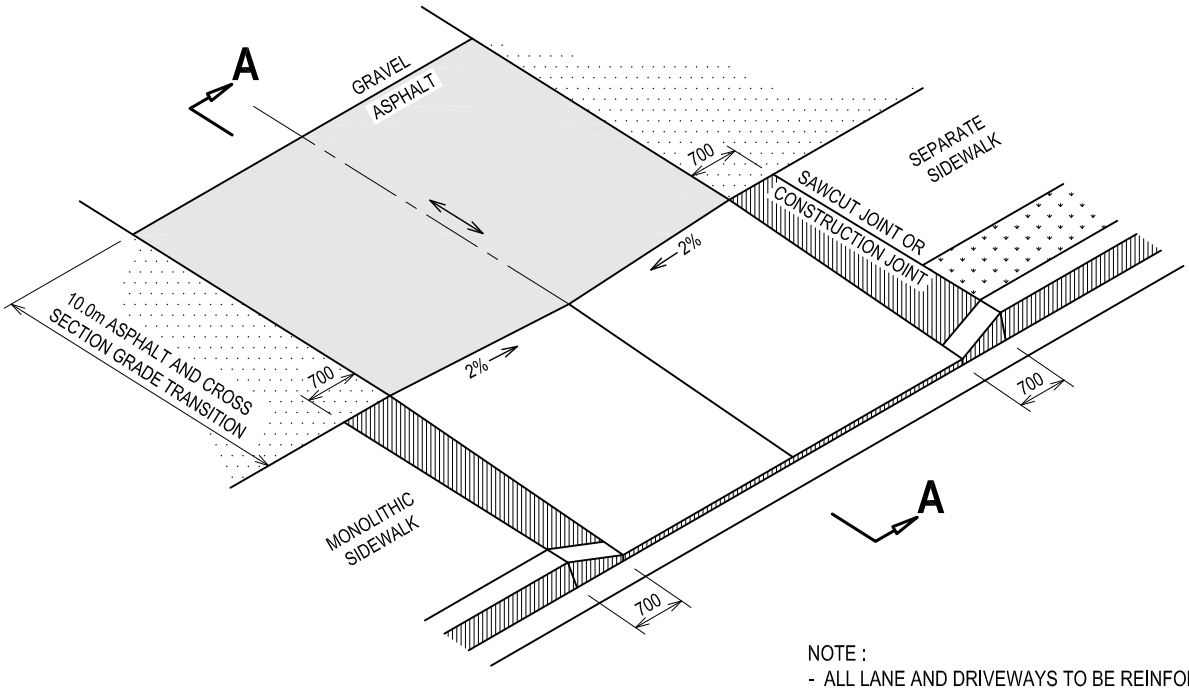


SECTION 'A - A'

NO.	DATE	REVISION

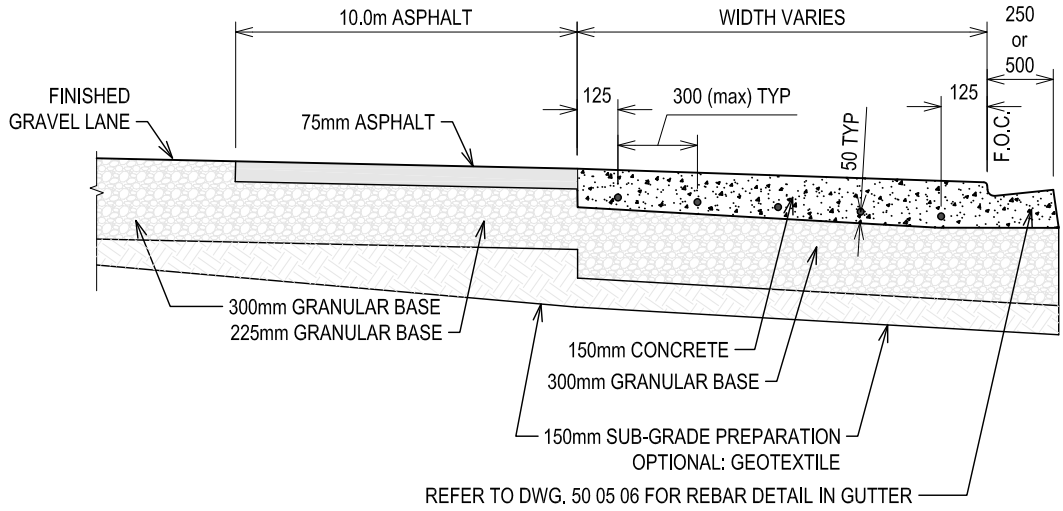
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**NEW CONSTRUCTION LANEWAY / SIDEWALK CROSSING**	
SCALE: N.T.S.		DRAWING NO. **50 05 15**



NOTE :
- ALL LANE AND DRIVEWAYS TO BE REINFORCED.

- 32 MPa CONCRETE
- 15M REBAR THROUGHOUT

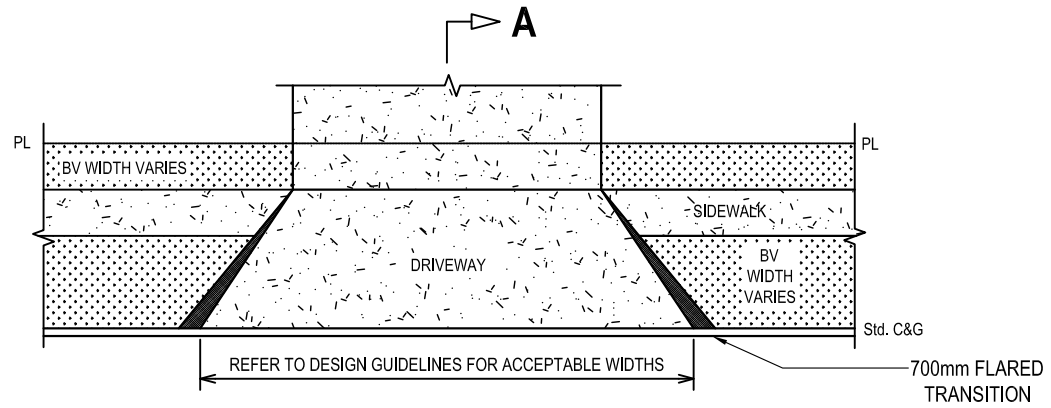


SECTION 'A - A'

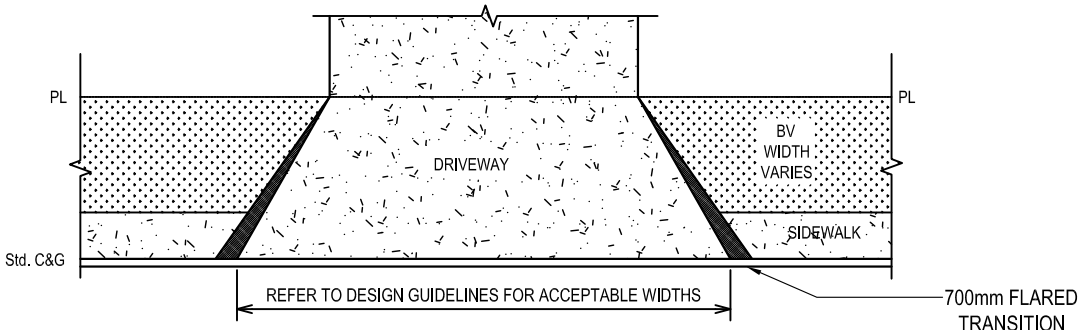
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

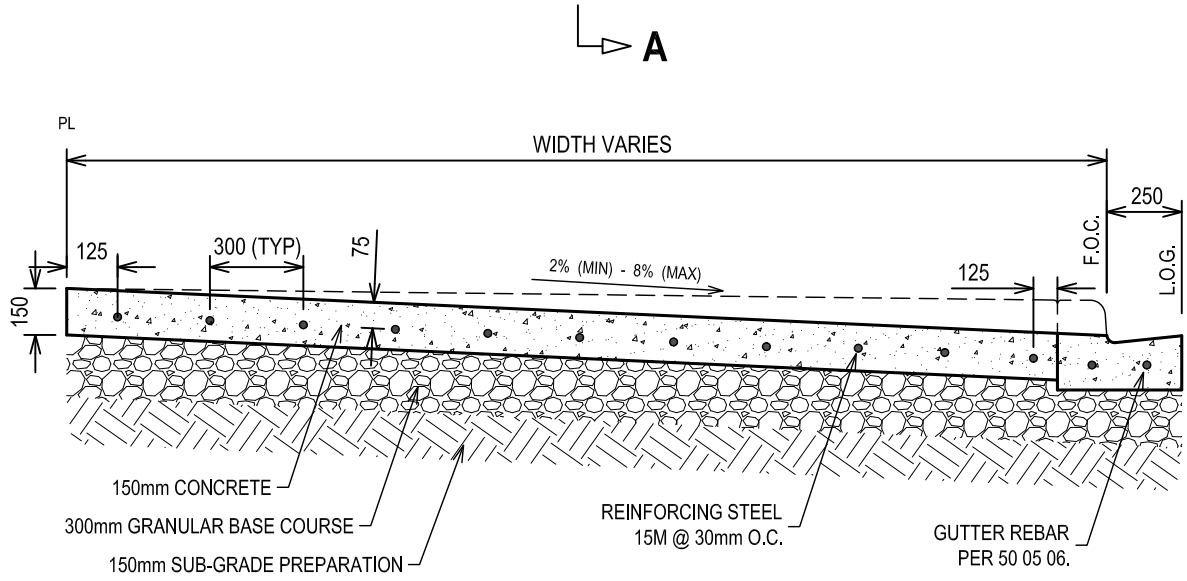
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY:
DATE: 2018-02-15	**RECONSTRUCTION OF LANEWAY / SIDEWALK CROSSING**	ENGINEER
SCALE: N.T.S.		DRAWING NO. **50 05 16**



COMMERCIAL / INDUSTRIAL with SEPARATE SIDEWALK



COMMERCIAL / INDUSTRIAL with MONOLITHIC SIDEWALK

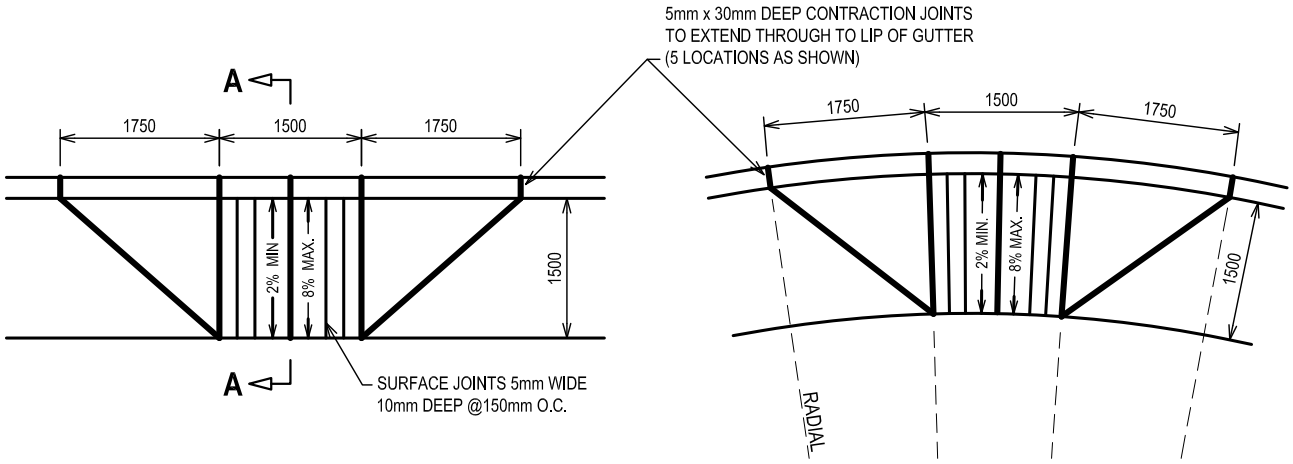


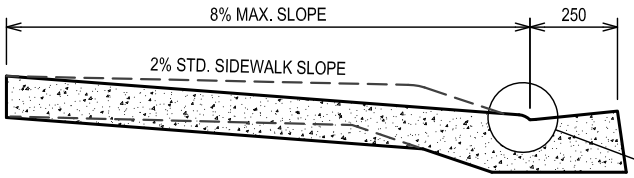
SECTION 'A - A'

NO.	DATE	REVISION

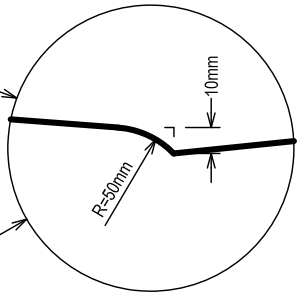
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**COMMERCIAL LANEWAY CROSSING**	
SCALE: N.T.S.		DRAWING NO. **50 05 17**

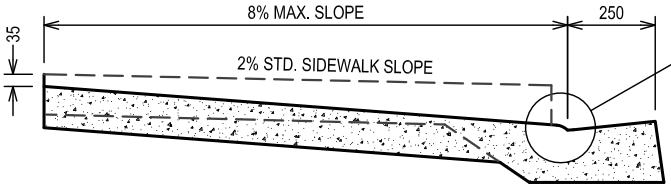




SECTION 'A - A'
ROLLED MONOLITHIC SIDEWALK

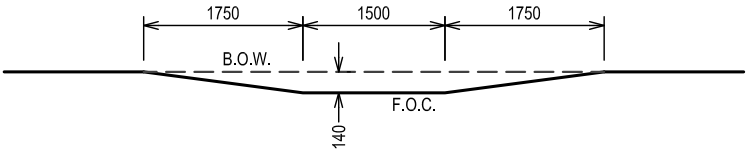


DETAIL



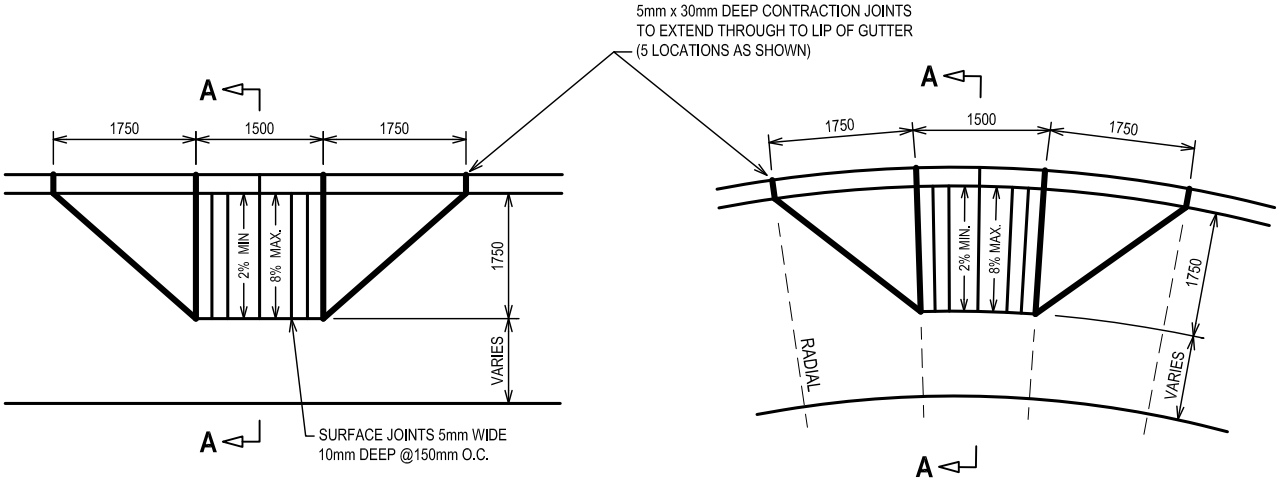
SECTION 'A - A'
STANDARD MONOLITHIC SIDEWALK

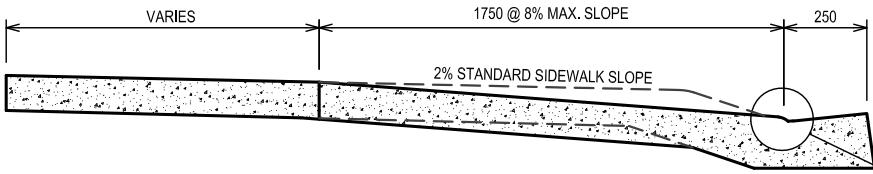
NOTE :
- 32 MPa CONCRETE
- REFER TO DRAWING 50 05 01 OR 50 05 02 FOR BASE INFORMATION



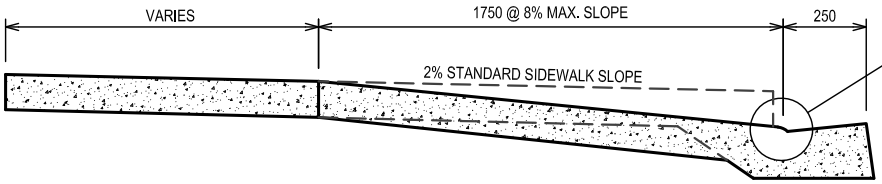
BACK OF WALK PROFILE
STANDARD MONOLITHIC SIDEWALK

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	CURB RAMP FOR MONOLITHIC SIDEWALK 1.5 m WIDTH OR LESS	DRAWING NO. 50 05 18
			SCALE: N.T.S.		

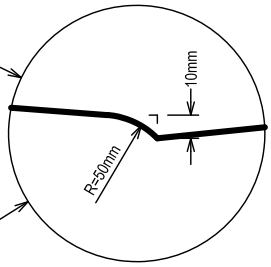




SECTION 'A - A'
ROLLED MONOLITHIC SIDEWALK

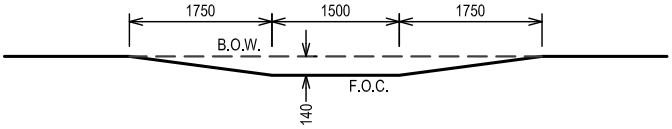


SECTION 'A - A'
STANDARD MONOLITHIC SIDEWALK



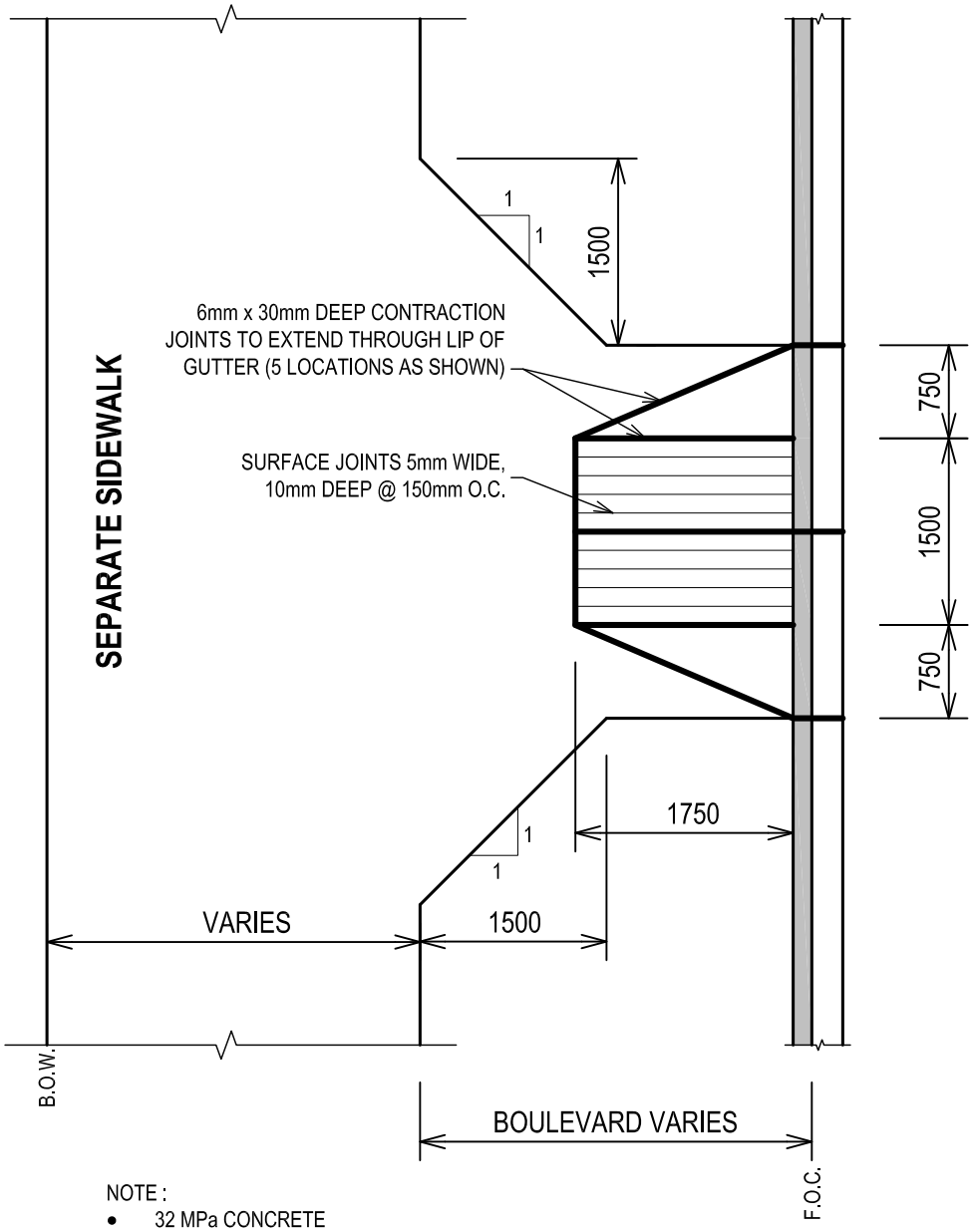
DETAIL

NOTE :
- 32 MPa CONCRETE
- REFER TO DRAWING 50 05 01 OR 50 05 02 FOR BASE INFORMATION



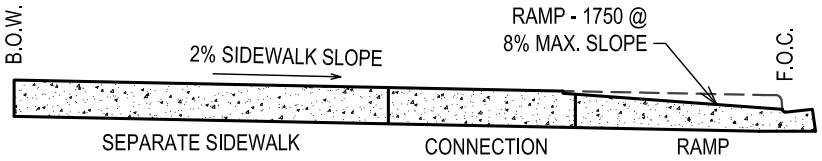
BACK OF WALK PROFILE
STANDARD MONOLITHIC SIDEWALK

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	CURB RAMP FOR MONOLITHIC SIDEWALK GREATER THAN 1.75 m	DRAWING NO. 50 05 19
			SCALE: N.T.S.		

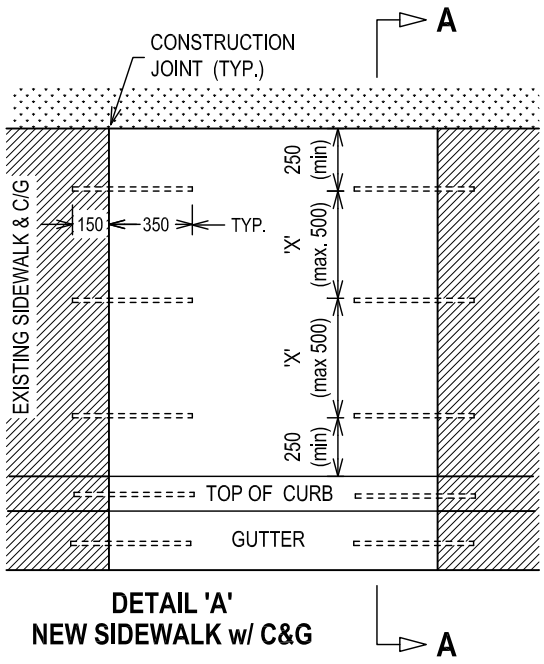


NOTE :

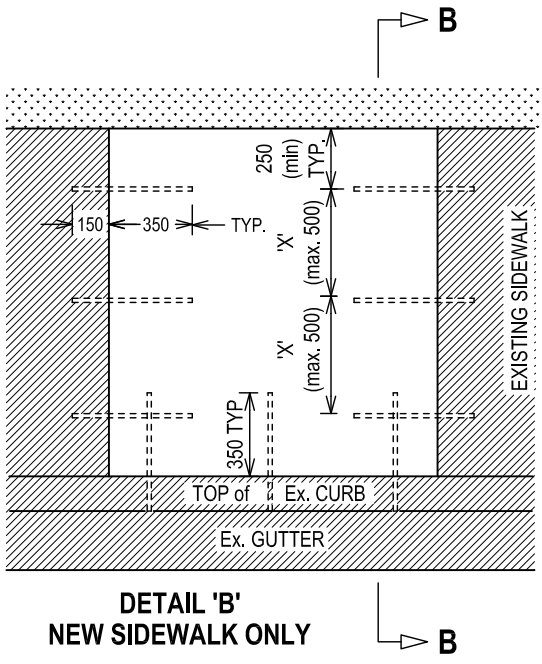
- 32 MPa CONCRETE
- REFER TO DRAWING 50 05 01 OR 50 05 02 FOR BASE INFORMATION
- IF BOULEVARD WIDTH LESS THAN 1.5m TAPER SHALL BE REDUCED TO MATCH BOULEVARD WIDTH.



NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	CURB RAMP FOR SEPARATE SIDEWALK	
			SCALE: N.T.S.		DRAWING NO. 50 05 20

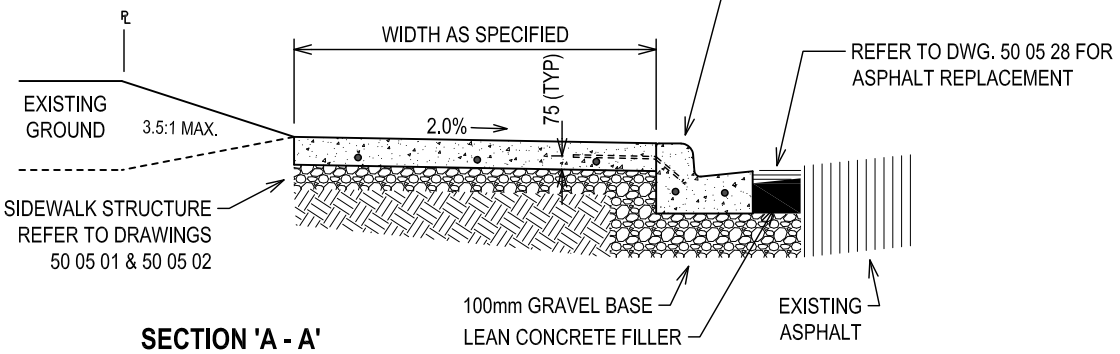


DETAIL 'A'
NEW SIDEWALK w/ C&G

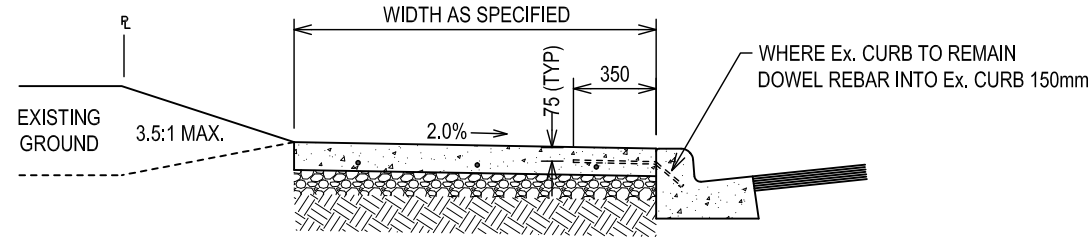


DETAIL 'B'
NEW SIDEWALK ONLY

NOTE :
- ALL REBAR TO BE 10M
- MINIMUM 50mm CONCRETE COVER



SECTION 'A - A'

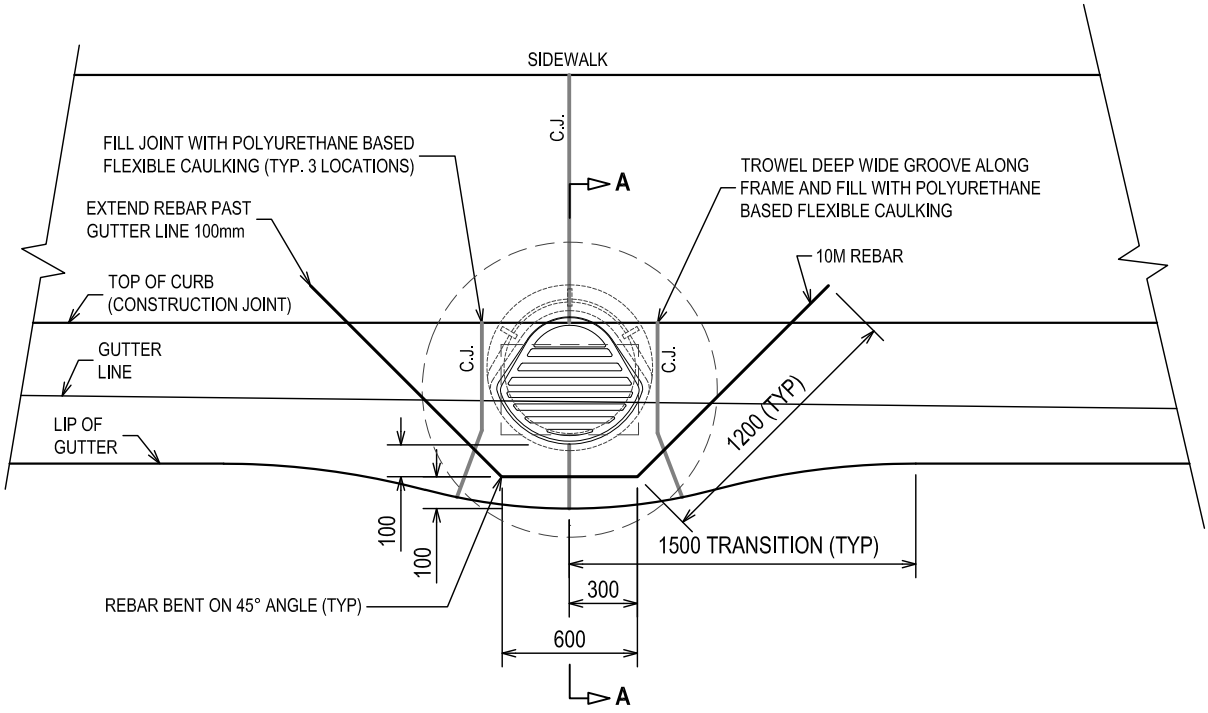


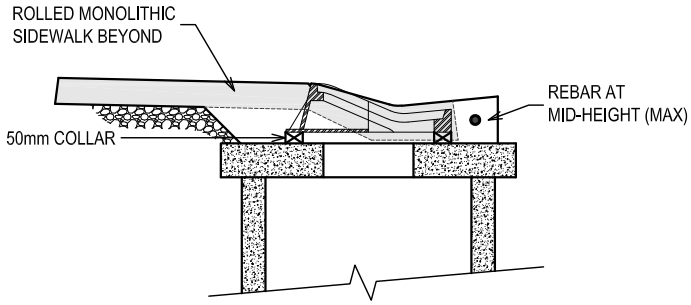
SECTION 'B - B'

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**CONCRETE DOWELING DETAIL FOR SIDEWALK OR CURB & GUTTER REPLACEMENT**	
SCALE: N.T.S.		DRAWING NO. **50 05 21**





SECTION A-A

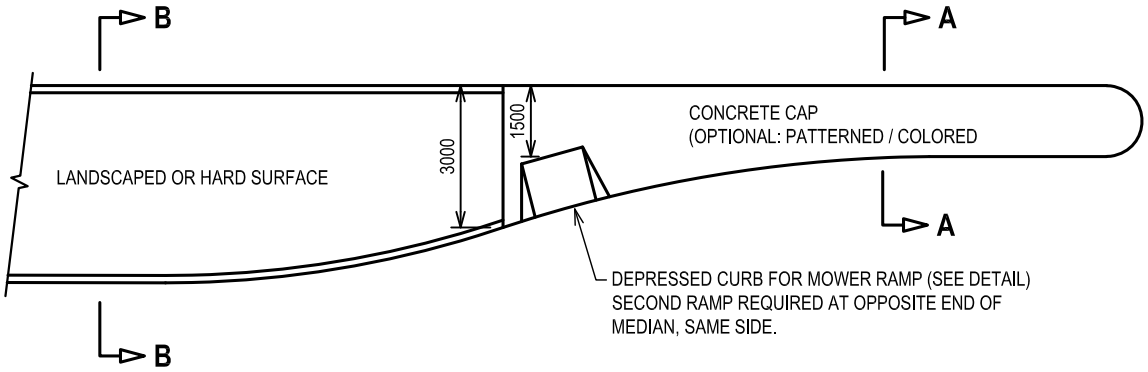
NOTE:

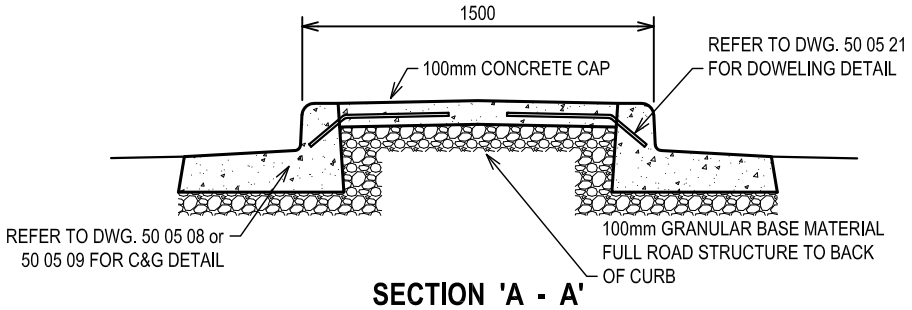
- DURING REPLACEMENT REMOVE AND REPLACE BRICKS OR MISC. ITEMS USED FOR RISER ADJUSTMENT AND REPLACE WITH PROPER ADJUSTMENT COLLARS. A MINIMUM OF ONE 50mm ADJUSTMENT COLLAR TO BE INSTALLED, IF POSSIBLE.
- FRAME AND COLLAR(S) JOINTS TO BE CAULKED, ENSURING A WATER TIGHT SEAL.
- GUTTER TO BE SHAPED TO ENSURE DRAINAGE AND SMOOTH CONCRETE SURFACE THROUGH-OUT THE TRANSITION AREA.
- C.J. = CONSTRUCTION JOINT

NO.	DATE	REVISION

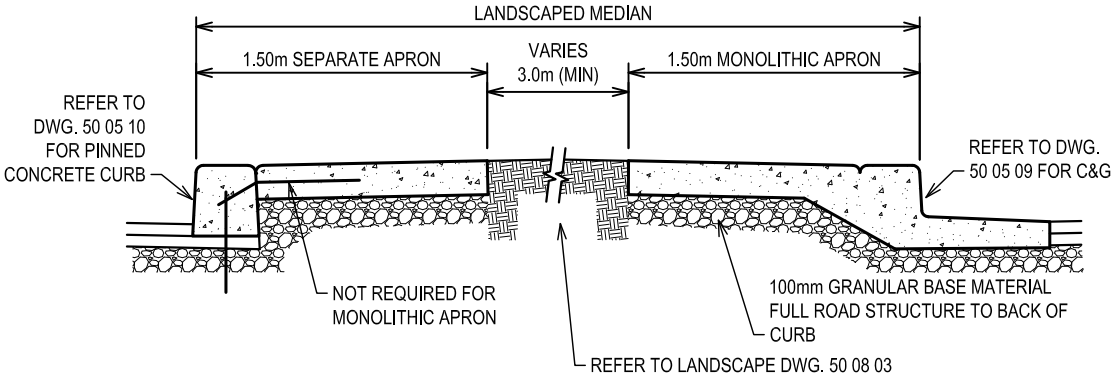
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**GUTTER REINFORCEMENT FOR CONCRETE REPAIR AT F-33 CATCHBASIN**	DRAWING NO. **50 05 22**
SCALE: N.T.S.		

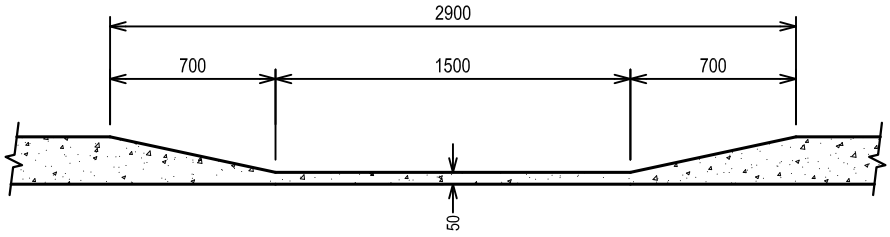




SECTION 'A - A'

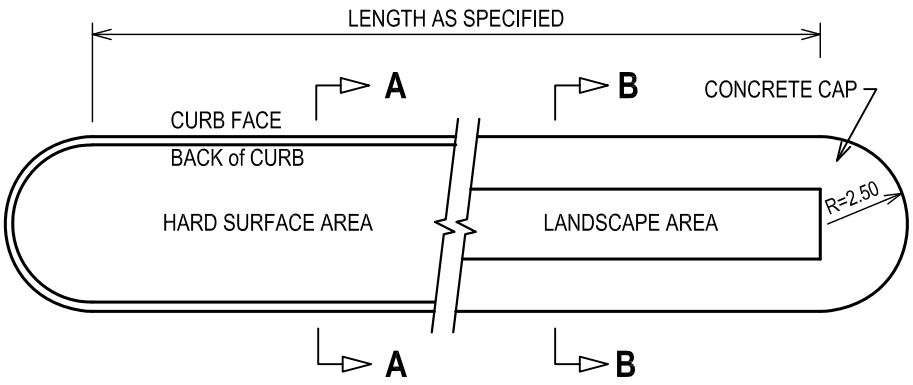


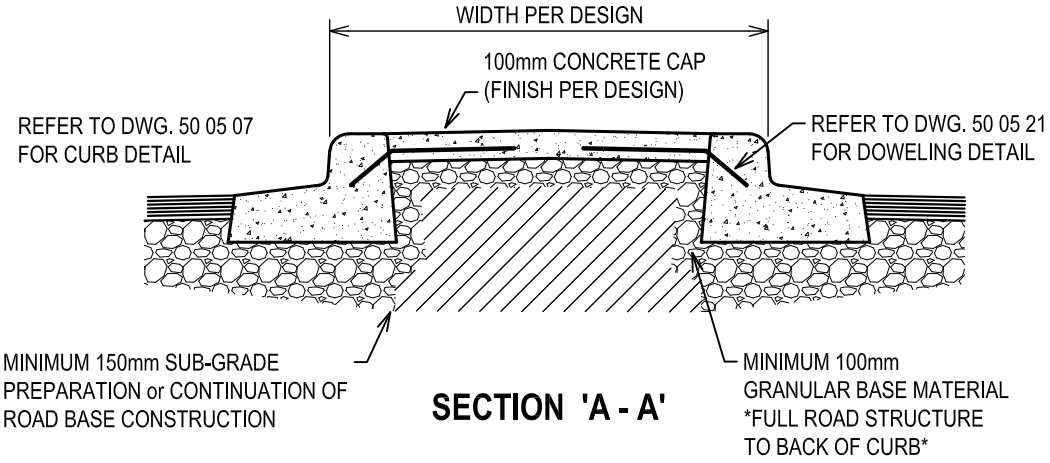
SECTION 'B - B'



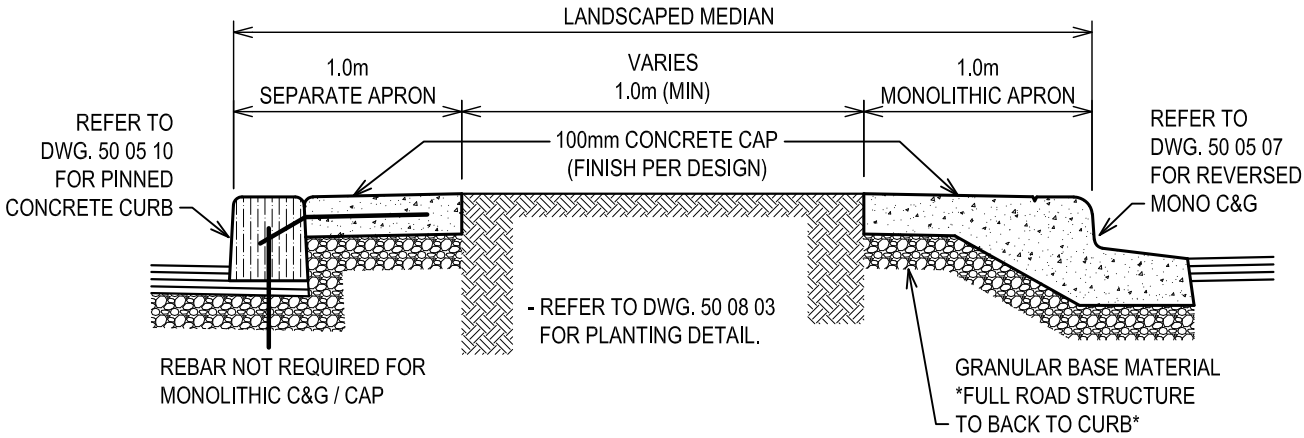
DEPRESSED CURB - MOWER RAMP DETAIL

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	ARTERIAL ROADWAY MEDIANS	DRAWING NO. 50 05 24
			SCALE: N.T.S.		



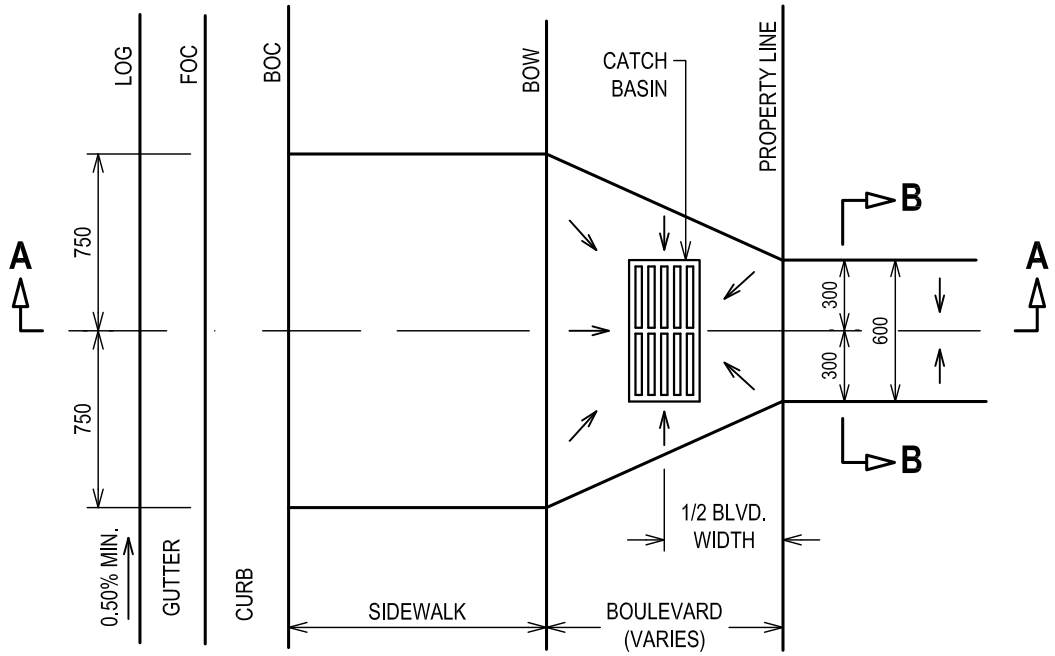


SECTION 'A - A'

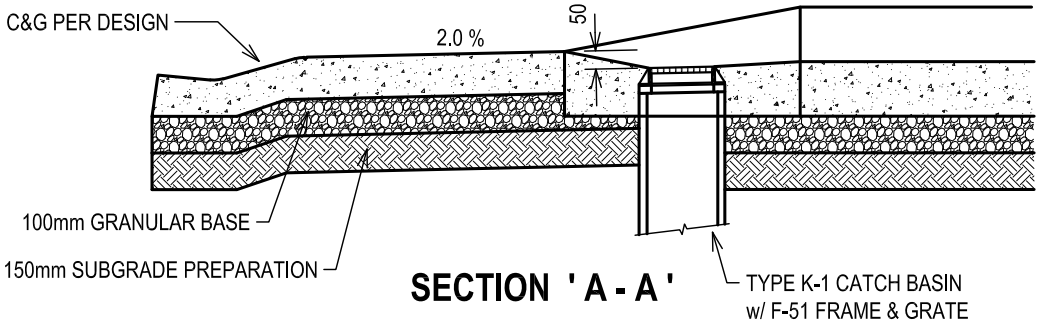


SECTION 'B - B'

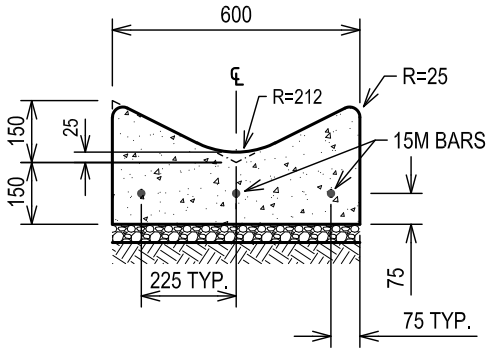
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY:
			DATE: 2018-02-15	COLLECTOR AND LOCAL ROADWAY MEDIANS	ENGINEER
			SCALE: N.T.S.		DRAWING NO. 50 05 25



PLAN VIEW

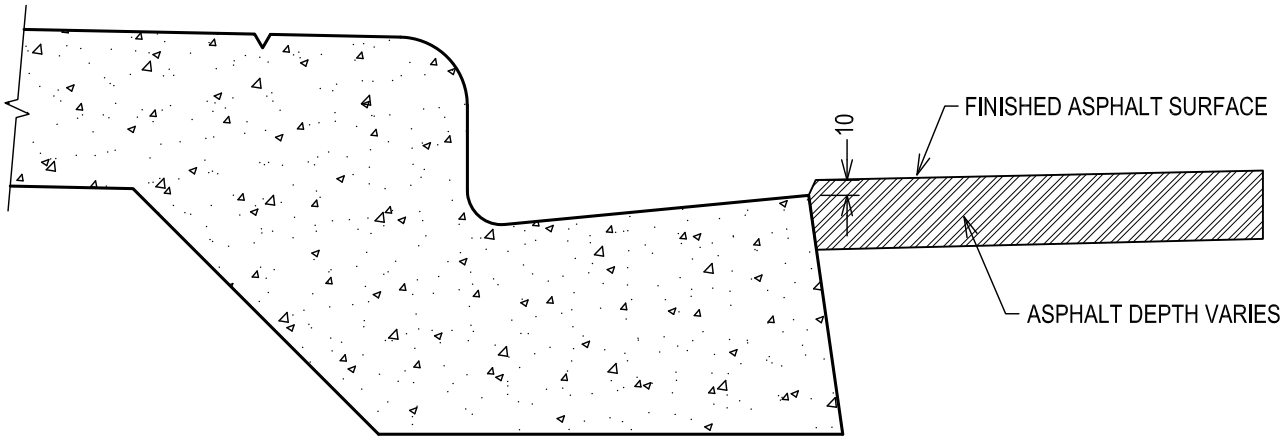


SECTION ' A - A '



SECTION ' B - B '

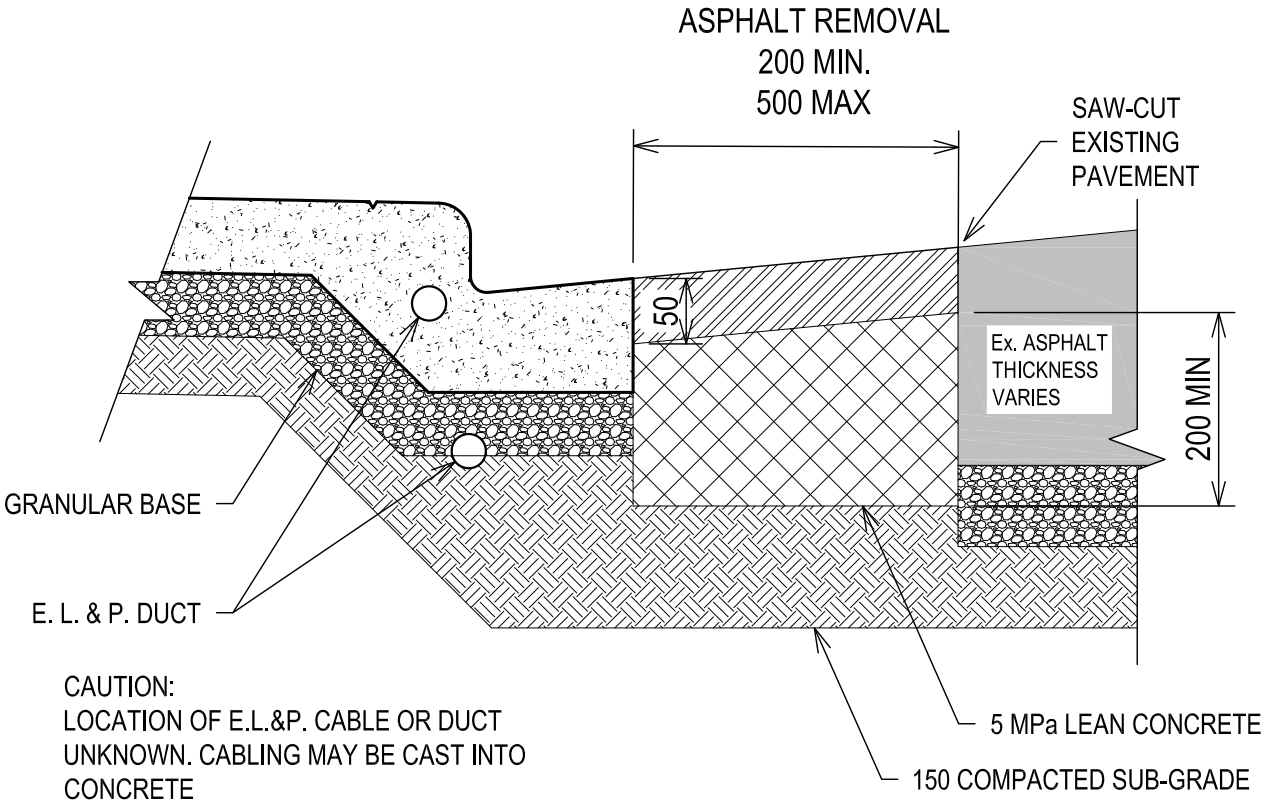
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	BOULEVARD CATCH BASIN FOR DRAINAGE SWALE	DRAWING NO. 50 05 26
			SCALE: N.T.S.		



NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**TYPICAL ASPHALT / CURB AND GUTTER FINISH TOLERANCE**	DRAWING NO. **50 05 27**
SCALE: N.T.S.		



NOTE:

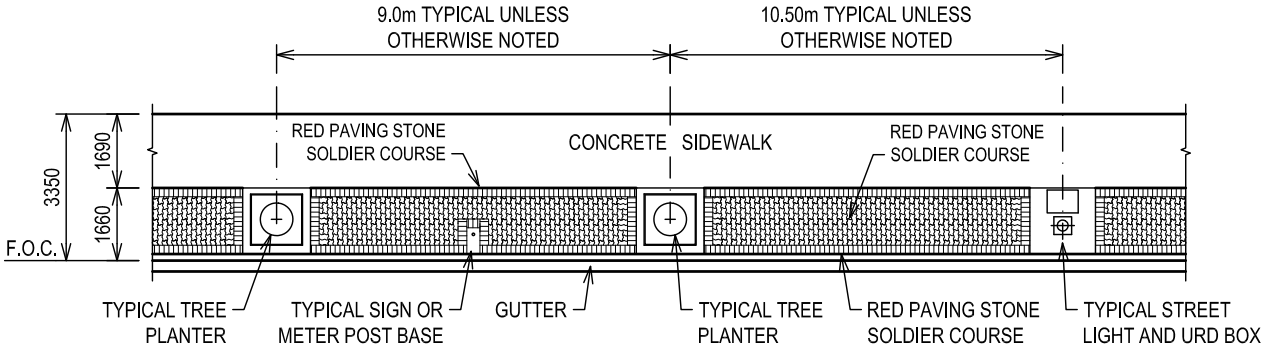
- SAW-CUT ALL MATCH LOCATIONS
- REMOVE ASPHALT, BASE COURSE AND RE-COMPACT SUB-GRADE
- AFTER NEW CONCRETE GUTTER HAS SET BACKFILL AREA BETWEEN LIP OF GUTTER AND EDGE OF ASPHALT WITH A LEAN CONCRETE SLURRY MIX.
- PLACE SLURRY MIX TO WITHIN 50mm BELOW THE LIP OF GUTTER.
- CAP SLURRY MIX WITH 50mm ASPHALT PATCH.
- REFER TO SPECIFICATION 32 13 14 FOR FURTHER DETAIL.

NO.	DATE	REVISION

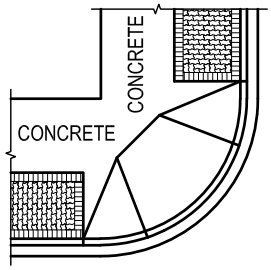
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS CONCRETE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**PAVEMENT REMOVAL and REPLACEMENT ADJACENT TO A CURB**	
SCALE: N.T.S.		DRAWING NO. **50 05 28**

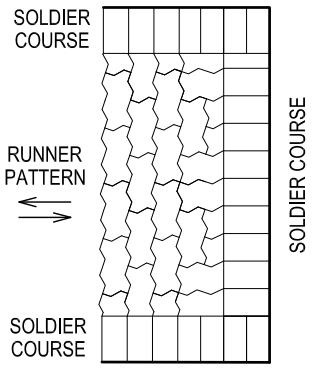
DISTANCES MAY VARY DUE TO SURFACE FEATURES OR UNDERGROUND SERVICES
TYPICAL STREETLIGHT SPACING IS 3.0m



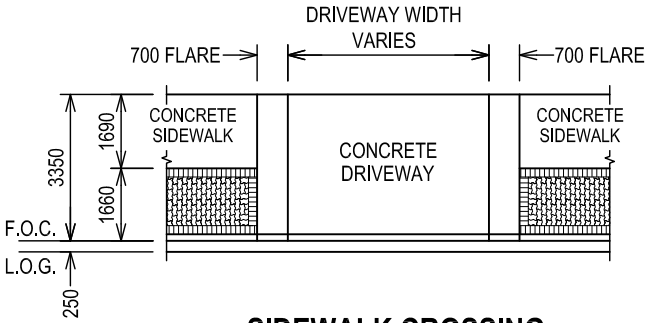
PAVING STONE SIDEWALK LAYOUT



COMMERCIAL CURB RAMP



RUNNER PATTERN DETAIL

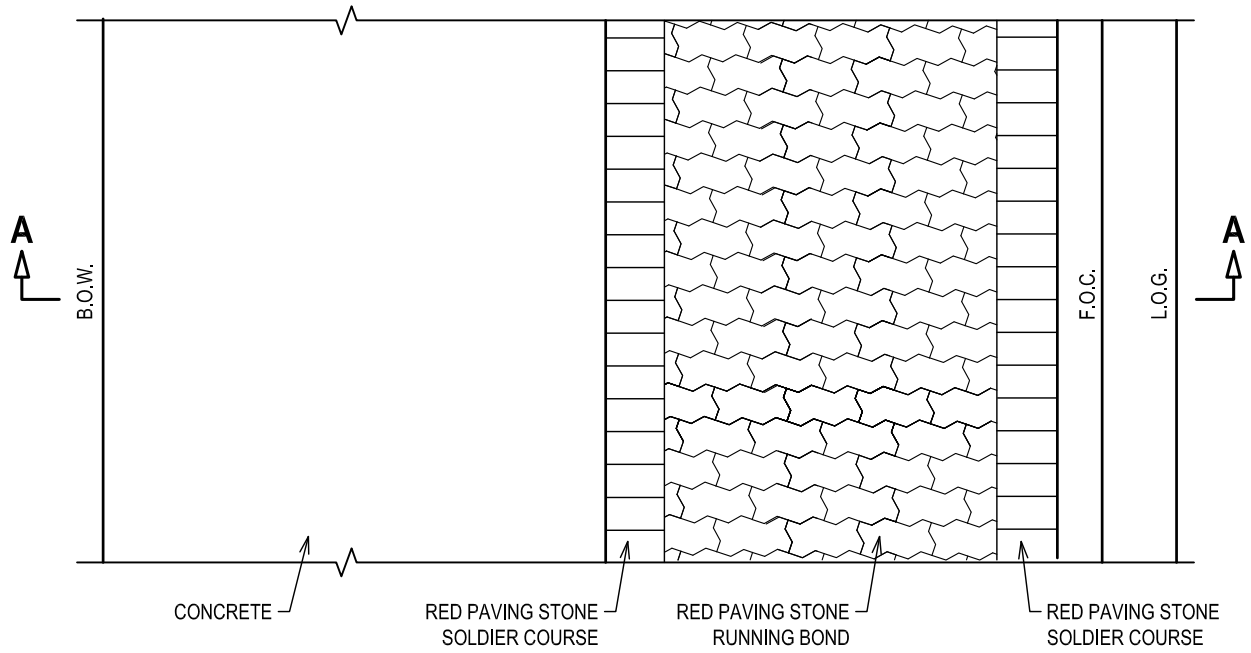


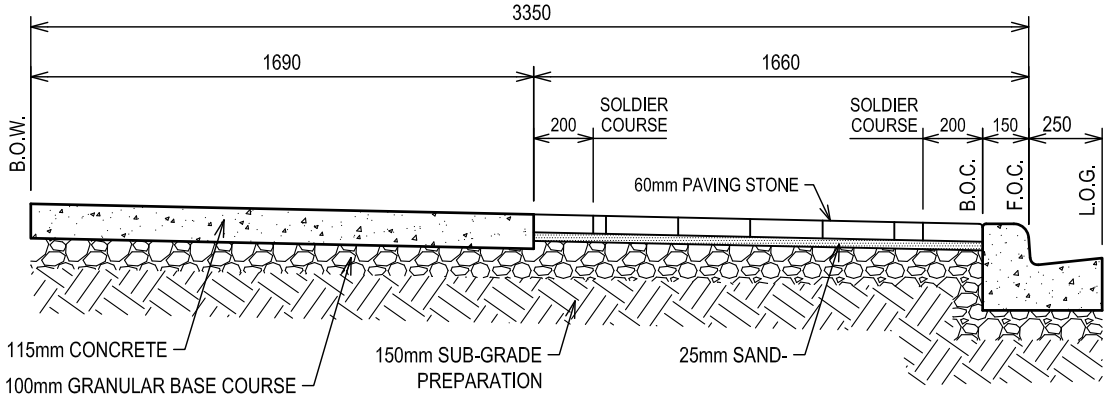
SIDEWALK CROSSING

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

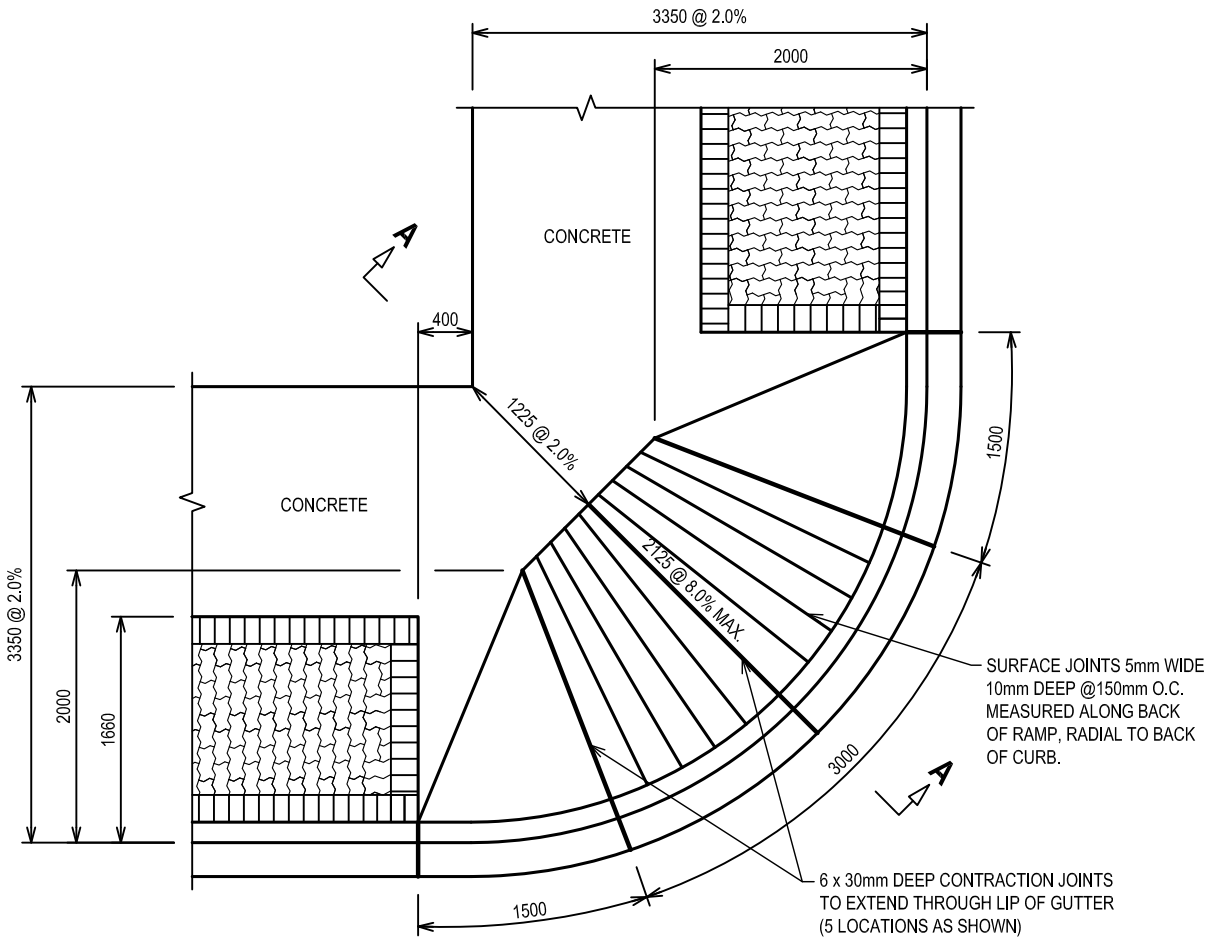
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**3.35m PAVING STONE CONCRETE SIDEWALK DETAIL**	DRAWING NO. **50 06 01**
SCALE: N.T.S.		

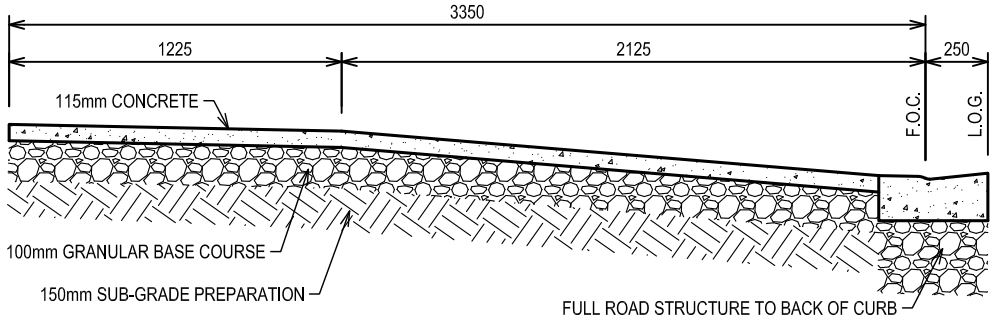




SECTION 'A - A'

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK	APPROVED BY: ENGINEER
			DATE: 2015-02-15	3.35m INTERLOCKING PAVING STONE / CONCRETE SIDEWALK CROSS SECTION	DRAWING NO. 50 06 02
			SCALE: N.T.S.		



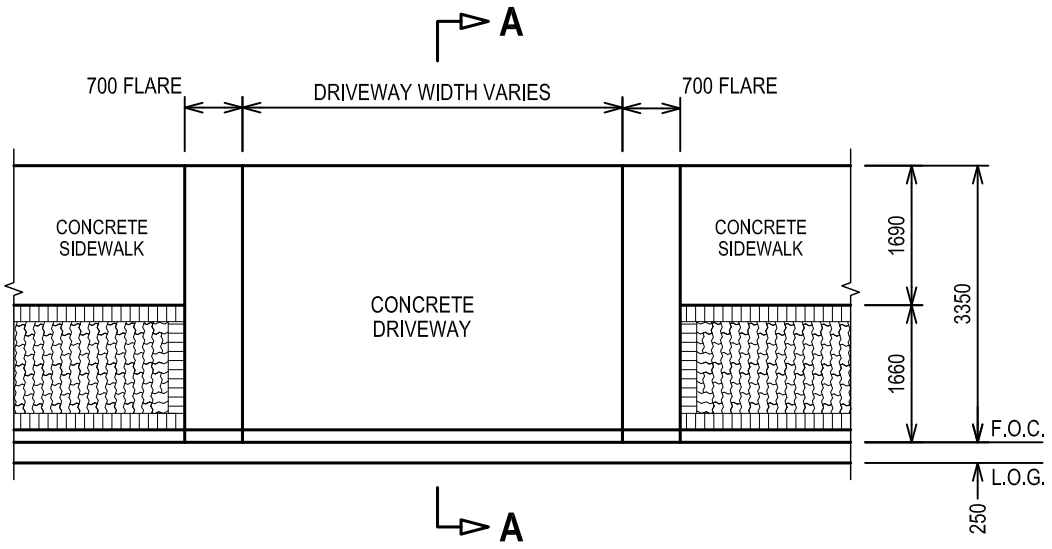


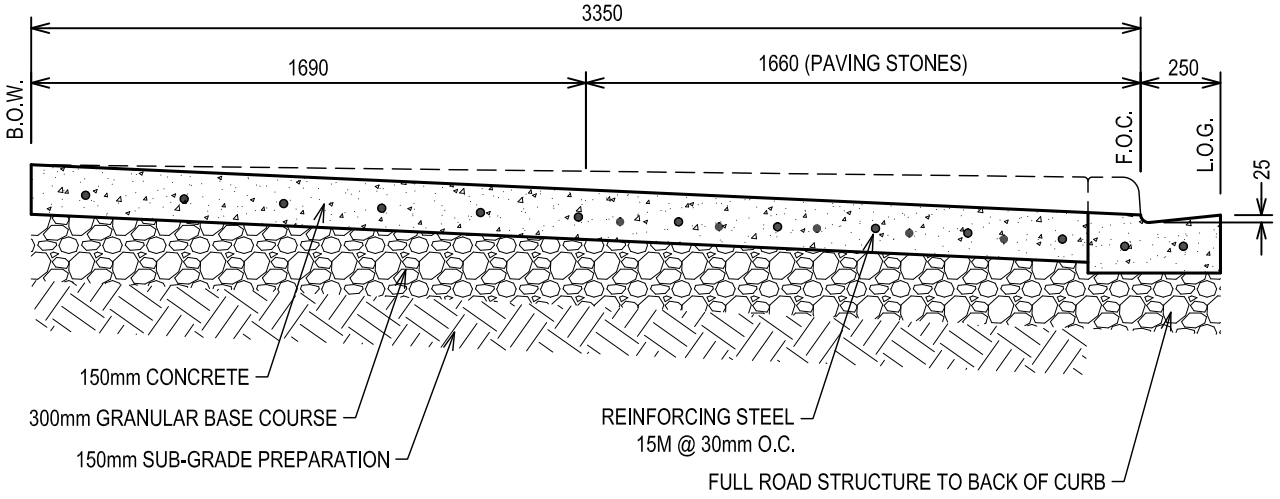
SECTION 'A - A'

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-15	**CURB RAMP**	
SCALE: N.T.S.		DRAWING NO. **50 06 03**





SECTION 'A - A'

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-15

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
INTERLOCKING PAVING STONE WORK

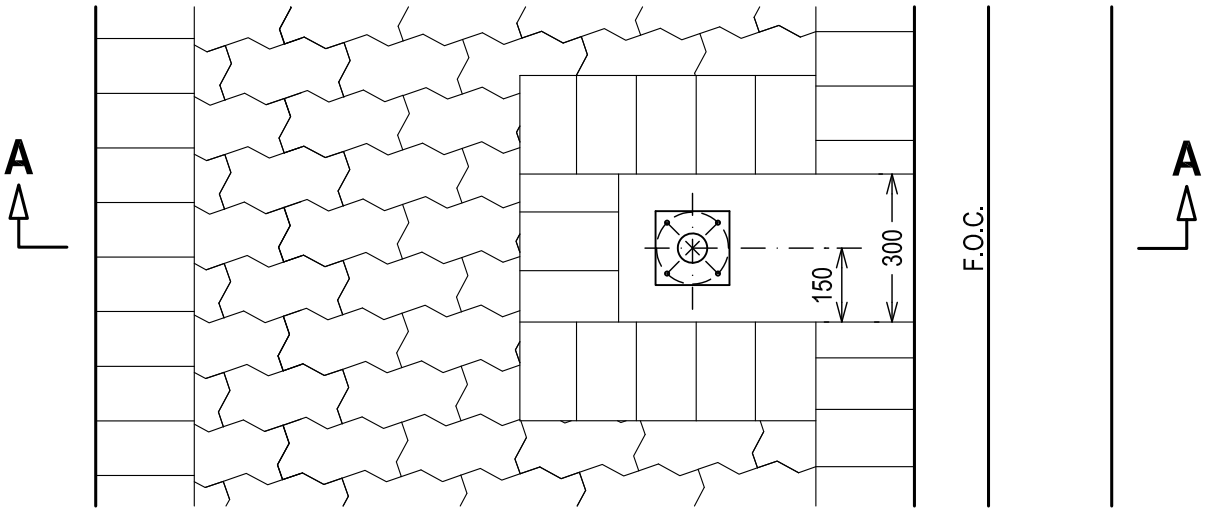
LANE CROSSING

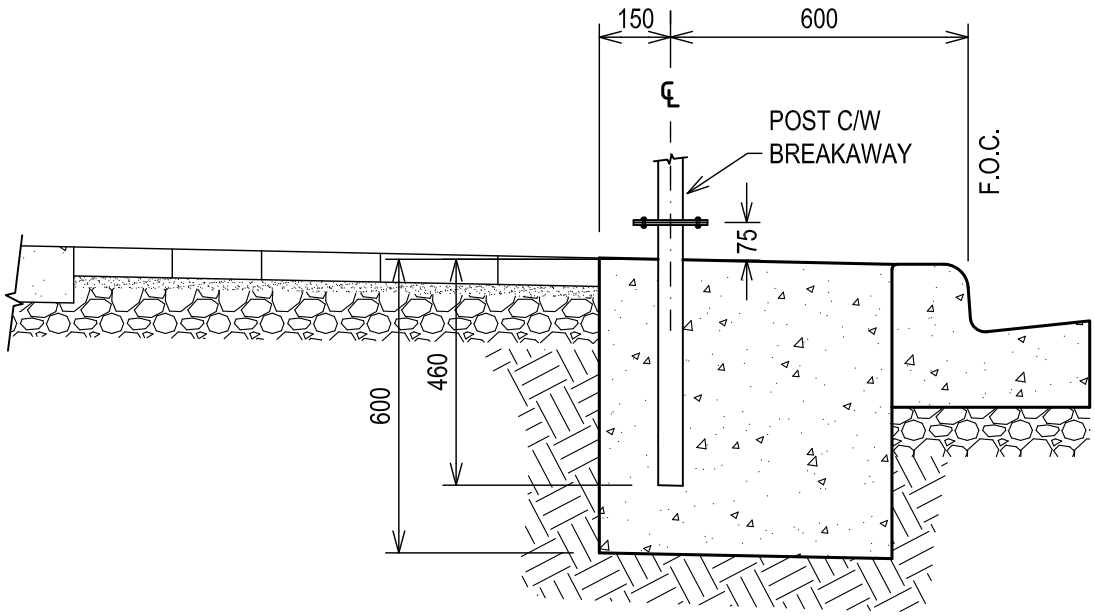
APPROVED BY:

ENGINEER

DRAWING NO.

50 06 04



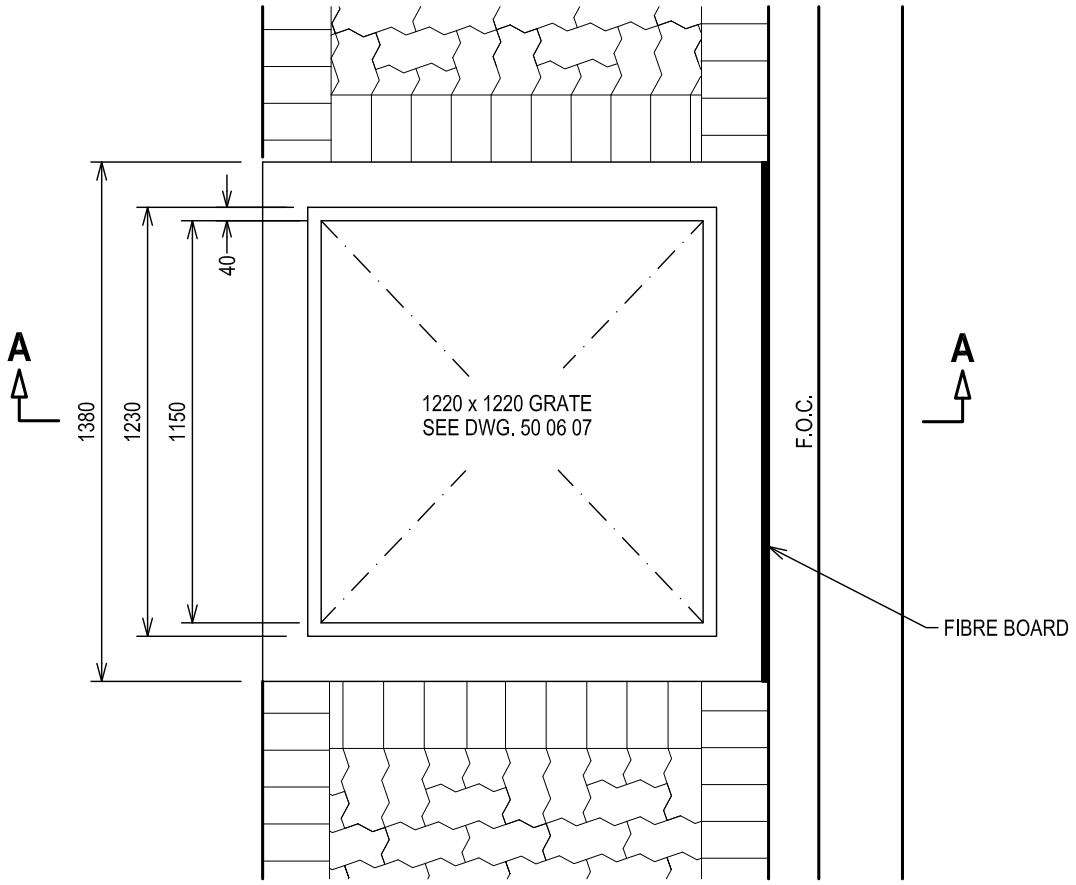


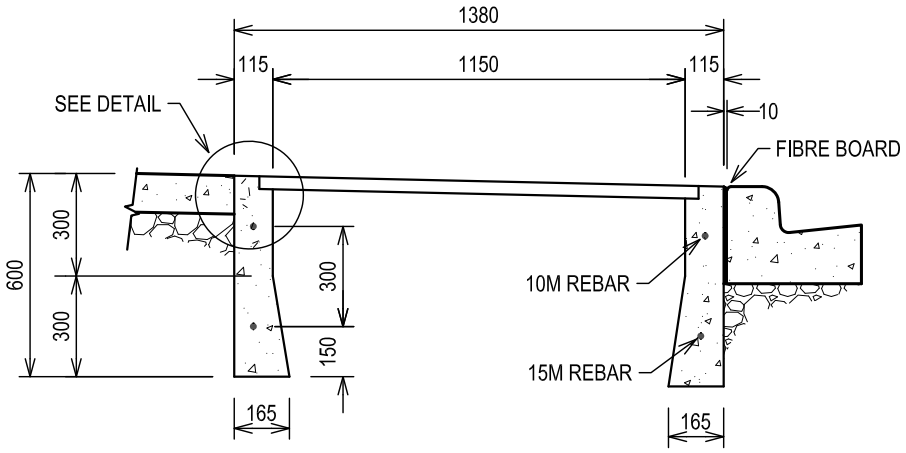
SECTION 'A - A'

NOTE :

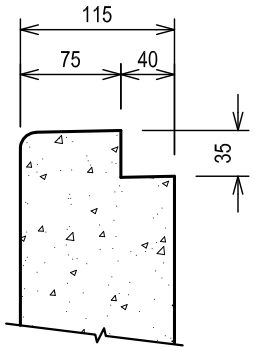
- ALL SIGN AND PARKING METER POSTS ARE TO BE SUPPLIED BY THE PUBLIC WORKS DEPARTMENT.
- ALL TRASH RECEPTACLE POSTS ARE TO BE SUPPLIED BY THE RECREATION, PARKS AND CULTURE DEPARTMENT.

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-15	SIGN, PARKING METER AND TRASH RECEPTACLE POST EMBEDMENT DETAIL	
			SCALE: N.T.S.		DRAWING NO. 50 06 05





SECTION 'A - A'

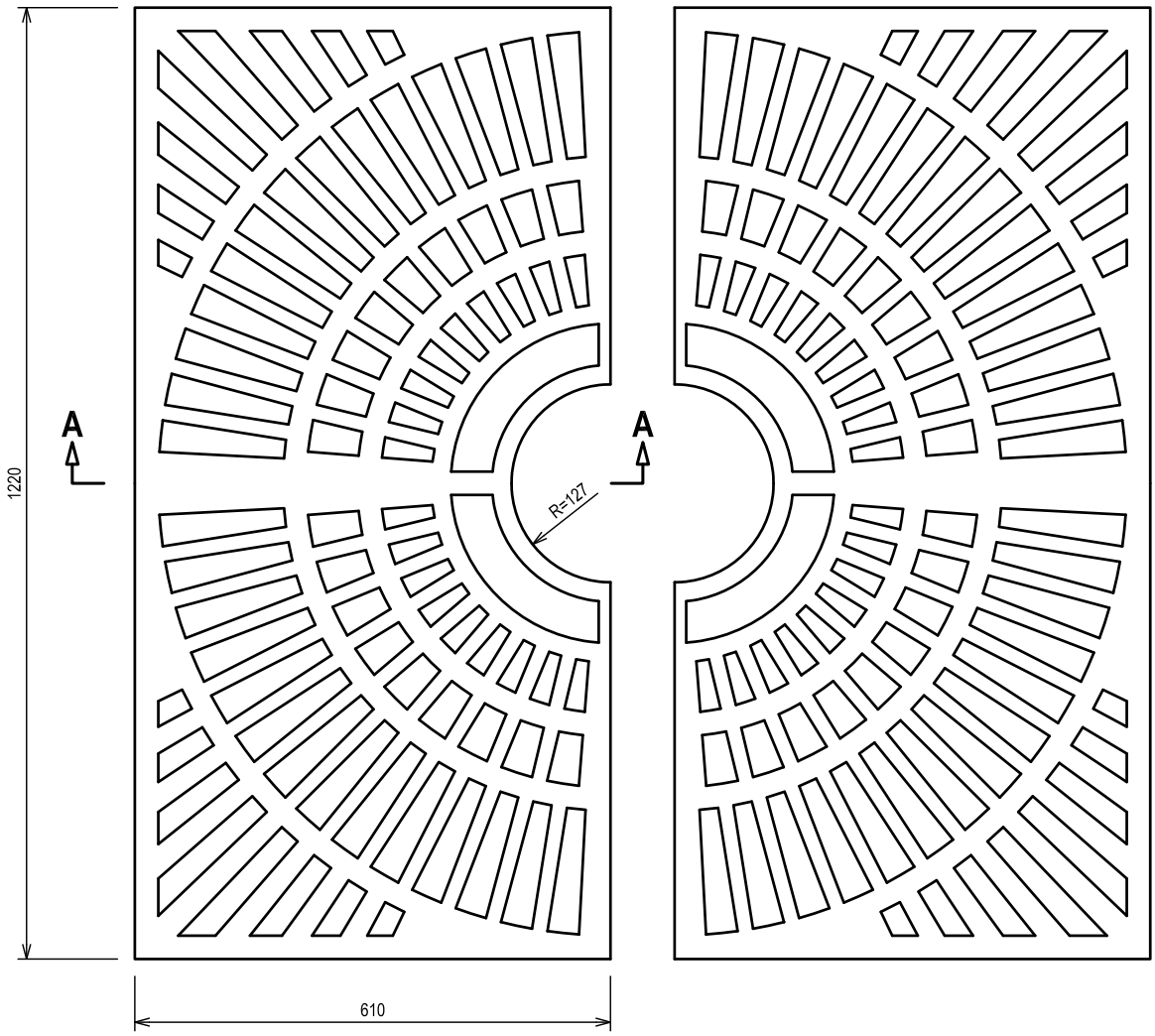


DETAIL

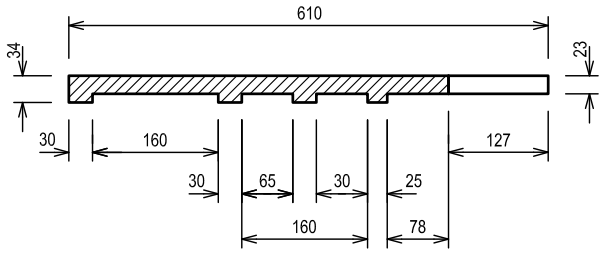
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-23	**PRECAST PLANTER BOX DETAIL**	DRAWING NO. **50 06 06**
SCALE: N.T.S.		



PLAN



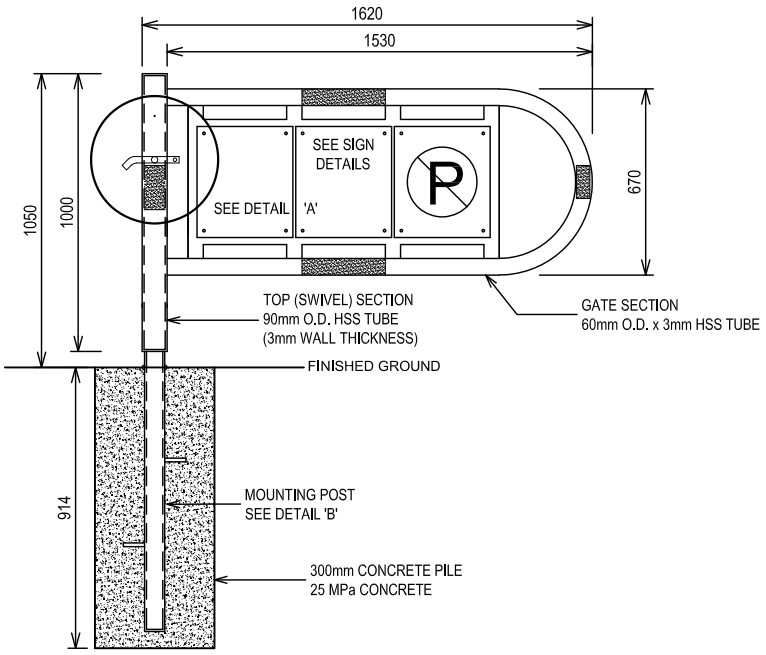
SECTION "A - A"

MATERIAL SPECIFICATION:
- GREY CAST IRON TO CONFORM TO A.S.T.M. A48, CLASS 20 (LATEST EDITION)
- DIMENSIONS IN MILLIMETERS

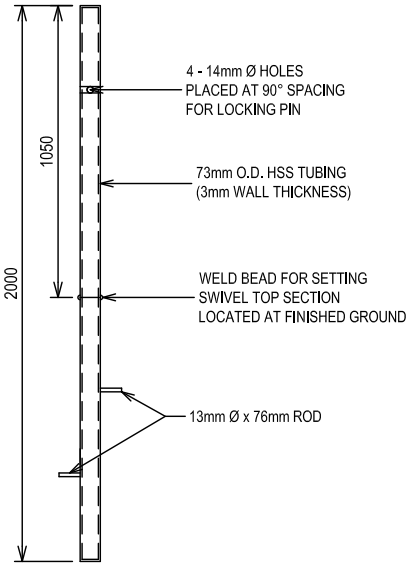
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

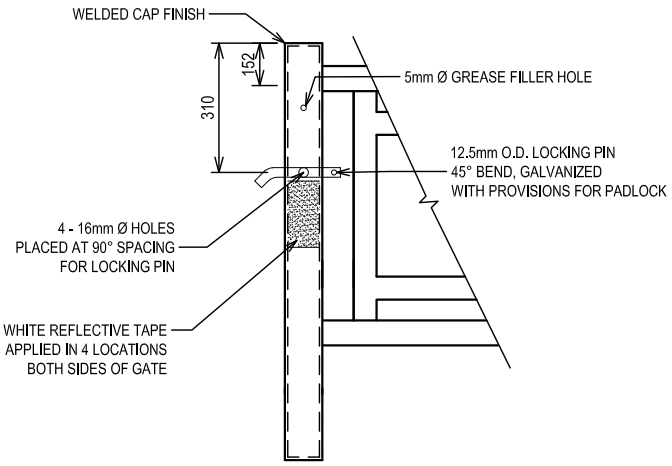
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK**	APPROVED BY: ENGINEER
DATE: 2018-02-23	**1220 x 1220 TREE GRATE**	
SCALE: N.T.S.		DRAWING NO. **50 06 07**



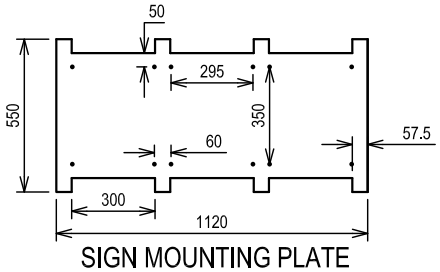
ELEVATION



DETAIL 'B'

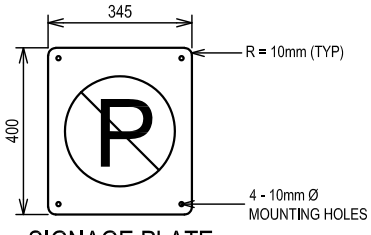


DETAIL 'A'



SIGN MOUNTING PLATE

- OPTIONAL
- 14 ga STEEL PLATE
- DIMENSIONS ARE TYPICAL



SIGNAGE PLATE

- OPTIONAL
- 14 ga ALUMINUM PLATE

NOTES:

- THIS IS THE TOWN'S PREFERRED BOLLARD TYPE, THE POST BOLLARD IS AN ALTERNATE.
- GENERAL USAGE FOR AREAS REQUIRING ROUTINE MAINTENANCE ACCESS AND PUBLIC ACCESS.
- "NO PARKING" SIGN IS OPTIONAL.
- ALL CEMENT TAILINGS TO BE REMOVED FROM FURNISHING IMMEDIATELY AFTER INSTALLATION.
- AREA SURROUNDING BOLLARD SHALL BE SHAPED TO FINISH GRADE, NOT EXCEEDING 50mm VARIATION FROM EXISTING OR DESIGN.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

NO.	DATE	REVISION
		Original CAD file w/ Parks

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

CONSTRUCTION SPECIFICATION DRAWINGS
MISCELLANEOUS ROADWAY CONSTRUCTION

APPROVED BY:

ENGINEER

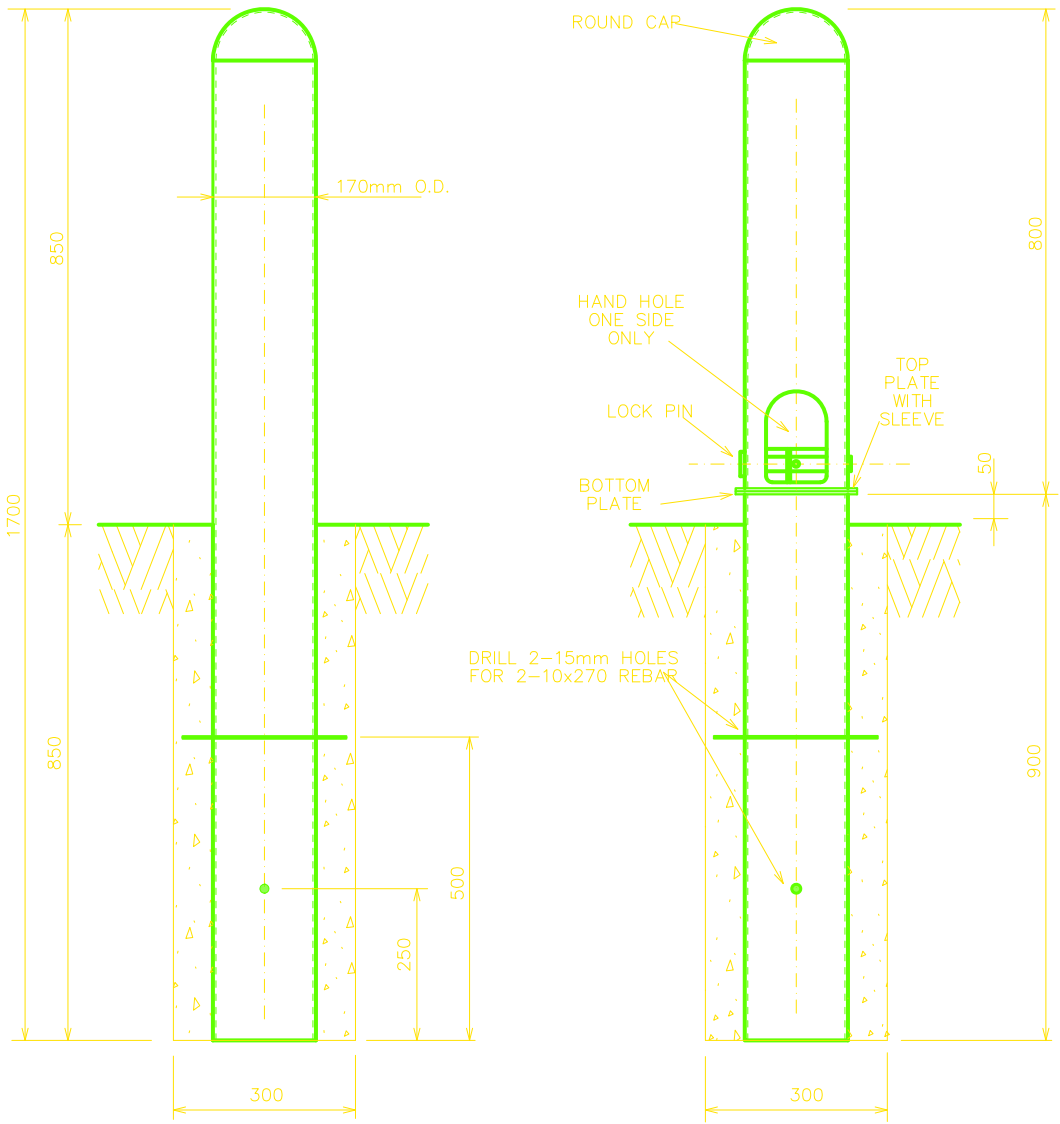
DATE: 2018-02-26

P - BOLLARD

SCALE: N.T.S.

DRAWING NO.

50 07 01



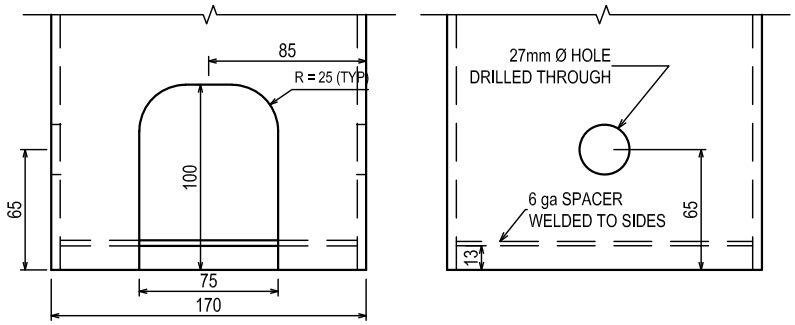
FIXED BOLLARD

KNOCKDOWN BOLLARD

NOTE: CONCRETE TO HAVE 25mm AGGREGRATE, MINIMUM 20 MPa

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS INTERLOCKING PAVING STONE WORK	APPROVED BY: ENGINEER
			DATE: 2018-02-23	BOLLARD POST TYPE	DRAWING NO. 50 07 02
			SCALE: N.T.S.		

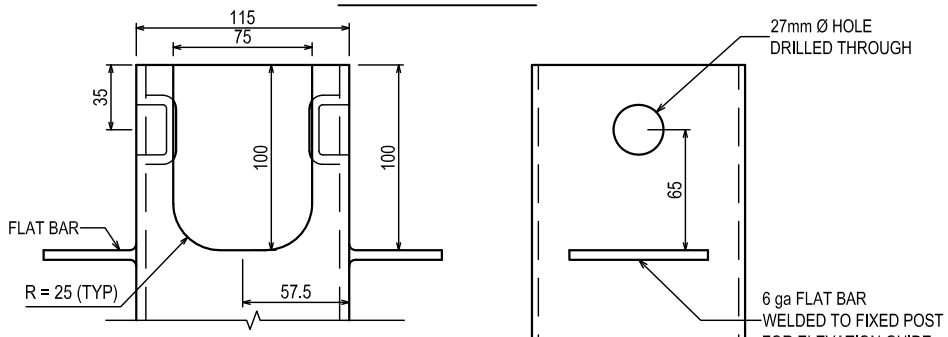
TOP SLEEVE



ACCESS (FACE)

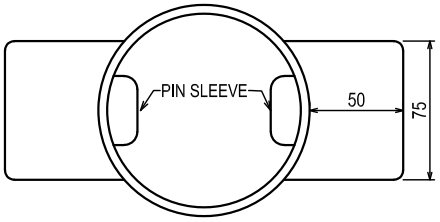
RIGHT SIDE

BOTTOM SLEEVE

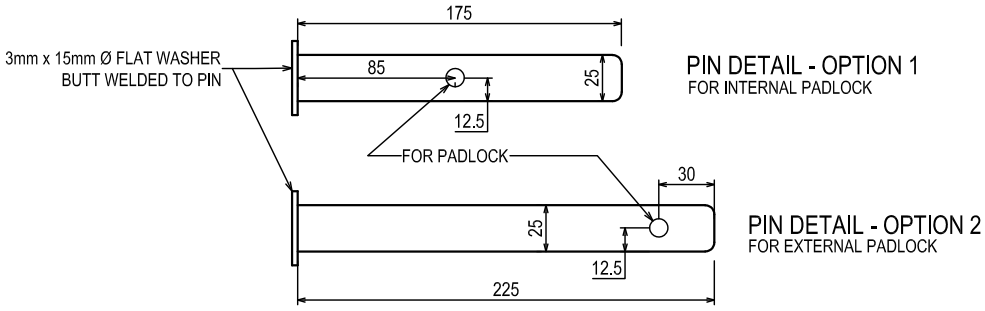


ACCESS (FACE)

RIGHT SIDE



FLAT BAR DETAIL



PIN DETAIL - OPTION 1
FOR INTERNAL PADLOCK

PIN DETAIL - OPTION 2
FOR EXTERNAL PADLOCK

NOTES:

- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

NO.	DATE	REVISION
		Original CAD file w/ Parks

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

CONSTRUCTION SPECIFICATION DRAWINGS
MISCELLANEOUS ROADWAY CONSTRUCTION

APPROVED BY:

ENGINEER

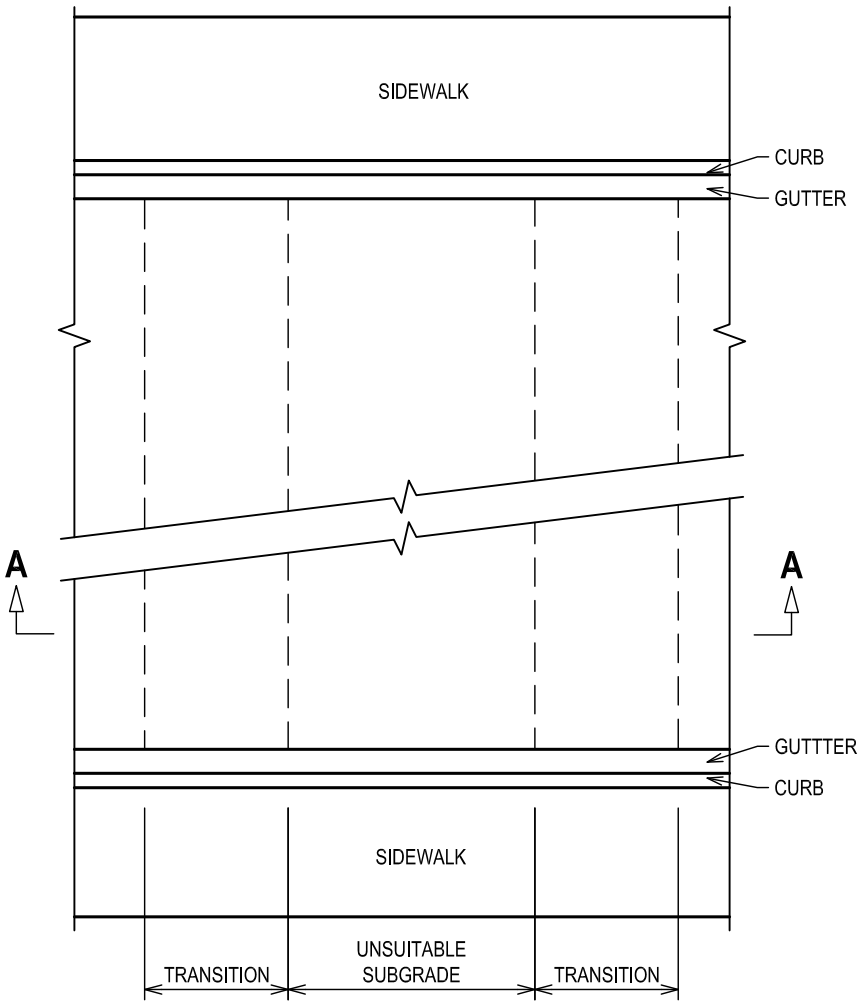
DATE: 2018-02-26

POST TYPE REMOVABLE BOLLARD DETAILS

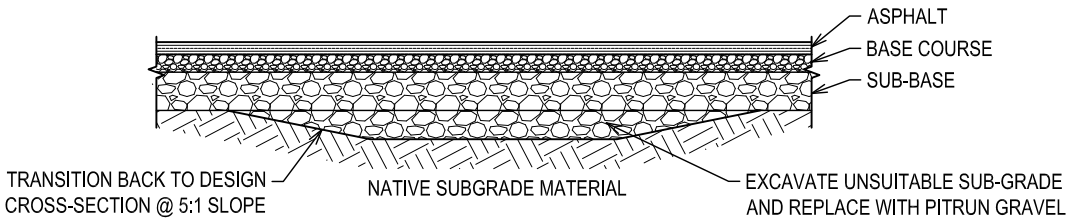
SCALE: N.T.S.

DRAWING NO.

50 07 03



NOTE :
- EXCAVATE FROM LIP OF GUTTER TO LIP OF GUTTER IF UNSUITABLE SUBGRADE IS ENCOUNTERED.
- VERTICAL CUT AT LIP OF GUTTER.



SECTION 'A - A'

NO.	DATE	REVISION

THE CITY OF RED DEER ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-23

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
MISCELLANEOUS ROADWAY CONSTRUCTION

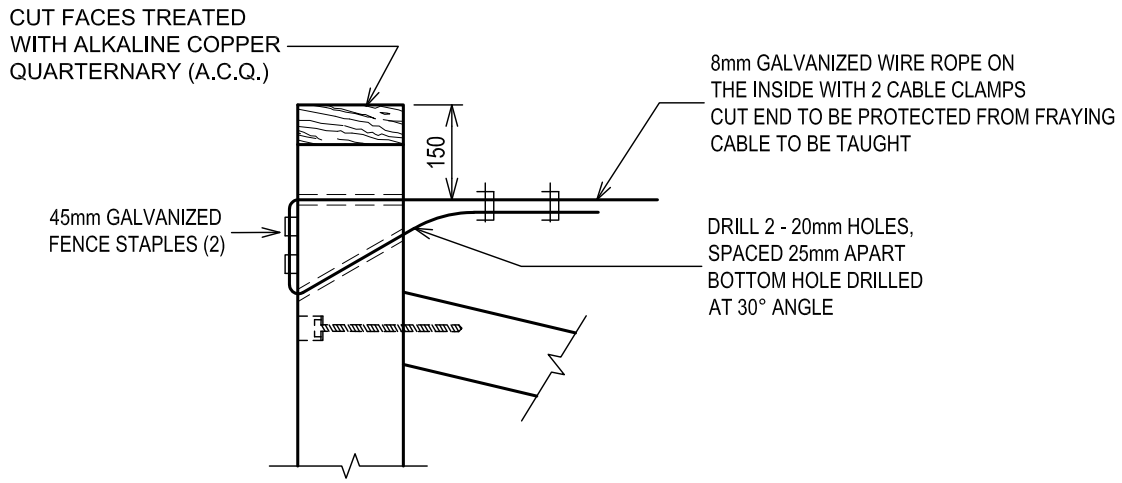
TYPICAL SECTION FOR REPLACING UNSUITABLE SUBGRADE

APPROVED BY:

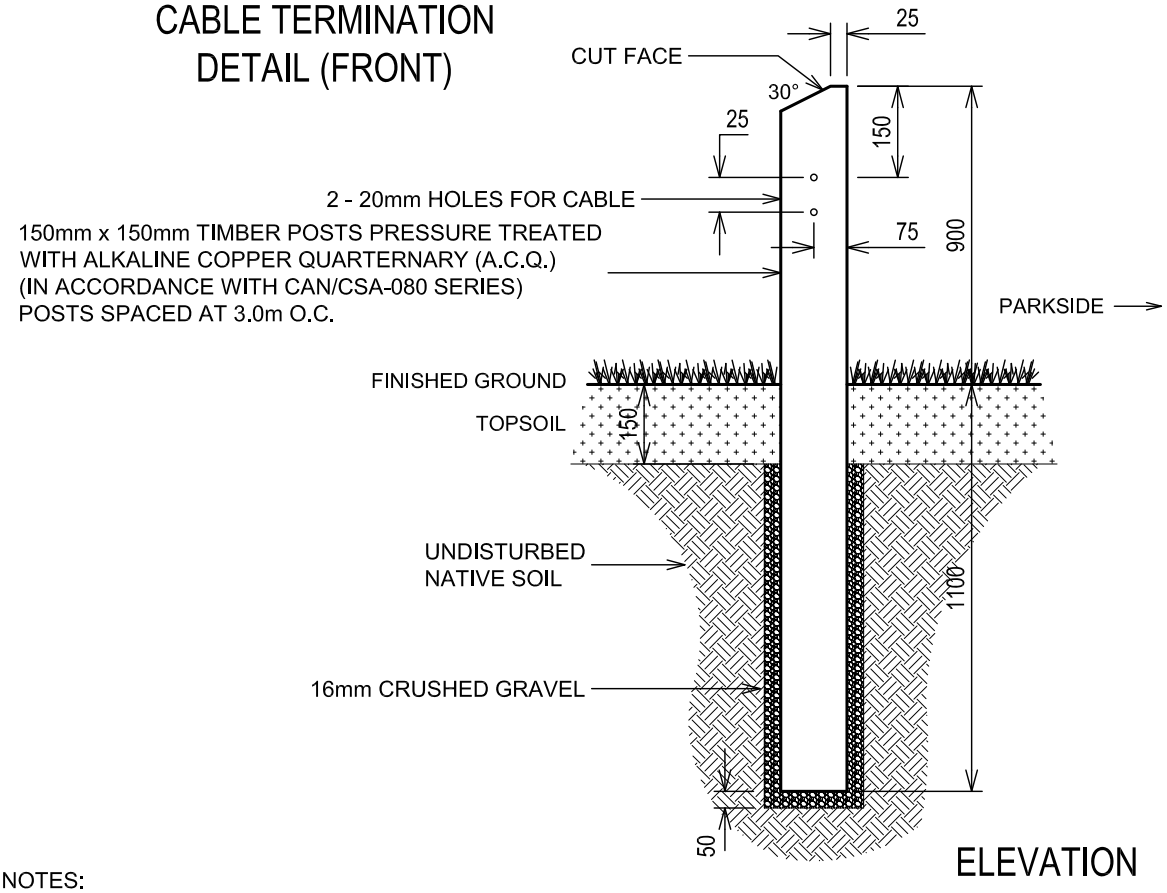
ENGINEER

DRAWING NO.

50 07 04



CABLE TERMINATION DETAIL (FRONT)



ELEVATION

NOTES:

- SEE SECTION 32 31 16, CITY OF RED DEER CONTRACT SPECIFICATIONS FOR POST AND CABLE SPECIFICATIONS.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

NO.	DATE	REVISION
		Original CAD file w/ Parks

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-26

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
MISCELLANEOUS ROADWAY CONSTRUCTION

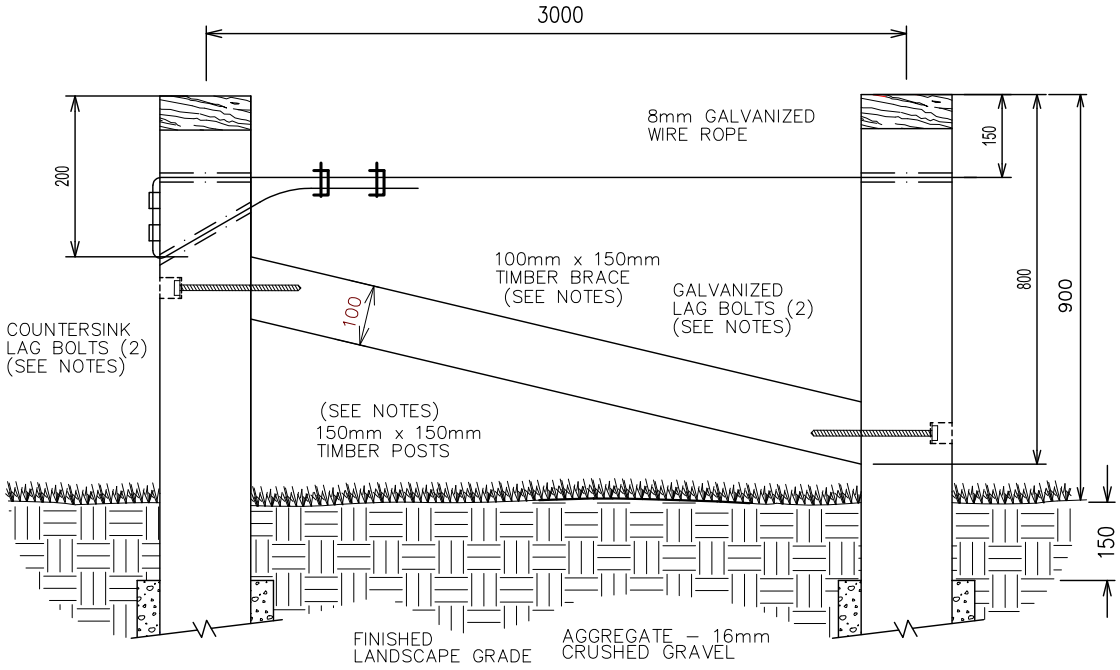
POST AND CABLE FENCE

APPROVED BY:

ENGINEER

DRAWING NO.

50 07 05



ELEVATION

NOTES:

- INSTALL 200mm (8") x 10mm (3/8") GALVANIZED LAG BOLTS (2) + 10mm (3/8") FLAT WASHERS (2).
- COUNTERSINK HOLE DIMENSION 50mm (2") DEPTH x 29mm (11/8") DIAMETER.
- BRACE TO BE INSTALLED AT ALL CORNERS OF FENCE LINE, GATES, AND END OF LINE.
- UPPER END OF BRACE TO BE LOCATED AT TERMINAL POST OF CORNERS, GATES, AND END OF LINE.
- ALL TIMBERS AND CUT FACES WILL BE TREATED WITH ALKALINE COPPER QUARTERNARY (A.C.Q.).
- CABLE TO BE TAUGHT.
- DIMENSIONS ARE IN MILLIMETERS.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-02-23

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
MISCELLANEOUS ROADWAY CONSTRUCTION

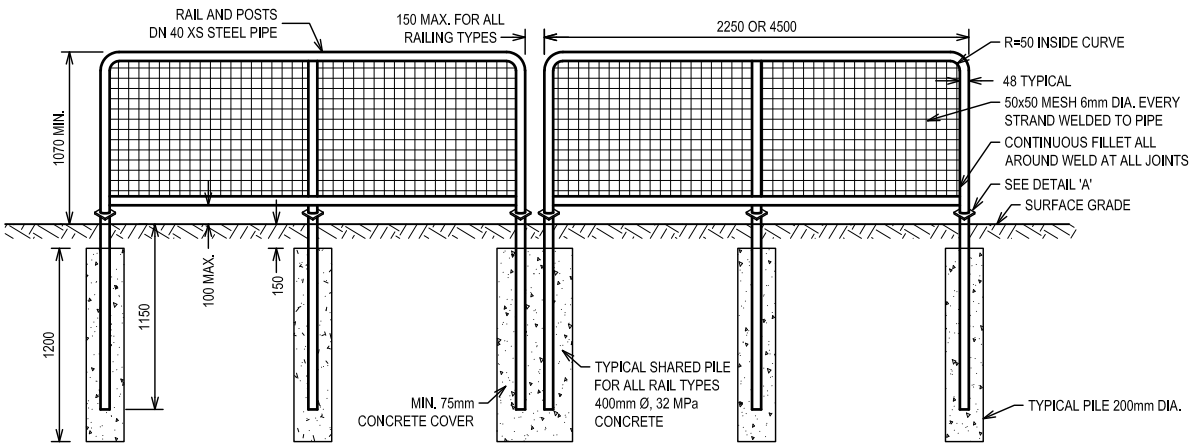
CORNER OR END BRACE DETAIL POST AND CABLE

APPROVED BY:

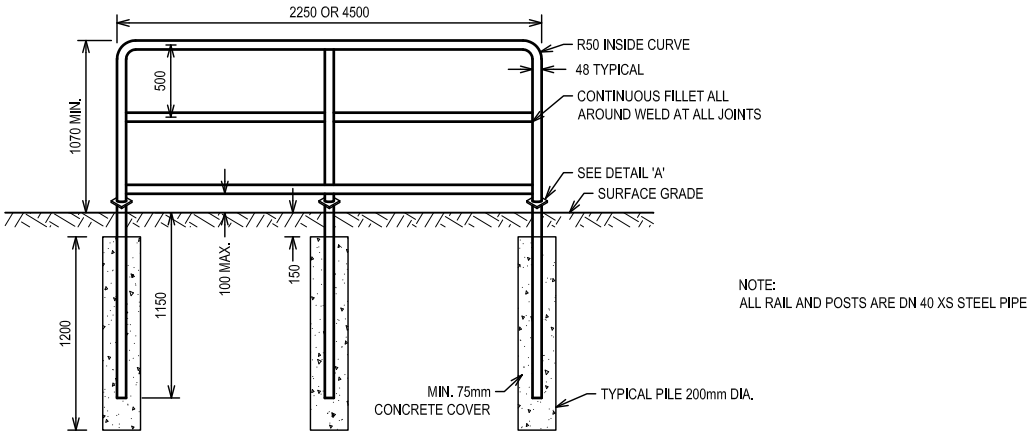
ENGINEER

DRAWING NO.

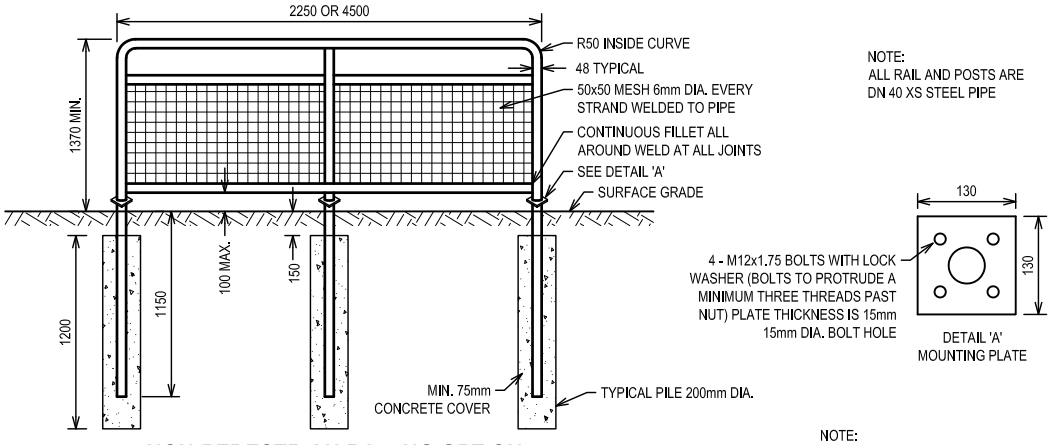
50 07 06



PEDESTRIAN RAILING OPTION



NON-PEDESTRIAN RAILING OPTION



NON-PEDESTRIAN RAILING OPTION

NO.	DATE	REVISION
		Original CAD file w/ Parks

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: bm

DATE: 2018-02-26

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
MISCELLANEOUS ROADWAY CONSTRUCTION

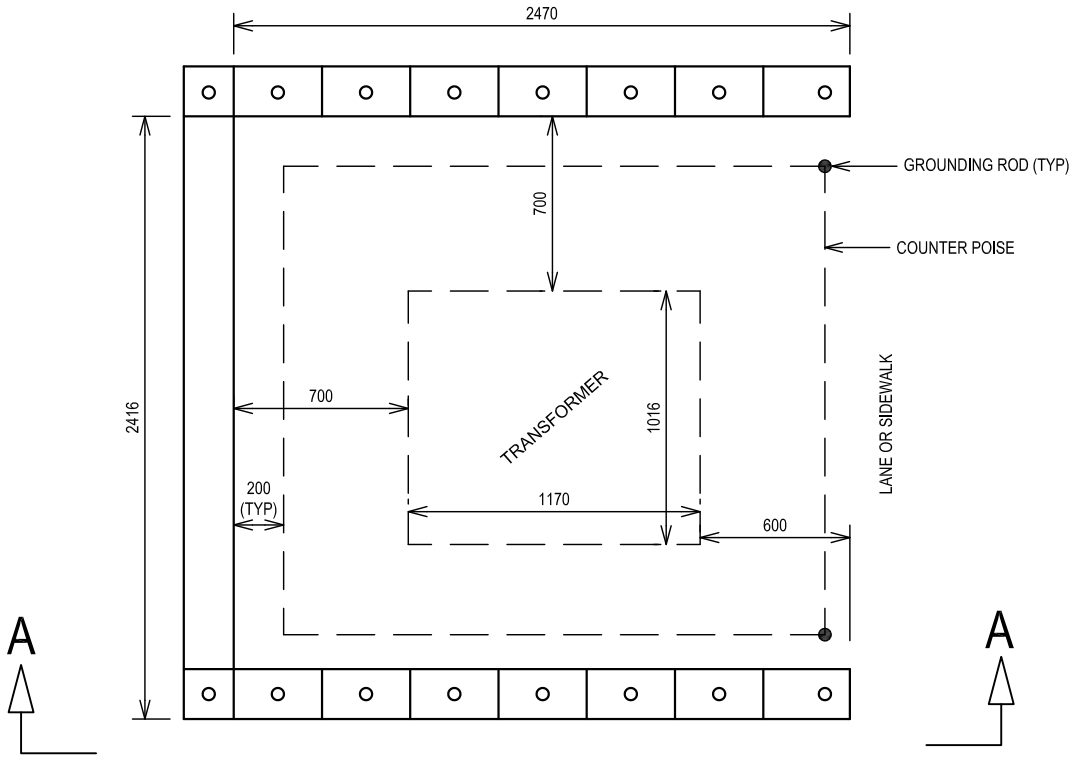
PROTECTIVE METAL RAILING

APPROVED BY:

ENGINEER

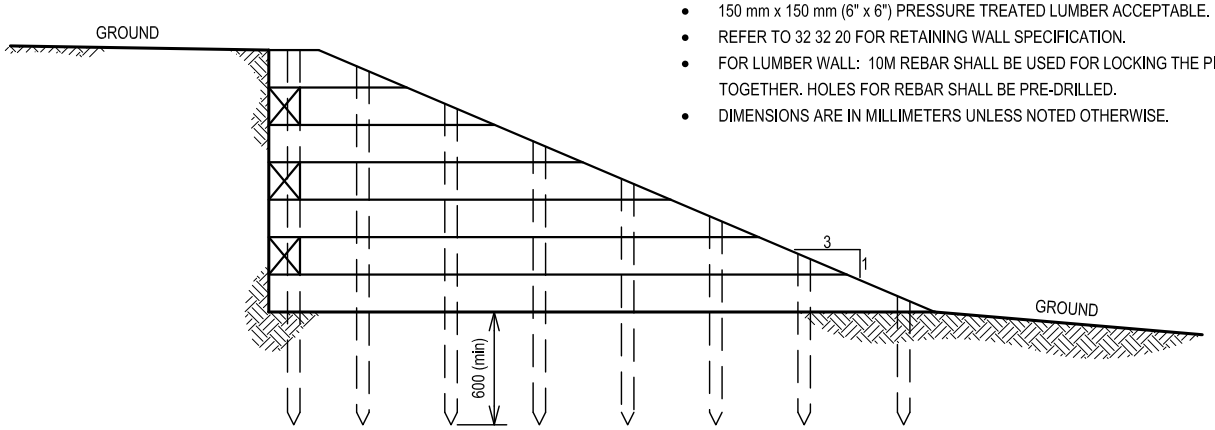
DRAWING NO.

50 07 07



NOTES:

- LUMBER SHOWN FOR EXAMPLE PURPOSES ONLY; TO SHOW THE SPACING RELATIONSHIP BETWEEN THE WALL AND TRANSFORMER.
- RETAINING WALL SHALL BE INTERLOCKING BLOCK PREFERRED.
- 150 mm x 150 mm (6" x 6") PRESSURE TREATED LUMBER ACCEPTABLE.
- REFER TO 32 32 20 FOR RETAINING WALL SPECIFICATION.
- FOR LUMBER WALL: 10M REBAR SHALL BE USED FOR LOCKING THE PIECES TOGETHER. HOLES FOR REBAR SHALL BE PRE-DRILLED.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



SECTION A-A

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

CONSTRUCTION SPECIFICATION DRAWINGS
MISCELLANEOUS ROADWAY CONSTRUCTION

APPROVED BY:

ENGINEER

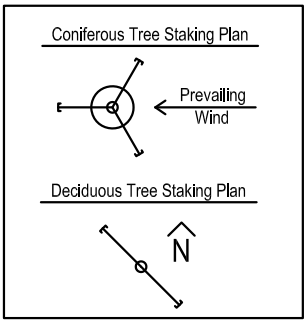
DATE: 2018-02-23

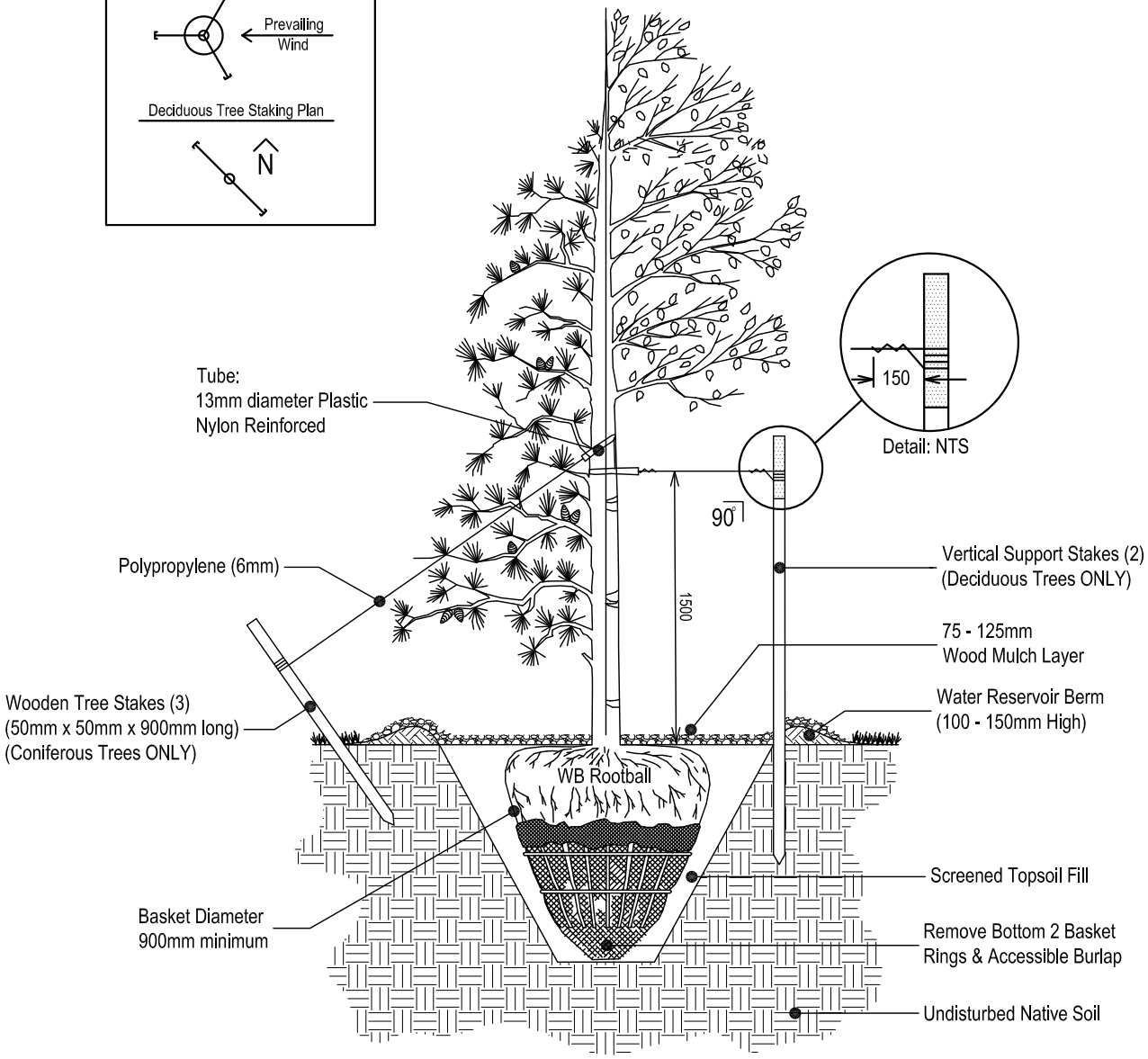
SCALE: N.T.S.

RETAINING WALL CLEARANCES (FOR TRANSFORMERS)

DRAWING NO.

50 07 08





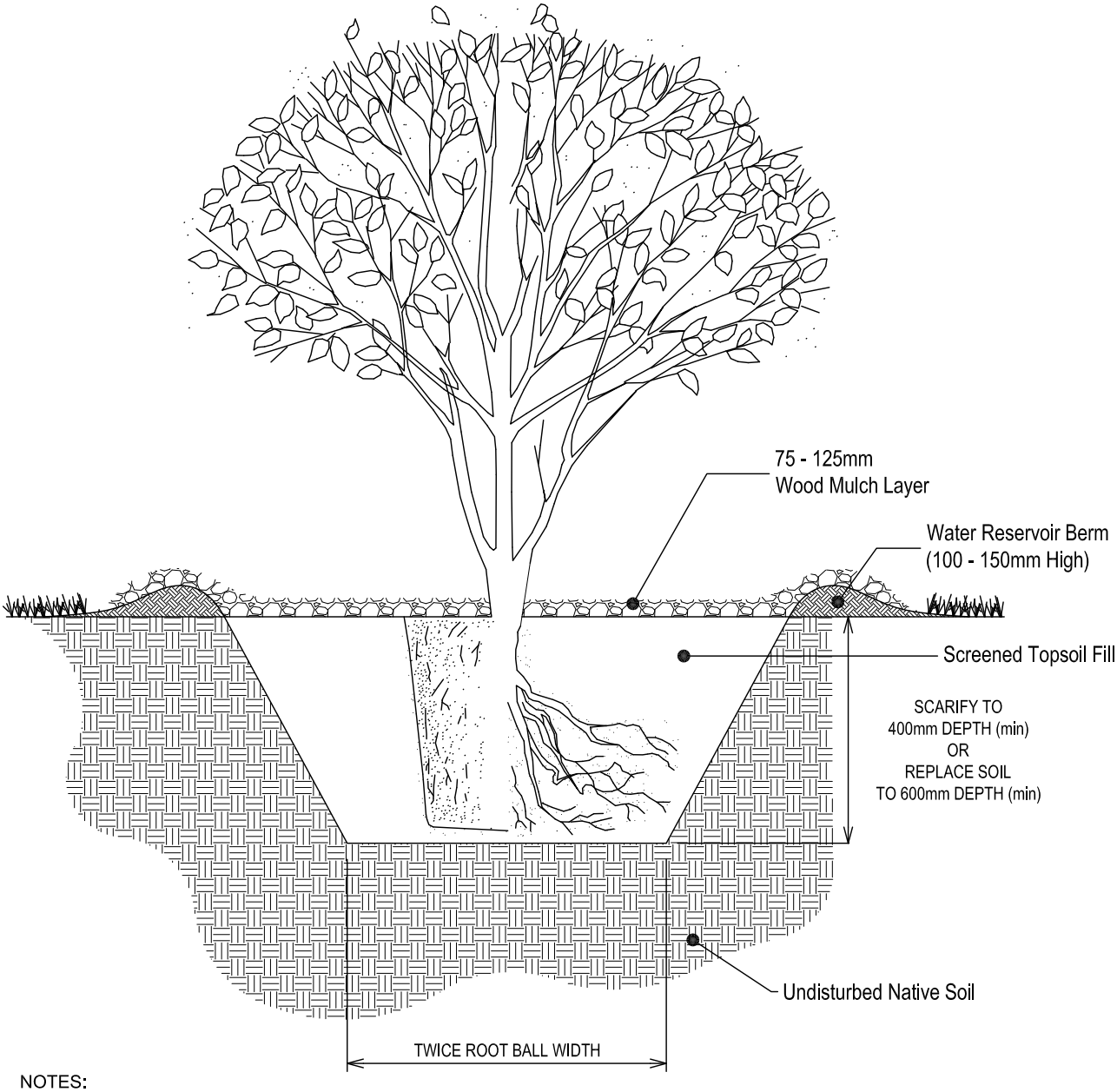
NOTES:

- SEE SECTION 32 93 10, CITY OF RED DEER CONTRACT SPECIFICATIONS FOR PLANTING SPECIFICATIONS.
- HOLE WIDTH EXCAVATION TO BE 2 TIMES THE ROOT BALL DIAMETER.
- FOR NEWLY PLANTED DECIDUOUS MATERIAL OVER 60mm A MINIMUM CANOPY CLEARANCE OF 1.2m IS REQUIRED.
- THE ROOT FLARE OF THE NEWLY PLANTED TREES MUST BE VISIBLE AT TIME OF INSTALLATION.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS PLANTING SPECIFICATIONS**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**WIRE BASKET TREE SPADE PLANTING TREE STAKING AND MULCHING**	
SCALE: N.T.S.		DRAWING NO. **50 08 01**



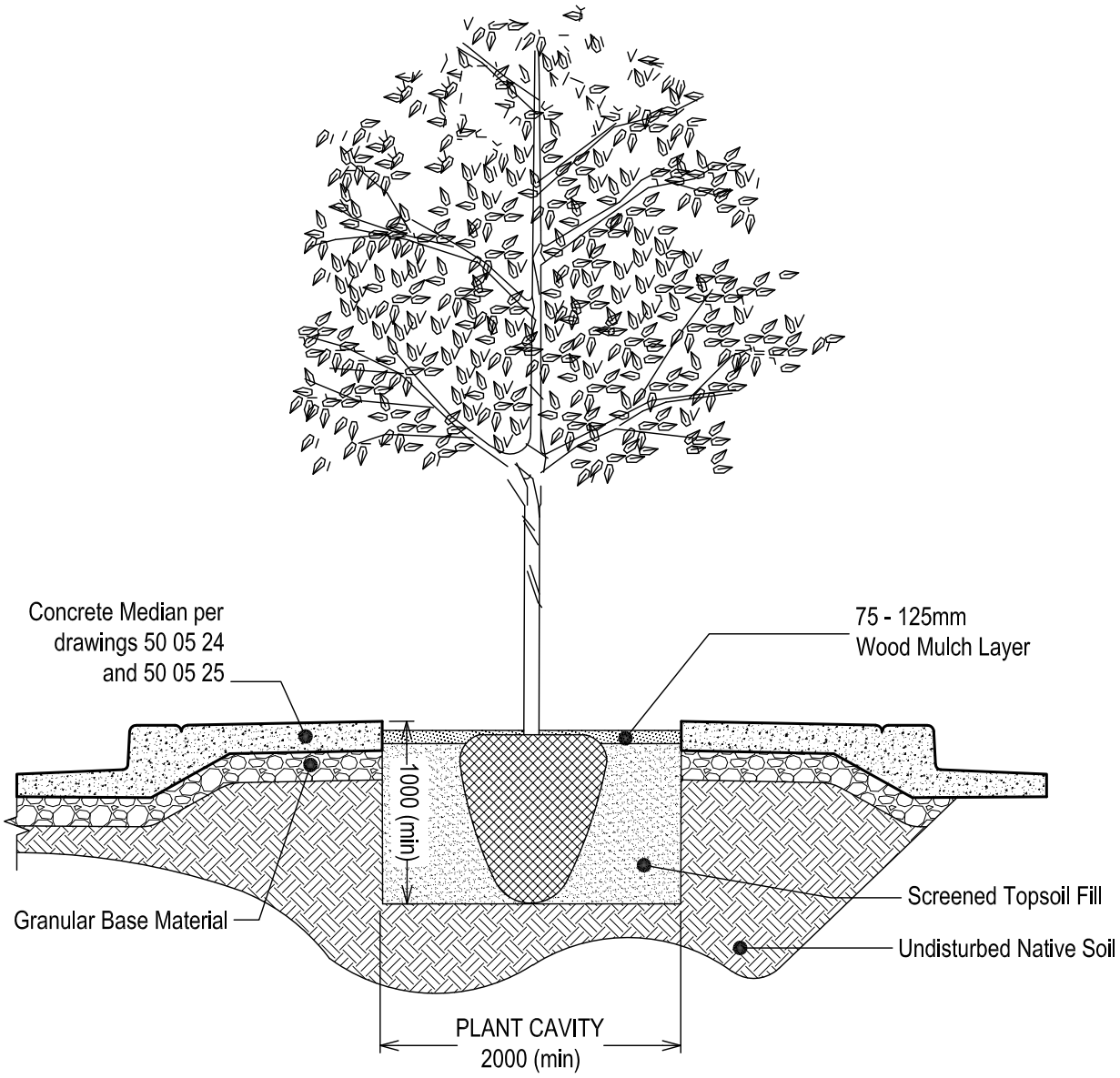
NOTES:

- SEE SECTION 32 93 10, CITY OF RED DEER CONTRACT SPECIFICATIONS FOR PLANTING SPECIFICATIONS.
- REQUIREMENTS FOR SCARIFICATION OR SOIL REPLACEMENT SHALL BE DETERMINED BY PARKS SECTION, RECREATION, PARKS AND CULTURE DEPARTMENT

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS PLANTING SPECIFICATIONS**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**TYPICAL CONTAINER PLANTING**	
SCALE: N.T.S.		DRAWING NO. **50 08 02**



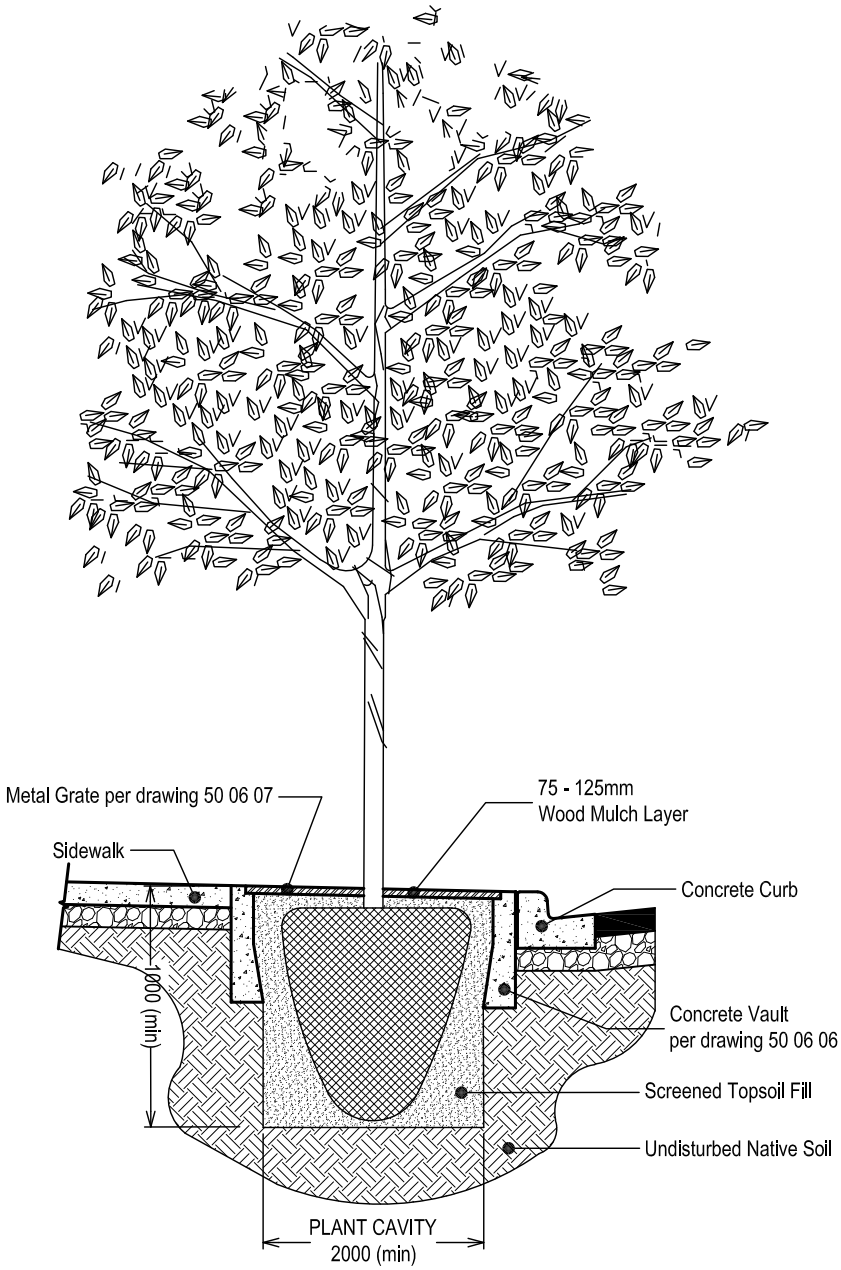
NOTES:

- SEE CITY OF RED DEER CONTRACT SPECIFICATIONS:
  - SECTION 32 93 10 FOR PLANTING SPECIFICATIONS,
  - SEE SECTION 32 93 50 FOR PREPARATION OF PLANTING SOIL.
- DEPTH OF HOLE TO BE 1.0m MINIMUM.
- FOR NEWLY PLANTED DECIDUOUS MATERIAL OVER 60mm CALIPER A MINIMUM CANOPY CLEARANCE OF 1.2m IS REQUIRED.
- THE ROOT FLARE OF A NEWLY PLANTED TREE MUST BE VISIBLE AT TIME OF INSTALLATION.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS PLANTING SPECIFICATIONS**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**TYPICAL MEDIAN PLANTING**	
SCALE: N.T.S.		DRAWING NO. **50 08 03**



NOTES:

- SEE CITY OF RED DEER CONTRACT SPECIFICATIONS:
  - SECTION 32 93 10 FOR PLANTING SPECIFICATIONS,
  - SEE SECTION 32 93 50 FOR PREPARATION OF PLANTING SOIL.
- DEPTH OF HOLE TO ACCOMMODATE THE ROOT BALL AND DEPTH OF MULCH FOR A MINIMUM OF 1.0m OR MORE TOTAL DEPTH.
- FOR NEWLY PLANTED DECIDUOUS MATERIAL OVER 60mm CALIPER A MINIMUM CANOPY CLEARANCE OF 1.2m IS REQUIRED.
- THE ROOT FLARE OF A NEWLY PLANTED TREE MUST BE VISIBLE AT TIME OF INSTALLATION.

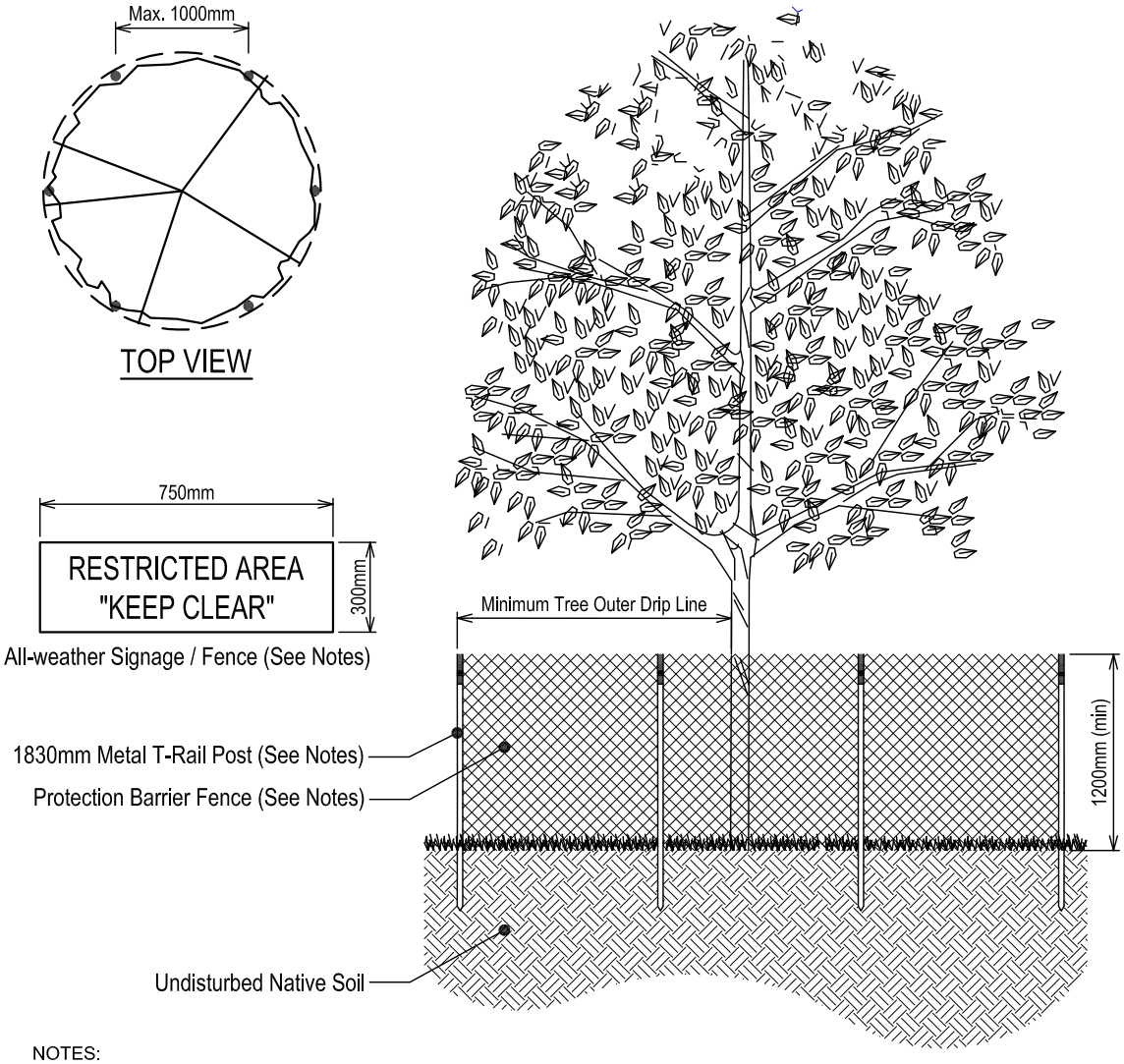
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS PLANTING SPECIFICATIONS**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**TYPICAL VAULT PLANTING**	
SCALE: N.T.S.		DRAWING NO. **50 08 04**

TOP VIEW

All-weather Signage / Fence (See Notes)



NOTES:

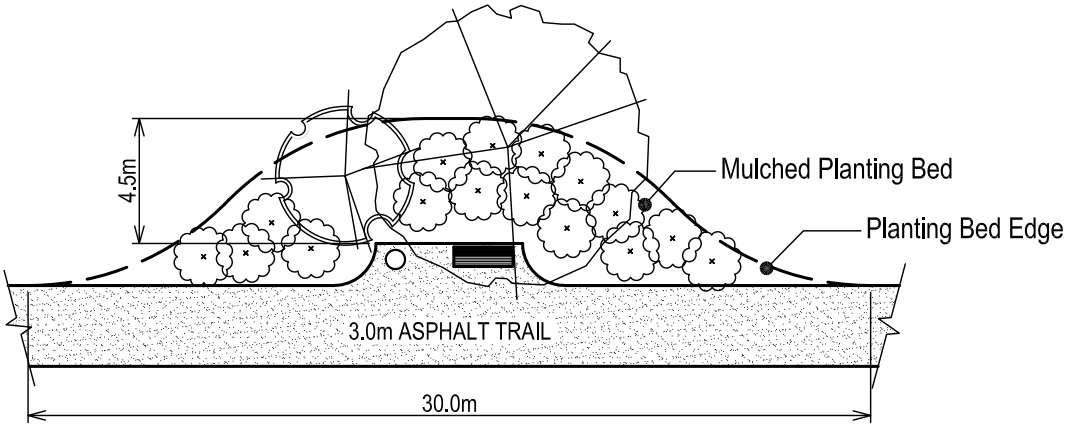
- ALLOW A MINIMUM SETBACK BETWEEN THE FENCE AND:
  - PATHWAY OF 300mm,
  - BACK OF CURB OF 600mm.
- PROVIDE FOR CLEAR VISIBILITY OF SURFACE UTILITY EQUIPMENT, DRIVEWAY ACCESS, CROSSWALKS, ETC.
- THE FENCE MATERIAL TO BE METAL FARM FENCING (MAXIMUM 50mm MESH OPENING) OR EQUIVALENT (SUBJECT TO PARKS SECTION APPROVAL.
- FENCE TO BE SUPPORTED BY HEAVY DUTY METAL T-RAIL POSTS (1830mm LONG) SPACED AT 1000mm (max).
- FENCE TO BE FASTENED TO THE STAKES WITH A WIRE FASTENER.
- TWO (min) ALL-WEATHER WARNING SIGNS TO BE CLEARLY DISPLAYED INDICATING THAT THE AREA WITHIN THE BARRIER IS A PROTECTED ZONE AND NO STORAGE, PARKING, DUMPING, MACHINERY OPERATIONS, ETC. TO BE ALLOWED.
- PRIOR APPROVAL FROM PARKS SECTION IS REQUIRED TO EXCAVATE IN THE PROTECTION ZONE.
- ONLY PARKS SECTION WILL BE AUTHORIZED, OR GRANT AUTHORIZATION, TO ROOT OR BRANCH PRUNE WITHIN THE PROTECTION ZONE.

NO.	DATE	REVISION

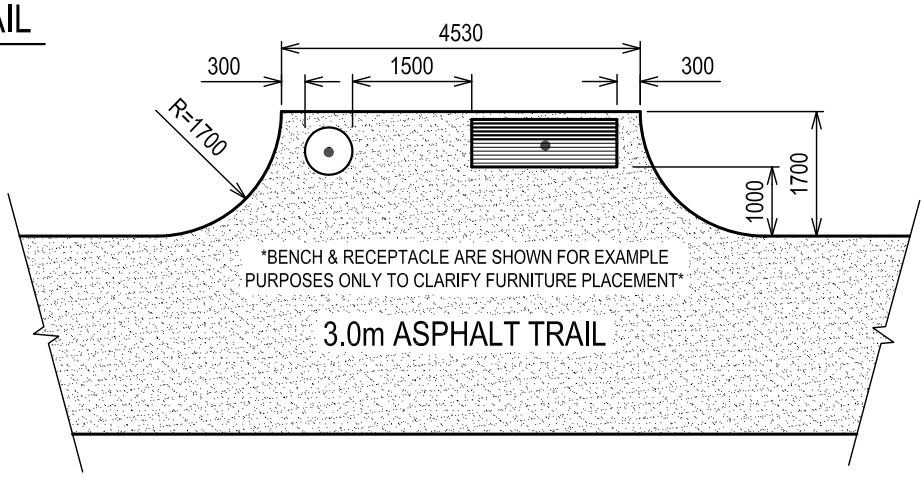
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS PLANTING SPECIFICATIONS**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**TREE PROTECTION FENCE**	
SCALE: N.T.S.		DRAWING NO. **50 08 05**

TYPICAL PLANTING BED



DETAIL



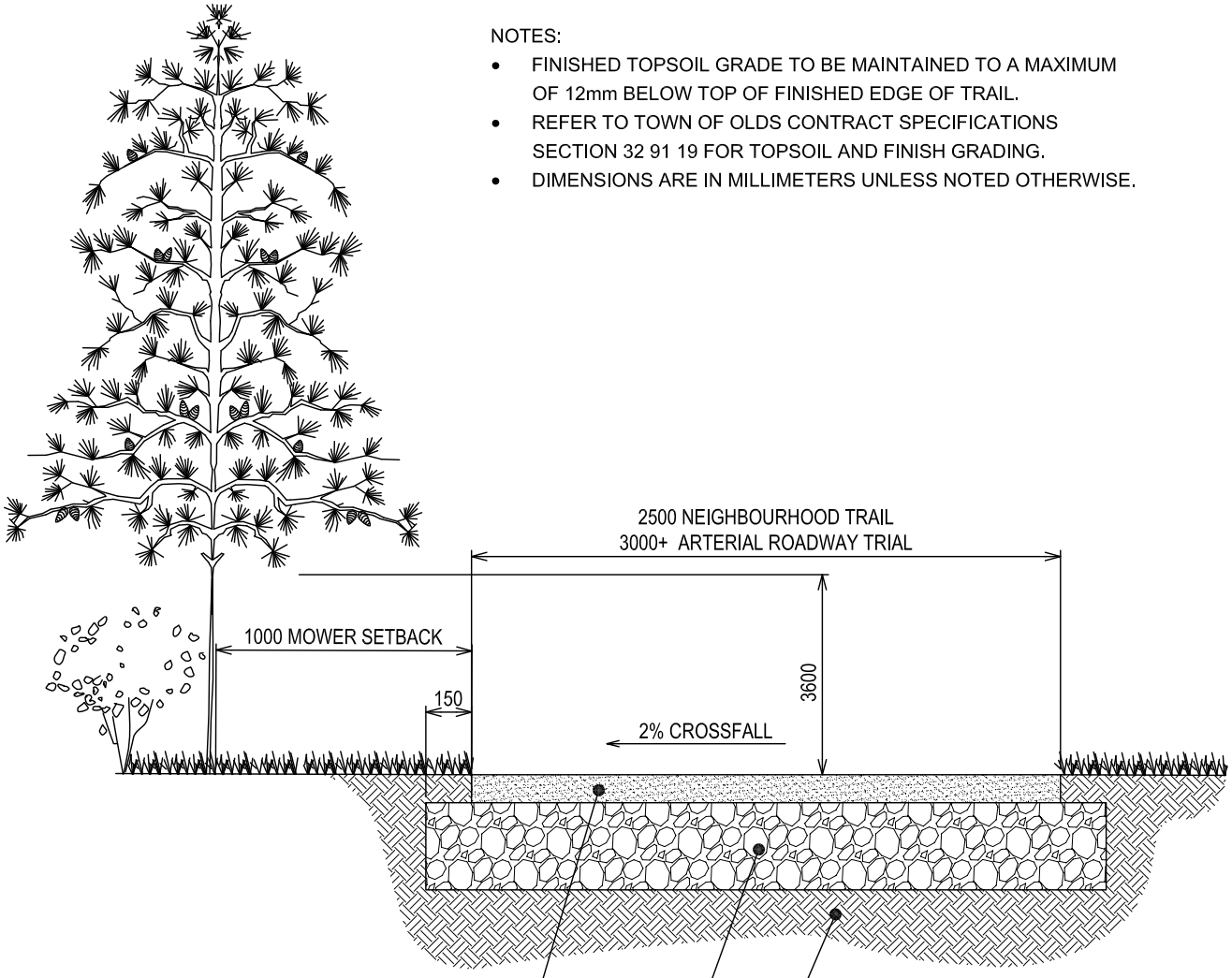
NOTES:

- PLANTING BED EDGE TO MAINTAIN A GRADUAL ARC TO ACCOMMODATE TRACTOR MOWER TURNING.
- ALL ASPHALT EDGES SHALL BE FINISHED AND NODE FREE OF ANY SEAMS.
- FINISHED TOPSOIL GRADE TO BE MAINTAINED TO A MAXIMUM OF 12mm BELOW TOP OF FINISHED SURFACE.
- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 91 19 FOR TOPSOIL AND FINISH GRADING.
- TYPICAL PLANTINGS PER NODE: 2 TREES AND 16 SHRUBS.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	PARKS STANDARD DRAWINGS PLANTING SPECIFICATIONS	APPROVED BY:
			DATE: 2018-02-23	TRAIL SEATING NODE	DEPARTMENT MANAGER
			SCALE: N.T.S.		DRAWING NO. 50 08 06

NOTES:

- FINISHED TOPSOIL GRADE TO BE MAINTAINED TO A MAXIMUM OF 12mm BELOW TOP OF FINISHED EDGE OF TRAIL.
- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 91 19 FOR TOPSOIL AND FINISH GRADING.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



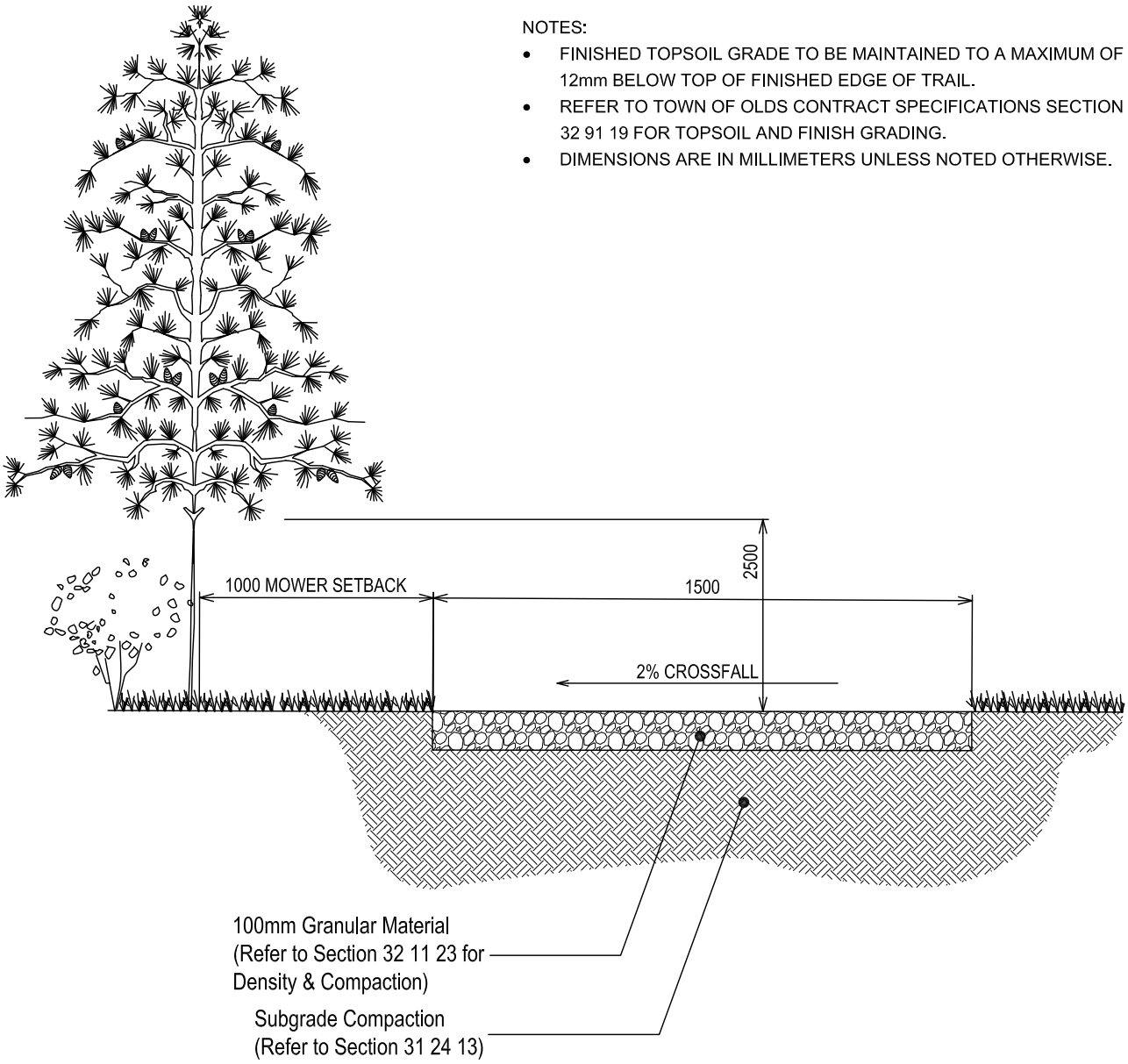
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS LANDSCAPE WORK**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**ASPHALT TRAIL**	
SCALE: N.T.S.		DRAWING NO. **50 08 07**

NOTES:

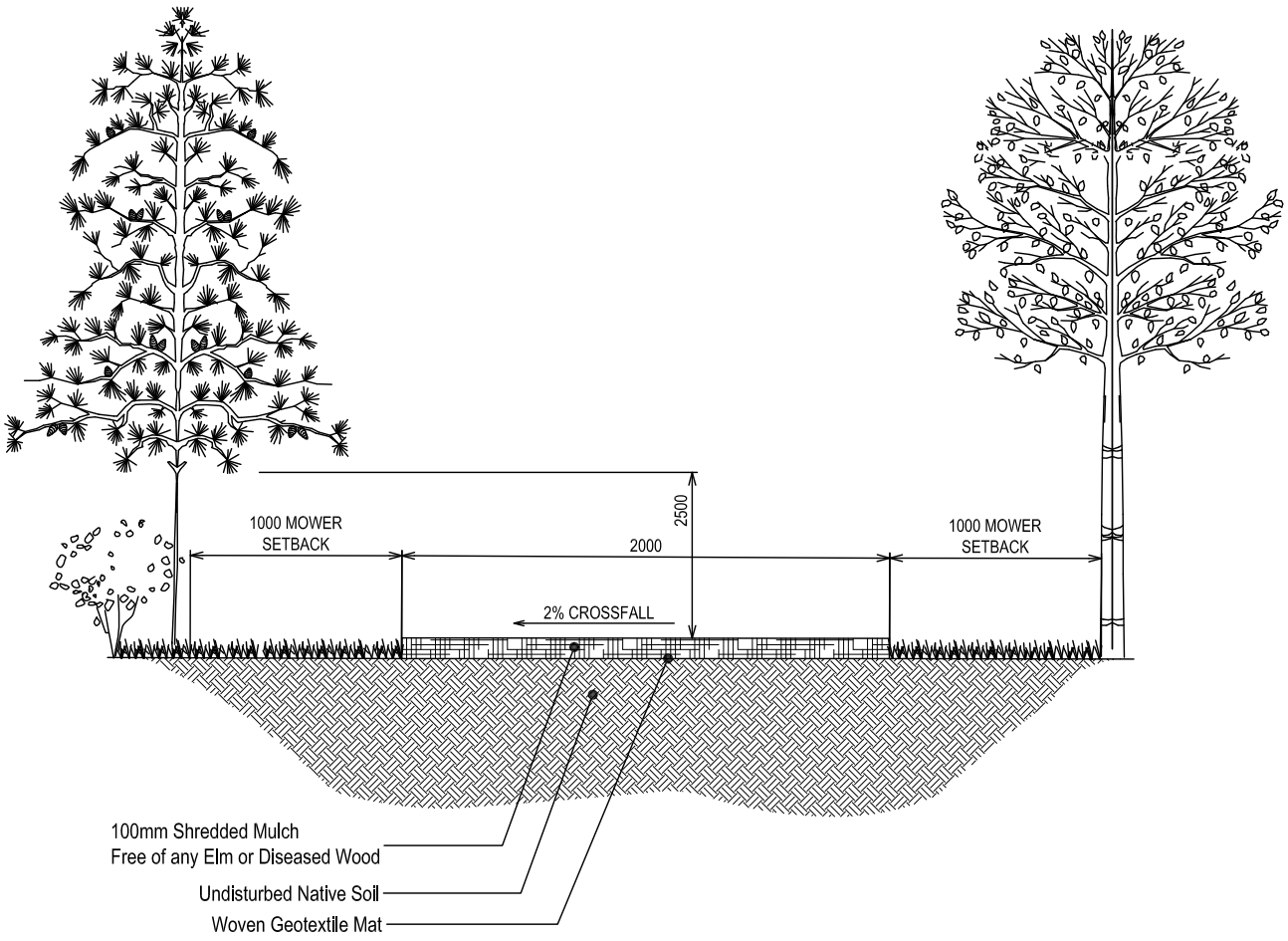
- FINISHED TOPSOIL GRADE TO BE MAINTAINED TO A MAXIMUM OF 12mm BELOW TOP OF FINISHED EDGE OF TRAIL.
- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 91 19 FOR TOPSOIL AND FINISH GRADING.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS LANDSCAPE WORK**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**HIKING / AGGREGATE TRAIL**	
SCALE: N.T.S.		DRAWING NO. **50 08 08**



NOTES:

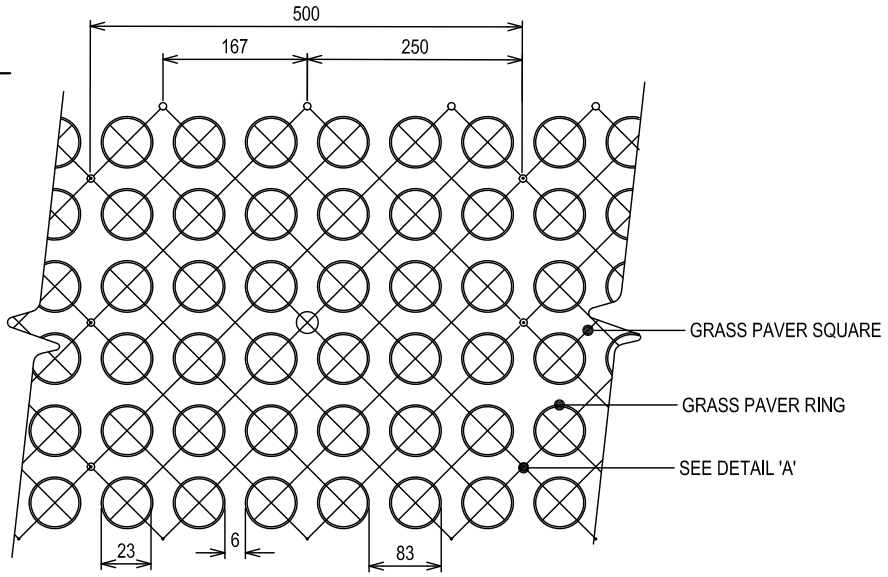
- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS:
  - SECTION 31 32 21 FOR WOVEN GEOTEXTILE MAT
  - SECTION 32 91 19 FOR TOPSOIL AND FINISH GRADING
- MULCH MATERIAL MUST COMPLY WITH TOWN OF OLDS SPECIFICATIONS.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

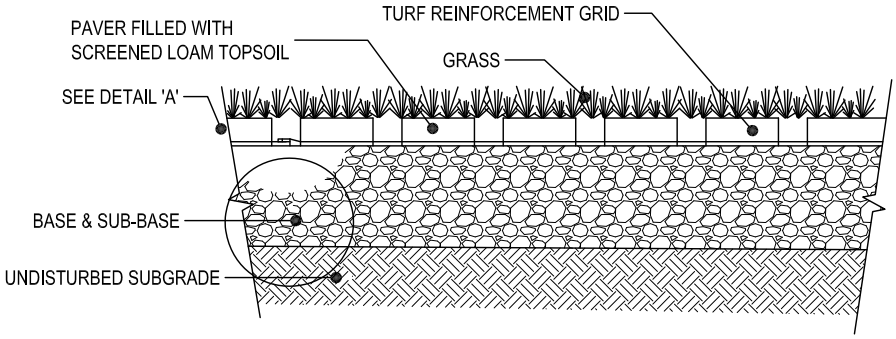
NO.	DATE	REVISION

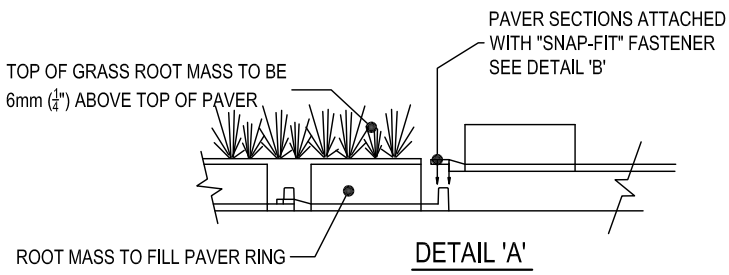
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS LANDSCAPE WORK**	APPROVED BY:
DATE: 2018-02-23	**NATURE TRAIL**	DEPARTMENT MANAGER
SCALE: N.T.S.		DRAWING NO. **50 08 09**

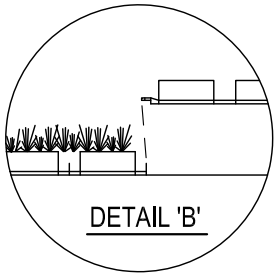
PLAN VIEW







DETAIL 'A'



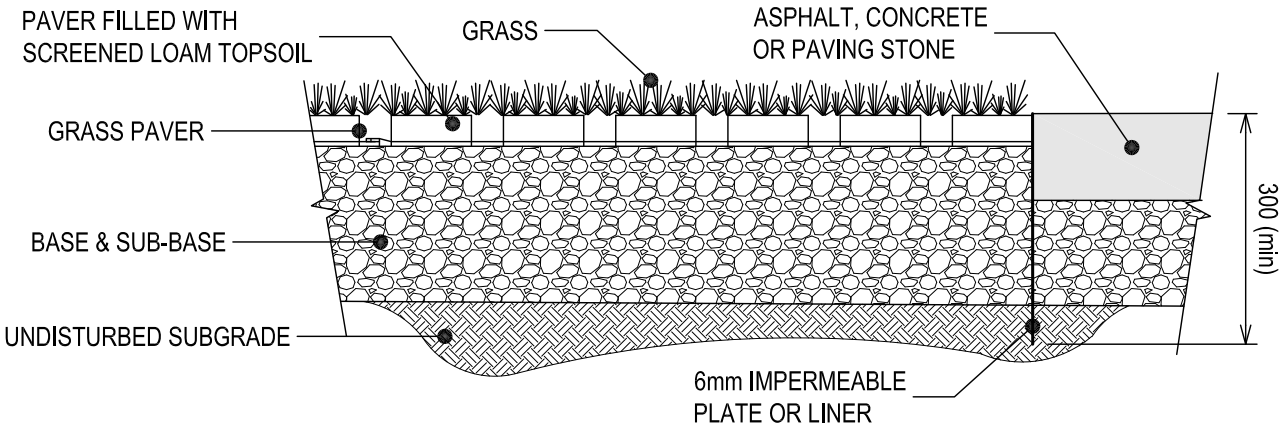
NOTES:

- TURF REINFORCEMENT GRID TO BE:
  - 500mm x 500mm x 250mm (20" x 20" x 1")
  - STRENGTH TO MEET OR EXCEED 402 Kg / cm (5720 psi)
- GRASS TYPE TO BE DETERMINED BY ENGINEER.
- FOR BASE AND SUB-BASE CONSTRUCTION REQUIREMENTS REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 11 23
- WHERE BASE WORK REQUIRED; PER DIRECTION OF ENGINEER AND / OR PER DESIGN.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS LANDSCAPE WORK**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**TURF REINFORCEMENT GRASS PAVER DETAIL**	
SCALE: N.T.S.		DRAWING NO. **50 08 10**



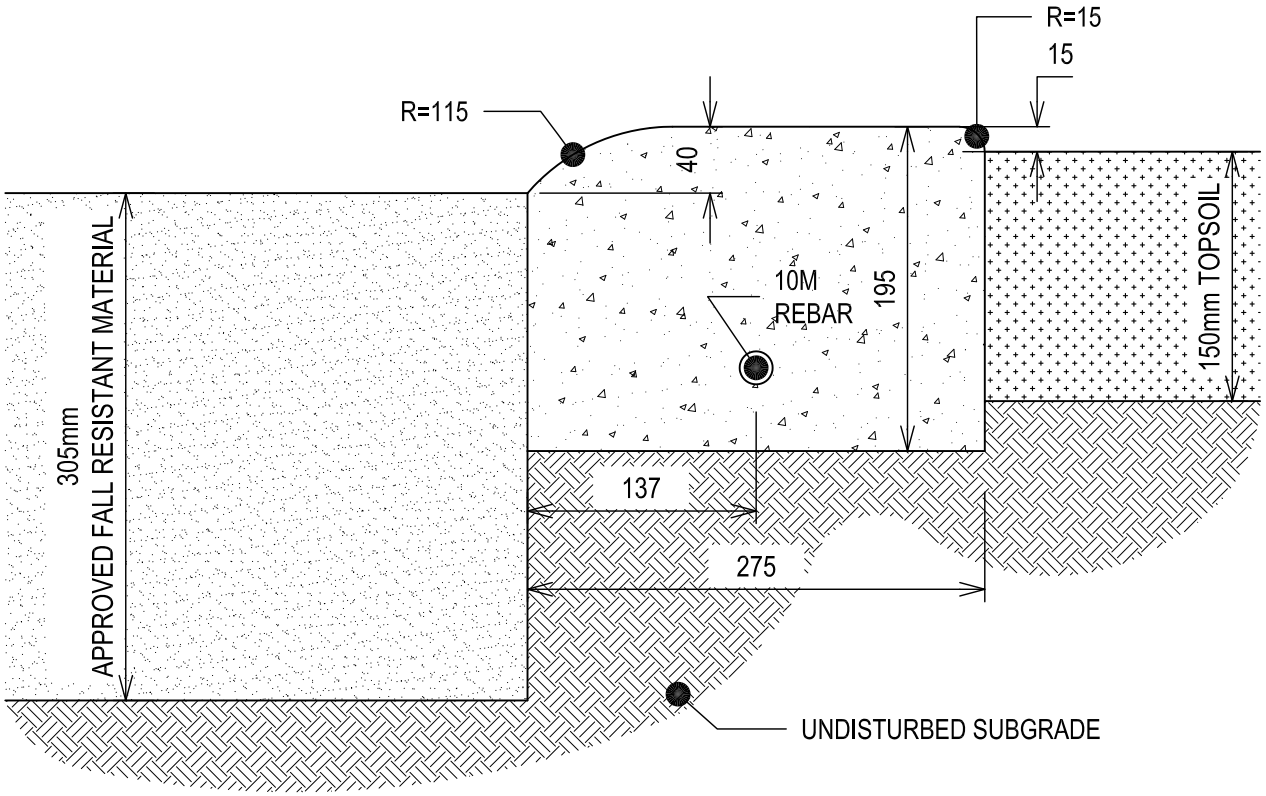
NOTES:

- GRASS TYPE TO BE DETERMINED BY ENGINEER.
- FOR BASE AND SUB-BASE CONSTRUCTION REQUIREMENTS REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 11 23
- WHERE BASE WORK REQUIRED; PER DIRECTION OF ENGINEER AND / OR PER DESIGN.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS LANDSCAPE WORK**	APPROVED BY:
DATE: 2018-02-23	**TURF REINFORCEMENT GRASS PAVER DETAIL AT HARD SURFACE EDGE**	DEPARTMENT MANAGER
SCALE: N.T.S.		DRAWING NO. **50 08 11**



NOTES:

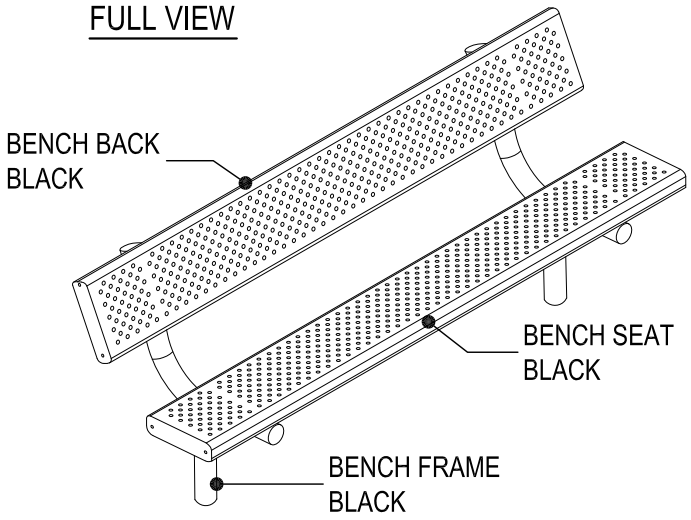
- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS:
  - SECTION 32 91 19 FOR TOPSOIL AND FINISH GRADING
  - SECTION 03 30 00 FOR CAST-INPLACE CONCRETE WORK
- CONCRETE CURB TO HAVE CONTRACTION JOINTS AT 1.5m SPACING.
- SURROUNDING GRASS SLOPE SHALL NOT EXCEED A MAXIMUM SLOPE OF 7:1.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

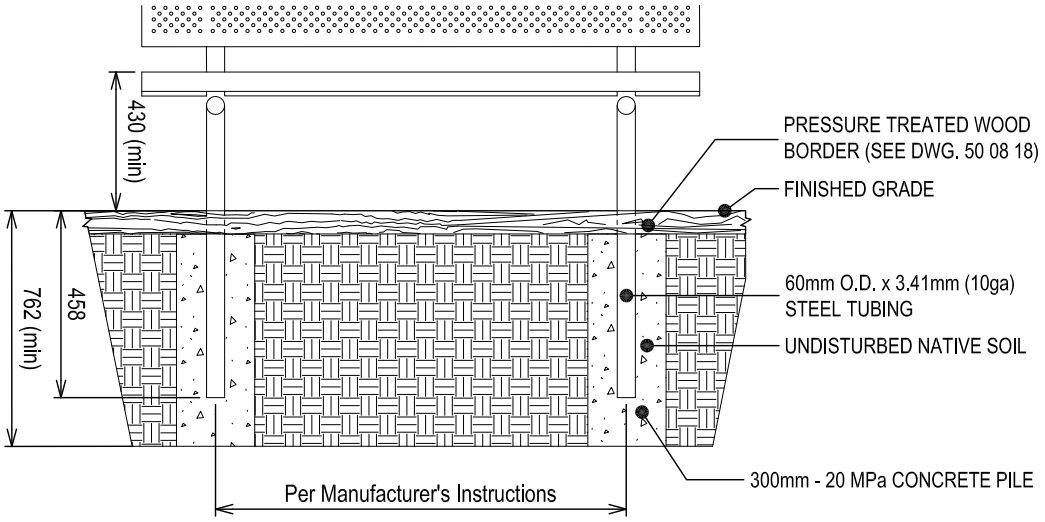
DRAWN BY: BM	**PARKS STANDARD DRAWINGS LANDSCAPE WORK**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**CONCRETE CURB EDGE RESTRAINT FOR PLAYGROUND AREA**	
SCALE: N.T.S.		DRAWING NO. **50 08 12**

FULL VIEW



NOTES:

- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 33 00 FOR FURTHER INFORMATION.
- PILES TO BE RECESSED BELOW FINAL GRADE
- SURROUNDING AREA TO BE FINISHED PER DESIGN OR TO MATCH EXISTING.
- FINISHED SURFACE ELEVATION TO BE WITHIN 75mm OF DESIGN.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



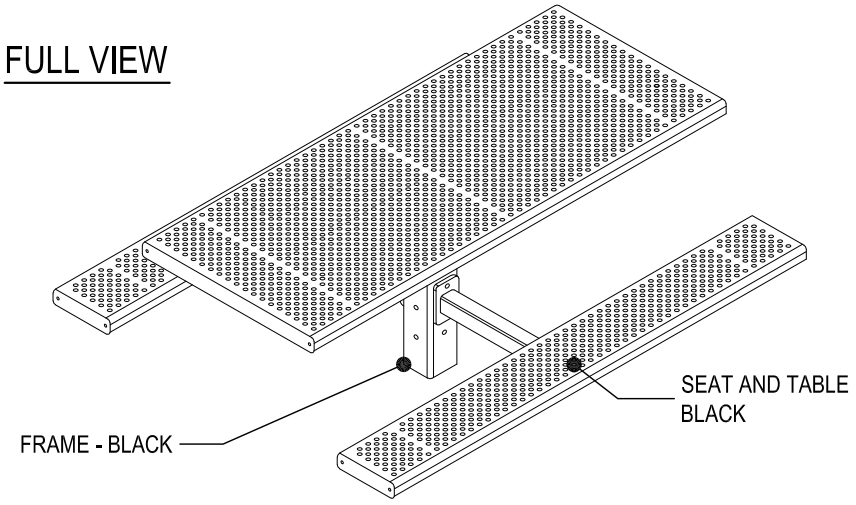
IN GROUND INSTALLATION

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

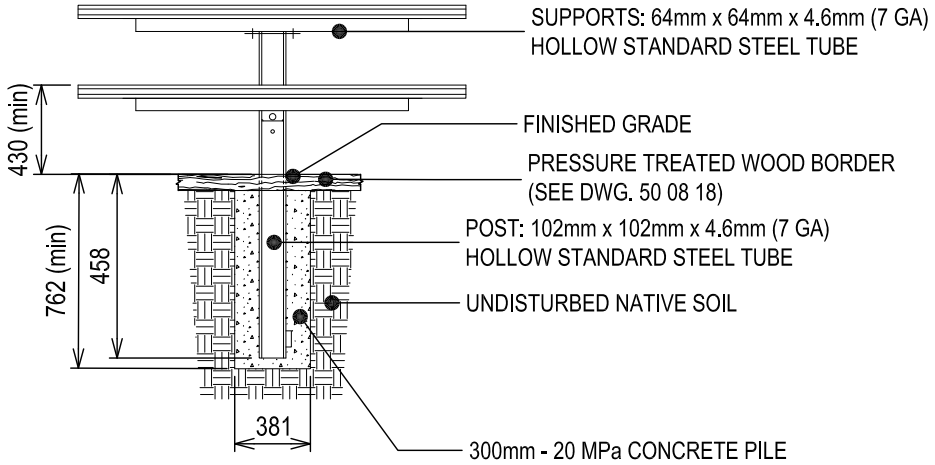
DRAWN BY: BM	**PARKS STANDARD DRAWINGS** **PARK FURNITURE**	APPROVED BY:
DATE: 2018-02-23	**PEDESTAL PARK BENCH**	DEPARTMENT MANAGER
SCALE: N.T.S.		DRAWING NO. **50 08 13**

FULL VIEW



NOTES:

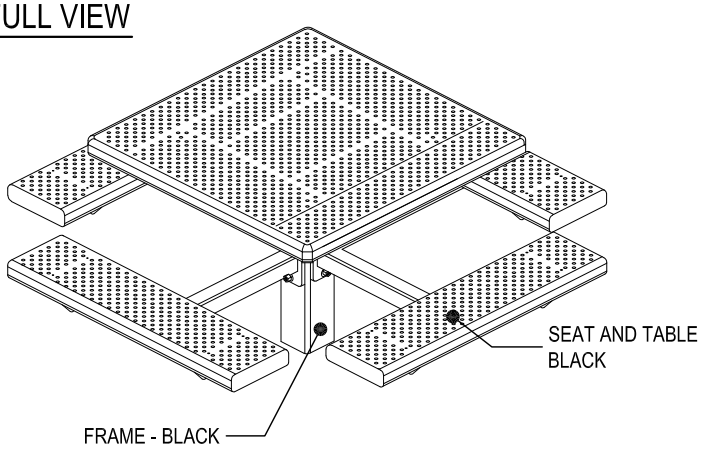
- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 33 00 FOR FURTHER INFORMATION.
- PILES TO BE RECESSED BELOW FINAL GRADE
- SURROUNDING AREA TO BE FINISHED PER DESIGN OR TO MATCH EXISTING.
- AREA BEING FINISHED SHALL NOT EXCEED 75mm IN ELEVATION VARIATION FROM DESIGN.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



IN GROUND INSTALLATION

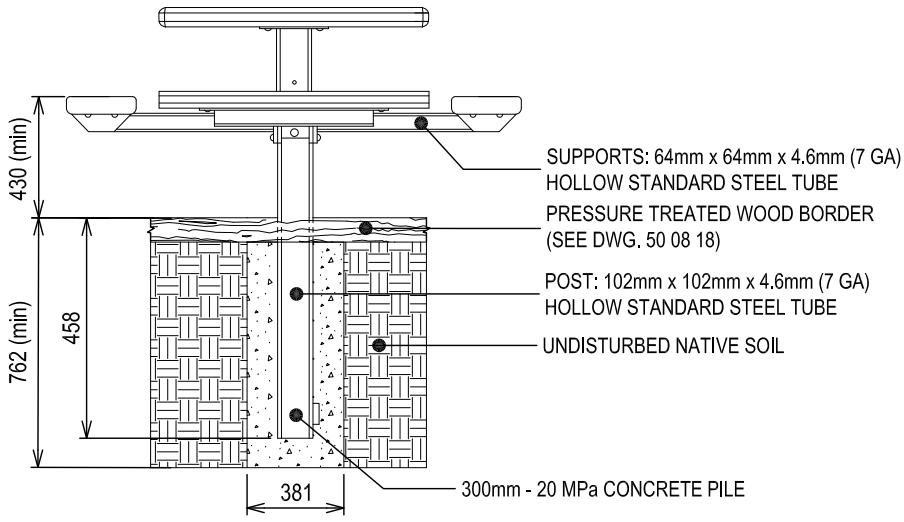
NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	PARKS STANDARD DRAWINGS PARK FURNITURE	APPROVED BY:
			DATE: 2018-02-23	RECTANGULAR PEDESTAL PARK BENCH	DEPARTMENT MANAGER
			SCALE: N.T.S.		DRAWING NO. 50 08 14

FULL VIEW



NOTES:

- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 33 00 FOR FURTHER INFORMATION.
- PILES TO BE RECESSED BELOW FINAL GRADE
- SURROUNDING AREA TO BE FINISHED PER DESIGN OR TO MATCH EXISTING.
- AREA BEING FINISHED SHALL NOT EXCEED 75mm IN ELEVATION VARIATION FROM DESIGN.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

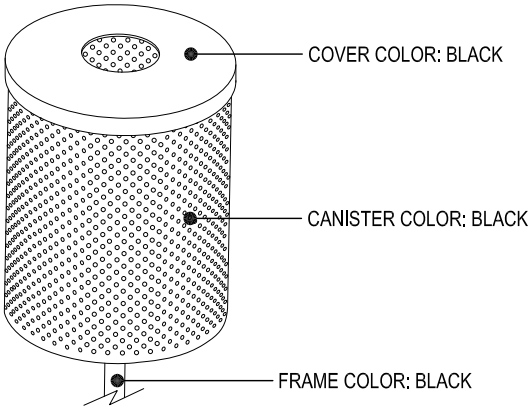


IN GROUND INSTALLATION

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

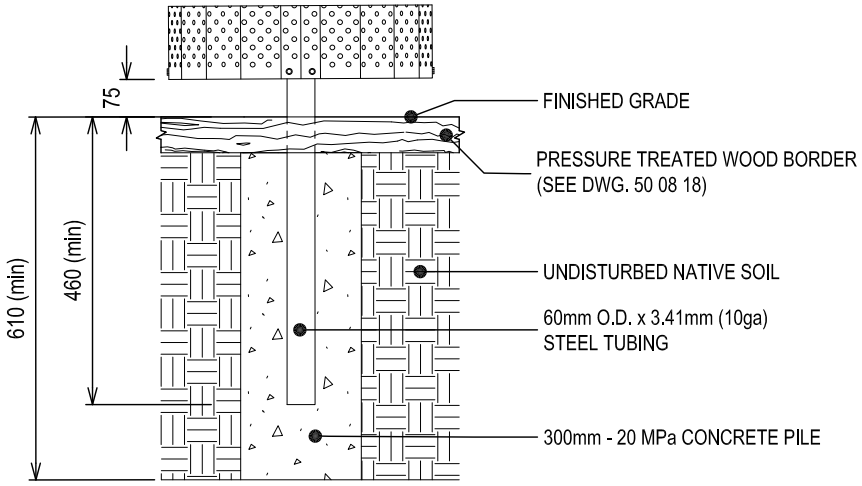
DRAWN BY: BM	**PARKS STANDARD DRAWINGS PARK FURNITURE**	APPROVED BY: DEPARTMENT MANAGER
DATE: 2018-02-23	**ALL-SIDES SQUARE PEDESTAL PARK BENCH**	
SCALE: N.T.S.		DRAWING NO. **50 08 15**



FULL VIEW

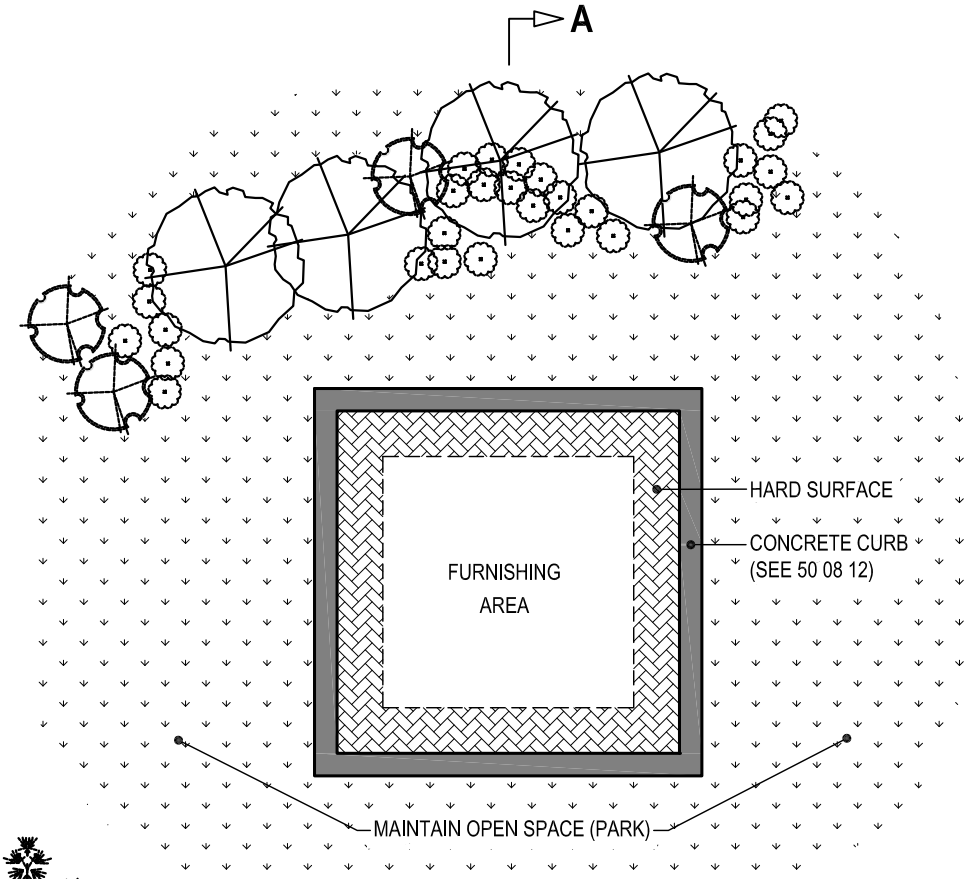
NOTES:

- REFER TO TOWN OF OLDS CONTRACT SPECIFICATIONS SECTION 32 33 00 FOR FURTHER INFORMATION.
- PILES TO BE RECESSED BELOW FINAL GRADE
- SURROUNDING AREA TO BE FINISHED PER DESIGN OR TO MATCH EXISTING.
- AREA BEING FINISHED SHALL NOT EXCEED 75mm IN ELEVATION VARIATION FROM DESIGN.
- DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



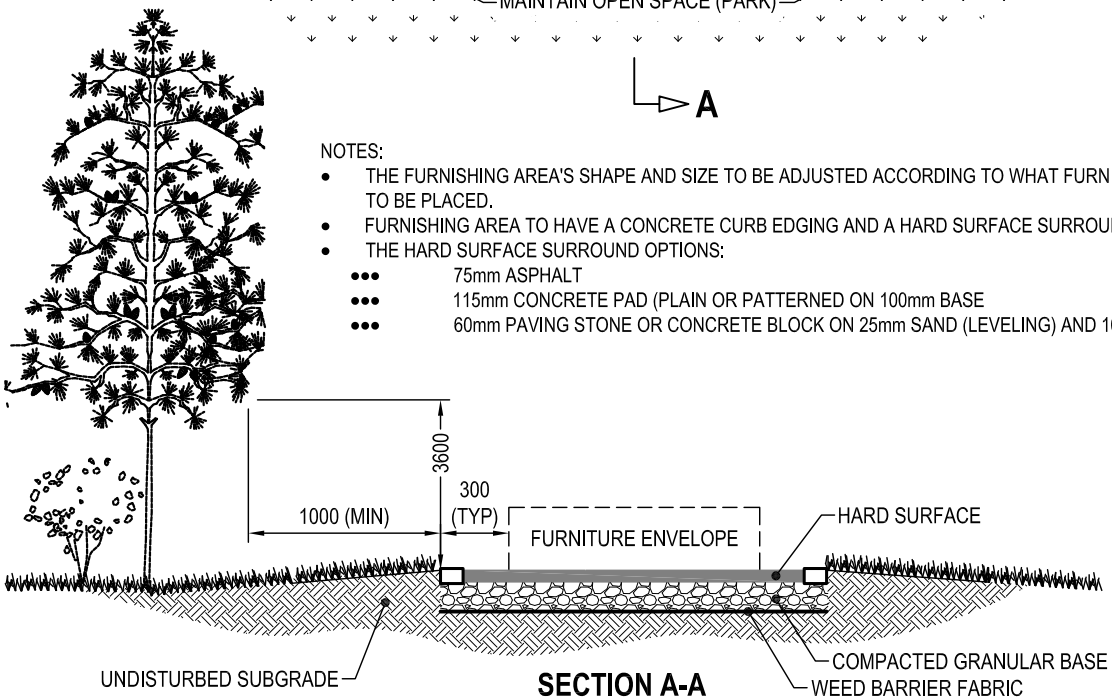
IN GROUND INSTALLATION

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	PARKS STANDARD DRAWINGS PARK FURNITURE	APPROVED BY:
			DATE: 2018-02-23	PEDESTAL GARBAGE RECEPTACLE	DEPARTMENT MANAGER
			SCALE: N.T.S.		DRAWING NO. 50 08 16



NOTES:

- THE FURNISHING AREA'S SHAPE AND SIZE TO BE ADJUSTED ACCORDING TO WHAT FURNISHING(S) IS TO BE PLACED.
- FURNISHING AREA TO HAVE A CONCRETE CURB EDGING AND A HARD SURFACE SURROUND.
- THE HARD SURFACE SURROUND OPTIONS:
  - 75mm ASPHALT
  - 115mm CONCRETE PAD (PLAIN OR PATTERNED ON 100mm BASE
  - 60mm PAVING STONE OR CONCRETE BLOCK ON 25mm SAND (LEVELING) AND 100mm BASE.

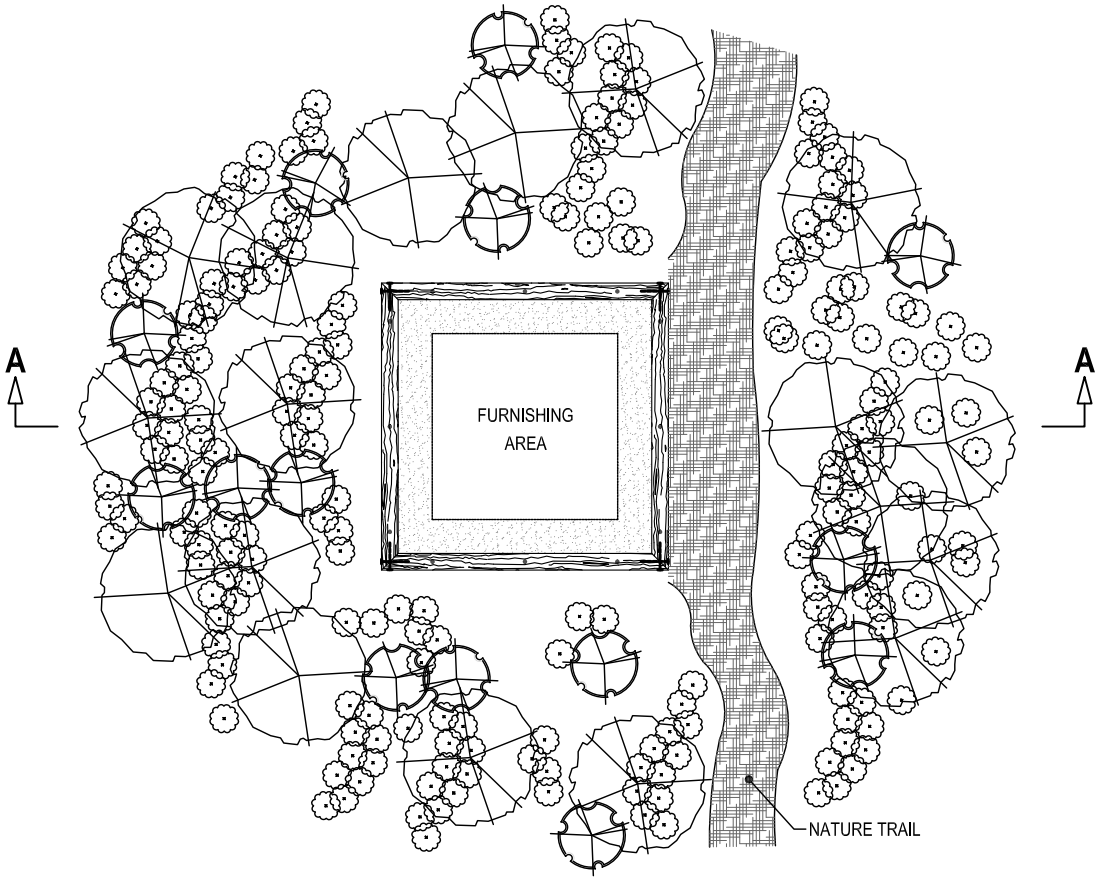


SECTION A-A

NO.	DATE	REVISION

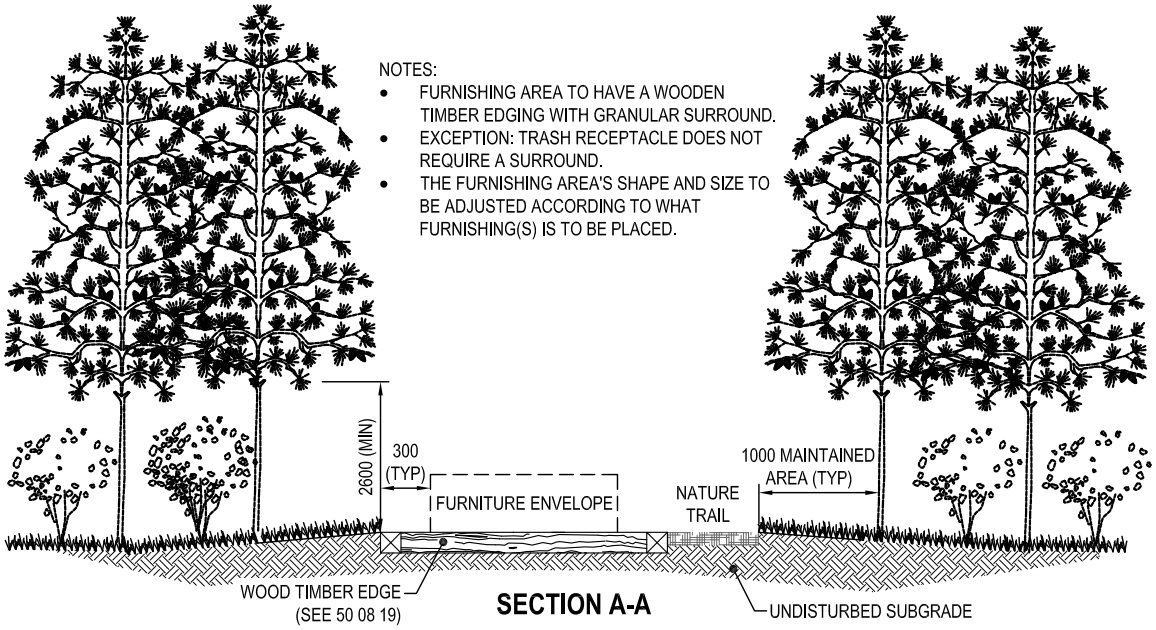
THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**PARKS STANDARD DRAWINGS** **PARK FURNITURE**	APPROVED BY:
DATE: 2018-03-06	**TYPICAL SURFACE TREATMENT** **OPEN SPACE (PARK)** **FURNISHING SURROUND**	DEPARTMENT MANAGER
SCALE: N.T.S.		DRAWING NO. **50 08 17**



NOTES:

- FURNISHING AREA TO HAVE A WOODEN TIMBER EDGING WITH GRANULAR SURROUND.
- EXCEPTION: TRASH RECEPTACLE DOES NOT REQUIRE A SURROUND.
- THE FURNISHING AREA'S SHAPE AND SIZE TO BE ADJUSTED ACCORDING TO WHAT FURNISHING(S) IS TO BE PLACED.

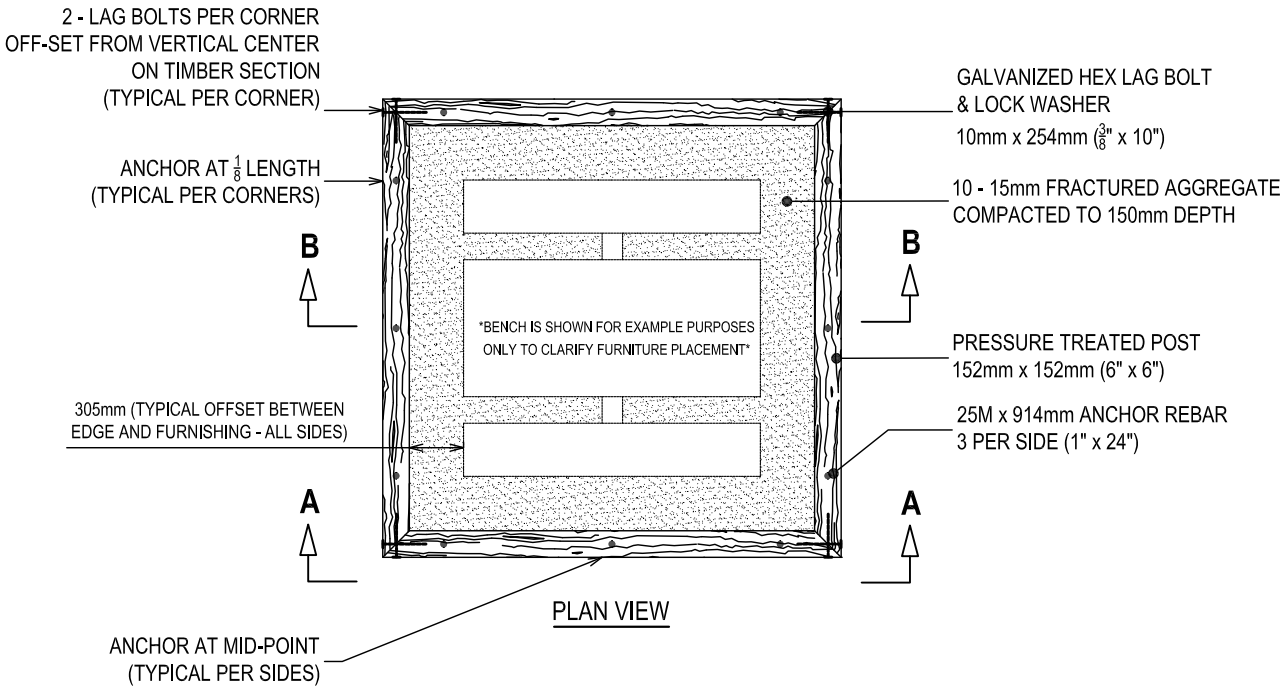


SECTION A-A

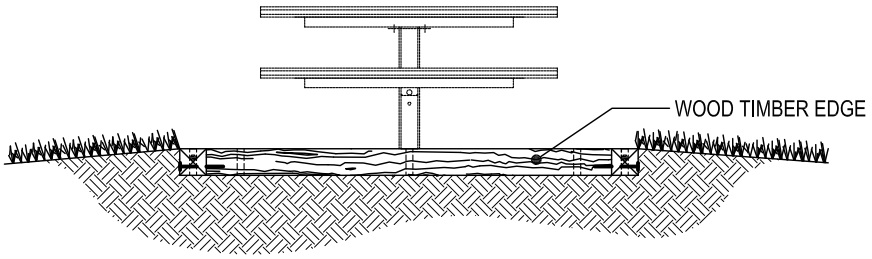
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

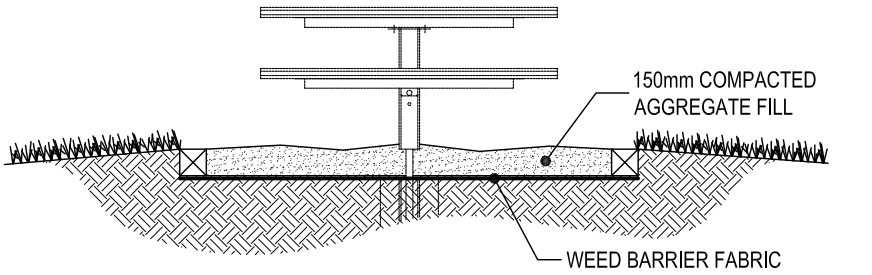
DRAWN BY: BM	**PARKS STANDARD DRAWINGS** **PARK FURNITURE**	APPROVED BY:
DATE: 2018-03-06	**TYPICAL SURFACE TREATMENT** **NATURAL AREA** **FURNISHING SURROUND**	DEPARTMENT MANAGER
SCALE: N.T.S.		DRAWING NO. **50 08 18**



PLAN VIEW



SECTION A-A

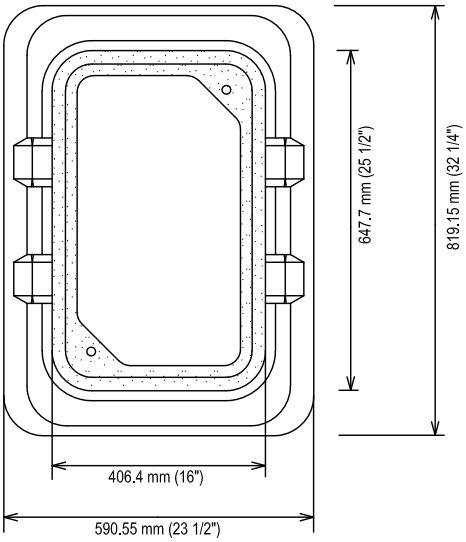


SECTION B-B

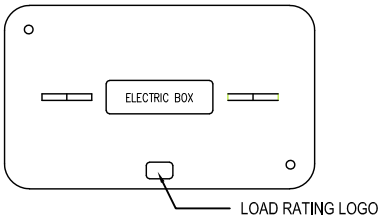
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

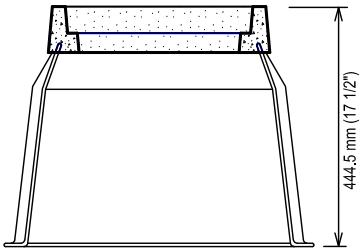
DRAWN BY: BM	**PARKS STANDARD DRAWINGS** **PARK FURNITURE**	APPROVED BY:
DATE: 2018-02-23	**TYPICAL SURFACE TREATMENT** **OPEN SPACE**	DEPARTMENT MANAGER
SCALE: N.T.S.	**TIMBER & PEA-GRAVEL SURROUND**	DRAWING NO. **50 08 19**



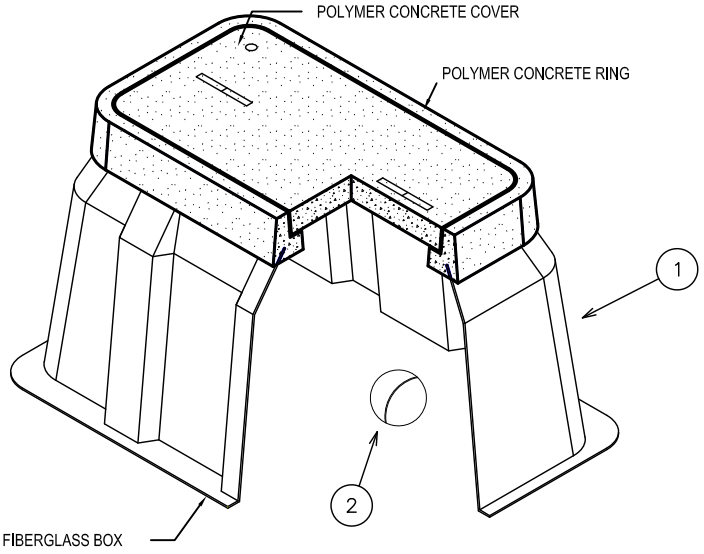
TOP PROFILE



CONCRETE POLYMER COVER



SIDE PROFILE



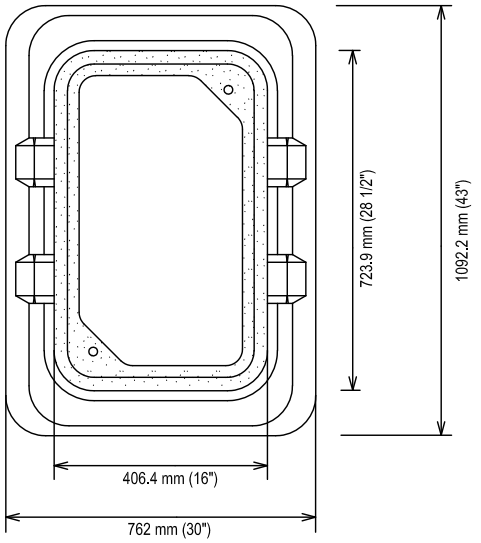
ISOMETRIC VIEW

1. Vault Secondary Service URD Fiberglass 406.4 mm x 635 mm x 431.8 mm (16" x 25" x 17")
2. Marker Ball (Locating)

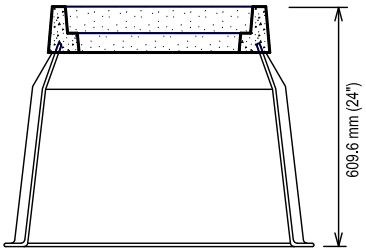
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

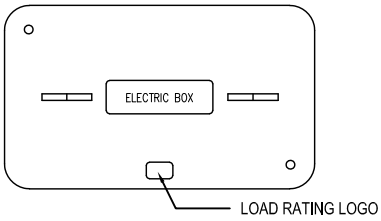
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION**	APPROVED BY: ENGINEER
DATE: 2018-03-05	**FIRBERGLASS URD VAULT SECONDARY SERVICE**	
SCALE: N.T.S.		DRAWING NO. **50 09 01**



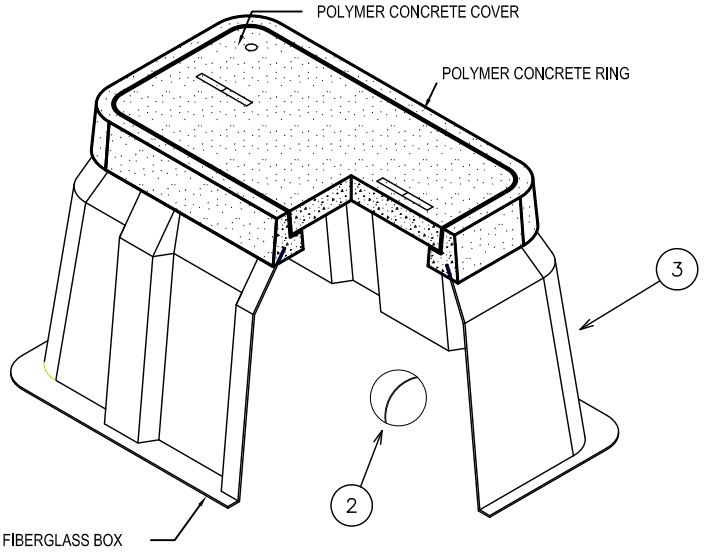
TOP PROFILE



SIDE PROFILE



CONCRETE POLYMER COVER

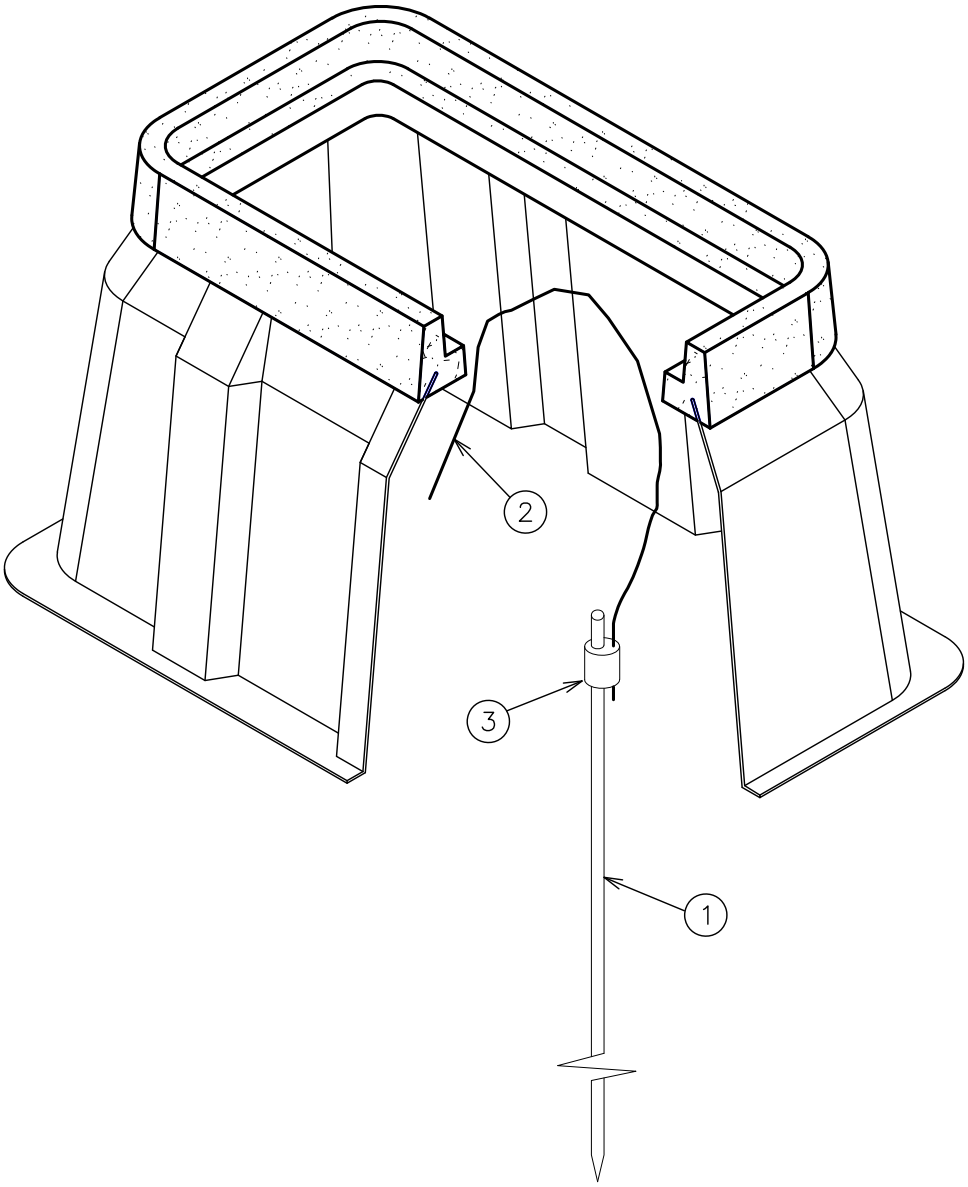


ISOMETRIC VIEW

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION**	APPROVED BY: ENGINEER
DATE: 2018-03-05	**FIRBERGLASS URD VAULT TRAFFIC CONTROL**	
SCALE: N.T.S.		DRAWING NO. **50 09 02**



NOTE:

1. Ground rod is located inside URD box.
2. Wire Grnd 2/0 CU Soft Stranded Bare
3. Connector Comp 2/0 CU to 15.875 mm (5/8") Ground Rod

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION	APPROVED BY: ENGINEER
			DATE: 2018-03-05	GROUNDING FOR URD BOXES	DRAWING NO. 50 09 03
			SCALE: N.T.S.		

1. The base shall extend above ground level with a sufficient height to maintain the vertical clearance specified in Dwg. No. 50 09 13 and Dwg. No. 50 09 14. Consult Engineer if extension exceeds 500mm beyond standard drawing.

2. Pile design is based on allowable skin friction of 19.1 KPa (400psf) in native sandy silt and clay fill. Allowable lateral soil pressure is 67 KPa (1400psf). Report any adverse soil conditions to the Engineer prior to concreting.

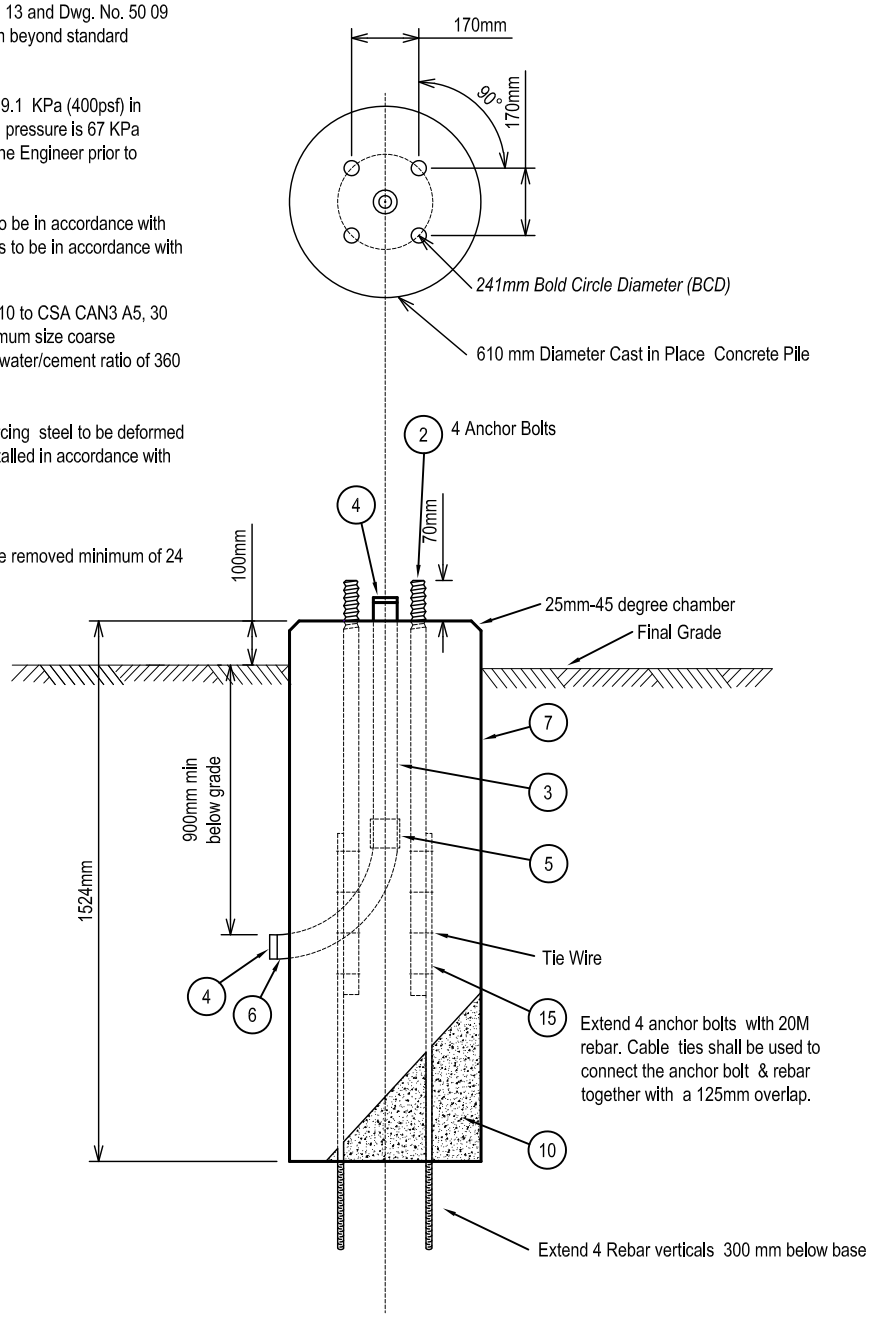
3. Concrete materials and methods of construction to be in accordance with CSA CAN3 A23.1-M. Design of concrete elements to be in accordance with CSA CAN3 A23.3-M. Refer to section 03 05 13.

4. Concrete, steel reinforced, Portland cement type 10 to CSA CAN3 A5, 30 MPa. 28 days compressive strength, 20mm maximum size coarse aggregate, 80+20 slump, air entrained 6% ± 1%, water/cement ratio of 360 Kg/m³ minimum cement content.

5. Reinforcing steel rods are 20M, 400 MPa. Reinforcing steel to be deformed billet steel, plain finish to CSA G30.18-M and installed in accordance with CSA CAN3 A23.1-M. Refer to section 03 20 00.

6. No welding allowed on anchor bolts.

7. Maximum depth of sonatube to be 1200mm. To be removed minimum of 24 hours after pouring base.



NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION**	APPROVED BY: ENGINEER
DATE: 2018-03-05	**MEDIAN / PEDESTRIAN POST CONCRETE BASE FOR 241 mm BOLT CIRCLE DIAMTER**	DRAWING NO. **50 09 04**
SCALE: N.T.S.		

NOTES

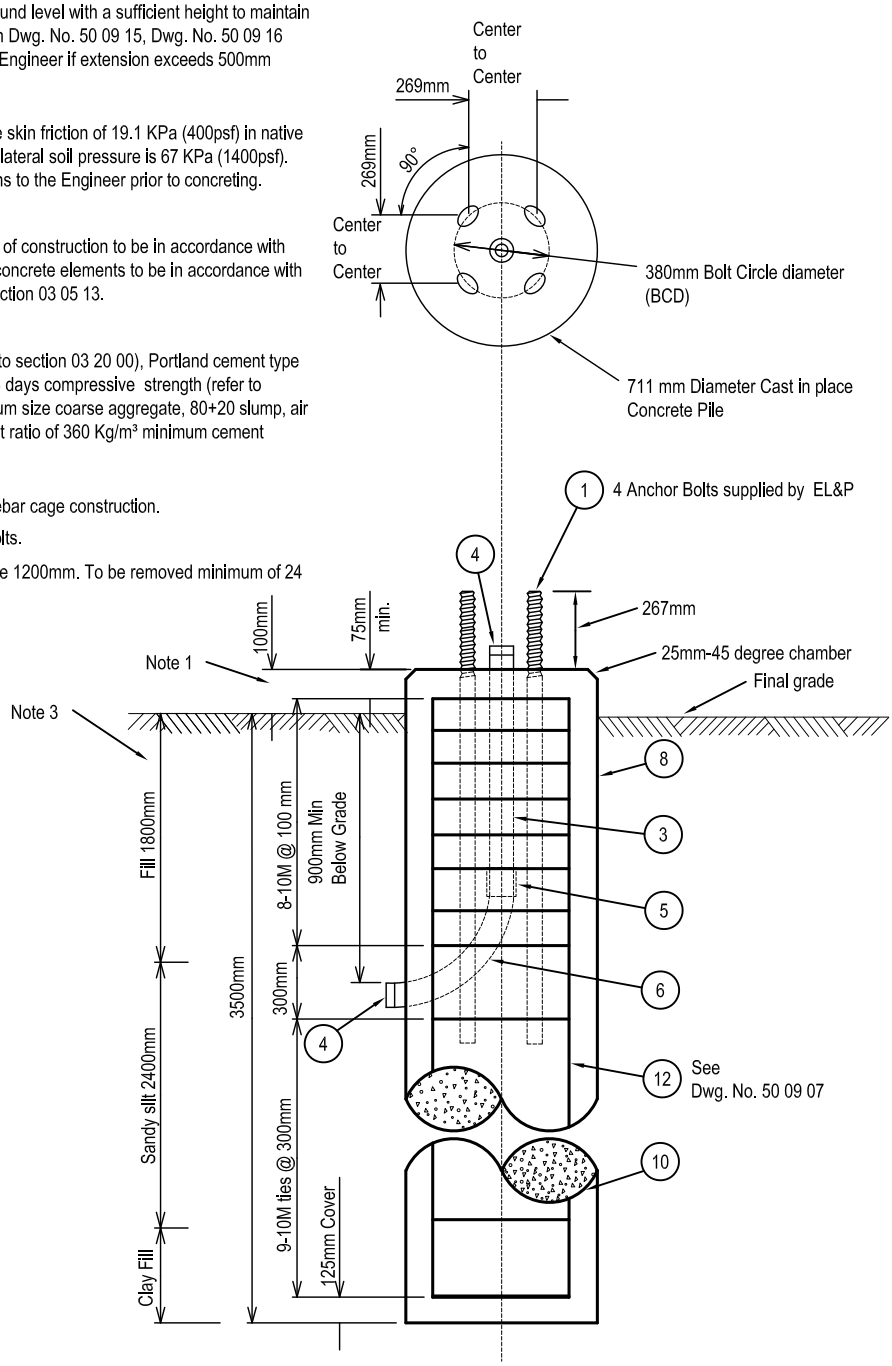
1. The base shall extend above ground level with a sufficient height to maintain the vertical clearance specified in Dwg. No. 50 09 15, Dwg. No. 50 09 16 and Dwg. No. 50 09 17. Consult Engineer if extension exceeds 500mm beyond standard drawing.

2. Pile design is based on allowable skin friction of 19.1 KPa (400psf) in native sandy silt and clay fill. Allowable lateral soil pressure is 67 KPa (1400psf). Report any adverse soil conditions to the Engineer prior to concreting.

3. Concrete materials and methods of construction to be in accordance with CSA CAN3 A23.1-M. Design of concrete elements to be in accordance with CSA CAN3 A23.3-M. Refer to section 03 05 13.

4. Concrete, steel reinforced (refer to section 03 20 00), Portland cement type 10 to CSA CAN3 A5, 30 MPa. 28 days compressive strength (refer to section 03 05 13), 20mm maximum size coarse aggregate, 80+20 slump, air entrained 6% ±1%, water/cement ratio of 360 Kg/m³ minimum cement content.

5. Refer to Dwg. No. 50 09 07 for rebar cage construction.
6. No welding allowed on anchor bolts.
7. Maximum depth of sonatube to be 1200mm. To be removed minimum of 24 hours after pouring base.



NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION	APPROVED BY: ENGINEER
			DATE: 2018-03-05	CANTILEVER BASE - CONCRETE FOUNDATION FOR 380 mm BOLT CIRCLE DIAMETER	DRAWING NO. 50 09 05
			SCALE: N.T.S.		

NOTES

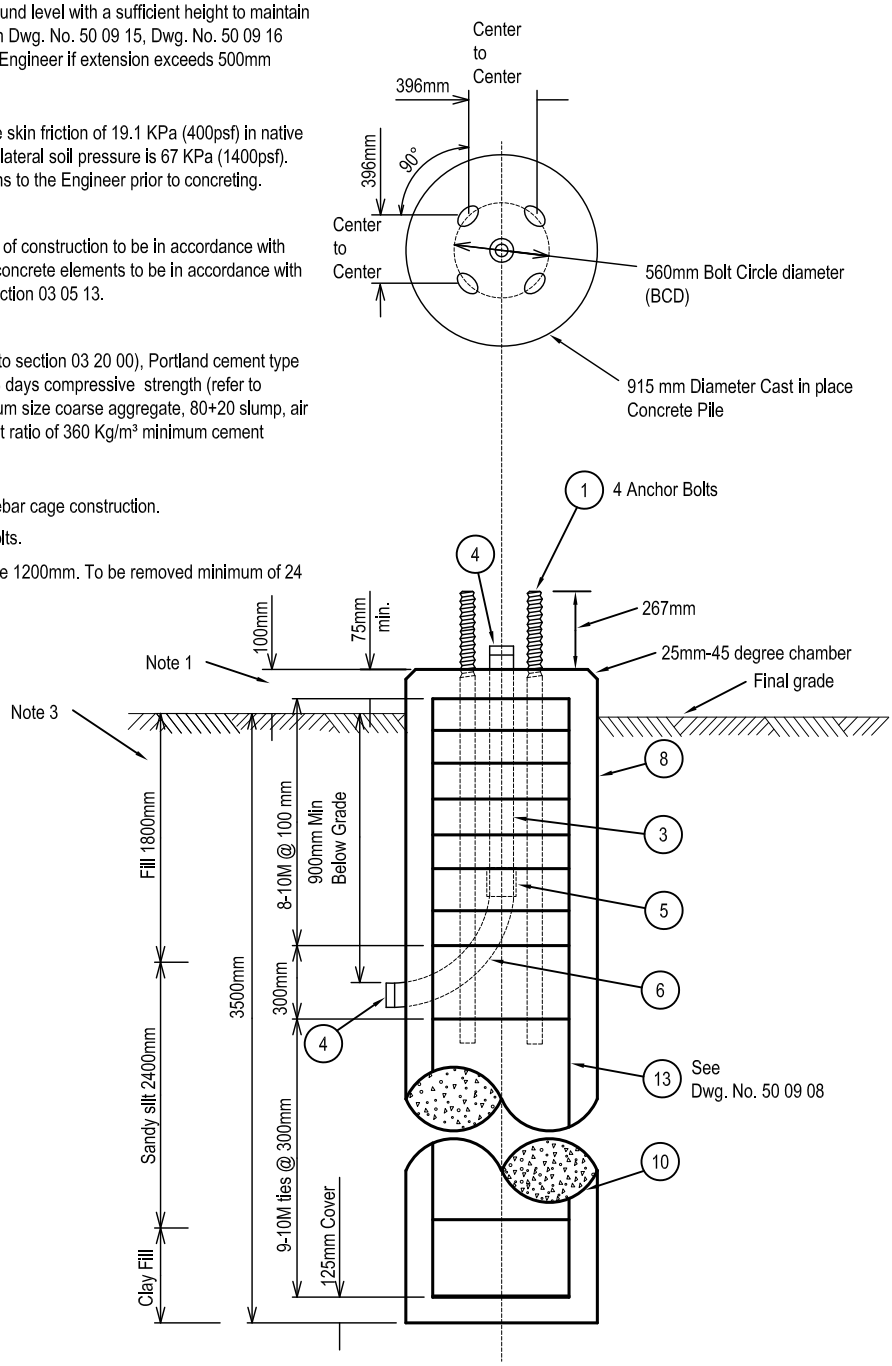
1. The base shall extend above ground level with a sufficient height to maintain the vertical clearance specified in Dwg. No. 50 09 15, Dwg. No. 50 09 16 and Dwg. No. 50 09 17. Consult Engineer if extension exceeds 500mm beyond standard drawing.

2. Pile design is based on allowable skin friction of 19.1 KPa (400psf) in native sandy silt and clay fill. Allowable lateral soil pressure is 67 KPa (1400psf). Report any adverse soil conditions to the Engineer prior to concreting.

3. Concrete materials and methods of construction to be in accordance with CSA CAN3 A23.1-M. Design of concrete elements to be in accordance with CSA CAN3 A23.3-M. Refer to section 03 05 13.

4. Concrete, steel reinforced (refer to section 03 20 00), Portland cement type 10 to CSA CAN3 A5, 30 MPa. 28 days compressive strength (refer to section 03 05 13), 20mm maximum size coarse aggregate, 80+20 slump, air entrained 6% ±1%, water/cement ratio of 360 Kg/m³ minimum cement content.

5. Refer to Dwg. No. 50 09 08 for rebar cage construction.
6. No welding allowed on anchor bolts.
7. Maximum depth of sonatube to be 1200mm. To be removed minimum of 24 hours after pouring base.



NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

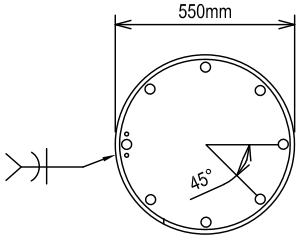
DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION**	APPROVED BY: ENGINEER
DATE: 2018-03-05	**CANTILEVER BASE - CONCRETE FOUNDATION FOR 560 mm BOLT CIRCLE DIAMETER**	DRAWING NO. **50 09 06**
SCALE: N.T.S.		

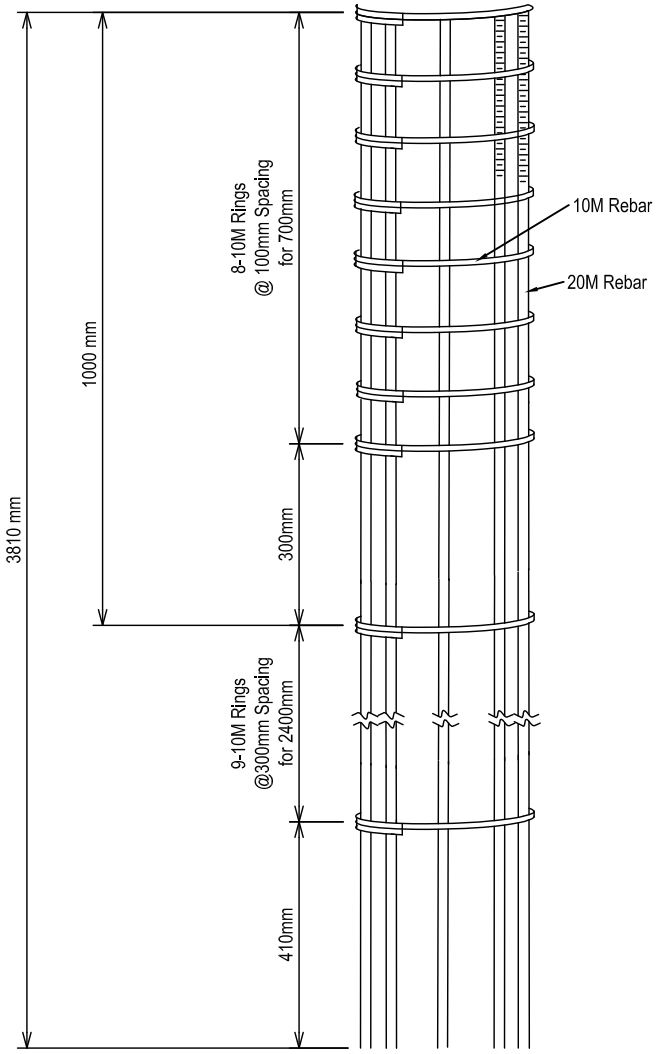
NOTES

1. Reinforcing steel rods are 20M, 400 MPa. Reinforcing steel circles are 10M, 300 MPa. Reinforcing steel to be deformed billet steel, plain finish to CSA G30.18-M92.

2. Rebar steel circles to be spot welded at a diameter of 550mm with the rebar overlapping an additional 550mm around the steel circle and spot welded.

3. Fabricator responsible for making welds shall be certified by the Canadian Welding Bureau to the latest requirements of CSA Standard W47.1 (Division 1.0 or 2.1).





MATERIAL

8 - Rebar steel rods ——— 20mm x 3810mm

17 - Rebar circles ——— 10mm x 550mm

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-03-05

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
ELECTRICAL CONSTRUCTION

REBAR CAGE FOR 380 mm BOLT CIRCLE DIAMETER CONRETE FOUNDATION

APPROVED BY:

ENGINEER

DRAWING NO.

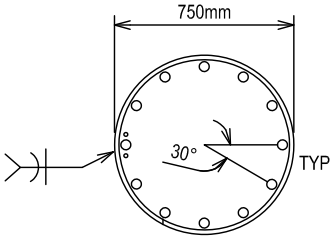
50 09 07

NOTES

1. Reinforcing steel rods are 20M, 400 MPa. Reinforcing steel circles are 10M, 300 MPa. Reinforcing steel to be deformed billet steel, plain finish to CSA G30.18-M92.

2. Rebar steel circles to be spot welded at a diameter of 750mm with the rebar overlapping an additional 750mm around the steel circle and spot welded.

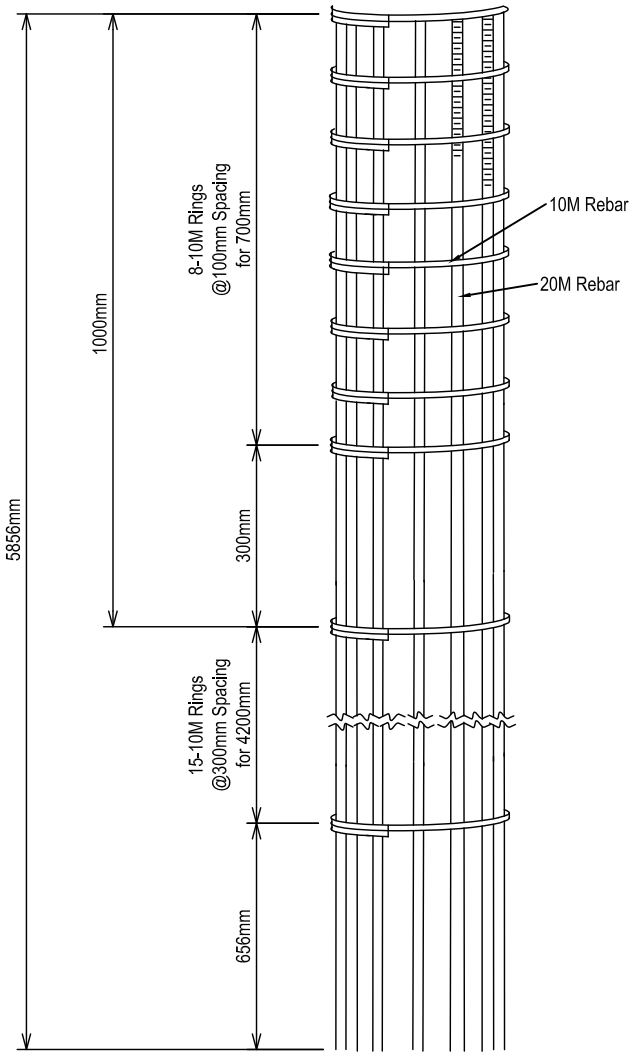
3. Fabricator responsible for making welds shall be certified by the Canadian Welding Bureau to the latest requirements of CSA Standard W47.1 (Division 1.0 or 2.1).



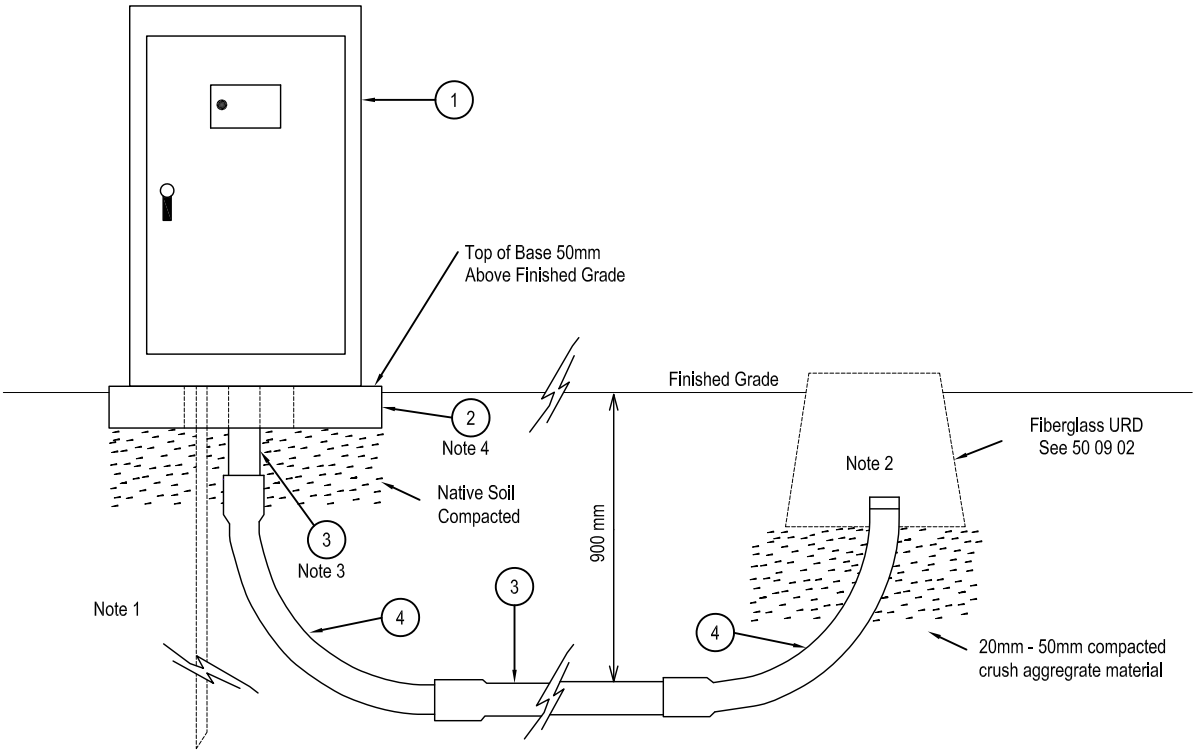
MATERIAL

12 - Rebar steel rods ——— 20mm x 5842mm

23 - Rebar circles ——— 10mm x 750mm



NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION	APPROVED BY: ENGINEER
			DATE: 2018-03-05	REBAR CAGE FOR 560 mm BOLT CIRCLE DIAMETER CONRETE FOUNDATION	DRAWING NO. 50 09 08
			SCALE: N.T.S.		



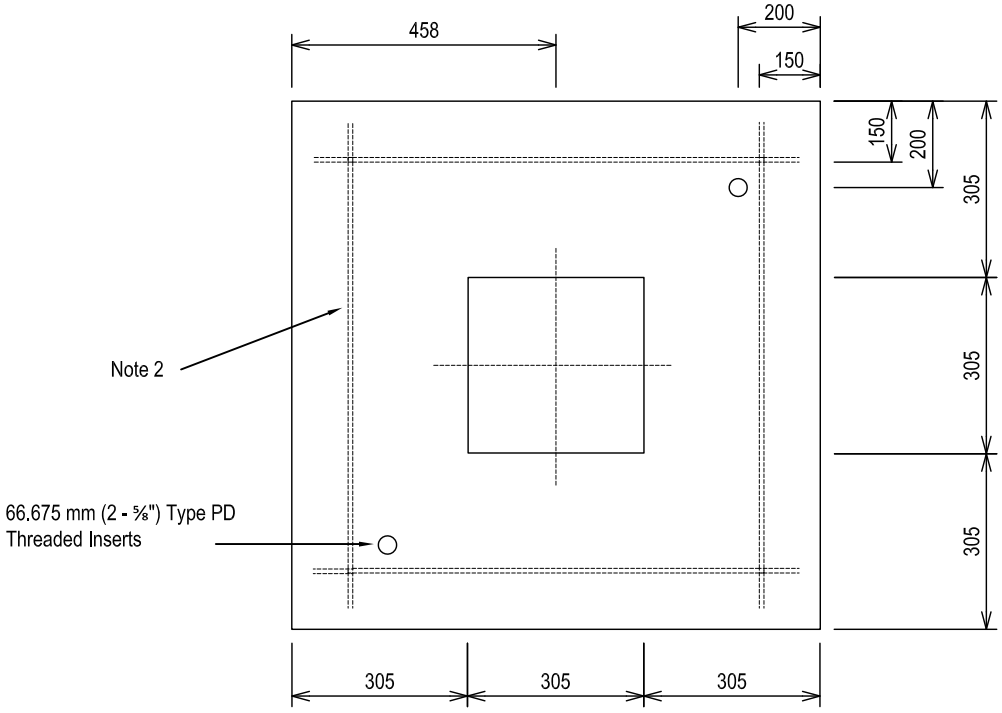
NOTES:

1. For supply & grounding details see standard drawing 50 09 11.
2. 100mm duct to be a min of 50mm above bottom of URD and centered.
3. 100mm duct to be flush with top of base and centered in opening. The ground rod is to be placed toward the front or rear corner away from duct, allowing for sufficient space to install a ground connector on the rod.
4. For the concrete base details see standard drawing 50 09 10.

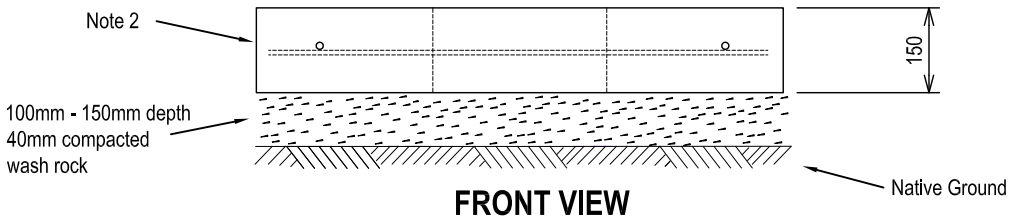
NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION**	APPROVED BY: ENGINEER
DATE: 2018-03-06	**TRAFFIC CONTROLLER TYPICAL INSTALLATION**	
SCALE: N.T.S.		DRAWING NO. **50 09 09**



PLAN VIEW

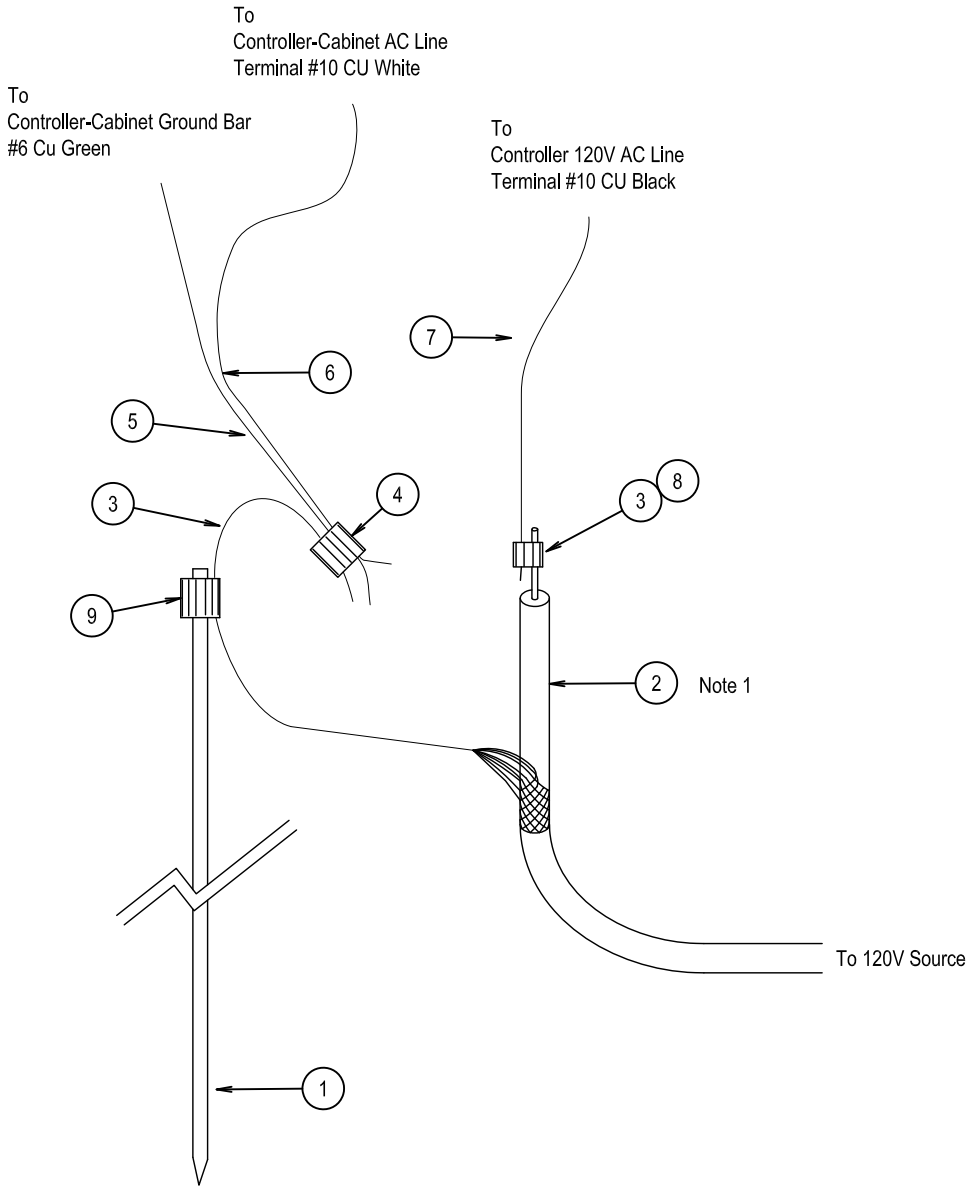


FRONT VIEW

Notes:

1. Concrete, steel reinforced, type 50, 30MPa. As per specification. Dry weight of base = 245kg. Volume of concrete = 0.12 cu.m.
2. 10M rebar reinforced steel. 2 bars each way.
3. All dimensions are in millimetres unless noted otherwise.

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION	APPROVED BY: ENGINEER
			DATE: 2018-03-06	BASE CONCRETE CONTROLLER - CABINET	
			SCALE: N.T.S.		DRAWING NO. 50 09 10



NOTES:

1. Supply cable is typically #4 AL 1 CDR via 100mm duct in the traffic-controller base.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-03-06

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
ELECTRICAL CONSTRUCTION

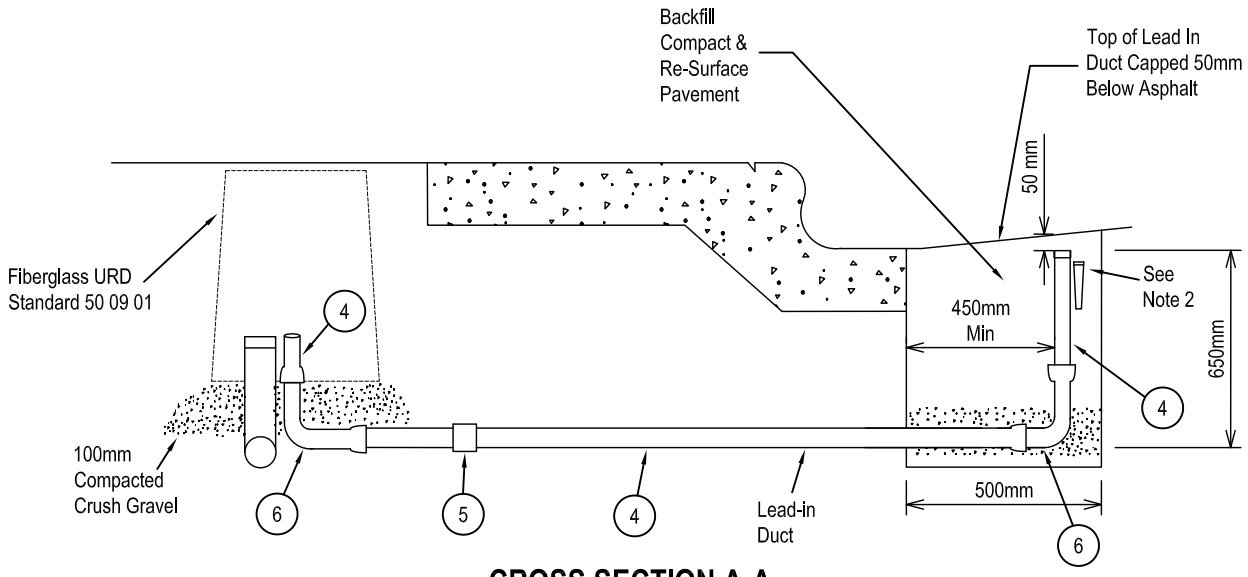
TRAFFIC CONTROLLER SUPPLY AND GROUNDING

APPROVED BY:

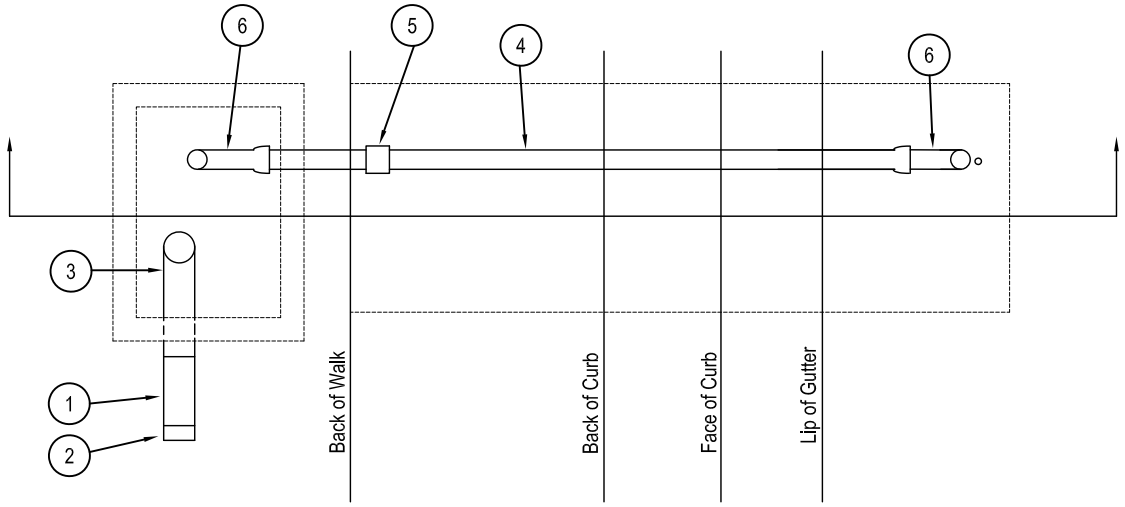
ENGINEER

DRAWING NO.

50 09 11



CROSS SECTION A-A



NOTES:

1. May use concrete instead of compacted backfill at the discretion of the engineer. Anchor duct to trench bottom with rebar.
2. Tie 3M Marker Pin on vertical piece of lead-in duct as marker for locating duct. The Marker Pin is to be left low enough as to not interfere with any pavement equipment.
3. URD location at the discretion of the engineer.
4. A section of the existing pavement and/or sidewalk may require removal and replacement to facilitate installation of the lead in duct.
5. Lead in duct to be perpendicular to curb face.

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM

DATE: 2018-03-06

SCALE: N.T.S.

CONSTRUCTION SPECIFICATION DRAWINGS
ELECTRICAL CONSTRUCTION

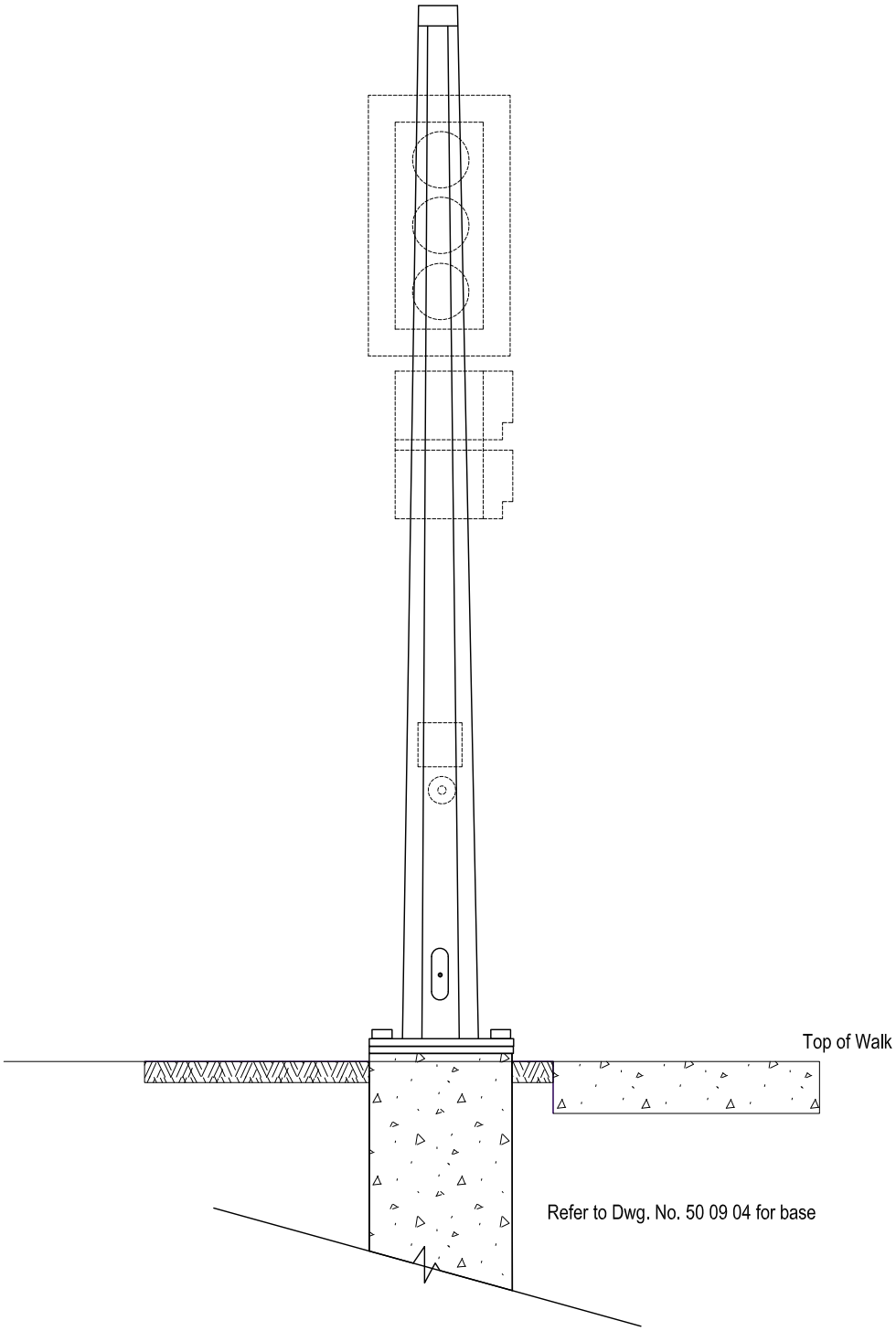
TRAFFIC LOOP SPLICE BOX HOME RUN BURIED BACK OF CURB

APPROVED BY:

ENGINEER

DRAWING NO.

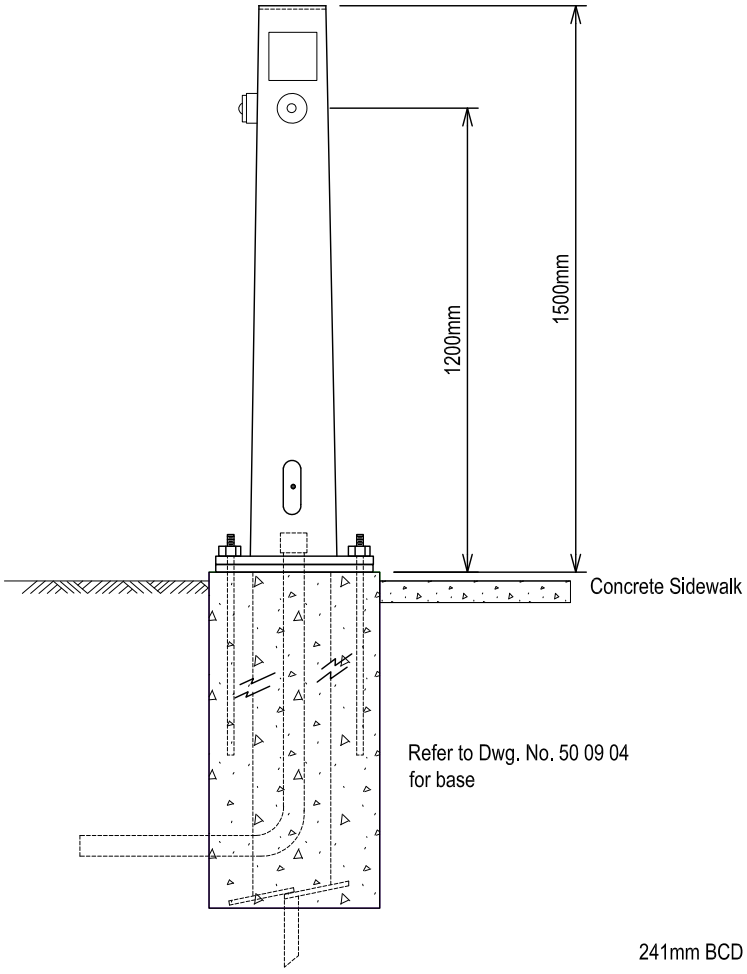
50 09 12

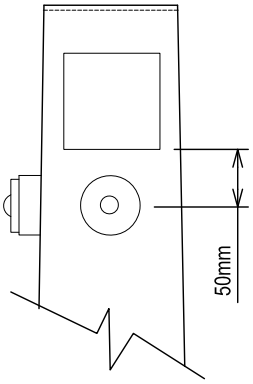


NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION**	APPROVED BY: ENGINEER
DATE: 2018-03-06	**MEDIAN SIGNAL POLE**	
SCALE: N.T.S.		DRAWING NO. **50 09 13**

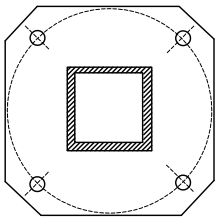




PUSH BUTTON AND SIGN DETAIL

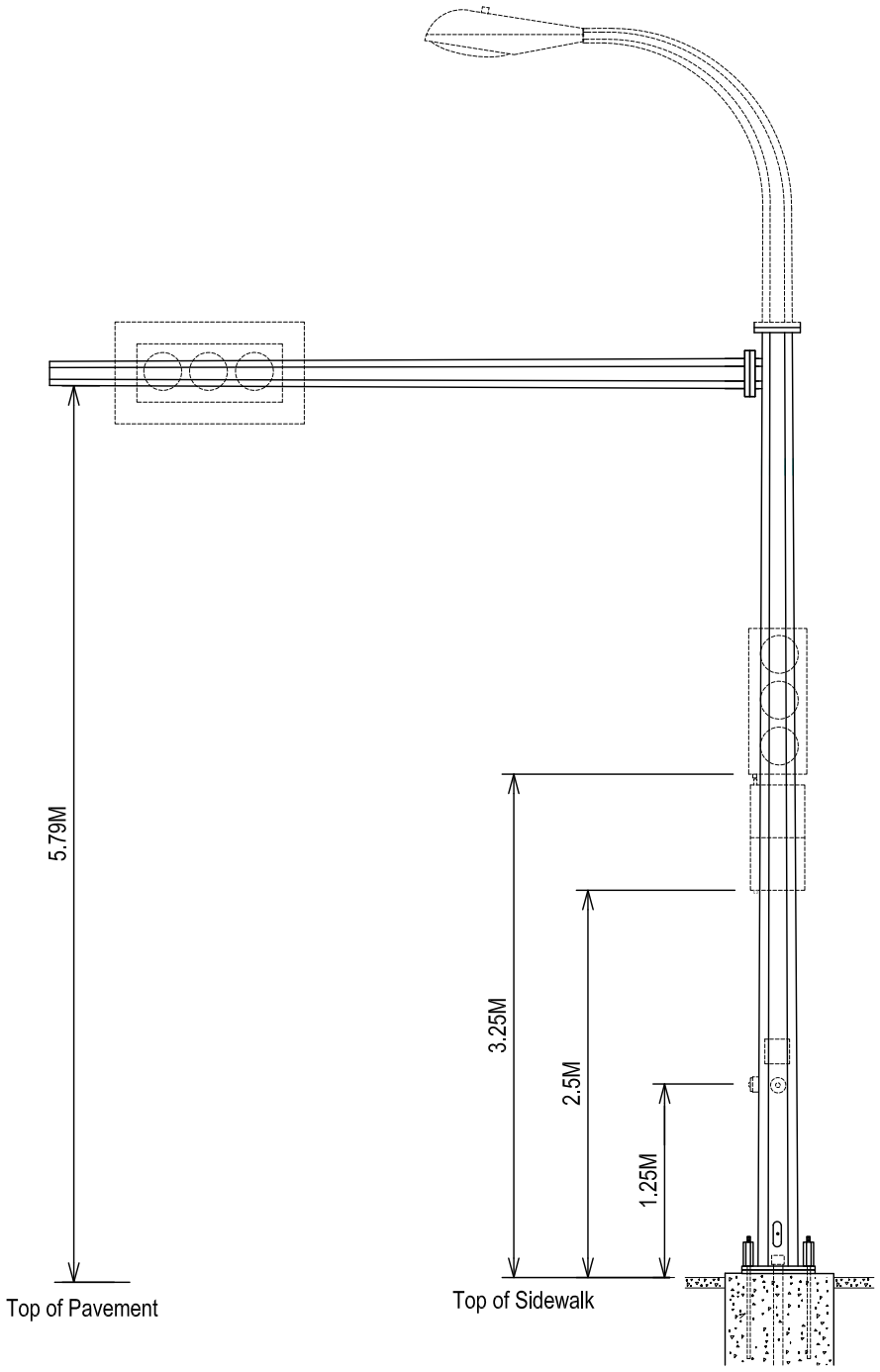
241mm BCD

32mm Dia Hole



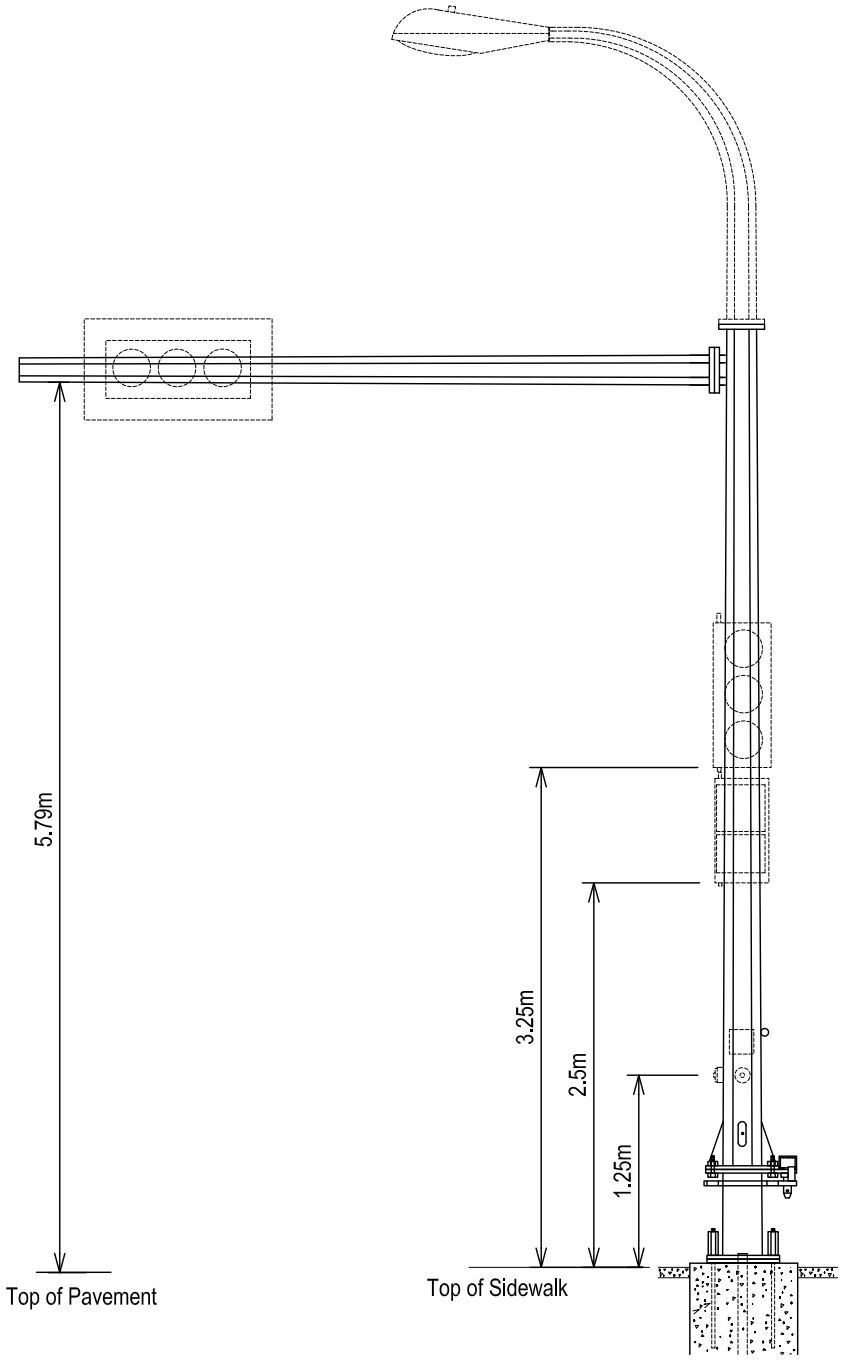
BASE PLATE DETAIL

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION	APPROVED BY: ENGINEER
			DATE: 2018-03-06	PEDESTRIAN SIGNAL POLE	DRAWING NO. 50 09 14
			SCALE: N.T.S.		



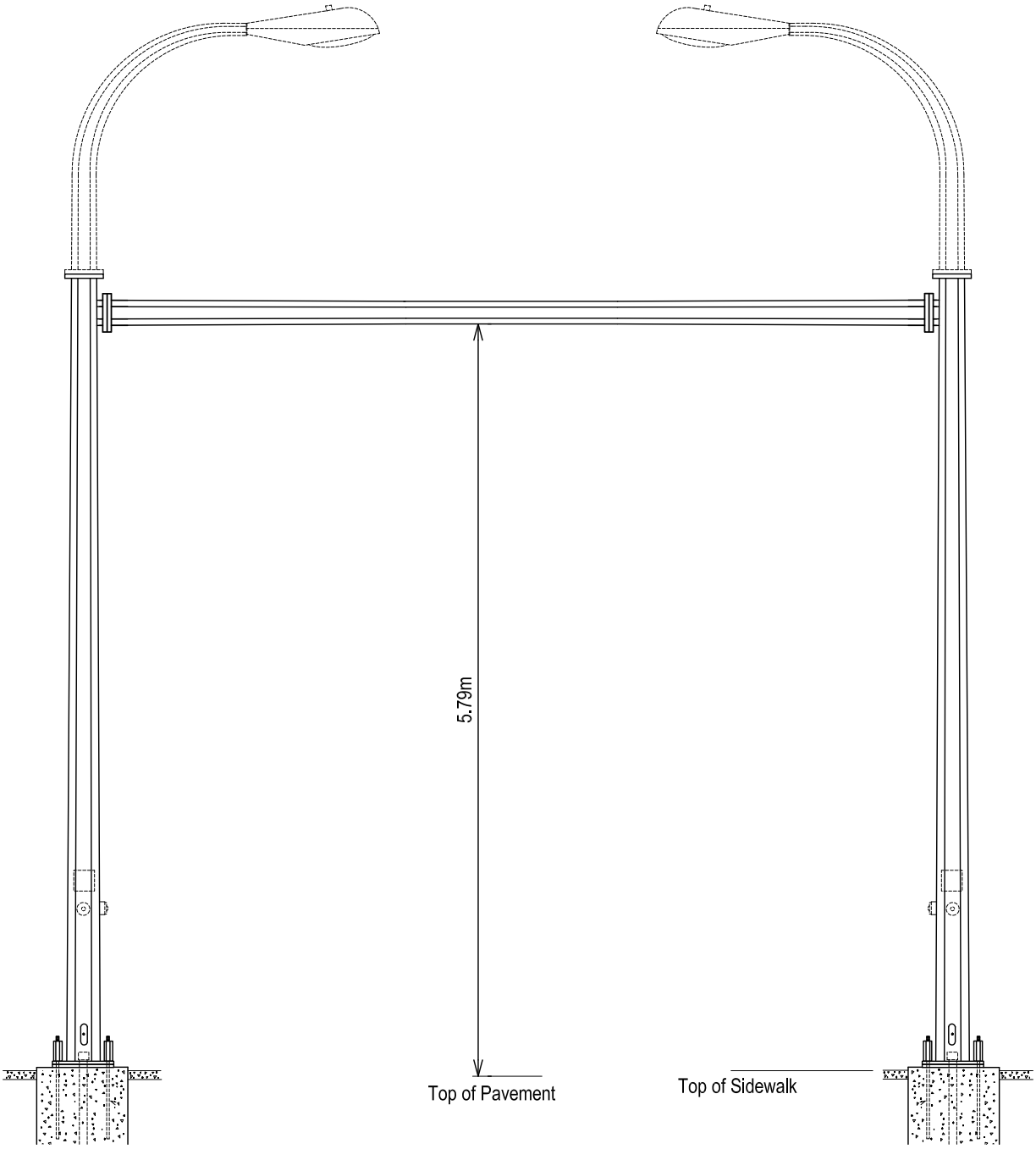
Refer to Dwg. No. 50 09 05 and Dwg. No. 50 09 06 for base

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION	APPROVED BY: ENGINEER
			DATE: 2018-03-06	TRAFFIC CANTILEVER	
			SCALE: N.T.S.		DRAWING NO. 50 09 15



Refer to Dwg. No. 50 09 05 and Dwg. No. 50 09 06 for base

NO.	DATE	REVISION	THE TOWN OF OLDS ENGINEERING DEPARTMENT		
			DRAWN BY: BM	CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION	APPROVED BY: ENGINEER
			DATE: 2018-03-06	TRAFFIC CANTILEVER ROTATING	
			SCALE: N.T.S.		DRAWING NO. 50 09 16



Refer to Dwg. No. 50 09 05 and Dwg. No. 50 09 06 for base

NO.	DATE	REVISION

THE TOWN OF OLDS ENGINEERING DEPARTMENT

DRAWN BY: BM	**CONSTRUCTION SPECIFICATION DRAWINGS ELECTRICAL CONSTRUCTION**	APPROVED BY: ENGINEER
DATE: 2018-03-06	**TRAFFIC CANTILEVER BRIDGE**	
SCALE: N.T.S.		DRAWING NO. **50 09 17**