

SECTION 423

SUPPLY AND INSTALLATION OF STRUCTURAL PLATE PIPE

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423.01 SCOPE

This specification covers the requirements for the supply and installation of structural plate round pipe and structural plate pipe-arch as new construction, or, where specified, to extend an existing structural plate pipe.

The structural plate round pipe or structural plate pipe-arch shall be of the size, thickness, and type specified in the contract documents.

The Contractor shall be responsible for quality control for the supply and installation of the Structural Plate Pipe.

Should headwalls be required, then they shall be covered separately under Section 451.

423.02 SUBMITTALS

423.02.01 General Requirements

The Contractor shall submit in a timely fashion all shop drawings for the Structural Plate Pipe. Drawings shall clearly show the dimensions of all components, materials, thicknesses, and special details. Drawings shall also detail the recommended backfill specifications, gradation, extents and backfilling procedures.

Shop drawings for the structure shall be received, reviewed and accepted by the Department prior to fabrication of the structure. All issued for construction submittals shall be received 2 weeks prior to the start of construction. The Contractor shall allow a minimum of 2 weeks for shop drawing review.

The Contractor is reminded of General Condition 41.3 and their responsibility to review, stamp, date and sign shop drawing submittals. Prior to the submission of shop drawings, all documents must be reviewed by the Contractor to ensure that the Department receives a compliant submission.

Any changes, deletions, omissions etc. to the Department's specifications shall be highlighted with each submission, with each instance specifically stated and explained for consideration by the Owner's Representative.

The above submittals for the structure shall be received, reviewed and accepted by the Department prior to fabrication of the structure.

Once submittals are accepted by the Department then no changes can be made by the Contractor or the Contractor's Engineer without the submission of such changes and written approval from the Owner's Representative acknowledging acceptance of such changes.

The manufacturer shall provide a copy of the certificate of compliance for Corrugated Steel Structures. The manufacturer's certificate of compliance shall be issued by an independent 3rd party certification agency who are accredited by the Standards Council of Canada, confirming that the manufacturer produces certified corrugated steel pipe products in accordance with CSA G401. The steel structure shall have two identifier plates attached to the upper ends of the structure or individual plates containing the Certifying Agency's logo, CSA logo, manufacturer name, serial / project number and supply year.

Mill certificates for the material, as well as other Quality Assurance documentation related to the design and fabrication of the structure shall be available upon request.

423.02.02 Quality Control Plan

The Contractor shall submit to the Department a Quality Control Plan which ensures compliance with the requirements stipulated by the manufacturer, designer, CAN/CSA S6, CSA G401 and the Contract Documents.

The Department requires a minimum of 2 weeks to review submitted documents. The Contractor's finalized Quality Control Plan must be submitted minimum of 2 weeks prior to construction.

At a minimum the Contractor's Quality Control Plan shall include the following:

423.02.02.01 Bolt Torque Testing

The Contractor shall include in their Quality Control plan a procedure that ensures that assembly and erection is in accordance with latest version of CAN/CSA S6, with the following exception:

423.02.02.01.01 Initial Assembly

The torque on all bolts prior to backfilling shall be in accordance with ASTM A807/807M for steel structures and ASTM B789/789M for aluminum structures. A minimum of 10% of all bolts shall be tested after assembly. The tested bolts shall be randomly selected and the bolted assembly shall be accepted if at least 90% of the randomly selected bolts tested above satisfy the torque requirement.

Should the tested bolts not meet the 90% threshold stated above, then the Contractor shall randomly select 50% of the remaining bolts for additional testing. The bolted assembly shall be accepted if at least 90% of the additional bolts tested satisfy the torque requirement. Otherwise, the Contractor shall re-torque all bolts.

423.02.02.01.02 During Backfill Operations

Additionally, a minimum of 5% of the bolts shall be randomly selected for testing as backfilling operations are underway. Testing shall be carried out as backfilling progresses and shall include the bolts which are exposed (above the current level of backfill at the time of testing). The tested bolts shall be randomly selected and the bolted assembly shall be accepted when at least 90% of the bolts tested satisfy the torque requirement.

Should the tested bolts not meet the 90% threshold stated above, then the Contractor shall randomly select 15% of the remaining bolts for additional testing. The bolted assembly shall be accepted if at least 90% of the additional bolts tested satisfy the torque requirement. Otherwise, the Contractor shall re-torque all bolts, or as directed by the Owner's Representative.

423.02.02.01.03 Bolt Testing Results

Bolt testing results shall be provided to the Owner's Representative as they become available. Bolt testing from initial assembly must be accepted by the Owner's Representative prior to commencing backfilling operations.

Bolt torque results must be signed by the Contractor's Representative and include: date, time, location and height of backfill.

423.02.02.02 Shape Monitoring

The Contractor must detail in the Quality Control Plan their procedure for monitoring shape throughout construction. Deflections from the specified dimensions shall be within the tolerances permitted by the soil-metal structure designer. Acceptable shape

monitoring tolerances for the specific structure must be clearly shown in the Quality Control Plan and Shop Drawings.

All surveying shall be non-destructive in nature. No permanent alterations shall be made to the structure as part of this quality control activity.

423.02.02.03 Backfill Testing and Compaction

The Contractor's material testing, backfilling and inspection plan must be detailed in their Quality Control Plan. Select Backfill quality control procedures shall be compliant with Section 411.

All material testing requirements, testing methods, and frequency of testing for the select backfill material shall be clearly identified.

All equipment being used in backfilling operations should be listed. Maximum backfill lift thickness must be identified.

All details are to be provided on construction loading; including minimum heights of cover during construction and the use of any specific equipment and weights being utilized.

The backfilling and inspection plan shall indicate which third party geotechnical engineering consultant has been engaged to certify select backfill compaction. The plan shall also include the method and frequency by which the compaction is being tested.

423.02.02.04 Manufacturer's Installation and Best Practices Manual

The manufacturer's installation and best practices guide shall form part of the Contractor's Quality Control Plan.

423.02.02.05 Handling, Shipping and Storage

As part of the Quality Control Plan the Contractor must detail the transportation, handling and storage methods for the structure. The methodology must be shown to be in compliance with the manufacturer's recommendations.

423.02.02.06 Letter's of Compliance

The Contractor's Quality Control Plan shall list all letters of compliance which are required to be submitted to the Department. These include, but are not limited to:

- Manufacturer's Certificate of Compliance
- Contractor's Geotechnical Engineer's Letter of Conformance (Materials Testing)

- Contractor's Geotechnical Engineer's Letter of Conformance (Compaction)

423.02.02.07 Material on Site

The Contractor's Quality Control Plan must include details to demonstrate compliance with Section 423.05 of this Specification.

As part of this procedure the Contractor must ensure that structure materials are made available and fully visible to the Owner's Representative for inspection and initial acceptance. The Contractor is advised that final acceptance of the structure material will only be given once the structure is completely installed and backfilled.

423.02.03 Quality Control Reporting

All quality control documentation shall be provided to the Department as the project progresses. Documentation shall include, but is not limited to: structure alignment/shape monitoring, bolt torque testing, material testing, and compaction testing. Failure to provide this information shall result in the issuance of a stop work order. Delays resulting from the failure to submit quality control documentation shall not form the basis of any claim.

Quality control reporting shall be provided as the installation progresses. Failure to submit quality control reporting in a timely manner shall result in a 10% holdback on the Structural Plate Pipe, until such time that the required reports have been submitted to, and accepted by, the Owner's Representative.

423.03 ENVIRONMENTAL PERMITS AND AUTHORIZATIONS

Authorization from the Department of Fisheries and Oceans Canada's Fish and Fish Habitat Protection Program is required for work in or near any watercourse or water body deemed to be viable fish habitat.

Where required by Fisheries and Oceans, a downstream pool shall be provided at the culvert outlet.

Culvert pipes are to be installed such that the bottom of the culvert is at least 300 millimetres below the natural streambed. This will allow the deposition of stream gravels in the culvert providing a natural appearing streambed and will assist fish passage during minimum flow periods.

For stream crossings requiring multiple culvert installations, only the culvert designed to carry minimum flows shall be installed to maintain fish passage (i.e. countersunk a

minimum of 300 millimetres). The other culverts shall normally be installed along the streambed or at an elevation determined by the Owner's Representative.

Work is to be carried out in accordance with all requirements stipulated by regulatory agencies whose approval is required. This includes, but is not limited to, the Department of Fisheries and Oceans Canada, Transport Canada's Navigation Protection Program and the Water Resources Division of the Department of Environment, Climate Change and Municipalities.

Where unwatering is required, the contractor shall carry out this work in accordance with Section 180.

The Contractor shall be aware of the requirements of Division 8.

423.04 MATERIALS

423.04.01 Fabrication

Structural components shall be carefully formed to the corrugation profile and curved to the required radius along the inner crest, in the manufacturer's plant.

Fabrication of all steel components must meet the requirements of CAN/CSA G401 or ASTM A761, as applicable.

423.04.02 Materials for Steel Structures

Steel plate to conform to the latest version of CSA G401.

Corrugated steel structural plate shall meet the general requirements as specified in CSA G401.

For galvanized structures, a zinc coating shall be applied after fabrication. The coating must provide a minimum coating weight of 915 grams per square metre total on both sides of the corrugated steel plates in accordance with CSA G401.

For structures that are specified by the Department to have a thermoplastic copolymer coating; a thermoplastic copolymer coating shall be applied to both sides of the corrugated steel plates in accordance with CSA G401.

Bolts and nuts for the structural plate connections shall be heavy hex, meeting the requirements of CSA G401. Anchor bolts shall meet CSA G401. All fasteners and anchor bolts shall be zinc coated in accordance with CSA G401.

For thermoplastic copolymer coated structures all fasteners shall be in accordance with the latest version of CSPI Technical Bulletin Issue Twenty-Three.

Steel for base channels, if required, to conform to CSA G401.

423.04.03 Materials for Aluminum Structures

Aluminum plates to conform to the latest version of ASTM B746.

The aluminum structural plate shall meet the general requirements as specified in ASTM B746. Bolt holes shall be 25 millimetres in diameter using 19 millimetre diameter (M20) bolts.

Bolts and nuts for the structural plate connections shall be heavy hex.

Steel bolts shall meet the requirements of CSA G401. Anchor bolts shall meet CSA G401.

All fasteners and anchor bolts shall be coated in accordance with CSA G401.

Aluminum bolts shall meet the requirements of ASTM F468, made from Alloy 6061-T6.

Aluminum nuts shall meet the requirements of ASTM F467, made from Alloy 6061-T6.

423.05 HANDLING, SHIPPING AND STORAGE

The Contractor shall be responsible for the acceptance, unloading, handling, and storage of all material delivered to the project site. All components shall be handled, stored and shipped in such a manner as to eliminate the potential for damage as detailed in the manufacturer's installation guide. All damaged components shall be rejected by the Department and replaced at the Contractor's expense. Any loss or damage to material after acceptance shall be replaced by the Contractor at their own expense. Damaged components shall include, but is not limited to, any structural plates which exhibit permanent deformation or strain.

Stockpile lay down areas shall be specified by the Contractor prior to the start of construction, and will be subject to the approval of the Owner's Representative. Stockpile locations shall be at or near the project site.

The stockpile lay down areas shall not impact the operation and/or access to utilities, including but not limited to power lines, waterlines, and underground utilities. The Contractor shall acquire any required approvals, clearances, or permits for stockpile lay

down areas prior to the start of construction. Work is to be carried out in accordance with all requirements stipulated by regulatory or utility agencies whose approval is required. This includes, but is not limited to, the Department of Fisheries and Oceans Canada and the Water Resources Division of the Department of Environment, Climate Change. The Contractor shall be aware of the requirements of Division 8.

Stockpile lay down areas shall be cleaned of any debris and objectionable material by the Contractor prior to placing the material. This cleaning shall be considered incidental to the work. Stockpile lay down areas shall have a uniform smooth surface and be graded to ensure positive drainage away from the stockpile materials.

For any stockpile lay down areas on private property, the Contractor shall obtain a signed agreement with the property owner prior to the start of construction. This agreement shall be submitted to the Owner's Representative for review and approval at minimum ten (10) working days prior to the start of construction.

Structural plate and any other fabricated material shall be stored at least 150 mm above ground level, in an organized fashion, and be supported to prevent any permanent deformation, in a manner acceptable to the Owner's Representative. Stockpiled material shall also be protected from environmental damage and corrosion, in a manner acceptable to the Owner's Representative. The Contractor shall adhere to any additional storage requirements specified by the manufacturer or as directed by the Owner's Representative.

The Contractor shall be responsible for providing any and all required security to prevent loss or damage to stockpiled materials. Any lost or damaged stockpiled material shall be replaced by the Contractor at their own expense.

423.06 EXCAVATION

The Contractor shall excavate a foundation within the limits and to the grade as staked by the Owner's Representative. This excavation shall be carried out and paid for in accordance with Section 403.

The foundation shall be excavated to a depth of 300 millimetres below the proposed grade of the invert and to a width equal to the width of the proposed structural plate pipe or pipe-arch plus half the span on each side, or as directed by the Owner's Representative.

423.07 EXTENSIONS TO EXISTING STRUCTURAL PLATE

When specified, the work will involve extending an existing structural plate pipe. Where the pipe has a beveled end on the end to be extended, then the Contractor shall remove

the plates comprising the beveled end before adding the extension. The plates comprising the dismantled beveled end shall be disposed of by the Contractor at their own expense.

Where in order to secure the extension to the existing pipe, cuts need to be made, or bolt holes need to be drilled in the existing pipe, then the Contractor shall make such cuts or holes as are necessary. Cuts and holes shall be made in such a manner so as to leave neat edges.

In the case of extensions or modifications to existing pipe all cutting and drilling shall be reviewed and accepted by the supplier and the Owner's Representative. Cuts (if essential) shall be made with saws and holes (if essential) shall be drilled. Following such alteration, the Contractor shall clean, pre-treat if necessary and coat all damaged sections with cold-galvanizing compound as outlined. The cold-galvanizing compound shall be allowed to thoroughly dry before adding the extension.

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

When applying a metal conditioner and a cold galvanizing compound near a watercourse or water body, the Contractor shall ensure that the application is carried out carefully as to prevent leakage or spillage.

All cut edges and any damage to aluminized or polymer laminated coatings shall be repaired in accordance with the latest version of CSA G401

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

423.08 BEDDING

The Contractor shall prepare a bed to the alignment, shape of underside of the structural plate and grade, as required by the Owner's Representative.

See Form 1231 and Form 1232 for typical details.

Select bedding material shall be used to prepare the bed. Select bedding material shall satisfy the following soil classification requirements:

1. ASTM D2487 - Group GW, SW, GP, GW-GM, or SW-SM
2. ASTM D6913 - Maximum 75mm particles size
Minimum Gravel Content 35% (particle size > 4.75mm)
Less than 50% passing the 0.150mm sieve
Less than 10% passing the 0.075mm sieve
3. ASTM D4318 - Plasticity index less than 6%
4. Uniformity Coefficient (Cu): $Cu \geq 4$
5. Coefficient of Curvature (Cc): $1 \leq Cc \leq 3$
6. Angularity of non-crushed Materials, ASTM D-2488: > 35% Angular/Sub-angular
7. Flat/Elongates, ASTM D-2488 or ASTM D479: <25%
8. Los Angeles Abrasion Loss, ASTM C131: < 40%
9. Magnesium sulphate Soundness Loss, AASHTO T104: < 30% after four cycles

No material testing requirements shall be waved.

The bedding directly below structural plate pipe shall be lightly compacted to the required grade and shaped with a thin layer of loose select bedding in direct contact with the invert plates. All remaining bedding shall be compacted to at least 95% of Standard Proctor Dry Density (ASTM D698).

423.09 ASSEMBLY

The Contractor shall load the plates, nuts, bolts, washers, ribs if required, and all necessary hardware at the point of supply and transport them to the installation site.

The cutting of plates or the drilling of holes in new structural plates in the field is not permitted without the Owner's written approval. On a case-by-case basis the Contractor shall submit to the Department a detailed request to modify any structural plate, which includes but is not limited to: drilling, cutting etc. Requests of this nature must also be accompanied by a manufacturer approved repair procedure.

Any defective plate(s) must be reported to the supplier and corrective action taken by the supplier or the manufacturer.

Plates shall be bolted at longitudinal and circumferential seams such that no more than 3 plates overlap at any bolt hole.

The Contractor shall assemble the structure using procedures as recommended by the supplier and in accordance with the instructions of the Owner's Representative.

The Contractor shall brush off all soil sticking to the outside of those parts of plates that are to be lapped when joined.

Structural plate pipes may be assembled at the proposed location or at the side of the location. If the assembled structure has to be moved to its final position it shall be moved in such a manner that no damage or distortion is caused to the structure or the bedding.

The structural plate pipe shall be placed to the required alignment, and grade and be within the required limits, as specified by the Owner's Representative.

After complete assembly all bolts shall be re-tightened with a torque wrench to not less than 200 N-m for plates of thickness up to and including 3.2 millimetres thick, and not less than 340 N-m for plate thicker than 3.2 millimetres or to the manufacturer's specifications.

Any damage to metallic coatings shall be repaired in accordance with the latest version of CSA G401, with the following exception; an individual structural plate shall be rejected for either of the following:

- If an individual uncoated/damaged area exceeds 300mm in any one dimension.
- If an individual uncoated/damaged area exceeds 50mm in both dimensions.
- If the total combined uncoated/damaged surface area measures more than 1% of the total surface area.

In any of the above cases the Contractor may propose an engineered repair plan for consideration by the Department. If the Department elects not to accept the engineered repair plan, the structural plate shall be replaced with new material, or be re-dipped in accordance with CSA G401. The acceptance of the repair procedure shall be at the sole discretion of the Department.

Any damage to polymer coatings shall be promptly repaired in accordance with CSA G401 and CSPI Technical Bulletin Number Two, with the following exception; an individual structural plate shall be rejected for either of the following:

- If an individual uncoated/damaged area exceeds 300mm in any one dimension.
- If an individual uncoated/damaged area exceeds 50mm in both dimensions.
- If the total combined uncoated/damaged surface area measures more than 1% of the total surface area.

In any of the above cases the Contractor may propose an engineered repair plan for consideration by the Department. If the Department elects not to accept the engineered repair plan, the structural plate shall be replaced with new material, or be re-coated in accordance with CSA G401. The acceptance of the repair procedure shall be at the sole discretion of the Department.

All costs associated with preparation of repair procedures and repairing or replacing the damaged structural plate components shall be borne entirely by the Contractor.

423.10 BACKFILLING

423.10.01 Select Backfill and Material Testing

Backfill material in the engineered backfill zone shall be clean, well graded, granular material meeting the strength, gradation, compressibility and electrochemical requirements specified herein.

Unless otherwise specified the select backfill envelope shall be as shown in Form 1231 and Form 1232, as appropriate. The engineered backfill envelope shall meet the requirements of the latest CAN/CSA-S6 design code.

All select backfill shall be provided from a single source.

When the air temperature is below 0°C, no backfilling is allowed. Frozen granular backfill materials will not be permitted. No backfill material will be permitted to be placed directly on frozen substrate.

It shall be the Contractor's responsibility to carry-out all required testing. The Contractor shall use professional geotechnical engineering services and a qualified testing firm licensed in Newfoundland and Labrador for all sampling and testing of the select backfill.

All material testing shall be carried-out on a project specific basis. Material testing results obtained from an alternate project will not be accepted by the Department.

At least two weeks prior to start of construction the Contractor shall identify the source of materials to be used for the select backfill and provide initial testing for the select backfill. This testing shall include both gradation and electrochemical testing as a minimum. A copy of these test results shall be provided to the Owner's Representative. The Contractor shall provide a letter of conformance from their third party geotechnical consultant stating that the material testing results are in compliance with this specification. Letters of conformance shall bear the stamp of a Professional Engineer licensed to practice in the Province of Newfoundland and Labrador.

Select backfill material shall satisfy the following soil classification requirements:

1. ASTM D2487 - Group GW, SW, GP, GW-GM, or SW-SM
2. ASTM D6913 - Maximum 75mm particles size
 Minimum Gravel Content 35% (particle size > 4.75mm)
 Less than 50% passing the 0.150mm sieve
 Less than 10% passing the 0.075mm sieve
3. ASTM D4318 - Plasticity index less than 6%
4. Uniformity Coefficient (C_u): $C_u \geq 4$
5. Coefficient of Curvature (C_c): $1 \leq C_c \leq 3$
6. Angularity of non-crushed Materials, ASTM D-2488: > 35% Angular/Sub-angular
7. Flat/Elongates, ASTM D-2488 or ASTM D4791: < 25%
8. Los Angeles Abrasion Loss, ASTM C131: < 40%
9. Magnesium sulphate Soundness Loss, AASHTO T104: < 30% after four cycles

No material testing requirements shall be waved.

All select backfill material must conform to the following electro-chemical limits per AASHTO LRFD specifications as detailed in Table 4 of Corrugated Steel Pipe Institute's (CSPi) Technical Bulletin Thirteen.

As a minimum requirement, the select backfill material shall be tested in accordance with AASHTO or ASTM standard methods and meet the following criteria:

ELECTRO-CHEMICAL PARAMETER	ELECTRO-CHEMICAL REQUIREMENT	TEST METHOD	
		AASHTO	ASTM
Chlorides (Cl ⁻)	< 100 ppm	T291	D4327
Sulphates (SO ₄ ²⁻)	< 200 ppm	T290	D4327
Resistivity	> 3000 ohm-cm	T288	G187
pH	5 – 10	T289	D4972
Max Organic Content	< 1%	T267	D2974

In addition to the initial gradation and electrochemical testing, the Contractor shall sample and test the backfill for conformance with the gradation requirements at least once for every 250 cubic metres of material placed.

The Contractor shall also provide a 20 kilogram representative sample of the backfill proposed for construction to the Owner's Representative for testing and approval two

weeks prior to start of construction. The sample provided shall meet the geotechnical parameters as specified.

All sampling shall be carried out in the presence of the Owner's Representative.

Additional gradation testing at the Contractor's expense may be required if based upon visual inspection in the field it is evident to the Owner's Representative that the gradation of the select backfill material has changed.

Gradation requirements will be strictly enforced and variances to coarser or less well graded material will not be accepted.

The Contractor shall also be responsible for testing to establish the Standard Proctor Maximum Dry Density (ASTM 698) of the approved backfill and will be responsible for having the compaction of each lift of backfill tested for conformance with the compaction requirements specified in Section 423.11.02.

All results shall be provided to the Owner's Representative as the work progresses.

Where conventional material testing is not possible, the Contractor shall use professional engineering services licensed to practice in Newfoundland and Labrador to provide a visual inspection of each lift, ensuring proper compaction. The Contractor shall provide a letter of conformance from the third party engineering firm stating that the select backfill meets the compaction requirements of this specification

There will be no payment for installation until all initial testing results have been submitted to the Owner's Representative and deemed acceptable.

Timely submission of all required gradation and compaction testing results shall be provided to the Owner's Representative as the work progresses. The Contractor is advised that failure to provide testing results, or failure to meet the specified requirements, may result in the rejection of the select backfill material. Select backfill rejected by the Department as a result of not meeting the material requirements of this specification, shall be carefully excavated and replaced in accordance with this specification, at the Contractor's expense.

The Contractor is advised that the Department may elect to carry out quality assurance work in relation to any aspect of this structure. No delay claims will be accepted as a result of this activity.

Where there are discrepancies between the Department's and manufacturer's specifications then the more stringent requirement shall govern.

423.10.02 Backfilling Operations

The Contractor shall notify the Owner's Representative a minimum of 7 days prior to the commencement of backfilling operations.

Backfilling shall not commence until concrete headwalls have achieved at least 70% of the specified design strength at 28 days or cured for seven days, whichever comes first. This requirement may be increased by the Owner's Representative.

The backfill material shall be uniformly placed in compacted lifts on both sides of the structure. The backfill lifts shall not exceed 250 millimetres in depth (before compaction) and shall be compacted to a minimum of 98% Standard Proctor Dry Density (ASTM D698).

The difference in levels of the backfill on the two sides at any transverse section shall not exceed two compacted lift thickness and the maximum particle size of 75 millimetres within 300 millimetres of the structure.

The select backfill shall extend along the sides of the structure at least a half span width away from the steel surfaces.

Backfilling with select backfill material shall be continued until all parts of the pipe have not less than 1 metre of backfill cover, or not less than the manufacturer's recommended minimum cover, whichever is less.

Heavy equipment cannot be operated within 1000 millimetres of the structure. Fill within 1000 millimetres of the structure must be placed and compacted using light equipment or by hand.

Loads that exceed design loading are not permitted on the structure. Live Load traffic is not permitted until the structure has been backfilled to the minimum design height of cover without prior approval from the Owner's Representative.

Backfill shall be carefully placed and compacted so that the correct shape of the structure is maintained. The Contractor shall monitor the shape of the structure during backfilling operations. Any deflection from the specified dimensions shall be within the tolerances noted on the manufacturer's shop drawings. If deflections exceed the permitted tolerances, then backfilling operations shall be ceased until a suitable procedure is

developed by the Contractor and accepted by the Department.. The Manufacturer and Owner's Representative shall be notified of any deflections in writing immediately.

All structural plates which exhibit permanent deformation or strain for any reason shall be rejected by the Department and replaced at the Contractor's expense.

423.11 PROTECTION FROM TRAFFIC

Prior to allowing the movement of construction equipment or any vehicular traffic over the structure, the depth of cover over the structure shall not be less than the manufacturer's recommended minimum cover for the particular loading. Any construction equipment exceeding CL-625 loading conditions shall not be permitted over the structure.

423.12 MEASUREMENT FOR PAYMENT

Measurement for payment for a structural plate pipe shall be the actual length of the new pipe measured in metres, to one decimal place, along the bottom of the pipe.

423.13 BASIS FOR PAYMENT

Payment at the contract price for the size, thickness, and type of structural plate pipe specified shall be full compensation for all labour, materials, and equipment-use required to: supply all plates, nuts, bolts, washers, ribs if required, together with all necessary hardware, load and haul the same from the supply point to the installation site, provide for temporary storage and all rehandling necessary, assemble the structure, locate to alignment, grade, and tolerance specified by the Owner's Representative, place, compact and test select bedding and select backfill as specified herein, together with all labour, materials and equipment-use necessary to provide any required unwatering and quality control.

Where the work involves extending an existing structural plate pipe, then the basis of payment shall, in addition to the aforesaid, also include all labour, materials and equipment-use for: removing and disposing of the existing beveled end or ends (if any), cutting plates (if needed), drilling holes (if needed), and treating, supplying and applying cold-galvanizing compound to any cuts or drilled holes.

Select bedding material and select backfill material shall be paid for in accordance with Section 206 or Section 207 or Section 310 as the case may be, but the additional requirements for bedding and backfilling as stipulated in this specification shall be considered compensated for in the contract price for the supply and installation of the structural plate pipe.

All excavation required for a new pipe or to expose the end of an existing pipe where an extension is required shall be paid for in accordance with Section 403 for (a) Solid Rock or (b) Other Material, as the case may be.

Payment for the long span structural plate structure, including materials, will only be made once the structure is installed, backfilled and all letters of conformance have been received and accepted by the Department. No interim payments will be considered.