

SUPPLEMENTAL SPECIFICATIONS
INDIANA DEPARTMENT OF TRANSPORTATION
1999 STANDARD SPECIFICATIONS

March 1, 2005

REVISION TO 1999 STANDARD SPECIFICATIONS

SECTION 701, BEGIN LINE 12, DELETE AS FOLLOWS:

Concrete for Prestressed Concrete Piles	707.04(e)
Epoxy Coating for Piles	915.01(d)
Prestress Strand for Prestressed Concrete Piles	910.01(a)7
Reinforcing Steel	910.01

SECTION 701, DELETE LINES 24 THROUGH 27.

SECTION 701, BEGIN LINE 569, DELETE AND INSERT AS FOLLOWS:

~~(a) Precast Prestressed Concrete Piles. Splicing of prestressed concrete piles shall be subject to approval.~~

~~(b) Steel Piles and Steel Shells for Cast-in-Place Concrete Piles.~~ Splicing of ~~these steel piles and steel shells for cast-in-place concrete~~ piles shall be made as shown on the plans. Welded connections for splices shall be used. All work shall be done with approved methods, and materials, and by *welders* qualified ~~welders~~ in accordance with ~~803.07(j)~~ *711.32*.

SECTION 701, DELETE LINES 653 THROUGH 663.

SECTION 702, BEGIN LINE 18, DELETE AND INSERT AS FOLLOWS:

Maximum water/cement ratio in	
kilogram (pounds) of water per	
kilogram (pound) of cement	0.532 <i>0.490</i> 0.620 0.443

SECTION 702, BEGIN LINE 31, DELETE AND INSERT AS FOLLOWS:

Coarse Aggregate

For exposed concrete, ~~Class AP or~~ Class A *or Higher*,

~~size~~ *Size* No. 8 ~~904.02~~

For non-exposed concrete, Class A ~~or~~ B *or Higher*,

~~size~~ *Size* No. 8 ~~904.02~~

Curing Materials 912.01

Curing-Sealing Materials 912.02

Fabric for Waterproofing 913.16

Fine Aggregate, ~~size~~ *Size* No. 23 ~~904.01~~

SECTION 702, LINE 46, DELETE AND INSERT AS FOLLOWS:

Utility Asphalt, UA-I..... ~~901.01(d)~~ *902.01(b)*

SECTION 702, BEGIN LINE 64, DELETE AND INSERT AS FOLLOWS:

The relative yield of the concrete shall be determined in accordance with ~~501.03(a)4~~ 505. The concrete when produced shall provide a relative yield of 1.00 ± 0.02 . When the relative yield is outside the tolerances, adjustments to the batch weights shall be made. The minimum amount of cement shall be used for the desired class of concrete. The cement content shall not be increased more than 36 kg/m^3 (60 lb/cu yd). The relative yield of the concrete shall be maintained as stated above. If ~~portland pozzolan cement, type IP, or air-entrained portland pozzolan cement, type IP-A,~~ cements are to be used in the structural concrete, the cement content shall be increased by a multiplier of 1.06 times the minimum amount of cement required or the desired increased cement content for the specified class of concrete (i.e., $1.06 \times 335 = 355$ kilograms per cubic meter ($1.06 \times 564 = 598 \text{ lb/cu yd}$) for class A concrete).

Fly ash from an approved source may be used as a partial replacement for portland cement. The substitution of fly ash for portland cement will not be permitted in conjunction with the use of blended portland cement ~~types, IP, IPA, IS, and ISA~~ nor ground granulated blast furnace slag. Mix designs will be based on using a maximum 20% cement reduction with a minimum 1.25 to 1 ash-to-cement replacement ratio by weight.

Ground granulated blast furnace slag from an approved source may be used as a partial replacement for portland cement. The substitution of ground granulated blast furnace slag for portland cement will not be permitted in conjunction with the use of blended portland cement ~~types, IP, IPA, IS, and ISA,~~ nor fly ash. Mix designs will be based on using a maximum 30% cement substitution with a 1:1 slag-to-cement ratio, by weight.

~~Portland~~ Blended portland pozzolan cements, ~~type IP,~~ fly ash, and ground granulated blast furnace slag used as a pozzolan may only be used in concrete bridge decks between April 1 and October 15 of the same calendar year.

SECTION 702, BEGIN LINE 114, DELETE AND INSERT AS FOLLOWS:

All concrete shall have an air content of $6.5\% \pm 1.5\%$ by volume. Air content shall be determined in accordance with ~~501.03(b)~~ 505. When fly ash is used, the first concrete truck on the contract will be tested by the Department for complete compliance with plastic concrete requirements for air content, slump, and yield. If not in complete

SECTION 702, BEGIN LINE 486, DELETE AND INSERT AS FOLLOWS:

Stockpiled aggregates may be heated by the use of dry heat or steam. Aggregates shall not be heated directly by gas or oil flame or on sheet metal over fire. However, a drier in accordance with ~~408.02(a)5~~ 409.02(a)5 may be used if approved.

SECTION 702, BEGIN LINE 495, INSERT AS FOLLOWS:

Immediately after a pour is completed, the freshly poured concrete and forms shall be covered so as to form a protective enclosure and the air in the enclosure kept at a temperature above 10°C (50°F) for at least *144 h for bridge decks, the top surface of reinforced concrete slab bridges, and for at least 72 h for all other concrete*. If for any reason this temperature is not

maintained, the heating period shall be extended. When dry heat is used, means shall be provided to maintain adequate moisture in the air within the enclosure.

SECTION 702, BEGIN LINE 506, DELETE AS FOLLOWS:

~~When rubbing of concrete is specified, early removal of forms and rubbing the concrete during the period of protection is required.~~

SECTION 702, BEGIN LINE 517, DELETE AND INSERT AS FOLLOWS:

702.12 Consistency. Slump ~~shall~~ *will* be measured in accordance with ~~AASHTO T-119~~
~~as modified in 501.03(a) 505~~ and shall be no less than 25 mm (1 in.) nor more than 100 mm (4 in.) except for concrete placed in foundation seals.

SECTION 702, BEGIN LINE 537, INSERT AS FOLLOWS:

In designing forms, fresh concrete shall be considered as a liquid weighing 2430 kg/m³ (150 lb/cu ft) for vertical loads and 1600 kg/m³ (100 lb/cu ft) for horizontal pressure. A live load allowance of 2.4 kPa (50 lb/sq ft) shall be used on horizontal projections of surfaces. The scheme of formwork for work on a span over active railroad

SECTION 702, BEGIN LINE 581, DELETE AND INSERT AS FOLLOWS:

2. Permanent.

~~a. General.~~ Fabricated permanent metal forms for concrete deck slabs may be used as an alternate method of forming on a steel beam, steel girder, or prestressed concrete I-beam, ~~and prestressed concrete spread box beam bridges only, or prestressed concrete bulb-T beam bridge.~~ Permanent metal forms shall not be removed, and shall otherwise be in accordance with the applicable requirements of ~~702.12(e) 702.13(e).~~

~~b. Construction Requirements.~~ The metal forms shall be designed on the

SECTION 702, AFTER LINE 682, DELETE AND INSERT AS FOLLOWS:

(f) Precast Concrete Deck Panels. The construction and furnishing of precast prestressed concrete deck panels in accordance with 707.09.1 will be permitted as an alternate method of forming a bridge deck slab for a prestressed concrete I-beam bridge. Precast concrete deck panels will not be permitted on a prestressed concrete I-beam bridge which is built on a sag vertical curve or on a superelevation transition unless otherwise shown on the plans. Precast concrete deck panels will not be permitted for use on a steel beam, steel girder, prestressed concrete bulb-T beam, or prestressed concrete spread box beam bridge.

The deck panel system shall replace the bottom mat of slab reinforcing and, depending on panel depth, the bottom 65 or 75 mm (2 1/2 or 3 in.) of the class C concrete slab. Formwork is eliminated in the areas between the beams, but forms shall be used for the copings and diaphragms.

Mating surfaces of the deck panels shall have a maximum deviation of 3 mm in 1.8 m (1/8 in. in 6 ft). All other dimensions as shown on the plans shall be fabricated to ± 6 mm ($\pm 1/4$ in.), except the vertical location of prestressing strands shall be ± 2 mm ($\pm 1/16$ in.). All panel joints shall be mortar tight immediately prior to placing the cast-in-place portion of the deck slab. Immediately prior to placement of concrete, the precast deck panels shall be wetted until free moisture appears and remains without ponding.

(f) (g) Removal and Re-Use of Forms. The forms for any portion of the structure

SECTION 702, BEGIN LINE 711, DELETE AND INSERT AS FOLLOWS:

(g) (h) Test Beams. When it is to the advantage of the Department or Contractor, when portland-pozzolan cement, type IP or IP-A, is incorporated into the structural concrete *elements listed below*, when fly ash or ground granulated blast furnace slag is incorporated into the structural concrete *elements listed below*, or when field operations are being controlled by beam tests, the removal of forms, supports, and housings, and the discontinuance of heating and curing may be permitted when the modulus of rupture reaches or exceeds the following values:

Concrete Used in	Required Flexural Strength, kPa (psi), Dead Load Only
Floor Slabs on steel structures and similar units	2070 (300)
Girders, Arches, Slabs, and similar units.....	2690 (390)
Floors between concrete girders	2070 (300)
Precast Concrete Piles	3650 (530)
Interior Bent or Pier Caps	3310 (480)

The beams ~~shall~~ *will* be cured under the same conditions as the concrete which they represent. Beams ~~shall~~ *will* be tested *for flexural strength* as simple beams with third point loading in accordance with ~~AASHTO T 97 as modified in 501.03(a)~~ *505*.

SECTION 702, BEGIN LINE 1078, DELETE AND INSERT AS FOLLOWS:

~~Exposed surfaces of retaining walls, concrete railings, curbs, wing walls on end bents and abutments, vertical abutment faces on underpasses, copings, and the outside vertical faces of fascia girders shall be given a class 2 finish. All other concrete surfaces shall be given a class 1 finish immediately following the removal of any forms.~~

~~If so directed, in order to obtain a uniform color, membrane curing compound shall be placed on substructures over roadways with no additional payment.~~

The concrete surfaces of pier and bent caps, the front face of mudwalls, and any other concrete surfaces specified shall be sealed. The material used for sealing shall be in

accordance with 709. It shall be applied so as to obtain a finished film thickness of at least 250 μm (10 mils). Mixing, surface preparation, and method of application shall be in accordance with the manufacturer's recommendations. However, the surfaces to be sealed shall be ~~sandblasted to remove form oil, curing compound, and other foreign matter prior to applying the sealer. The surfaces to be sealed shall not be rubbed prepared in accordance with 709 prior to applying the sealer.~~

SECTION 702, DELETE LINES 1093 THROUGH 1129.

SECTION 702, AFTER LINE 1130, INSERT AS FOLLOWS:

At the time of the removal of forms, the concrete surface shall be scraped to remove all fins and irregular projections. The surface shall then be power ground to smooth all joints and chamfers.

After grinding is completed, a paste of grout shall be applied to the concrete surface with a sponge float to fill all air holes and small irregularities. The paste grout shall be 6 parts of pre-mix mortar mix for masonry and 1 part white portland cement in accordance with ASTM C-150, Type 1.

After the paste grout takes its initial set, the surface of the concrete shall be scraped with a steel drywall knife to remove the paste from the surface.

SECTION 702, BEGIN LINE 1131, DELETE AND INSERT AS FOLLOWS:

702.22 Curing Concrete. *Concrete in bridge decks or the top surface of reinforced concrete slab bridges shall be cured continuously for at least 168 h commencing immediately after initial set. ~~If pozzolans in excess of 10 percent, by mass, of the portland cement are used in the mix, the surface shall be cured continuously for 240 h~~ the surface is able to support the protective covering without deformation. Curing of patches or small full depth deck replacement areas on existing bridge decks that are to be overlayed, may be controlled by test beams in accordance with 702.24(a).*

Unless otherwise specified or permitted, *all other* concrete shall be cured for at least 96 h commencing immediately after ~~initial set~~ *the surface is able to support the protective covering without deformation.* If portland-pozzolan cement, type IP or IP-A, or fly ash is used, the concrete shall be cured for at least 120 h ~~commencing immediately after initial set.~~

Membrane forming curing compound may be used in lieu of protective covering curing methods. Where it has been determined that a surface treatment or class 2 finish is to be used, the membrane forming curing compound shall not be used.

The curing of surfaces to be waterproofed may be discontinued when waterproofing is started.

If field operations are controlled by beam tests, *the* curing time, *except for bridge decks and the top surface of reinforced concrete slab bridges*, shall be in accordance with 702.13~~(g)~~*(h)*.

If further precautions are necessary to ensure strength, they shall be taken as directed.

SECTION 702, BEGIN LINE 1150, DELETE AND INSERT AS FOLLOWS:

(a) Protective Covering Curing Methods. Surfaces to be cured shall be protected by covering with ~~canvas, straw, cotton mats, burlap, sand,~~ or other satisfactory protective material and shall be ~~wetted at sufficient intervals~~ *kept continuously and thoroughly wet* during the curing period ~~to prevent premature drying.~~ ~~Canvas, straw, and burlap~~ *The protective covering* shall be suitably anchored *to keep the protective materials in place during the curing period.* Curbs, walls, handrails, copings, and other surfaces requiring a ~~rubbed~~ *finish in accordance with 702.21* may have the covering temporarily removed for finishing, but the covering shall be restored as soon as possible.

SECTION 702, BEGIN LINE 1276, DELETE AND INSERT AS FOLLOWS:

Traffic, live loads, and backfill against wingwalls, spandrel walls, and abutments may be allowed when test beams indicate a flexural strength of ~~at least 3310~~ *3300 kPa (480 psi) or greater* for third point loading. Concrete pavement may be opened to traffic in accordance with ~~501.22~~ *502.18*. Beams ~~shall~~ *will* be prepared and tested in accordance with 702.12(g). Before traffic is permitted over a concrete structure built to be under fill, it shall be covered with ~~at least 230~~ *225 mm (9 in.) or more* of earth or other suitable material, or otherwise protected. All other structures shall be properly protected against impact or other damage.

SECTION 702, BEGIN LINE 1354, INSERT AS FOLLOWS:

the footing and parallel thereto, regardless of the quantity actually removed. *If design of the structure requires sheeting to be outside these limits, the limits will be extended to 150 mm (6 in.) beyond the neat lines required by the design of the structure. If the Contractor chooses to construct a rectangular cofferdam around a U-shaped abutment in lieu of following the outline of the footing, the maximum allowable increase in the pay quantity above the theoretical shall not exceed 25%.* The pay quantity for the foundation seal will be equal to the excavation volume described above.

SECTION 702, AFTER LINE 1393, INSERT AS FOLLOWS:

The cost of precast prestressed concrete deck panels shall be included in the cost of concrete, C, superstructure. The pay quantity of such concrete in the slab will be computed from the dimensions for the formed and poured bridge floor slab shown on the plans. The pay quantity of reinforcing steel will be the plan quantity shown with no adjustment for eliminating the bottom reinforcing steel layer nor for additional reinforcing steel required due to use of the precast concrete deck panels.

SECTION 704, BEGIN LINE 80, DELETE AND INSERT AS FOLLOWS:

The finishing machine shall be in accordance with the applicable requirements of ~~501.04(e)~~ *508.04(b)* except it shall have ~~at least~~ *a minimum of* one reciprocating non-vibrating screen. The weight

of the machine shall not cause undue deflection of the bridge members or falsework.
The

SECTION 704, BEGIN LINE 101, DELETE AND INSERT AS FOLLOWS:

When a finishing machine is not required or used, as soon as the concrete is placed and consolidated it shall be struck-off to the specified cross section and grade by means of a steel template or other satisfactory metal clad implement having a minimum width of ~~at least 230~~ 225 mm (9 in.) or greater.

For all methods of striking off the surface, an excess of concrete shall be kept in front of the cutting edge at all times. The strike-off shall go over the entire area only for the number of times necessary to produce the required profile and cross section. In general, the strike-off process shall be in accordance with ~~501.15(a)~~ 504 except a vibrator on the strike-off will not be required.

SECTION 704, BEGIN LINE 129, DELETE AND INSERT AS FOLLOWS:

particles during the final checking and brooming. After final checking, the surface shall be tined in accordance with ~~Method 2 of 501.15(d)~~ 504.03, ~~except the spacing of the tines shall be~~

~~22 mm, 19 mm, 19 mm, 25 mm, 19 mm, 19 mm, 29 mm (7/8 in., 3/4 in., 3/4 in., 1 in., 3/4 in., 3/4 in., 1 1/8 in.), and then repeated.~~ If a new bridge deck is to be overlaid with

SECTION 704, BEGIN LINE 140, DELETE AND INSERT AS FOLLOWS:

Smoothness shall be in accordance with ~~501.16~~ 502.20. If, after the above requirements have been met, portions of the floor are not entirely satisfactory, the removal and replacement of such portions may be ordered to secure a satisfactory floor. Such removal and replacement shall be done with no additional payment.

SECTION 705, DELETE LINES 18 THROUGH 22.

SECTION 706, DELETE LINES 1 THROUGH 136.

SECTION 706, AFTER LINE 137, INSERT AS FOLLOWS:

SECTION 706 – BRIDGE RAILINGS

140 ***706.01 Description.*** *This work shall consist of the furnishing and placing of concrete or steel railings on bridges and on top of wingwalls and retaining walls in accordance with 105.03.*

706.02 Materials. *Materials shall be in accordance with the following:*

	<i>Barrier Delineators.....</i>	<i>913.08(c)</i>
	<i>Concrete, Class C.....</i>	<i>702</i>
	<i>Organic Zinc Primer.....</i>	<i>909.02(a)3</i>
	<i>Polyurethane Finish Coat.....</i>	<i>909.02(c)</i>
150	<i>Reinforcing Bars, Epoxy Coated.....</i>	<i>910.01</i>
	<i>Steel Bridge Railing Components</i>	<i>910.20</i>

Thrie-beam railing and guardrail elements for retrofit bridge railing shall be steel and shall be in accordance with the applicable requirements for steel beam guardrail shown in 910.09, 910.11, and 910.12.

CONSTRUCTION REQUIREMENTS

706.03 Concrete Railing. *Concrete railings shall not be placed until the falsework for all of the spans have been removed and the spans are self supporting. Concrete railings shall be constructed in accordance with 702 and 703.*

Forms shall be smooth, tight fitting, held true to line and grade, and be removed without damaging the concrete. These forms shall be made from selected dressed lumber or steel. Moldings, panel work, and bevel strips shall be constructed according to the detail plans with mitered joints, true corners and be sharp, clean-cut, and free from cracks, spalls, or other defects. The forms shall be constructed with a plate at the base of the copings. Lumber which is 50 mm (2 in.) thick shall be used for coping forms.

The slip form method may be permitted as a means to place concrete railing on bridge structures. If the slip form method is chosen, a signed and dated QCP shall be prepared and submitted to the Engineer for acceptance at least 15 days prior to the start of slip form barrier rail placement. The QCP shall include, as a minimum, the Contractor's concrete mix design, including materials sources and admixtures; the Contractor's methods of materials control and testing; the Contractor's proposed method of placement, including finishing and curing; and the corrective action that will be taken when defects are found. The QCP shall also contain documentation that shows the Contractor had a successful trial demonstration of the slip form machine previously and that proper consolidation around the reinforcing steel in the wall was achieved. The slip form paver shall consolidate, screed, and finish the freshly placed concrete in one complete pass in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous railing in conformance with the plans and specifications. The slump shall be 13 mm (1/2 in.) \pm 13 mm (1/2 in.). The joints may be formed or sawed as long as a satisfactory joint is attained. If joints are to be sawed, the full depth saw cut shall be made before uncontrolled shrinkage cracking occurs and within 48 h of concrete placement. Before full depth sawing, partial depth saw cuts of 64 mm (2 1/2 in.) \pm 13 mm (1/2 in.) at the joint locations may be made as soon as the concrete has hardened sufficiently to permit sawing without raveling. All saw cuts shall be made at the locations shown on the plans or as directed.

All concrete bridge railings shall be reflectorized in accordance with 602.03(f).

Posts and joints shall be constructed perpendicular to grade. The line and grade shall not follow any unevenness of the superstructure.

If concrete railing is not in compliance with the specified design, does not present a uniform appearance of smoothness or color, or is not otherwise a workmanlike job, the Engineer may require such railing to be removed and replaced.

Concrete railing which the Engineer has ordered removed and replaced in accordance with 706.03 shall be with no additional payment.

SECTION 707, BEGIN LINE 4, DELETE AND INSERT AS FOLLOWS:

707.01 Description. This work shall consist of the construction and furnishing of reinforced *or prestressed cement* concrete structural members *or, if specified, concrete deck panels* cast outside the structure, transported to, and incorporated into the structure in accordance with ~~these specifications and in reasonably close conformance with the lines, grades, and dimensions shown on the plans or as directed~~ *105.03*.

~~The members shall be prestressed if so specified. This work shall also consist of the construction and furnishing of a precast prestressed deck panel superstructure, which will be permitted as an alternate to the formed and poured bridge floor slab for a prestressed concrete I-beam bridge.~~

SECTION 707, BEGIN LINE 17, DELETE AND INSERT AS FOLLOWS:

Coarse Aggregates, Class A <i>or Higher</i> , Size No. 91	904.02
Concrete Curing Materials and Admixtures	912
<i>Concrete Sealers</i>	<i>909.09, 909.10</i>
Elastomeric Bearings	915.04
Fine Aggregates, Size No. 23	904.01

SECTION 707, DELETE LINES 31 THROUGH 35.

SECTION 707, LINE 43, DELETE AS FOLLOWS:

~~approved. Design computations for deck panels shall be submitted for approval for total~~

SECTION 707, DELETE LINES 44 THROUGH 50.

SECTION 707, BEGIN LINE 115 DELETE AND INSERT AS FOLLOWS:

(c) Concrete. Concrete shall be air entrained and in accordance with the applicable provisions *requirements* of 702.05. ~~Water-reducing, or water-reducing and retarding admixtures may be used. Admixtures shall not contain chlorides which have been added as an ingredient of manufacture. Chemical admixture types A, D, F, or G shall be used in combination with an air entraining admixture. High range water reducing, HRWR, and high range water reducing retarding, HRWRR, admixture systems may be used. Chemical admixtures types B, C, and E will be permitted only with written permission.~~ Admixtures, other than air-entraining admixtures, shall not be used with air-entrained cement. The cement content of the mixed concrete shall be sufficient to obtain the specified minimum 28 day compressive strength. ~~The provisions of the yield test to determine the cement content in accordance with 109.01(e) will not apply. The total of portland cement and other cementitious materials shall not exceed 475 kg/m³ (800 lb/cyd).~~ Slump shall be no less than 50 mm (2 in.) nor more than 125 mm (5 in.) *for concrete without chemical admixtures or concrete containing chemical admixture types A and D.* ~~Precast concrete members which are not prestressed shall have a minimum compression strength of 31 MPa (4500 psi) in 28 days.~~

Concrete containing admixture types F, G, or admixture systems shall have a slump no less than 75 mm (3 in.) nor more than 175 mm (7 in.). The amount of time

from mixing to final placement and consolidation shall be a maximum of 30 min. The concrete shall not be rettempered with additional amounts of chemical admixture types F or G after the initial mixing has been completed.

Precast concrete members which are not prestressed shall have a minimum compressive strength of 31 MPa (4500 psi) in 28 days. Prestressed members shall be in accordance with the following unless otherwise shown on the plans:

- 1. Maximum water/cement ratio in kilograms (pounds) of water per kilogram (pound) of cement shall be 0.400.*
- 2. Minimum 28 day compressive strength of concrete shall be 34.5 MPa (5,000 psi).*
- 3. Minimum compressive strength of concrete at time of prestressing shall be 27.6 MPa (4,000 psi).*
- 4. Initial tension of prestressing steel shall be as shown on the plans.*

SECTION 707, DELETE LINES 161 THROUGH 174.

SECTION 707, BEGIN LINE 187, DELETE AND INSERT AS FOLLOWS:

~~continuous operation. Roadway surfaces shall be finished with a wood float. The outside vertical faces of fascia girders and the exposed face and top of the curb section shall be finished in accordance with 702.20(b), by using grout, or by mechanical or other approved methods 702.21.~~

SECTION 707, DELETE LINES 191 THROUGH 210.

SECTION 707, LINE 211, DELETE AND INSERT AS FOLLOWS:

~~placed.~~ *The tops of all beams and the outside faces of the fascia beams shall be sealed with an approved concrete sealer in accordance with 709.*

SECTION 707, DELETE LINES 212 THROUGH 219.

SECTION 707, BEGIN LINE 273, DELETE AND INSERT AS FOLLOWS:

707.08 Handling and Shipping. The precast members shall not be subjected to excessive abuse which produces crushing or undue marring of the concrete. ~~Members damaged by improper storing or handling shall be replaced with no additional payment.~~ *All members damaged during handling, storing, transporting, or erecting shall be replaced.* Unless some other method is approved, precast members shall be handled with a suitable hoisting device provided with a spreader sling. The spreader shall be of sufficient length to prevent horizontal forces being produced in the member due to lifting and shall be equipped with leads and hooks at each end. The girders shall be lifted by the devices shown on the plans. Alternate lifting devices and procedures shall be at the owner's or supplier's option, and must be approved prior to use. If any other method of handling is used, it shall be shown on the shop drawings and approved prior to use. If the method produces horizontal forces in the precast member, sufficient steel reinforcement shall be added to compensate for them.

707.09.1 Precast Prestressed Concrete Deck Panels. Precast prestressed concrete deck panels shall be designed as a noncomposite section to support the dead load of the panel, reinforcement, plastic concrete, and a construction load of 2.4 kPa (50 lb/ft²). The panel shall be designed as a composite section with the class C concrete to support the live load. The Contractor shall revise the area of top longitudinal reinforcing steel over interior supports for negative moment to be equal to the total area of top and bottom longitudinal reinforcing steel.

The concrete for deck panels shall be placed in accordance with 702.20. The concrete shall be vibrated to prevent honeycombs and voids, especially at the corners and edges of the panels. The tops of the deck panels shall be broom or wire brush finished in the direction of the prestressing strands. The corrugations formed shall be uniform in appearance and shall not be more than 6 mm (1/4 in.) in depth. The coarse aggregate shall not be displaced when preparing the roughened surface.

707.11 Basis of Payment. The accepted quantities of precast or prestressed concrete structural members will be paid for at the contract unit price per ~~each~~ *meter (linear foot)* or per square meter (square foot) for structural member, concrete, of the type and size specified.

~~Structural Member, Concrete, _____, _____ EACH m (LFT)~~

~~type size~~

~~m2 (SFT)~~

~~Structural Members, Concrete,.....LS~~

No payment will be made for replacing precast members damaged during handling, storing, transporting or erecting.

-712-

SECTION 708, AFTER LINE 8, INSERT AS FOLLOWS:

Fine Aggregate904.02(c)

SECTION 708, DELETE LINE 11.

SECTION 709, BEGIN LINE 5, DELETE AND INSERT AS FOLLOWS:

reasonably close conformance with the plans or as directed. Surfaces to be sealed with ~~portland cement concrete~~ *pcc* sealers shall be given ~~only a class 1~~ finish in accordance with 702.21(a). *Where existing concrete or bridge decks are to be sealed, their surfaces shall be sandblasted to remove all foreign material.*

SECTION 709, BEGIN LINE 16, DELETE AND INSERT AS FOLLOWS:

709.03 Surface Preparation. The surface to be sealed shall be thoroughly cleaned of all foreign materials by sandblasting *if the surface is a bridge deck or older existing concrete, or by air blasting for all other surfaces*, just prior to sealing. ~~Final cleaning shall be done with compressed air.~~ The air compressor shall be equipped with suitable separators, traps, or filters which remove water, oil, grease, or other substances from the air lines. If rain sufficient to uniformly wet the surface occurs after the ~~sandblast~~ *cleaning operations* and prior to the sealing, ~~and the cleaned surface is not protected from the rain,~~ the surface to be sealed shall be ~~re-sandblast cleaned~~ *re-sandblasted or re-airblasted.*

SECTION 709, BEGIN LINE 114, DELETE AND INSERT AS FOLLOWS:

(e) Alternate To Concrete Sealers. In lieu of concrete surface sealing for concrete barrier wall and concrete bridge railing, and alternate concrete mix design may be used. The concrete mix design shall be as specified, except either 3% ~~microsilica~~ *silica fume* by mass (weight) of cementitious material shall be added to the mix design or 30% ground granulated blast furnace slag substitution based on the required cement content shall be incorporated into the mix.

SECTION 709, BEGIN LINE 124, DELETE AS FOLLOWS:

When one of these alternate concrete mix designs are used in lieu of a concrete surface sealer, a ~~class 1~~ finish in accordance with 702.21(a) will be required.

SECTION 710, BEGIN LINE 51, DELETE AND INSERT AS FOLLOWS:

~~The areas~~ *Areas* where repointing masonry in structures exceeds an average of 100 mm (4 in.) in depth, ~~will be paid for at a price to be determined by multiplying the contract unit price for repointing masonry for structures, respectively, by the factors as follows:~~ *the work shall be completed as extra work. Payment will be made in accordance with 104.03.*

SECTION 710, DELETE LINES 54 THROUGH 69.

SECTION 711, BEGIN LINE 184h, INSERT AS FOLLOWS:

TABLE

Description of Discontinuity	Repair Required
All discontinuity of 3 mm (1/8 in.) Maximum depth	None-depth shall be explored as directed.
Any discontinuity over 25 mm (1 in.) in Length with depth over 3 mm (1/8 in.) But not greater than 6 mm (1/4 in.)	Remove and weld.
Any discontinuity over 25 mm (1 in.) in Length with depth over 6 mm (1/4 in.) But not greater than 11 mm (7/16 in.).	Remove completely and weld. Aggregate length of welding not <i>over 20% of plate edge length being repaired.</i>
Any discontinuity over 25 mm (1 in.) in length with depth greater than 11 mm (7/16 in.).	Plate rejected. Defective portion may be removed and remainder may be used in 11 mm (7/16 in.) depth.

SECTION 711, AFTER LINE 362, INSERT AS FOLLOWS:

Welders, welder operators, and tack welders shall be qualified in accordance with AWS D1.5 Chapter 5 Part B.

SECTION 711, BEGIN LINE 376, DELETE AS FOLLOWS:

711.33 Stud Shear Connectors. Stud shear connectors shall be in accordance with 711.32 *and as shown on the plans.* ~~Welded channels or 22 mm (7/8 in.) diameter welded studs will be permitted as alternate shear connectors. If used, they shall have equivalent shear value. The proposed size and spacing shall be submitted for approval.~~

SECTION 711, AFTER LINE 911, INSERT AS FOLLOWS:

Stud shear connectors placed on new structural steel will not be measured. Stud shear connectors placed on existing structural steel will be measured by the number installed.

SECTION 711, AFTER LINE 932, INSERT AS FOLLOWS:

Stud shear connectors placed on existing structural steel will be paid for at the contract unit price per each, complete in place and accepted.

SECTION 711, AFTER LINE 1005, INSERT AS FOLLOWS:

Stud Shear Connectors EACH

SECTION 711, AFTER LINE 1010, INSERT AS FOLLOWS:

The cost of stud shear connectors placed on new structural steel will be included in the costs of structural steel.

SECTION 713, BEGIN LINE 48, DELETE AND INSERT AS FOLLOWS:

Temporary pavement markings in accordance with ~~801-13~~ 801.12 shall be placed as shown on the plans. Delineators in accordance with 804 shall be placed as shown on the plans.

SECTION 713, BEGIN LINE 85, DELETE AND INSERT AS FOLLOWS:
 and later removed as specified. HMA mixtures for temporary pavement will be paid for as the type of mixture specified, in accordance with ~~610.07~~ *610.06* complete in place.
 Guardrail

SECTION 714, LINE 10, DELETE AS FOLLOWS:
~~B-Borrow for Structure Backfill~~.....211

SECTION 714, AFTER LINE 18, INSERT AS FOLLOWS:
Structure Backfill.....904

SECTION 714, BEGIN LINE 81, DELETE AND INSERT AS FOLLOWS:
714.06 Method of Measurement. Concrete used in retaining walls, culverts, and culvert extensions will be measured in accordance with 702.27. Reinforcing steel will be measured in accordance with 703.07. Precast reinforced concrete box sections and precast reinforced concrete box section extensions will be measured by the meter (linear foot), complete in place. ~~B-borrow for structure~~ *Structure* backfill will be measured in accordance with 211.09. Field drilled holes will be measured in accordance with 702.27.

SECTION 714, BEGIN LINE 96, DELETE AND INSERT AS FOLLOWS:
 in place. ~~B-borrow for structure~~ *Structure* backfill will be paid for in accordance with 211.10. Field drilled holes will be paid for in accordance with 702.28.

SECTION 715, BEGIN LINE 23, DELETE AND INSERT AS FOLLOWS:
~~B-Borrow for Structure Backfill~~.....211
 Bituminous Mastic Pipe Joint Sealer906.05
 Concrete702
 Flowable ~~Mortar~~ *Backfill*.....213

SECTION 715, AFTER LINE 29 INSERT AS FOLLOWS:
Structure Backfill.....904

SECTION 715, BEGIN LINE 121, DELETE AND INSERT AS FOLLOWS:
 furnished with the grating. The aggregate leveling bed required for precast units shall be coarse aggregate size No. 8 in accordance with ~~904.02~~ *904.03*. The hardware cloth used to cover

SECTION 715, BEGIN LINE 170, DELETE AND INSERT AS FOLLOWS:
 Where rock or boulder formation is encountered at or above the proposed trench bottom elevation, the trench shall be excavated at least 200 mm (8 in.) below the proposed grade, backfilled with ~~B-borrow for structure~~ *structure* backfill, and then compacted in accordance with 211.04.

SECTION 715, LINE 193, INSERT AS FOLLOWS:
Pipe Except for circular concrete pipe, pipe joints designed to accommodate seals or pipe joints requiring seals shall be sealed with approved rubber type gaskets, caulking, bituminous mastic pipe joint sealer, elastomeric material, or sealing compound. *Circular concrete pipe joints shall utilize rubber type gaskets.*

SECTION 715, BEGIN LINE 266, DELETE AND INSERT AS FOLLOWS:

715.08 Backfilling. All plastic pipes, except longitudinal underdrains, which are not fabricated with hydrostatic design basis rated resins and are installed within 1.5 m (5 ft) of mainline or public road approach pavement, paved shoulders, or sidewalks shall be backfilled with flowable ~~mortar~~ *backfill*. Flowable ~~mortar~~ *backfill* shall be placed in accordance with ~~213.04(e)~~ *213.07*. All other pipe installations shall be backfilled as shown on the plans or as directed. ~~B-borrow-for-structure~~ *Structure* backfill shall be placed in accordance with 211.04.

Prior to placing flowable ~~mortar~~ backfill, all standing water shall be removed from the trench. If the water cannot be removed from the trench, ~~B-borrow-for~~ structure backfill shall be used in lieu of flowable ~~mortar~~ *backfill* to an elevation 0.6 m (2 ft) above the groundwater. The remainder of the trench shall be backfilled as shown on the plans.

Except where prohibited due to groundwater, flowable ~~mortar~~ *backfill* may be used as a substitute for ~~B-borrow-for~~ structure backfill.

After the completion of the backfill operation and prior to beginning the paving operation, all plastic pipes, except longitudinal underdrains, not fabricated with hydrostatic design basis rated resins installed within 1.5 m (5 ft) of mainline or public road approach pavement, paved shoulders, or sidewalks shall be mandrel tested. The mandrel shall be a go/no go mandrel with a minimum of nine arms or prongs and a diameter of 5% less than the pipe pay item diameter. If the mandrel does not pass through the pipe when pulled by hand or the mandrel damages the pipe, the deficient pipe shall be removed, replaced, and mandrel tested after the flowable ~~mortar~~ backfill has been replaced.

Where material other than ~~B-borrow-for~~ structure backfill or flowable ~~mortar~~ *backfill* is permitted and used for backfilling, it shall be of such nature that compacts readily. That portion around and for 150 mm (6 in.) above the top of the pipe shall be free from large stones. This material shall be placed in layers not to exceed 150 mm (6 in.), loose measurement, and each layer compacted thoroughly by means of mechanical tamps.

SECTION 715, BEGIN LINE 367, DELETE AND INSERT AS FOLLOWS:

~~B-Borrow-for-structure~~ *Structure* backfill will be measured in accordance with 211.09. Flowable ~~mortar~~ *backfill* will be measured in accordance with ~~213.06~~ *213.08*.

SECTION 715, BEGIN LINE 382, DELETE AND INSERT AS FOLLOWS:

Pipe end sections, concrete anchors, and safety metal end sections will be paid for at the contract unit price per each for the size specified, complete in place. A concrete anchor attached at one end of twin pipes will be paid for as two concrete anchors. A concrete anchor attached at one end of triple pipes will be paid for as three concrete anchors. ~~B-borrow-for-structure~~ *Structure* backfill will be paid for in accordance with 211.10. If utilized as a substitute for ~~B-borrow-for~~ structure backfill or if used to backfill thermoplastic pipes fabricated of non-hydrostatic design basis resins, flowable ~~mortar~~ *backfill* will be paid for as ~~B-borrow-for~~ structure backfill. Otherwise, flowable ~~mortar~~ *backfill* will be paid for in accordance with ~~213.07~~ *213.09*.

SECTION 715, BEGIN LINE 621, DELETE AND INSERT AS FOLLOWS:

The costs of sawing of pavement, excavation above the trench bottom elevation shown on plans, backfilling with material other than ~~B-borrow~~ for structure backfill or flowable ~~mortar~~ backfill, dewatering, shoring, timber mats, pavement replacement, class A

SECTION 716, DELETE LINES 1 THROUGH 141.

SECTION 716, AFTER LINE 142, INSERT AS FOLLOWS:

SECTION 716 – TRENCHLESS PIPE INSTALLATION

716.01 Description. This work shall consist of installing pipes underground using construction techniques that eliminate open cutting of the pavement or of the ground all in accordance with 105.03.

150 *The techniques included are auger boring, guided boring, horizontal directional drilling, micro-tunneling, pipe jacking, and pipe ramming. Other methods may be utilized when approved.*

The size of installations by the directional drilling method shall be limited to those that can be accomplished by using a 600 mm (24 in.) maximum sized reamer unless otherwise approved.

MATERIALS

716.02 Materials. The materials shall be in accordance with the following.

160

<i>Cement</i>	<i>901.01(b)</i>
<i>Clay Pipe, Extra Strength</i>	<i>907.08</i>
<i>Fine Aggregate</i>	<i>904</i>
<i>Fly Ash</i>	<i>901.02</i>
<i>Foam Concentrate</i>	<i>ASTM C 869</i>
<i>Polyvinyl Chloride Pipe</i>	<i>907.23</i>
<i>Reinforced Concrete Pipe</i>	<i>907.02</i>
<i>Smooth Wall Polyethylene Pipe</i>	<i>907.21</i>
<i>Steel Pipe</i>	<i>908.11</i>
170 <i>Water</i>	<i>913.01</i>

Concrete pipe shall be class IV or stronger and shall have tongue and groove joints. All reinforced concrete pipes shall have steel reinforcement concentric with the pipe wall, and where required, additional reinforcement at the ends of the pipe.

Steel pipe used as a carrier pipe shall have the following minimum wall thickness.

<i>Outside Diameter, mm (in.)</i>	<i>Wall Thickness mm (in.)</i>
<i>457 or less (18 or less)</i>	<i>6 (1/4)</i>
<i>483 – 508 (19 – 20)</i>	<i>8 (5/16)</i>
<i>533 – 660 (21 – 26)</i>	<i>10 (3/8)</i>
<i>686 – 762 (27 – 30)</i>	<i>13 (1/2)</i>
<i>787 – 1070 (31 – 42)</i>	<i>13 (1/2)</i>
<i>1092 – 1219 (43 – 48)</i>	<i>14 (9/16)</i>

180 *The cellular concrete grout shall be designed and produced in accordance with ASTM C 796 except as herein modified.*

Admixtures, retarders, and plasticizers used shall be in accordance with the foam concentrate supplier's specifications.

190 *The grout shall be made using the preformed foam process using foam generating equipment calibrated daily by the foam manufacturer to produce a precise and predictable volume of foam. The foam concentrate shall be certified by the manufacturer to have specific liquid/foam expansion ratio at a constant dilution ratio with water.*

The specific job mix shall be submitted by the foam concentrate supplier certified or licensed grouting contractor to the Engineer for approval prior to use on the project. The mix shall have a minimum 28 day compressive strength of 1040 kPa (150 psi). The mix shall be tested and will be approved based on the test results or will be approved based on prior acceptance and suitable performance on Department projects.

200 *Grout mixed off site shall be delivered to the job site in a truck mixer in accordance with 702.09 filled to a capacity recommended by the foam manufacturer. The foam concentrate shall then be added to the cement mix in the truck and mixed to a uniform consistency.*

Grout mixed on site shall be batched in a deck mate or a similar device. Small batches of approximately 1 cubic meter (1 cubic yard) shall be mixed and pumped in a continuous operation.

210 *For each day worked or for each 100 cubic meters (100 cubic yards) placed, four test cylinders measuring 75 mm by 150 mm (3 in. by 6 in.) shall be cast at the point of placement of the grout. The cylinders shall be prepared, cured, and transported in accordance with ASTM C 31.*

The compressive strength shall be determined in accordance with ASTM C 39, except as modified herein. Initial curing shall be at room temperature and shall be from 2 to 5 days. After the initial curing, the test specimens shall be placed in a moist closet or moist room. All specimens shall be kept in their molds in the moist closet or moist room for the remainder of the curing period. The specimens shall be tested at 28 days.

220 *At that time the specimens shall be stripped, capped, and tested in compression as rapidly as possible to minimize drying. If more than one specimen is removed from the moist closet or moist room at the same time, these specimens shall be covered with a damp cloth until time of testing. The test results shall be submitted to the Engineer with a type D certification in accordance with 916.*

CONSTRUCTION REQUIREMENTS

***716.03 General Requirements.** Upon completion of the installation of the pipe, all excavated areas not occupied by the pipe shall be backfilled and compacted with suitable material in accordance with 203.*

230 *When ground water is known or anticipated, a dewatering system of sufficient capacity to handle the flow shall be maintained at the site until its operation can be safely halted. The dewatering system shall be equipped with screens or filter media sufficient to prevent the displacement of fines.*

When the use of explosives is necessary for performing the work, their use shall be in accordance with 107.13.

240 *Bentonite or other suitable lubricants, may be applied to the outside surface of the pipe to reduce frictional forces.*

Joints in steel pipe shall be water tight. Where welded joints are utilized, they shall be welded in accordance with 711.32. Joints in concrete pipe shall be designed to withstand the additional forces that are created in the joints during the installation process. The joints in concrete pipe shall be protected with a resilient material around the circumference of the pipe. Resilient material shall also be used between the pipe and the thrust ring.

250 *When installation is to be performed under railroads, highways, or streets, care shall be taken to prevent interference with the operations of the railroads, highways, or streets. The Contractor shall submit a QC plan of the installation process including, as a minimum, the chosen method of installation, the equipment to be used, and the materials to be utilized, for review and acceptance, at least seven calendar days prior to the start of the operations.*

Pavement or ground surface heave or settlement above the installation will not be permitted. To confirm if heave or settlement is occurring, the Contractor shall undertake surface monitoring. The plan for monitoring the surface shall be included in the Contractor's QC plan.

260 *Installations shall have a bored hole essentially the same diameter as the outside of the installed pipe. If voids develop or if the bored diameter is greater than the outside diameter of the pipe by more than 25 mm (1 in.), grouting shall be used to fill such voids. The Contractor's QC plan shall address the method of grouting.*

When the installation is 100 mm (4 in.) or larger and the casing is used as the carrier pipe, a visual or a video inspection shall be performed using high resolution, high sensitivity color video camera/recording equipment. The pipe shall be cleaned of debris prior to the inspection. Cleaning shall be accomplished by water jetting or other approved methods.

270

The camera/recording equipment shall be specifically designed for continuous viewing/recording of detailed images of the interior wall of pipes and transitions of the specified sizes. The equipment shall include sufficient lighting to view the entire periphery of the pipe. The equipment shall have appropriate attachments to maintain a position in the center of the pipe and an electronic counter to continuously record the location of the equipment in the pipe. The recording equipment shall be a minimum four head industrial grade VHS recorder or a digital archiving and reviewing system. A color video printer shall be included in the equipment for printing observations during inspection. A copy of the video inspection shall be submitted to the Engineer.

280

All sections of pipe found to be damaged or where joint failure is evident shall be repaired as approved by the Engineer or removed and replaced.

For installations not utilizing tunnel shields or tunnel boring machines, if an obstruction is encountered during installation which stops the forward progress of the pipe, and it becomes evident that it is impossible to advance the pipe, and if ordered, operations shall cease and the pipe shall be abandoned in place and filled with grout or other approved materials.

290

When a gravity-flow carrier pipe is placed inside a casing pipe, the gravity-flow carrier pipe shall be shimmed to proper line, elevation, and grade and then the void between the two pipes shall be grouted.

716.04 Method of Measurement. Pipe installed by trenchless installation methods will be measured by the meter (linear foot) along the center line of the pipe installed.

716.05 Basis of Payment. Pipe installed by trenchless installation methods will be paid for by the meter (linear foot) for pipe, installation, trenchless of the size specified, complete and in place.

300

Payment will be made under:

Pay Item

Pay Unit Symbol

Pipe Installation, Trenchless, _____m (LFT)
size

The cost of the QC plan, the excavating and backfilling of the entrance and receiving pits, video inspection, camera/recording equipment, bentonite or other lubricant, grout, and the casing when installed shall be included in the cost of pipe installation, trenchless.

310

If a partial installation has to be abandoned in place and filled with grout due to the encountering of an obstruction, the abandoned work will be paid for at 75% of the contract unit price of the pipe installed.

320 *For installations where unknown obstructions such as boulders, concrete, and other unforeseen obstructions are encountered, and the crossing cannot be abandoned or where tunnel shields or tunnel boring machines are being utilized, the additional cost as a result of encountering the unforeseen conditions will be paid for as differing site conditions in accordance with 104.02(a).*

SECTION 717, BEGIN LINE 9, DELETE AND INSERT AS FOLLOWS:

B Borrow for Structure Backfill	211
Bituminous Mastic Pipe Joint Sealer	906.05
Concrete, Class A.....	702
Flowable Mortar Backfill.....	213
Grouted Riprap	616.02(d) 904
Reinforcing Steel	910.01
<i>Structure Backfill</i>	<i>904</i>
Structural Plate Arches.....	908.09
Structural Plate Pipe and Pipe-Arches	908.09

SECTION 717, BEGIN LINE 43 DELETE AND INSERT AS FOLLOWS:

If shown on the plans, or otherwise required, the flowline of arches shall be paved with grouted riprap in accordance with ~~616.06~~ *616.04* or paved with class A concrete.

SECTION 717, BEGIN LINE 78, DELETE AND INSERT AS FOLLOWS:

717.04 Backfill. Where shown on the plans or when directed, ~~B borrow for structure-backfill~~ or flowable ~~mortar~~ *backfill* shall be used in backfilling around pipe and pipe-arch structures. Arch structure backfill shall be ~~B borrow for structure backfill~~. The amount of camber on the invert of the pipe or pipe-arch shall be varied to suit the height of fill and supporting soil, except the camber grade shall not be above level. The finished backfill grade shall be as shown on the plans.

After the pipe or pipe-arch has been assembled and is in place, backfill material shall be placed in accordance with 211.04 or ~~213.04(e)~~ *213.07*.

SECTION 717, LINE 140 DELETE AND INSERT AS FOLLOWS:

~~B borrow for structure~~ *Structure* backfill will be measured in accordance with 211.09.

Flowable ~~mortar~~ *backfill* used for backfill will be measured in accordance with ~~213.06~~ *213.08*.

SECTION 717, BEGIN LINE 153 DELETE AND INSERT AS FOLLOWS:

If a pipe or pipe-arch is lowered or relocated, or if rock or unsuitable material is encountered which requires additional excavation, such excavation will be paid for in accordance with 715.12. ~~B-borrow for structure~~ *Structure* backfill will be paid for in accordance with 211.10. Flowable ~~mortar~~ *backfill* will be paid for in accordance with ~~715.12~~ *213.09*.

SECTION 718, DELETE LINES 1 THROUGH 130.

SECTION 718, AFTER LINE 131, INSERT AS FOLLOWS:

SECTION 718 – UNDERDRAINS

718.01 Description. *This work shall consist of constructing underdrains using pipe, granular aggregates, outlet protectors, or geotextiles in accordance with 105.03.*

MATERIALS

718.02 Materials. *Materials shall be in accordance with the following:*

140

<i>Coarse Aggregate, Size No. 8 or 9</i>	<i>904</i>
<i>Concrete, Class A.....</i>	<i>702</i>
<i>Geotextile for Underdrains</i>	<i>913.19</i>
<i>Reinforcing Steel.....</i>	<i>910.01</i>
<i>Sod, including Nursery Sod.....</i>	<i>621</i>
<i>Structure Backfill.....</i>	<i>904</i>
<i>Underdrain Pipes.....</i>	<i>715.02(d)</i>
<i>Underdrain Outlet Pipes</i>	<i>907.24</i>

150

Rodent screens shall be woven stainless steel wire mesh or galvanized hardware cloth. Coarse aggregate No. 8 or 9 shall be used for 150 mm (6 in.) underdrain installations. Coarse aggregate No. 9 shall be used for 100 mm (4 in.) underdrain installations.

The mixture for HMA for underdrains shall be Intermediate C19.0 mm in accordance with 401. An ESAL Category 5 in accordance with 401.04 and a PG Binder 76-22 shall be used. A MAF in accordance with 401.05 will not apply. Acceptance of the HMA for underdrains will be in accordance with 402.09.

160

CONSTRUCTION REQUIREMENTS

718.03 Pipe Installation. *Trenches shall be excavated to the dimensions and grade shown on the plans. Pipes shall be secured to ensure that the required grade and horizontal alignment of the pipe are maintained. Perforated pipe shall be placed with the perforations down. The pipe sections shall be joined securely with the appropriate couplings, fittings, or bands. Aggregate for underdrains shall be placed in a manner which minimizes aggregate contamination.*

170

If plain end concrete pipe is being laid, the joint width shall not exceed 6 mm (1/4 in.).

718.04 Geotextile. *Storage and handling of geotextiles shall be in accordance with the manufacturer's recommendations. Each geotextile roll shall be labeled or tagged. Damaged or defective geotextile shall be replaced as directed. The geotextile shall be placed loosely, but with no wrinkles or folds. The ends of subsequent rolls of geotextile shall be overlapped a minimum of 0.3 m (1.0 ft). The upstream geotextile shall overlap the downstream geotextile. Placement of aggregate shall proceed following placement of the geotextile.*

180 **718.05 Underdrain Outlets.** *After the outlet pipe installation, the trench shall be backfilled as shown on the plans. Structure backfill shall not extend into the limits of the underdrain trench. The trench outside the limits of structure backfill shall be filled with materials suitable for growing vegetation. Aggregate and stabilized materials removed from an existing shoulder shall not be used as backfill and shall be disposed of in accordance with 206.07. At the time of installation, a rodent screen shall be placed on the outlet pipe or the ends of the underdrain pipe when located in inlets or catch basins.*

190 **718.06 Underdrain Outlet Protectors.** *Underdrain outlet protectors shall be constructed as shown on the plans.*

718.07 Video Inspection. *Underdrains and outlets shall be inspected using high resolution, high sensitivity, waterproof color video camera/recording equipment.*

200 *The camera/recording equipment shall be specifically designed for continuous viewing/recording of detailed images of the interior wall of pipes and transitions of the specified sizes. The equipment shall have the capability of viewing a minimum of 140 m (450 ft) into the pipes and shall be designed to include sufficient lighting to view the entire periphery of the pipe. The equipment shall have appropriate attachments to maintain a position in the center of the pipe and an electronic counter to continuously record the location of the equipment in the pipe. The recording equipment shall be a minimum four head industrial grade VHS recorder or a digital archiving and reviewing system. A color video printer shall be included in the equipment for printing observations during inspection.*

The Engineer will determine the runs of the underdrain installations to be inspected. Video inspection shall be conducted after guardrail, lighting, sign installation, and final seeding or sodding operations are completed.

210 *Damage discovered by the video inspection shall be repaired. Damage shall include but is not limited to; crushed or partially crushed pipes that impedes the progress of the camera, blockages, vertical pipe sags filled with water to a depth of d/2 or greater, 90 degree connections, connector separations, cracks or splits in the pipes. All repaired sections shall be video reinspected prior to acceptance. A copy of the video inspection shall be submitted to the Engineer.*

718.08 Method of Measurement. Underdrains and outlet pipe will be measured in accordance with 715.11. Outlet protectors will be measured by the number and type of units installed.

220

Structure backfill will be measured in accordance with 211.09. HMA for underdrains will be measured by the megagram (ton).

Aggregate for underdrains will be measured by the cubic meter (cubic yard), complete in place. The pay limits will not extend beyond the neat lines shown on the plans.

Geotextiles will be measured by the square meter (square yard) based on the neat line limits shown on the plans.

230

Video inspections for underdrains will be measured by the meter (linear foot) as determined by the electronic equipment.

Rodent screens, elbows, increaser or decreaser connections, and other incidentals will not be measured for payment.

Concrete, reinforcing steel, or sod for underdrain outlet protectors will not be measured for payment.

240

718.09 Basis of Payment. The accepted quantities of underdrains and underdrain outlet pipe will be paid for in accordance with 715.12. Aggregate for underdrains will be paid for at the contract unit price per cubic meter (cubic yard). Geotextile for underdrains will be paid for at the contract unit price per square meter (square yard). Outlet protectors will be paid for at the contract unit price per each of the type of unit installed, complete in place. The accepted quantities of HMA for underdrains will be paid for at the contract unit price per megagram (ton).

Structure backfill will be paid for in accordance with 211.10.

250

The final accepted quantity video inspection for underdrain will be paid for at the contract unit price per meter (linear foot).

Payment will be made under:

Metric Pay Item
(English Pay Item
Pay Item

Metric Pay Unit Symbol
English Pay Unit Symbol)
Pay Unit Symbol

260

Aggregate for Underdrainsm3 (CYS)
Geotextile for Underdrains m2 (SYS)
HMA for Underdrains..... Mg (TON)
Outlet Protector, _____ EACH
type
Video Inspection for Underdrainm (LFT)

Geotextile for underdrains which has been rejected due to contamination or other reasons shall be replaced with no additional payment.

270 *The cost of excavation, forming, reinforcing steel, concrete, curing materials, and sod shall be included in the cost of outlet protector.*

The cost of providing the video inspection equipment, technician, videotapes, or computer disks shall be included in the cost of the underdrain video inspection. The cost of repair of underdrain pipes, aggregates, backfill, outlet protectors, geotextile fabric, etc. shall be included in the cost of the other pay items. The cost of providing video reinspection of the repairs shall be included in the cost of the other pay items.

280 *The cost of disposal of unsuitable excavated materials, installation of pipe end caps, rodent screens, elbows, increaser or decreaser connections, and other incidentals shall be included in the cost of other pay items.*

SECTION 719, BEGIN LINE 11, DELETE AND INSERT AS FOLLOWS:

B Borrow for Structure Backfill	211
Concrete, Class A	702
Drain Tile Terminal Pipe	907.24
Flowable Mortar Backfill	213
Reinforcing Steel	910.01
Riprap	616.02(b) 904
Rodent Screen	718.02
Structure Backfill	904

SECTION 719, BEGIN LINE 75, DELETE AND INSERT AS FOLLOWS:

719.07 Method of Measurement. Drain tile and replacement pipe of the type and size specified will be measured in accordance with 715.11. Terminating pipe sections of the type and size specified will be measured per meter (linear foot). ~~B borrow for structure~~ Structure backfill will be measured in accordance with 211.09. and flowable ~~mortar~~ Flowable backfill will be measured in accordance with ~~715.11~~ 213.08. Riprap will be measured in accordance with 616.11.

SECTION 719, BEGIN LINE 92, DELETE AND INSERT AS FOLLOWS:

719.08 Basis of Payment. The accepted quantities of drain tile and replacement pipe will be paid for in accordance with 715.12. Terminating pipe sections will be paid for at the contract unit price per meter (linear foot) for pipe, drain tile terminal section, of the size specified, complete in place). ~~B borrow for structure~~ Structure backfill will be paid for in accordance with 211.10. and flowable ~~mortar~~ Flowable backfill will be paid for in accordance with ~~715.12~~ 213.09. Riprap will be paid for in accordance with 616.12.

SECTION 720, BEGIN LINE 139, DELETE AS FOLLOWS:

The Contractor may precast inlets, catch basins, or manholes, subject to approval. If precast concrete inlets, catch basins, or manholes are used, a layer of ~~B borrow for~~ structure backfill of minimum thickness of 100 mm (4 in.) shall be used under each unit for ease in positioning. If holes

SECTION 720, AFTER LINE 221, INSERT AS FOLLOWS:

Inlet, type H, with Slotted Drains..... EACH
Inlet, type HA, with Slotted Drains..... EACH

SECTION 720, AFTER LINE 231, DELETE AND INSERT AS FOLLOWS:

The cost of both inlets, the 300 mm (12 in.) pipe connecting the two inlets, the type 5 castings, the concrete filler between the barrier wall and the inlet, and other miscellaneous materials shall be included in the cost of the inlet, type H. The cost of the inlet, the type 5 casting, the concrete filler between the barrier wall and the inlet, and other miscellaneous materials shall be included in the cost of the inlet, type HA.

The cost of both inlets, the 300 mm (12 in.) pipe connecting the two inlets, the type 5 castings, the concrete filler between the barrier wall and the inlets, the slotted drain pipe, the concrete collar around the slotted drain pipe, and other miscellaneous materials shall be included in the cost of the inlet, type H, with slotted drains. The cost of the inlet, the type 5 casting, the concrete filler between the barrier wall and the inlet, the slotted drain pipe, the concrete collar around the slotted drain pipe, and other miscellaneous materials will be included in the cost of the inlet, type HA, with slotted drains.

The costs of excavation, backfill, reinforcing steel, ~~B-borrow~~ for structure backfill, concrete collar required for pipe connection to structures, removal, disposal and replacement of pavement, or surface material, and necessary incidentals shall be included in the costs of the pay items.

SECTION 722, BEGIN LINE 11, DELETE AND INSERT AS FOLLOWS:

Coarse Aggregate, *Class A or Higher, Size No. 11**.....904.02
Epoxy Penetrating Sealer909.09
Epoxy Resin Adhesive909.11
Fine Aggregate, *Size No. 23*.....904.01
Fly Ash901.02
Latex Modifier.....912.04
PCC Sealer/Healer.....901.06

SECTION 722, AFTER LINE 18, INSERT AS FOLLOWS:

** Crushed stone only*

SECTION 722, BEGIN LINE 58, DELETE AND INSERT AS FOLLOWS:

waiting period for the slump test. The air content test shall be in accordance with ~~501.03(b)~~ 505. Any concrete mixture which is not properly proportioned or does not conform to the specified slump ~~shall~~ will be rejected.

SECTION 722, BEGIN LINE 71, DELETE AND INSERT AS FOLLOWS:

(a) Fine aggregate shall be ~~size No. 23 and shall be~~ 35% to 45% of the total weight of aggregate used.

~~(b) Coarse aggregate shall be size No. 11, class A crushed stone.~~

(e)(b) The cement shall be 335 kg/m³ (564 lbs/cu yd) of portland cement type III or type IIIA, or 503 kg/m³ (846 lbs/cu yd) of portland cement type I or type IA.

(d)(c) Air entraining admixture shall be added to produce 5% to 8% entrained air.

(e)(d) The net water added shall produce a slump of no more than 100 mm (4 in.).

SECTION 722, BEGIN LINE 278, DELETE AND INSERT AS FOLLOWS:
damage. The finished surface shall be in accordance with ~~501.16~~ 504.03.

SECTION 722, BEGIN LINE 286, DELETE AND INSERT AS FOLLOWS:
surface or bringing coarse aggregate to the top. The grooves shall be in accordance with ~~501.15(d)2~~ 504.03. ~~However, until December 1, 1995, the spacing of the grooves, unless otherwise directed, may be 22.2 mm (7/8 in.), 19 mm (3/4 in.), 19 mm (3/4 in.), 25 mm (1 in.), 19 mm (3/4 in.), 19 mm (3/4 in.), 28.6 mm (1 1/8 in.), then repeat.~~ The grooves shall be terminated approximately ~~457~~ 450 mm (18 in.) from vertical faces such as curbs and concrete railing.

SECTION 722, BEGIN LINE 305, DELETE AND INSERT AS FOLLOWS:

The minimum curing shall be 24 h of wet cure followed by 72 h of dry cure. ~~In lieu of 72 h of dry cure, an~~ An overlaid bridge deck may be opened to traffic *during the minimum curing duration when* if the compressive strength of test cylinders is ~~27,500~~ 27 500 kPa (4,000 psi) or greater. The strength

SECTION 722, BEGIN LINE 338, DELETE AS FOLLOWS:

If it is determined by sounding or coring that adequate bonding between the overlay and the bridge deck has not been attained, the deficient ~~370~~ areas shall be removed and replaced as directed.

SECTION 722, BEGIN LINE 484, INSERT AS FOLLOWS:

Bridge deck overlay will be measured by the square meter (square yard) for the specified thickness. *If there is no specified thickness shown on the plans, the specified thickness shall be 45 mm (1 3/4 in.).*

SECTION 722, BEGIN LINE 515, DELETE AND INSERT AS FOLLOWS:

Patching material used for partial depth patching will be paid for at the contract unit price of ~~\$395~~ \$434.50 per cubic meter (~~\$300~~ \$330 per cubic yard) for bridge deck overlay, additional.

Overlay material used to fill surface irregularities will be paid for at the contract unit price of ~~\$395~~ \$434.50 per cubic meter (~~\$300~~ \$330 per cubic yard) for bridge deck overlay, additional.

SECTION 725, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 725 – SLIP LINING OF EXISTING PIPE

725.01 Description. *This work shall include installing a thermoplastic liner into an existing pipe and filling the space between the liner and the existing pipe with cellular concrete grout all in accordance with 105.03.*

MATERIALS

725.02 Materials. *Materials shall be in accordance with the following.*

Cement.....	901.01(b)
Fine Aggregate	904
Fly Ash	901.02
Flowable Backfill	213
Foam Concentrate.....	ASTM C 869
Profile Wall HDPE Pipe Liner	907.24.1(b)
Profile Wall PVC Pipe Liner	907.24.1(c)
Solid Wall HDPE Pipe Liner	907.24.1(a)
Water.....	913.01

Individual liner section lengths shall be a minimum of 5.8 m (19 ft), but shall not exceed 16.7 m (55 ft) unless approved.

Liner joints shall be bell and spigot, screw type, or thermal welded. Grooved press-on joints shall be used only when approved by the Engineer. All joints shall have sufficient mechanical strength to withstand the liner installation and grouting operations. Joints shall not reduce the hydraulic capacity of the liner.

Only pipe liners selected from the Department's list of approved thermoplastic pipe liners shall be used.

The cellular concrete grout shall be designed and produced in accordance with ASTM C 796 except as herein modified.

The admixtures, retarders, and plasticizers used in the grout shall be in accordance with the foam concentrate supplier's specifications.

The grout shall be made using the preformed foam process using foam generating equipment calibrated daily by the foam manufacturer to produce a precise and predictable volume of foam. The foam concentrate shall be certified by the manufacturer to have specific liquid/foam expansion ratio at a constant dilution ratio with water.

The specific job mix shall be submitted to the Engineer by the foam concentrate supplier certified or licensed grouting contractor for approval prior to use on the contract. The mix shall have a minimum 28 day compressive strength of 1040 kPa

(150 psi). The mix shall be tested and verified in accordance with these specifications or shall be approved based on prior acceptable performance on Department contracts.

50 *Grout mixed off site shall be delivered to the job site in a truck mixer in accordance with 702.09 filled to half its capacity. The foam concentrate shall then be added to the cement mix in the truck and mixed to a uniform consistency.*

Grout mixed on site shall be batched in a deck mate or similar device. Small batches of approximately 1 cubic meter (1 cubic yard) shall be mixed and pumped in a continuous operation.

60 *For each day worked or for each 100 cubic meters (100 cubic yards) placed, four test cylinders measuring 75 mm by 150 mm (3 in. by 6 in.) shall be cast at the point of placement of the grout. The cylinders shall be prepared, cured, and transported in accordance with ASTM C 31, except as modified herein.*

70 *The compressive strength shall be determined in accordance with ASTM C 39, except as modified herein. Initial curing shall be at room temperature and shall be from 2 to 5 days. After the initial curing, the test specimens shall be placed in a moist closet or moist room or stored in an enclosed curing tank above the water level. All specimens shall be kept in their molds in the moist storage for the remainder of the curing period. The specimens shall be tested at 28 days. At that time the specimens shall be stripped, capped, and tested in compression as rapidly as possible to minimize drying. If more than one specimen is removed from the moist storage at the same time, these specimens shall be covered with a damp cloth until time of testing.*

Existing circular pipe structures shall be lined with solid wall high density polyethylene, HDPE, pipe liner; profile wall HDPE pipe liner; or profile wall polyvinyl chloride, PVC, pipe liner. Existing deformed pipe structures shall be lined with solid wall HDPE pipe liner.

CONSTRUCTION REQUIREMENTS

80 **725.03 Construction Requirements.**

(a) Right-of-Entry Areas. If the right-of-way does not provide sufficient room for performance of the work, rights-of-entry from all necessary adjacent property owners shall be obtained in accordance with 107.14. A temporary fence shall be installed as required to prevent encroachment of the public or livestock into the work area. Upon completion of the work, disturbed areas on private property shall be restored in accordance with 107.14.

90 *(b) Filling of Cavities Outside the Existing Pipe. All obvious cavities outside the existing pipe shall be filled with flowable backfill in accordance with 213 prior to the liner installation or with grout placed in conjunction with the grouting operation after the liner is installed.*

(c) Liner Installation. Prior to commencing the liner installation, all jagged existing pipe edges or other deformities shall be repaired. All foreign material shall be removed from the existing pipe.

The inside diameter of the liner shall be in accordance with the following:

<i>EXISTING CIRCULAR CMP STRUCTURES</i>	
<i>PAY ITEM DIAMETER mm (in.)</i>	<i>MINIMUM LINER INSIDE DIAMETER mm (in.)</i>
300 (12)	250 (10.0)
375 (15)	290 (11.7)
450 (18)	355 (14.3)
525 (21)	420 (16.8)
600 (24)	460 (18.5)
675 (27)	515 (20.7)
750 (30)	585 (23.5)
825 (33)	650 (26.1)
900 (36)	735 (29.5)
1050 (42)	840 (33.6)
1200 (48)	980 (39.2)
1350 (54)	1050 (42.0)
1500 (60)	1200 (48.0)
1650 (66)	1350 (51.6)
1800 (72)	1475 (59.1)
1950 (78)	1500 (60.0)
2100 (84)	1650 (66.0)
2250 (90)	1800 (72.0)
2400 (96)	1950 (78.0)
2550 (102)	1950 (78.0)
2700 (108)	2100 (84.0)
2850 (114)	2250 (90.0)
3000 (120)	2400 (96.0)
3150 (126)	2400 (96.0)
3300 (132)	2700 (108.0)
3450 (138)	2700 (108.0)
3600 (144)	3000 (120.0)

100

<i>EXISTING CIRCULAR STRUCTURAL PLATE PIPE STRUCTURES</i>	
<i>PAY ITEM DIAMETER mm (ft - in.)</i>	<i>MINIMUM LINER INSIDE DIAMETER mm (in.)</i>
1500 (5 - 0)	1200 (48.0)
1655 (5 - 6)	1290 (51.7)
1810 (6 - 0)	1475 (59.1)
1965 (6 - 6)	1475 (59.1)
2120 (7 - 0)	1475 (59.1)

2275 (7 - 6)	1800 (72.0)
2430 (8 - 0)	1950 (78.0)
2585 (8 - 6)	2100 (84.0)
2740 (9 - 0)	2250 (90.0)
2895 (9 - 6)	2400 (96.0)
3050 (10 - 0)	2400 (96.0)
3205 (10 - 6)	2400 (96.0)
3360 (11 - 0)	2700 (108.0)
3515 (11 - 6)	2700 (108.0)
3670 (12 - 0)	3000 (120.0)

<i>EXISTING DEFORMED PIPE STRUCTURES</i>	
<i>PAY ITEM END AREA m² (ft²)</i>	<i>MINIMUM LINER INSIDE DIAMETER mm (in.)</i>
<i>CORRUGATED METAL PIPE-ARCH</i>	
<i>68 mm x 13 mm (2 2/3" x 1/2") Corrugations</i>	
0.10 (1.1)	300 (12.0)
0.15 (1.6)	370 (14.9)
0.20 (2.2)	420 (16.8)
0.27 (2.9)	460 (18.5)
0.42 (4.5)	600 (24.0)
0.60 (6.5)	735 (29.5)
0.83 (8.9)	840 (33.6)
1.08 (11.6)	980 (39.2)
1.37 (14.7)	1050 (42.0)
1.68 (18.1)	1200 (48.0)
2.03 (21.9)	1290 (51.6)
2.42 (26.0)	1475 (59.1)
<i>75 mm x 25 mm (3" x 1") Corrugations</i>	
1.45 (15.6)	1050 (42.0)
1.79 (19.3)	1200(48.0)
2.16 (23.2)	1290 (51.6)
2.55 (27.4)	1475 (59.1)
2.98 (32.1)	1500 (60.0)
3.44 (37.0)	1650 (66.0)
3.94 (42.4)	1800 (72.0)
4.46 (48.0)	1950 (78.0)
5.04 (59.2)	1950 (78.0)
5.62 (60.5)	2100 (84.0)
6.26 (67.4)	2250 (90.0)
6.92 (74.5)	2400 (96.0)
<i>STRUCTURAL PLATE STEEL PIPE-ARCH</i>	
2.0 (22)	1200 (48.0)
2.2 (24)	1290 (51.7)

2.4 (26)	1290 (51.7)
2.6 (28)	1475 (59.1)
2.9 (31)	1475 (59.1)
3.1 (33)	1475 (59.1)
3.3 (35)	1475 (59.1)
3.5 (38)	1475 (59.1)
3.7 (40)	1475 (59.1)
4.0 (43)	1475 (59.1)
4.3 (46)	1800 (72.0)
4.6 (49)	1800 (72.0)
4.8 (52)	1950 (78.0)
5.1 (55)	2100 (84.0)
5.4 (58)	2100 (84.0)
5.7 (61)	2250 (90.0)
5.9 (64)	2250 (90.0)
6.2 (67)	2400 (96.0)
6.6 (71)	2400 (96.0)
6.9 (74)	2400 (96.0)
7.2 (78)	2400 (96.0)
7.5 (81)	2400 (96.0)
7.9 (85)	2400 (96.0)
9.0 (97)	2700 (108.0)
9.5 (102)	2700 (108.0)
9.8 (105)	2700 (108.0)
10.1 (109)	3000 (120.0)

Prior to commencing the liner installation operation, steps shall be taken to verify that a liner meeting the minimum inside diameter requirements can be successfully placed inside the existing pipe. If it is discovered prior to installation that a liner with the required inside diameter cannot fit, the inside and outside diameters of a substitute liner shall be submitted to the Engineer for approval. If this discovery is not made until after the liner installation has begun, the partially installed liner shall be removed. Inside and outside diameters for a substitute liner shall then be submitted to the Engineer for approval.

After the liner installation is complete and the liner has cooled to approximately the temperature of the existing pipe, the liner shall be cut so that each end is no more than 75 mm (3 in.) outside the end of the existing pipe.

Grout shall be injected into the space between the existing pipe and the liner. The injection operation shall provide sufficient grout to fill all voids between the existing pipe and the liner over the entire structure length, but shall also be performed in a manner that does not distort the liner. The pressure developed in the space between the liner and the existing pipe shall not exceed the liner manufacturer's recommended maximum value.

All existing culverts, storm drains, underdrain pipes, drain tile, or other pipes that are directly connected to the lined structure shall be perpetuated. Grout shall not leak through the liner at these connections.

725.04 Method of Measurement. *Thermoplastic liner will be measured by the meter (linear foot), complete in place. An allowance of 1.5 m (5 ft) of liner will be made for the perpetuation of an existing pipe through the liner.*

725.05 Basis of Payment. *The accepted quantities of pipe liner, thermoplastic, will be paid for at the contract unit price per meter (linear foot) for the size of the existing pipe in which the liner is installed, complete in place. Perpetuating the direct connection of an existing pipe through the liner will be paid for by means of an allowance of 1.5 m (5 ft) of liner for each such connection.*

Payment will be made under:

<i>Pay Item</i>	<i>Metric Pay Unit Symbol (English Pay Unit Symbol)</i>
<i>Pipe Liner, Thermoplastic, _____ mm..... m</i> <i>diameter</i>	
<i>(Pipe Liner, Thermoplastic, _____ in.LFT)</i> <i>diameter</i>	
<i>Pipe Liner, Thermoplastic, _____ m² m</i> <i>area</i>	
<i>(Pipe Liner, Thermoplastic, _____ sftLFT)</i> <i>area</i>	

The cost of repairing jagged edges or deformities to existing pipe, filling cavities around the existing pipe with flowable backfill or grout, acquisition and restoration of required right-of-entry areas, erection, maintenance, and removal of temporary fence, removing foreign material from the existing pipe, grouting the space between the existing pipe and the liner, and other incidentals will not be paid for separately, but shall be included in the cost of the pay items in this section.

In situations where the condition of the existing pipe requires that a substitute liner be utilized, there will be no reduction in payment for the installation of the substitute liner. There will be no additional payment for the additional grout required to fill the larger void between the existing pipe and the smaller liner.

There will be no payment for the installation or removal of any liner that cannot be successfully installed due to the condition of the existing pipe.

If the existing pipe or any other object not designated for removal is damaged while performing this work, it shall be considered unauthorized work and repaired or replaced in accordance with 105.11.