CONSTRUCTION SPECIFICATION FOR CONCRETE BARRIER

TABLE OF CONTENTS

740.01 SCOPE

This specification covers the requirements for the construction of cast-in-place (formed and slipformed) and precast concrete barrier, for use in permanent applications. Concrete in barrier walls and concrete in parapet walls on structures is not covered by this specification.

740.02 REFERENCES

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications, Construction:

OPSS 313	Hot Mixed, Hot Laid Asphaltic Concrete Paving and Hot Mix Patching Including Recycled and Specialty Mixes
OPSS 314	Untreated Granular Subbase, Base, Surface, Shoulder and Stockpiling
OPSS 501	Compacting
OPSS 904	Concrete Structures
OPSS 919	Formwork and Falsework

Ontario Provincial Standard Specifications, Material:

OPSS 1010	Aggregates - Granular A, B, M, and Select Subgrade Material
OPSS 1151	Superpave and Stone Mastic Asphalt Mixtures
OPSS 1306	Burlap
OPSS 1308	Joint Filler (Concrete)
OPSS 1315	White Pigmented Membrane Curing Compounds for Concrete
OPSS 1350	Concrete - Materials and Production
OPSS 1355	Precast Concrete - Materials and Production
OPSS 1442	Epoxy Coated Steel Reinforcement for Concrete

Ontario Ministry of Transportation Publications:

Designated Sources of Materials (DSM) List

MTO Laboratory Testing Manual:
LS-607 Determination of Percent Crushed Particles in Processed Coarse Aggregate

Ontario Traffic Manual (OTM):
Book 11 - Pavement, Hazard, and Delineation Markings

Canadian Standards Association (CSA)

G40.20-13/G40.21-13 (R2018)	General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel
G164-18	Hot Dip Galvanizing of Irregularly Shaped Articles

ASTM International

C171-07	Sheet Materials for Curing Concrete
D4956-11a	Standard Specification for Retroreflective Sheeting for Traffic Control

740.03 DEFINITIONS

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

Asymmetric Concrete Barrier means a concrete barrier constructed where the pavement elevation on each side of the concrete barrier wall differs. Asymmetric concrete barrier can be asymmetric 825 mm concrete barrier or asymmetric tall wall concrete barrier.

Cast-in-Place, Formed means a method of placing concrete whereby fixed formwork is utilized.

Cast-in-Place, Slipformed means a construction method in which concrete is placed using a continuously moving form.

Cold Weather means those conditions when the ambient air temperature is at or below 5ºC. It is also considered to occur when the ambient air temperature is at or is likely to fall below 5ºC within 96 hours after completion of concrete placement. Air temperature refers to shade temperature.

Concrete Barrier means all types of concrete barrier wall that are either cast-in-place or precast, used for median or roadside permanent installations. Concrete barrier includes; 825 mm concrete barrier, tall wall concrete barrier, asymmetric 825 mm concrete barrier, asymmetric tall wall concrete barrier and transition wall.

Construction Joint means the surface where two successive placements of concrete meet or where new concrete is placed against existing concrete.

Contraction Joint means a joint which is formed or created by scoring the plastic concrete to prevent uncontrolled cracking due to drying or thermal shrinkage.

Element means an individual precast concrete unit.

Expansion Joint means a joint which is formed using expansion joint material, which allows for differential horizontal movement between two abutting faces of concrete.

Knuckling means irregular undulations or ripples in the concrete surface.

Mortar means a mixture of cement paste and fine aggregate.

825 mm Concrete Barrier means a concrete barrier constructed to a height of 825 mm above the adjacent pavement surface. Includes Type A, C and M barriers and their numerical subtypes.

Tall Wall Concrete Barrier means a concrete barrier constructed to a height of 1,050 mm above the adjacent pavement surface. Includes Type TW and its numerical subtypes.

Tears mean a vertical opening in the surface of slipformed concrete caused by movement of the slipforming machine.

Transition Wall means the section of concrete barrier where the cross-sectional dimensions vary to form a transition between the concrete barrier and high mast lighting poles, sign supports, or structure components such as bridge piers or between symmetric and asymmetric wall.

740.04 DESIGN AND SUMISSION REQUIREMENTS

740.04.01 Submission Requirements

740.04.01.01 Cast-in-Place Concrete Barrier

740.04.01.01.01 Cold Weather Concreting

For cold weather concreting, the temperature control plan, and temperature records shall be submitted according to OPSS 904.

740.04.01.01.02 Curing Compound

Curing compound submissions shall be according to OPSS 904.

740.05 MATERIALS

740.05.01 Asphaltic Concrete

Asphaltic concrete shall be according to OPSS 1151.

740.05.02 Bond Breaker

Bond breaker shall be RC-250, Tectyl 506, or an alternative type of material acceptable to the Owner.

740.05.03 Burlap

Burlap shall be according to OPSS 1306.

740.05.04 Concrete

Cast-in-place concrete shall be according to OPSS 1350 and precast concrete barrier shall be according to OPSS 1355, with the following additions:

a) The minimum compressive strength of 825 mm concrete barrier shall be 30 MPa at 28-Days.

b) The minimum compressive strength of tall wall concrete barrier shall be 35 MPa at 28-Days.

c) Coarse aggregate shall have all faces crushed when tested according to LS-607.

740.05.05 Curing Compound

Curing compound shall be according to OPSS 1315.

740.05.06 Dowels

Dowel bars for construction joints shall be size 25M, Grade 400W, deformed bars according to OPSS 1442.

Dowel bars for expansion joints shall be size 25M, Grade 400W, epoxy-coated smooth bars according to OPSS 1442.

740.05.07 Dowel Adhesive

Dowel adhesive shall be from the Designated Source of Materials list.

740.05.08 Dowel Bond Breaker

Bond breaker used for dowels shall be RC-250 or Tectyl 506 or an alternative product acceptable to the Owner.

740.05.09 Granular

740.05.09.01 Foundation

Granular foundation material shall be Granular A according to OPSS 1010.

740.05.09.02 Transition Wall at Bridge Pier

Granular A material for transition wall at bridge piers shall be according to OPSS 1010.

740.05.10 Joint Filler

Expansion joint filler shall be Type A with a minimum width of 12 mm according to OPSS 1308.

740.05.11 Moisture Vapour Barrier

Moisture vapour barrier shall be a white opaque polyethylene film according to ASTM C171, with a minimum thickness of 100 µm.

740.05.12 Precast Concrete Barrier Connection Assemblies

Hollow structural steel and wide flange steel sections shall be according to CSA G40.20/G40.21, grade 350W or higher, and shall be hot dip galvanized after fabrication according to CSA G164.

740.05.13 Proprietary Patching Materials

Proprietary patching materials shall be from the Ministry's List of Concrete Patching Materials. The list shall be obtained from the Contract Administrator.

740.05.14 Reflectors

Reflectors shall have:

a) A minimum reflective surface of 100 x 100 mm;

b) High intensity retroreflective sheeting according to ASTM D 4956, Type VIII;

c) Colour according to OTM Book 11; and

d) Flexibility to bend 90^{o} from vertical and self-restore.

740.06 EQUIPMENT

740.06.01 Compressor - Air Blasting

The compressor for air blasting shall have a minimum capacity of 3.5 m^3/minutes. The compressed air shall be free of oil or other contaminants.

740.06.02 Consolidating Equipment

For formed concrete barrier, consolidating equipment shall be according to OPSS 904.

For slipformed concrete barrier, consolidation equipment shall consist of surface vibrators or internal vibrators.

740.06.03 Hand Finishing Tools

Floats shall be made of magnesium or wood.

740.06.04 Straight Edges

Two straight edges commercially made of metal, one 3 m and one 1 m long shall be used.

740.06.05 Spray Equipment for Curing Compound

The curing compound shall be applied to the concrete surface by means of motorized spraying equipment approved by the manufacturer of the curing compound. The equipment shall include a mechanical agitator.

740.06.06 Temperature Monitoring and Recording System

The temperature monitoring and recording system shall provide unalterable records of temperature during the temperature monitoring period. Prior to use on the Contract, the temperature monitoring and recording system shall be confirmed by the Contract Administrator, in writing, to be acceptable.

Temperature sensors and associated instrumentation shall have a combined accuracy of ± 1.5°C and shall record temperatures at time intervals not exceeding 1 hour and shall digitally display the temperature.

740.07 CONSTRUCTION

740.07.01 General

Concrete barriers shall be constructed according to the following requirements:

a) The dimensions and locations specified in the Contract Documents;

b) Asymmetric concrete barrier shall be cast-in-place. For all other types of concrete barriers, the Contractor has the option to either use formed, slipformed or precast concrete barriers, unless otherwise specified in the Contract Documents;

c) The type of construction select shall be used for the entire Contact, unless otherwise specified in the Contract Documents;

d) The minimum compressive strength of the concrete barrier shall be 20 MPa prior to the commencement of the shouldering operations or construction of adjacent lanes; and

e) Concrete barrier abutting barrier walls on a structure shall be connected to the structure as specified in the Contract Documents.

Written notification shall be provided to the Contract Administrator a minimum of 21 Days prior to commencement of construction of what method of construction will be used (formed, slipformed or precast) to construct the concrete barrier.

740.07.02 Foundation Preparation

Preparation of the granular foundation shall be according to OPSS 314.

740.07.03 Dimensional Tolerances

The dimensions of the concrete barrier shall be as specified in the Contract Documents with the following tolerances:

a) Dimensions up to 300 mm shall be within ± 5 mm; and

b) Dimensions greater than 300 mm shall be within ± 10 mm.

740.07.04 Alignment Tolerances

Any variation of the horizontal and vertical alignment from the required lines indicated in the Contract Documents shall not exceed ± 10 mm.

740.07.05 Reflectors

Reflectors shall be installed on concrete barrier as follows:

a) Starting within the first meter from the approach end of the concrete barrier installation;

b) At a maximum interval of 20 m on tangent;

c) According to Table 4 of OTM Book 11, on curves where interval is not greater than 20 m; and

d) Ending within 1 m from the leaving end of the concrete barrier installation.

Reflectors shall be securely fastened to the top of the concrete barrier according to the manufacturer's recommendations. One-sided reflectors shall be installed on one-way ramps and on the right side of divided highways. Two-sided reflectors shall be installed on undivided highways and on the left side of divided highways. Reflector placement shall not obscure any markings on top of the concrete barrier.

740.07.06 Additional Requirements for Cast-in-Place Concrete Barrier

740.07.06.01 Placing of Concrete

740.07.06.01.01 General

Concrete placement shall be according to the General and Concrete Placing Restriction clauses of the Placing of Concrete subsection of OPSS 904.

Immediately prior to concrete placement, the subgrade shall be moistened by means of a uniform spray of water sufficient to wet the subgrade thoroughly without leaving standing water.

Formwork shall be according to OPSS 919. Textile form liners shall not be used.

740.07.06.01.02 Slipformed Concrete Barrier

Placement of slipformed concrete barrier shall be continuous. When there is an interruption in the slipforming operation, a construction joint shall be formed. If the work has stopped within 2 m of a contraction joint, the concrete shall be removed to the contraction joint.

During the slipforming operation, accumulation of granular material ahead and within the slipform equipment shall be prevented. Loose material shall be removed from the placement area.

The slipforming operation shall leave a smooth, even surface on the sides and top of the wall such that hand finishing is not required.

If surface holes or cavities larger than 15 mm in diameter occur or any other of the defects specified in the Quality Assurance section are present, adjustments to the operation shall be made to correct the defect. If the adjustments do not correct the defect within 10 m, the operation shall be halted until the defect is corrected either by adjustments to the operation or to the concrete mix. Unacceptable concrete barrier shall be removed and replaced as specified in the Remedial Work clause of this specification.

740.07.06.02 Consolidation

Consolidation of concrete shall be according to OPSS 904.

740.07.06.03 Concrete Finishing

740.07.06.03.01 General

Finishing of the concrete surface shall be according to OPSS 904.

740.07.06.03.02 Slipformed Concrete Barrier

Hand finishing is not permitted other than to remove offsets, fins and protrusions, or repair bugholes.

Offsets, fins and protrusions shall be removed immediately by light trowelling.

Bugholes shall be repaired immediately with mortar from the plastic concrete. For all other surface imperfections, no new concrete shall be added to the surface.

The concrete surface shall not be brushed.

No water or other material shall be added to the surface of the concrete.

Tears in the concrete shall not be permitted, and shall be repaired by removing and replacing concrete to the nearest contraction joint at the Contractor's expense.

740.07.06.04 Additional Requirements for Transition Wall

704.07.06.04.01 General

Transition wall at bridge piers, sign supports, poles and between symmetric and asymmetric wall shall be cast-in-place.

Slipforming shall not be used for transition wall.

Connections between transition wall and structures or concrete barrier shall be as specified in the Contract Documents.

Unless otherwise specified in the Contract Documents, cast-in-place concrete barrier shall be connected to cast-in-place transition concrete barrier by dowelling into the vertical joint as specified in the "Installation of Dowel Bars at Construction and Expansion Joints" clause of this specification and the Contract Documents.

740.07.06.04.02 Treatment at Bridge Piers

Granular A material with asphaltic concrete surface shall be used to fill the area between concrete barriers where separation occurs at bridge piers or at other locations where separation of the concrete barriers is required. Compaction of granular shall be according to OPSS 501. The asphaltic surface shall be according to OPSS 313.

740.07.06.05 Curing

Curing shall be according to OPSS 904. For cast-in-place, formed concrete barrier, curing with curing compound is not permitted. For cast-in-place, slipformed concrete barrier, curing with curing compound is permitted.

When curing compound is used to cure cast-in-place, slipformed concrete barrier, it shall also be applied to adjacent new cast-in-place, formed concrete barrier or transition wall sections or both, for colour uniformity, after the curing period is completed.

740.07.06.06 Cold Weather Protection

During cold weather, the concrete temperature shall not fall below 10 °C for a minimum period of 7 Days following concrete placement. Protection of concrete shall be according to the, Concrete Subject to Cold Weather subsection of OPSS 904.

Monitoring of air and concrete temperature shall be according to the Control of Temperature and Temperature Difference subsection of OPSS 904 with the following exception:

a) Temperature sensors shall be embedded in the concrete within 5 mm of the surface, at a frequency of one every 250 lineal metres, with no less than one for each Day's placement.

740.07.06.07 Surface Finish

Surface finish of concrete barrier shall be according to the Surface Finish subsection of OPSS 904.

740.07.06.08 Joints

740.07.06.08.01 General

All joints shall be square and perpendicular to the pavement. Joints shall be continuous along the front, back vertical face and top of the concrete barrier. Joints shall not be within 2 m of each other.

740.07.06.08.02 Contraction Joints

Contraction joints shall be created by sawcutting the hardened concrete. Contraction joints shall be sawcut as soon as the joint can be made without ravelling the joint or damaging the concrete surface, and prior to any cracks developing outside of the joint.

Contraction joints shall be equally spaced along the concrete barrier at 4 m intervals. This interval may be locally modified to a length between 3 to 5 m to avoid being within 2 m of any other joint or the ends of the concrete barrier.

Contraction joints shall have a width of 3 ± 1 mm. The depth of contraction joints shall be 45 ± 5 mm for concrete barrier with a top width less than or equal to 200 mm and 60 ± 5 mm for concrete barrier with a top width greater than 200 mm.

A contraction joint shall be placed on each side of the outside perimeter of all sub-surface components such as catch basins and maintenance access structures.

740.07.06.08.03 Construction Joints

A construction joint shall be created at the end of each Day's production and where new concrete barrier is connected longitudinally to existing concrete barrier, or transition wall, including locations of repair to newly placed, hardened barrier. The construction joint shall coincide with a contraction or expansion joint.

Dowels shall be installed at construction joints as specified in the Contract Documents and the Installation of Dowel Bars at Construction and Expansion Joints clause of this specification.

740.07.06.08.04 Expansion Joints

Expansion joints for cast-in-place concrete barrier shall be installed at the following locations:

a) Where concrete barrier abuts a structure;

b) Adjacent to piers; and

c) At locations indicated in the Contract Documents.

Expansion joints shall be filled with a joint filler.

Dowels shall be installed as specified in the Contract Documents and the "Installation of Dowels at Construction Joints and Expansion Joints" clause of this specification.

740.07.06.08.05 Installation of Dowels at Construction Joints and Expansion Joints

Dowels shall be installed in hardened concrete by drilling holes in the concrete using a gang drill. The embedment length and alignment shall be as specified in the Contract Documents. Dowels shall be located along the centre line of the concrete barrier cross-section, commencing 150 mm from the top of the concrete barrier and equally spaced vertically at 150 mm intervals, unless otherwise specified in the Contract Documents. 825 mm concrete barrier and asymmetric 825 mm concrete barrier shall have three dowel bars. Tall wall concrete barrier and asymmetric tall wall concrete barrier shall have five dowel bars.

The diameter of the drill hole shall be no more than 5 mm larger than the diameter of the dowel bar. Prior to filling the drill hole, the inside surface of each drill hole shall be thoroughly cleaned using a wire brush and then cleaned by air blasting using a compressor. The dowel bar shall be secured into the existing concrete with dowel adhesive. The dowel adhesive shall be mixed in the nozzle (cartridge). The dowel adhesive shall be injected into the back of the cleaned drill hole and the dowel bar, with grout retention disks attached, shall be inserted to ensure the bars are completely encased with dowel adhesive for the full depth of the hole.

Holes that have been started but not completed shall be cleaned and filled with a proprietary patching material.

For expansion joints:

a) A greased sleeve shall be installed as specified in the Contract Documents; and

b) The free ends of the dowel bars and the exposed vertical concrete face shall be coated with bond breaker immediately prior to placing concrete.

740.07.06.09 Testing for Early Strength

Sampling and testing for early strength shall be according to OPSS 904. Cylinders shall represent the concrete barrier placed during one Day's production.

740.07.07 Additional Requirements for Precast Concrete Barrier

740.07.07.01 General

Precast concrete barrier shall consist of new elements. Precast concrete barrier shall be free of any defect specified in the Quality Assurance section, prior to installation.

Precast concrete barrier connection types shall be as specified in the Contract Documents.

740.07.07.02 Installation of Precast Concrete Barrier

Installation of precast concrete barrier shall not cause damage to the elements or adjacent concrete or pavement.

Each unit shall be placed so as to maintain a 10 to 15 mm wide gap between elements on alignment tangents or inside of horizontal curves. No joint filler shall be utilised unless otherwise specified in the Contract Documents.

The horizontal and vertical alignment discontinuity between adjacent elements shall not exceed 10 mm, as measured with a 1 m straight edge.

740.07.08 Remedial Work

The Contract Administrator shall be immediately notified in writing if any portion of the concrete barrier does not meet the acceptance requirements listed in the Quality Assurance section of this specification. Any work that does not meet the acceptance requirements of this specification shall be removed and replaced at the Contractor's expense.

For precast concrete barrier, removal shall consist of removing and replacing entire elements.

For cast-in-place concrete barrier, the area to be removed and replaced shall be bounded by the nearest contraction joints. The two vertical joints shall be constructed as specified in the Construction Joints clause of this specification.

Removals of concrete barrier shall not damage adjacent asphalt pavement or concrete.

A proposal for remedial work for any defects or deficiencies may be submitted to the Contract Administrator for review. Repairs shall not proceed until acceptance of the proposal has been received. If permitted to proceed, documentation for any repairs shall be provided to the Contract Administrator indicating the nature and location of repairs. The Contract Administrator may conduct a visual inspection or use other measures as required, including requesting additional coring or any other testing deemed necessary, to verify the acceptability of the repairs.

740.07.09 Management of Excess Material

Management of excess material shall be as specified in the Contract Documents.

740.08 QUALITY ASSURANCE

740.08.01 Acceptance of Concrete Barrier

740.08.01.01 General

Acceptance shall be as specified in this specification, including satisfactory completion of all remedial work associated with any deficiencies. Any portion of the concrete barrier that fails to meet the requirements of this specification shall be removed and replaced as specified in the Remedial Work subsection of this specification.

Concrete barrier shall meet the following acceptance requirements:

a) The top of the concrete barrier shall be a minimum of 1050 mm above the finished road surface for Type TW and a minimum of 825 mm above the finished road surface for Types A, C and M.

b) The horizontal and vertical alignment of the concrete barrier from the required lines indicated in the Contract Documents shall not exceed ± 10 mm.

c) The dimensions of the concrete barrier shall not deviate from those specified by more than the following tolerance:

   i. Specified dimensions up to 300 mm: ± 5 mm
   ii. Specified dimensions greater than 300 mm: ± 10 mm

d) Concrete barrier shall be free of cracks, including horizontal cracks and vertical cracks other than at joints.

e) Concrete barrier shall be of uniform colour and appearance, and shall be free of the following defects:

i. Voids;
ii. Holes with any dimension greater than 15 mm;
iii. Cavities;
iv. Spalls;
v. Delaminations;
vi. Honeycombing;
vii. Breakaway of an edge or surface;
viii. Knuckling;
iv. Visible segregation;
x. Poor consolidation;
xi. Placement lines;
xii. Cold joints;
xiii. Exposed steel reinforcement; and
xiv. Excessive frequency of bugholes.

740.08.01.02 Additional Acceptance Requirements for Cast-in-Place Concrete Barrier

740.08.01.02.01 General

Cast-in-place concrete barrier shall meet the following additional acceptance requirements:

a) Slipformed concrete barrier shall not contain tears or repaired tears.

b) The concrete temperature during cold weather shall not fall below 10˚C during the first 7 Days.

c) Joints shall be as specified in this specification and the Contract Documents.

d) Concrete barrier shall meet the surface finish requirements specified in this specification.

740.08.01.02.02 Curing Compounds

Acceptance of curing compounds shall be according to OPSS 904.

740.08.01.03 Additional Acceptance Requirements for Precast Concrete Barrier

Precast concrete barrier shall meet the following additional acceptance requirements:

a) The connection assemblies shall be located as specified in the Contract Documents and shall be perpendicular to the base of the concrete barrier.

b) The steel components of each connecting device shall be free of visible fracture, distortion and perforation.

c) The horizontal and vertical alignment discontinuity between adjacent elements shall not exceed 10 mm.

740.08.02 Scaling Performance Requirement for Concrete Barrier

740.08.02.01 General

The surface of concrete barrier shall be free from any surface scaling as specified in Table 1.

740.08.02.02 Warranty

Concrete barrier shall meet the scaling performance requirement specified in this specification for the duration of the warranty period.

740.08.02.03 Warranty Period

The warranty shall begin on the date of the Completion Certificate and shall continue for 3 years.

740.08.02.04 Distress Survey

The Owner may carry out a survey at any time during the warranty period. Severity and extent of surface scaling will be evaluated as specified in this specification.

The Contractor may be present during the survey. The results of the survey will be provided to the Contractor.

740.09 MEASUREMENT FOR PAYMENT

740.09.01 Actual Measurement

740.09.01.01 825 mm Concrete Barrier
Tall Wall Concrete Barrier
Asymmetric 825 mm Concrete Barrier
Asymmetric Tall Wall Concrete Barrier

Measurement will be made in metres along the centreline of the concrete barrier, from end to end of installation, and shall include the length required for lighting pole footings and over-head sign structure footings.

Where two concrete barriers are constructed back-to-back (Type M-2 or TW-2), they will be treated as a single installation and the length will be measured only once for payment purposes.

Transition wall shall be included in the adjacent barrier quantity for measurement and payment purposes.

When a repair proposal is accepted by the Owner, repairs shall be completed at no cost to the Owner.

740.09.01.02 Granular

Measurement for granular shall be according to OPSS 314.

740.09.01.03 Asphaltic Concrete

Measurement for asphaltic concrete shall be according to OPSS 313.

740.09.02 Plan Quantity Measurement

740.09.02.01 825 mm Concrete Barrier
Tall Wall Concrete Barrier
Asymmetric 825 mm Concrete Barrier
Asymmetric Tall Wall Concrete Barrier

Measurement is by Plan Quantity, as may be revised by Adjusted Plan Quantity of the length in metres along the centreline of the concrete barrier, from end to end of the installation, and shall include the length for lighting pole footings and overhead sign structure footings.

Where two concrete barriers are constructed back-to-back (Type M-2 or TW-2), they will be treated as a single installation for measurement and payment purposes.

Transition wall shall be included in the adjacent barrier quantity for measurement and payment purposes.

740.10 BASIS OF PAYMENT

740.10.01 825 mm Concrete Barrier - Item
Tall Wall Concrete Barrier - Item
Asymmetric 825 mm Concrete Barrier - Item
Asymmetric Tall Wall Concrete Barrier - Item

Payment at the Contract price for the above item(s) shall be full compensation for all labour, Equipment and Material required to construct the concrete barriers, including any concrete backfill between Type M-2 or TW-2 concrete barriers at the location of bridge piers or transitions work, subject to payment adjustments according to OPSS 1350 for cast-in-place concrete barrier and OPSS 1355 for precast concrete barrier.

740.10.02 Granular

Granular material used as backfill between concrete barriers shall be paid for at the Contract price for the appropriate granular items.

740.10.03 Asphaltic Concrete

Asphaltic concrete used as asphalt surface at bridge piers shall be paid for at the Contract price for the appropriate hot mix item.

TABLE 1
Performance Requirement for Concrete Barrier
During and Up to the End of the Warranty Period

Defects and Deficiencies	Test Method	Performance Requirements	Consequence of Non-conformance
Concrete Surface Scaling	Visual inspection and assessment of severity of scaling according to Figures 1- 6.	At the end of the warranty period there shall be no medium, or severe scaling and total area of light scaling shall be no more than 5% of the component.	Areas of medium and severe scaling shall be removed and replaced. For light scaling greater than 5% of the component, the Contractor shall submit a repair proposal for approval by the Owner.

FIGURE 1. Example of Light Scaling

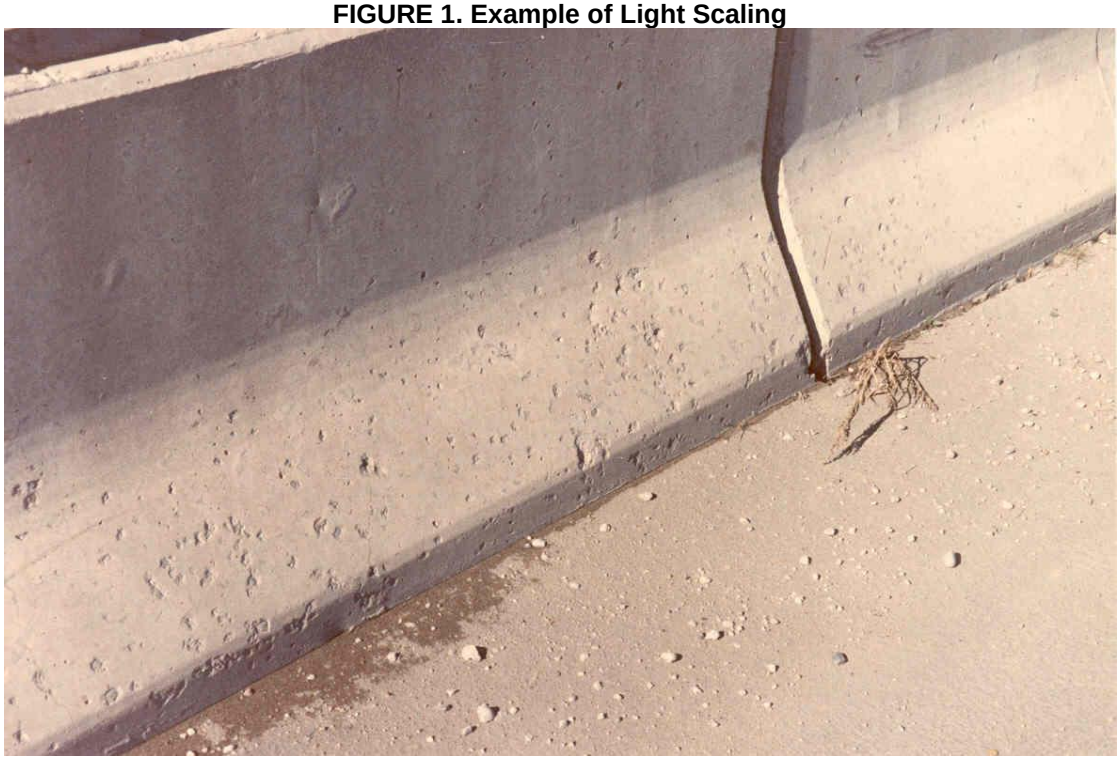

FIGURE 2. Example of Light Scaling

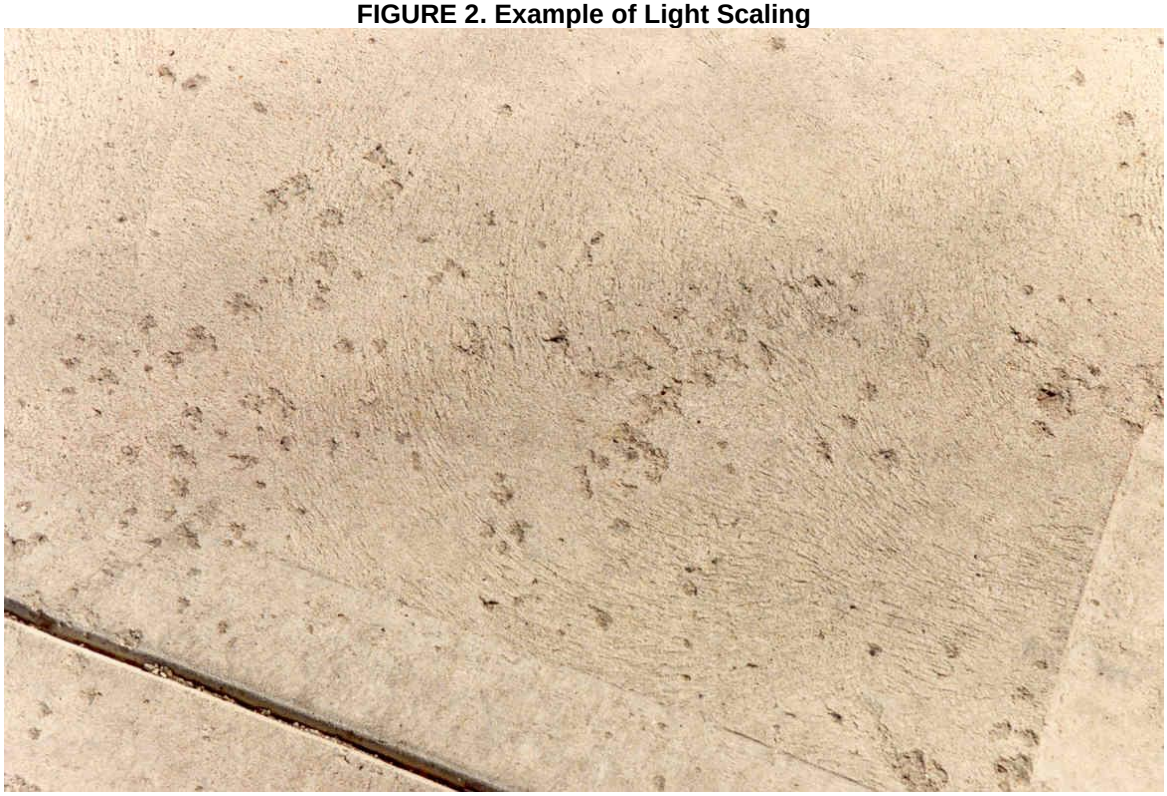

FIGURE 3. Example of Medium Scaling

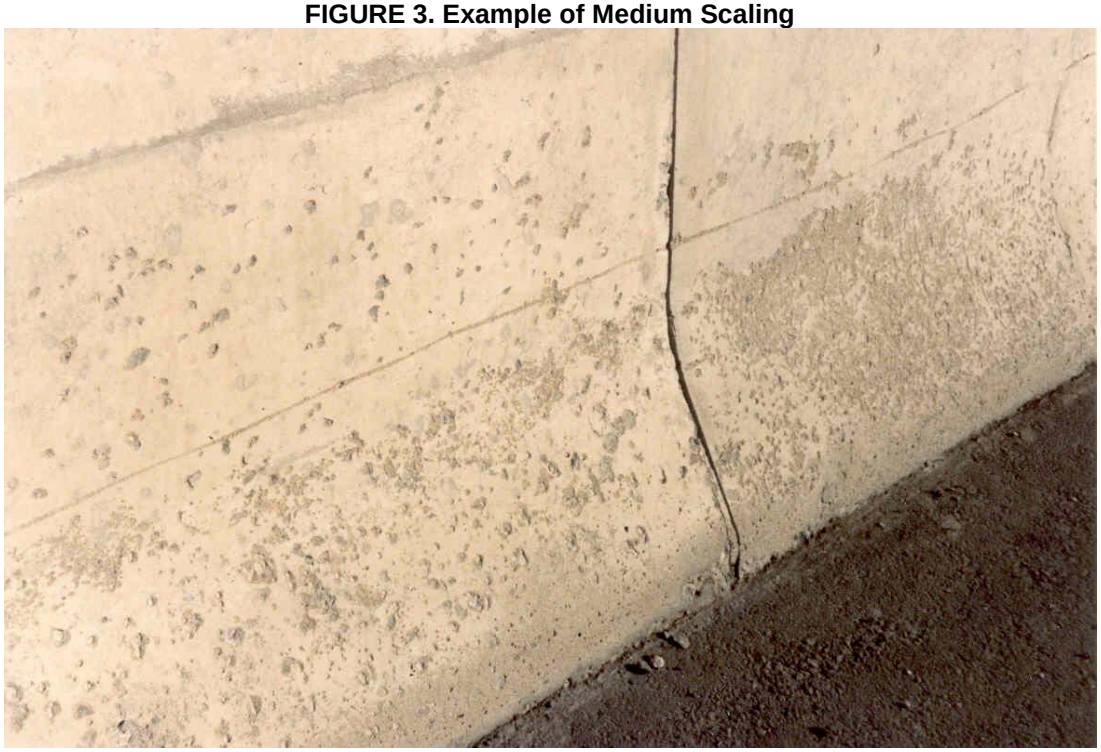

FIGURE 4. Example of Medium Scaling

FIGURE 5. Example of Severe Scaling

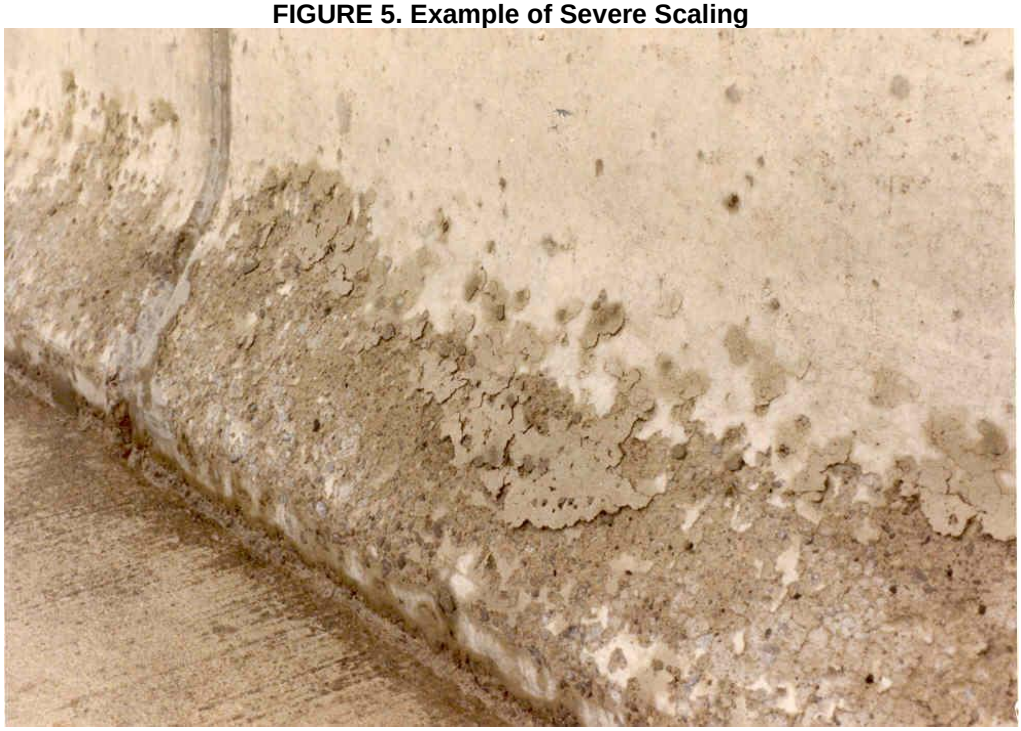

FIGURE 6. Example of Severe Scaling