**Streetscape Specifications**

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# Item [No.] Unit Pavers on Concrete Base

1. **GENERAL** 
   1. Provide pavers laid on 50mm No. 8 stone as per ASTM D448 leveling bed on cast-in-place concrete base with Welded Wire Mesh (WWM) reinforcement and with 50mm diameter weep holes on 2m centers.
   2. The following specifications for Unit Pavers on Concrete Base shall be read in conjunction with the Contract Drawings.
2. **SUBMITTALS AND EXECUTION:**
   1. In accordance with OPSS 905 [date], the Contractor shall prepare and submit shop drawings for the sizing and placement of reinforcement of the concrete base at intersection quadrants. The shop drawings shall be stamped by a licensed Professional Engineer in the Province of Ontario. Note that only intersections quadrants shall have concrete reinforcement unless otherwise directed by the Commissioner.
   2. The Contractor shall install a 2.0 m x 2.0 m mock-up section on site for testing and approval by the Commissioner prior to the placement of any other unit pavers.
   3. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any formwork. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.
   4. The installation shall be in conformance with the Contract Drawings and the Specifications. The concrete base compressive strength shall be a minimum of 32MPa, and air entrained between 5% - 7%.
   5. Any exposed concrete shall be a broom finish in accordance with OPSS 351.07.09 [date].
   6. The Contractor shall ensure that the placement of the reinforcement, together with the control joints are completed in accordance with the Contract Drawings. Expansion joints are not required at reinforced intersection quadrants.
   7. Control joints shall be laid out with the joints at 1500 mm on centre and with an expansion joint at every third (3) joint. The contractor is to lay out the visible joints in a manner that compliments the streetscape design.
   8. An isolation joint shall be placed at the junction of concrete paving with all raised walls, curbs and fixed structures, including utility covers and frames.
   9. Control joints shall be 25mm deep.
   10. If the area to be paved exceeds 2.5m in width, an intermediate control joint shall be introduced at the midpoint, at right angles to all other expansion and control joints.
   11. The maximum water-cement materials ratio shall be 0.45.
   12. The slump shall not exceed 100mm.
   13. No steel trowels, steel floats or power trowels are to be used on exterior concrete.
   14. All concrete shall have control joints sawn within four (4) to eighteen (18) hours after placement of the concrete.
3. **50MM DIAMETER WEEP HOLES ON 2M CENTERS:**
   1. All weep holes are to be PVC lined or approved equal.
   2. All holes are to be formed so they enter directly into the concrete’s Granular base.
   3. All concrete dust and debris is to be cleaned and taken away from the weep hole area as soon as possible so that the holes to not become clogged.
   4. Once the weep holes have been created they are to be filled and compacted with No. 8 stone as per ASTM D448 or pea gravel and compacted using a piece of rebar or pry bar.
4. **DELIVERY, STORAGE AND HANDLING OF PRODUCT**
   1. The Contractor shall comply with manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.
   2. Concrete pavers will be delivered to the site in steel-banded, plastic-banded or plastic-wrapped packaging capable of transfer by forklift or clamp lift.
   3. Pavers will be unloaded at job site in such a manner that no damage occurs to the product. Materials should be protected such that they are kept free from mud, dirt, and other foreign materials.
   4. Polymeric jointing sand should be securely covered with waterproof covering if required to prevent exposure to rainfall or removal by wind.
5. **PAVERS AND SAND SHALL NOT BE INSTALLED UNDER THE FOLLOWING CONDITIONS:** 
   1. During rain or snowfall.
   2. Over frozen base materials.
   3. Over saturated soil.
   4. Over frozen sand or No. 8 stone as per ASTM D448 or saturated sand
6. **PAVER SCHEDULE**
   1. Product name/shapes, colors, overall dimensions, and thickness of the pavers specified as follows:
   2. General Paving Areas = Types, colours and patterns as noted on the drawings.
   3. [ Insert applicable details ]
7. **EDGE RESTRAINT** 
   1. A secure concrete or steel edge restraint shall be installed flush around the perimeter of all interlocking concrete paving units where interlocking paving units are not already enclosed by other hard surfaces such as curbs, retaining walls, and concrete paving, as shown on the contract drawings. All adjacent materials shall be flush and tight with the edge restraint. Joints between the edge restraint and pavers shall not exceed 4mm.
8. **BEDDING MATERIAL** 
   1. No. 8 stone as per ASTM D448. The bedding shall be clean, non-plastic, and free from deleterious or foreign matter. Do not use limestone screenings or stone dust.
   2. The No. 8 stone as per ASTM D448 shall be a washed, well graded material.
   3. Contractor to provide supplier data sheets and product sample for approval prior to installation.
9. **SITE PREPARATION**
   1. Strip the site of all topsoil, unstable or unconsolidated materials to the grades indicated on the contract drawings.
   2. All sub drainage or underground services within the pavement area shall have been completed in conjunction with subgrade preparation before the commencement of base construction.
10. **VERIFICATION OF SUBGRADE**
    1. Construction will not proceed until the subgrade has been inspected and approved by the Commissioner. Compacted subgrade to be compacted to 98% Standard Protector maximum dry density.
11. **DRAINAGE**
    1. If poor draining soil is found during excavation a 150mm diameter pipe sub drain shall be installed at the lowest elevations and connected to storm structures or ditches as specified in OPSD 809.010 [date].
12. **SURFACE DRAINAGE**
    1. Gradients and cross falls are to have a minimum value of 2% and are to be channeled to appropriate drains away from any unrestrained edge.
13. **LEVELING COURSE**
    1. The No. 8 stone as per ASTM D448 is to be spread loose in a uniform layer to give a depth after compaction of the paving units.
    2. The spread No. 8 stone as per ASTM D448 will be carefully maintained in a loose condition and protected against pre-compaction by traffic or rain both prior to and following delivery. Neither pedestrian nor vehicular traffic will be permitted on the No. 8 stone as per ASTM D448 bedding.
14. **INSTALLATION OF PAVERS**
    1. Pavers with excessive chips, cracks, voids, discolorations or other defects are not to be installed.
    2. Pattern: The pavers are to be laid in pattern as indicated on drawings unless otherwise instructed by the Commissioner.
    3. Joints: In order to maintain the desired pattern, joint spacing must be consistent. For maximum interlock, joint spacing of 2 mm to 4 mm (is to be maintained. This spacing must also be provided for the first row abutting the edge restraint for final infill jointing sand.
    4. Alignment: All pattern lines are to be straight and true as per the contract drawings.
    5. Cutting: The gaps at the edge of the paving surface are to be filled with manufactured edge pavers or with pavers cut to fit. Cutting will be accomplished to leave a clean edge to the traffic surface using a mechanical hydraulic or guillotine cutter or masonry saw. Where there are gaps remaining of less than 50mm larger pavers are to be cut and used to fill the required gap. All soldier course pavers along a curve shall be cut on both sides to ensure consistent and uniform curve with each piece having consistent and uniform pie shape to make up the curve.
    6. Dust: Make every effort to minimize dust pollution from cutting.
    7. Sweeping Clean: Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure pavers are not damaged during compaction.
    8. Inspection of Installed Pavers: After sweeping and prior to compaction, the paved area must be inspected by the Commissioner to ensure satisfactory installation.
15. **POLYMERIC JOINTING SAND**
    1. Unit paver joints to be filled with Gator Maxx G2 by Alliance Designer Products inc. Polymeric Sand or approved equal. The sand shall be installed using the installation method described by the manufacturer. Excess sand shall be removed from the pavement surface and the pavers are to be compacted to settle the jointing sand.
    2. After pavers have been compacted and cleaned:
       1. Use a watering gun connected to a hose. Set to shower.
       2. Watering must be started at the lowest point of the paved surface.
       3. Never allow paved surface to dry out during the water-activation phase.
       4. Do not allow polymeric sand to wash out of joint.
       5. Shower for a minimum of 30 seconds per 2.8 square meters or until the polymeric sand repels the water and the water starts to accumulate on the joint
16. **COMPACTION OF PAVERS**
    1. After jointing sand has been installed and the pavement surface swept clean, final compaction will be accomplished by not less than two passes of a vibratory plate compactor. All plate compactors must be fitted with a protective pad designed for compacting unit pavers.
    2. Final compaction will proceed as closely as possible following installation of jointing sand and prior to the acceptance of any traffic.
    3. Inspection by the Commissioner will determine whether an additional application of jointing sand and compaction is required.
17. **CLEAN UP**
    1. Sweep clean all paved areas of excess sand and dirt.
    2. Pick-up and remove from the site all surplus materials, equipment and debris resulting from the Work.
18. **TOLERANCE OF SURFACE PROFILE** 
    1. All surface and pavement structures will be true to the lines, levels, grades, thickness and cross sections as shown on the drawings.
    2. All pavements will be finished to lines and levels to ensure positive drainage at all drainage outlets and channels.
    3. The surface elevation of pavers shall be 3mm to 6mm above adjacent drainage inlets, concrete collars or channels.
    4. The pavement surface will not deviate by more than 7mm in 2 m from a straight edge laid in any direction.
    5. There shall be no more than 3 mm difference in height between adjacent pavers.
19. **WARRANTY**
    1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
    2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
20. **MAINTENANCE DURING WARRANTY** 
    1. During year one (1) and two (2) of the warranty period the contractor is to remove all weeds that may grow within the paver joints. All weeds that are found growing in the joints are to be pulled by hand so that all the roots are removed. And any voids in the unit paver joints are to be filled with the exact same type, brand, and colour of polymeric sand as stated in the Contract.
21. **MEASUREMENT AND BASIS OF PAYMENT**
    1. Payment at the applicable unit price shall be full compensation for all costs relating to the supply and installation of paving stones, reinforced concrete base, granular base, drainage and the provision of maintenance during the two (2) year warranty period. Payment shall be made based on the actual area of material installed, calculated on a square metre basis.

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# Item [No.] Unit Pavers on Granular Base

1. **SYSTEM DESCRIPTION** 
   1. Provide pavers laid on 50mm No. 8 stone as per ASTM D448 leveling bed on a Granular ‘O’ limestone base. Crusher run depths to be as detailed on the drawings.
   2. The following specifications for Unit Pavers on Granular Base shall be read in conjunction with the Contract Drawings.
2. **SUBMITTALS AND EXECUTION:**
   1. The Contractor shall install a 2.0 m x 2.0 m mock-up section on site for testing and approval by the Commissioner prior to the placement of any other unit pavers.
   2. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any work.
   3. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.
   4. The installation shall be in conformance with the Contract Drawings and the Specifications.
3. **DELIVERY, STORAGE AND HANDLING OF PRODUCT**
   1. The Contractor shall comply with manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.
   2. Concrete pavers will be delivered to the site in steel-banded, plastic-banded or plastic-wrapped packaging capable of transfer by forklift or clamp lift.
   3. Pavers will be unloaded at job site in such a manner that no damage occurs to the product. Materials should be protected such that they are kept free from mud, dirt, and other foreign materials.
   4. Polymeric jointing sand should be securely covered with waterproof covering if required to prevent exposure to rainfall or removal by wind.
4. **PAVERS AND SAND SHALL NOT BE INSTALLED UNDER THE FOLLOWING CONDITIONS:** 
   1. During rain or snowfall.
   2. Over frozen base materials.
   3. Over saturated soil.
   4. Over frozen sand or No. 8 stone as per ASTM D448 or saturated sand
5. **PAVER SCHEDULE**
   1. Product name/shapes, colors, overall dimensions, and thickness of the pavers specified as follows:
   2. General paving Types, colours and patterns as noted on the drawings.
   3. [ Insert applicable details ]
6. **EDGE RESTRAINT** 
   1. A secure concrete or steel edge restraint shall be installed flush around the perimeter of all interlocking concrete paving units, as shown on the contract drawings. All adjacent materials shall be flush and tight with the edge restraint. Joints between the edge restraint and pavers shall not exceed 4mm.
7. **BEDDING MATERIAL** 
   1. No. 8 stone as per ASTM D448 may be used or approved equal. The bedding shall be clean, non-plastic, and free from deleterious or foreign matter. Do not use limestone screenings or stone dust.
   2. The No. 8 stone as per ASTM D448 shall be a washed, well graded material.
   3. Contractor to provide supplier data sheets and product sample for approval prior to installation.
8. **SITE PREPARATION**
   1. Strip the site of all topsoil, unstable or unconsolidated materials to the grades indicated on the contract drawings.
   2. All sub drainage or underground services within the pavement area shall have been completed in conjunction with subgrade preparation before the commencement of base construction.
9. **VERIFICATION OF SUBGRADE**
   1. Construction will not proceed until the subgrade has been inspected and approved by the Commissioner. Compacted subgrade to be compacted to 98% Standard Protector maximum dry density.
10. **DRAINAGE**
    1. If poor draining soil is found during excavation a 150mm diameter pipe sub drain shall be installed at the lowest elevations and connected to storm structures as specified in OPSD 809.010 [date].
11. **SURFACE DRAINAGE**
    1. Gradients and cross falls are to have a minimum value of 2% and are to be channeled to appropriate drains away from any unrestrained edge.
12. **LEVELING COURSE**
    1. The No. 8 stone as per ASTM D448 is to be spread loose in a uniform layer to give a depth after compaction of the paving units.
    2. The spread No. 8 stone as per ASTM D448 will be carefully maintained in a loose condition and protected against pre-compaction by traffic or rain both prior to and following delivery. Neither pedestrian nor vehicular traffic will be permitted on the No. 8 stone as per ASTM D448 bedding.
13. **INSTALLATION OF PAVERS**
    1. Pavers with excessive chips, cracks, voids, discolorations or other defects are not to be installed.
    2. Pattern: The pavers are to be laid in pattern as indicated on drawings unless otherwise instructed by the Commissioner.
    3. Joints: In order to maintain the desired pattern, joint spacing must be consistent. For maximum interlock, joint spacing of 2 mm to 4 mm (is to be maintained. This spacing must also be provided for the first row abutting the edge restraint for final infill jointing sand.
    4. Alignment: All pattern lines are to be straight and true as per the contract drawings.
    5. Cutting: The gaps at the edge of the paving surface are to be filled with manufactured edge pavers or with pavers cut to fit. Cutting will be accomplished to leave a clean edge to the traffic surface using a mechanical hydraulic or guillotine cutter or masonry saw. Where there are gaps remaining of less than 50mm larger pavers are to be cut and used to fill the required gap.
    6. Dust: Make every effort to minimize dust pollution from cutting.
    7. Sweeping Clean: Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure pavers are not damaged during compaction.
    8. Inspection of Installed Pavers: After sweeping and prior to compaction, the paved area must be inspected by the Commissioner to ensure satisfactory installation.
14. **POLYMERIC JOINTING SAND**
    1. Unit paver joints to be filled with Gator Maxx G2 by Alliance Designer Products inc. Polymeric Sand or approved equal. The sand shall be installed using the installation method described by the manufacturer. Excess sand shall be removed from the pavement surface and the pavers are to be compacted to settle the jointing sand.
    2. After pavers have been compacted and cleaned:
    3. Use a watering gun connected to a hose. Set to shower.
    4. Watering must be started at the lowest point of the paved surface.
    5. Never allow paved surface to dry out during the water-activation phase.
    6. Do not allow polymeric sand to wash out of joint.
    7. Shower for a minimum of 30 seconds per 2.8 square meters or until the polymeric sand repels the water and the water starts to accumulate on the joint.
15. **COMPACTION OF PAVERS**
    1. After jointing sand has been installed and the pavement surface swept clean, final compaction will be accomplished by not less than two passes of a vibratory plate compactor. All plate compactors must be fitted with a protective pad designed for compacting unit pavers.
    2. Final compaction will proceed as closely as possible following installation of jointing sand and prior to the acceptance of any traffic.
    3. Inspection by the Commissioner will determine whether an additional application of jointing sand and compaction is required.
16. **CLEAN UP**
    1. Sweep clean all paved areas of excess sand and dirt.
    2. Pick-up and remove from the site all surplus materials, equipment and debris resulting from the Work.
17. **TOLERANCE OF SURFACE PROFILE** 
    1. All surface and pavement structures will be true to the lines, levels, grades, thickness and cross sections as shown on the drawings.
    2. All pavements will be finished to lines and levels to ensure positive drainage at all drainage outlets and channels.
    3. The surface elevation of pavers shall be 3mm to 6mm above adjacent drainage inlets, concrete collars or channels.
    4. The pavement surface will not deviate by more than 7mm in 2 m from a straight edge laid in any direction.
    5. There shall be no more than 3 mm difference in height between adjacent pavers.
18. **WARRANTY**
    1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
    2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
19. **MAINTENANCE DURING WARRANTY** 
    1. During year one (1) and two (2) of the warranty period the contractor is to remove all weeds that may grow within the paver joints. All weeds that are found growing in the joints are to be pulled by hand so that all the roots are removed. And any voids in the unit paver joints are to be filled with the exact same type, brand, and colour of polymeric sand as stated in the Contract.
20. **MEASUREMENT AND BASIS OF PAYMENT**
    1. Payment at the applicable unit price shall be full compensation for all costs relating to the supply and installation of paving stones, granular base, drainage and the provision of maintenance during the two (2) year warranty period. Payment shall be made based on the actual area of material installed, calculated on a square metre basis.

# Item [No.] Reinstate Unit Pavers on Concrete Base

1. **SYSTEM DESCRIPTION**
   1. Reinstate unit pavers laid on 50mm No. 8 stone as per ASTM D448 leveling bed on cast-in-place concrete base with 50mm diameter weep holes on 2m centers.
   2. The following specifications for Reinstate Unit Pavers on Concrete Base shall be read in conjunction with the Contract Drawings.
2. **SUBMITTALS AND EXECUTION:**
   1. If existing pavers cannot be salvaged the Contractor shall present sample replacement unit pavers to the Commissioner for approval prior to the placement of unit pavers.
   2. In accordance with OPSS 905 [date], the Contractor shall prepare and submit shop drawings for the sizing and placement of reinforcement of the concrete base. The shop drawings shall be stamped by a licensed Professional Engineer in the Province of Ontario. Note that only intersections quadrants shall have concrete reinforcement unless otherwise directed by the Commissioner.
   3. The Contractor shall install a 2.0 m x 2.0 m mock-up section on site for testing and approval by the Commissioner prior to the placement of any other unit pavers.
   4. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any formwork. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.
   5. The installation shall be in conformance with the Contract Drawings and the Specifications. The concrete base compressive strength shall be a minimum of 35MPa, and air entrained between 5% - 7%.
   6. Any exposed concrete shall be a broom finish in accordance with OPSS 351.07.09 [date].
   7. The Contractor shall ensure that the placement of the reinforcement, together with the expansion and control joints are completed in accordance with the Contract Drawings.
   8. Control joints shall be laid out with the joints at 1500 mm on centre and with an expansion joint at every third (3) joint. The contractor is to lay out the visible joints in a manner that compliments the streetscape design.
   9. An isolation joint shall be placed at the junction of concrete paving with all raised walls, curbs and fixed structures, including utility covers and frames.
   10. Control joints shall be 25mm deep.
   11. If the area to be paved exceeds 2.5m in width, an intermediate control joint shall be introduced at the midpoint, at right angles to all other expansion and control joints.
   12. The maximum water-cement materials ratio shall be 0.45.
   13. The slump shall not exceed 100mm.
   14. No steel trowels, steel floats or power trowels are to be used on exterior concrete.
   15. All concrete shall have control joints sawn within four (4) to eighteen (18) hours after placement of the concrete.
3. **50MM DIAMETER WEEP HOLES ON 2M CENTERS:**
   1. All weep holes are to be core drilled using a water cooled diamond core drill or approved equal.
   2. All holes are to be formed so they enter directly into the concrete’s Granular base.
   3. All concrete dust and debris is to be cleaned and taken away from the weep hole area as soon as possible so that the holes to not become clogged.
   4. Once the weep holes have been created they are to be filled and compacted with No. 8 stone as per ASTM D448 or pea gravel and compacted using a piece of rebar or pry bar.
4. **DELIVERY, STORAGE AND HANDLING OF PRODUCT**
   1. The Contractor shall comply with manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.
   2. Concrete pavers will be delivered to the site in steel-banded, plastic-banded or plastic-wrapped packaging capable of transfer by forklift or clamp lift.
   3. Pavers will be unloaded at job site in such a manner that no damage occurs to the product. Materials should be protected such that they are kept free from mud, dirt, and other foreign materials.
   4. Polymeric jointing sand should be securely covered with waterproof covering if required to prevent exposure to rainfall or removal by wind.
5. **PAVERS AND SAND SHALL NOT BE INSTALLED UNDER THE FOLLOWING CONDITIONS:** 
   1. During rain or snowfall.
   2. Over frozen base materials.
   3. Over saturated soil.
   4. Over frozen sand or No. 8 stone as per ASTM D448 or saturated sand.
6. **PAVER SCHEDULE**
   1. Product name/shapes, colors, overall dimensions, and thickness of the pavers specified as follows:
   2. General Paving Areas = Types, colours and patterns as noted on the drawings.
   3. [ Insert applicable details ]
7. **EDGE RESTRAINT** 
   1. A secure concrete or steel edge restraint shall be installed flush around the perimeter of all interlocking concrete paving units, as shown on the contract drawings. All adjacent materials shall be flush and tight with the edge restraint. Joints between the edge restraint and pavers shall not exceed 4mm.
8. **BEDDING MATERIAL** 
   1. No. 8 stone as per ASTM D448 may be used or approved equal. The bedding shall be clean, non-plastic, and free from deleterious or foreign matter. Do not use limestone screenings or stone dust.
   2. The No. 8 stone as per ASTM D448 shall be a washed, well graded material.
   3. Contractor to provide supplier data sheets and product sample for approval prior to installation.
9. **SITE PREPARATION**
   1. Strip the site of all topsoil, unstable or unconsolidated materials to the grades indicated on the contract drawings.
   2. All sub drainage or underground services within the pavement area shall have been completed in conjunction with subgrade preparation before the commencement of base construction.
10. **VERIFICATION OF SUBGRADE**
    1. Construction will not proceed until the subgrade has been inspected and approved by the Commissioner. Compacted subgrade to be compacted to 98% Standard Protector maximum dry density.
11. **DRAINAGE**
    1. If poor draining soil is found during excavation a 150mm diameter pipe sub drain shall be installed at the lowest elevations and connected to storm structures as specified in OPSD 809.010 [date].
12. **SURFACE DRAINAGE**
    1. Gradients and cross falls are to have a minimum value of 2% and are to be channeled to appropriate drains away from any unrestrained edge.
13. **LEVELING COURSE**
    1. The No. 8 stone as per ASTM D448 is to be spread loose in a uniform layer to give a depth after compaction of the paving units.
    2. The spread No. 8 stone as per ASTM D448will be carefully maintained in a loose condition and protected against pre-compaction by traffic or rain both prior to and following delivery. Neither pedestrian nor vehicular traffic will be permitted on the No. 8 stone as per ASTM D448bedding.
14. **INSTALLATION OF PAVERS**
    1. Pavers with excessive chips, cracks, voids, discolorations or other defects are not to be installed.
    2. Pattern: The pavers are to be laid in pattern as indicated on drawings unless otherwise instructed by the Commissioner.
    3. Joints: In order to maintain the desired pattern, joint spacing must be consistent. For maximum interlock, joint spacing of 2 mm to 4 mm (is to be maintained. This spacing must also be provided for the first row abutting the edge restraint for final infill jointing sand.
    4. Alignment: All pattern lines are to be straight and true as per the contract drawings.
    5. Cutting: The gaps at the edge of the paving surface are to be filled with manufactured edge pavers or with pavers cut to fit. Cutting will be accomplished to leave a clean edge to the traffic surface using a mechanical hydraulic or guillotine cutter or masonry saw. Where there are gaps remaining of less than 50mm larger pavers are to be cut and used to fill the required gap.
    6. Dust: Make every effort to minimize dust pollution from cutting.
    7. Sweeping Clean: Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure pavers are not damaged during compaction.
    8. Inspection of Installed Pavers: After sweeping and prior to compaction, the paved area must be inspected by the Commissioner to ensure satisfactory installation.
15. **POLYMERIC JOINTING SAND**
    1. Unit paver joints to be filled with Gator Maxx G2 by Alliance Designer Products inc. Polymeric Sand or approved equal. The sand shall be installed using the installation method described by the manufacturer. Excess sand shall be removed from the pavement surface and the pavers are to be compacted to settle the jointing sand.
16. **COMPACTION OF PAVERS**
    1. After jointing sand has been installed and the pavement surface swept clean, final compaction will be accomplished by not less than two passes of a vibratory plate compactor. All plate compactors must be fitted with a protective pad designed for compacting unit pavers.
    2. Final compaction will proceed as closely as possible following installation of jointing sand and prior to the acceptance of any traffic.
    3. Inspection by the Commissioner will determine whether an additional application of jointing sand and compaction is required.
17. **CLEAN UP**
    1. Sweep clean all paved areas of excess sand and dirt. After everything is cleaned the unit pavers are to be watered as per the polymeric sand manufactures specifications and recommendations.
    2. Pick-up and remove from the site all surplus materials, equipment and debris resulting from the Work.
18. **TOLERANCE OF SURFACE PROFILE** 
    1. All surface and pavement structures will be true to the lines, levels, grades, thickness and cross sections as shown on the drawings.
    2. All pavements will be finished to lines and levels to ensure positive drainage at all drainage outlets and channels.
    3. The surface elevation of pavers shall be 3mm to 6mm above adjacent drainage inlets, concrete collars or channels.
    4. The pavement surface will not deviate by more than 7mm in 2 m from a straight edge laid in any direction.
    5. There shall be no more than 3 mm difference in height between adjacent pavers.
19. **WARRANTY**
    1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
    2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
20. **MAINTENANCE DURING WARRANTY** 
    1. During year one (1) and two (2) of the warranty period the contractor is to remove all weeds that may grow within the paver joints. All weeds that are found growing in the joints are to be pulled by hand so that all the roots are removed. And any voids in the unit paver joints are to be filled with the exact same type, brand, and colour of polymeric sand as stated in the Contract.
21. **MEASUREMENT AND BASIS OF PAYMENT**
    1. Payment at the applicable unit price shall be full compensation for all costs relating to the supply and installation of paving stones, reinforced concrete base, granular base, drainage and the provision of maintenance during the two (2) year warranty period. Payment shall be made based on the actual area of material installed, calculated on a square metre basis.

# Item [No.] Reinstate Unit Pavers on Granular Base

1. **SYSTEM DESCRIPTION** 
   1. Reinstate pavers laid on 50mm High Performance Bedding on 300mm of Granular ‘O’ gravel, on filter fabric.
   2. The following specifications for Reinstate Unit Pavers on Granular Base shall be read in conjunction with the Contract Drawings.
2. **SUBMITTALS AND EXECUTION:**
   1. If existing pavers cannot be salvaged the Contractor shall present replacement sample unit pavers to the Commissioner for approval prior to the placement of unit pavers.
   2. The Contractor shall install a 2.0 m x 2.0 m mock-up section on site for testing and approval by the Commissioner prior to the placement of any other unit pavers.
   3. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any work.
   4. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.
   5. The installation shall be in conformance with the Contract Drawings and the Specifications.
3. **DELIVERY, STORAGE AND HANDLING OF PRODUCT**
   1. The Contractor shall comply with manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.
   2. Concrete pavers will be delivered to the site in steel-banded, plastic-banded or plastic-wrapped packaging capable of transfer by forklift or clamp lift.
   3. Pavers will be unloaded at job site in such a manner that no damage occurs to the product. Materials should be protected such that they are kept free from mud, dirt, and other foreign materials.
   4. Polymeric jointing sand should be securely covered with waterproof covering if required to prevent exposure to rainfall or removal by wind.
4. **PAVERS AND SAND SHALL NOT BE INSTALLED UNDER THE FOLLOWING CONDITIONS:** 
   1. During rain or snowfall.
   2. Over frozen base materials.
   3. Over saturated soil.
   4. Over frozen sand or No. 8 stone as per ASTM D448 or saturated sand.
5. **PAVERS AND PAVER SCHEDULE**
   1. If pavers cannot be salvaged similar pavers shall be sourced by the contractor and approved by the commissioner prior to installation.
6. **EDGE RESTRAINT** 
   1. A secure concrete or steel edge restraint shall be installed flush around the perimeter of all interlocking concrete paving units, as shown on the contract drawings. All adjacent materials shall be flush and tight with the edge restraint. Joints between the edge restraint and pavers shall not exceed 4mm.
7. **BEDDING MATERIAL** 
   1. No. 8 stone as per ASTM D448 may be used or approved equal. The bedding shall be clean, non-plastic, and free from deleterious or foreign matter. Do not use limestone screenings or stone dust.
   2. The No. 8 stone as per ASTM D448 shall be a washed, well graded material.
   3. Contractor to provide supplier data sheets and product sample for approval prior to installation.
8. **SITE PREPARATION**
   1. Strip the site of all topsoil, unstable or unconsolidated materials to the grades indicated on the contract drawings.
   2. All sub drainage or underground services within the pavement area shall have been completed in conjunction with subgrade preparation before the commencement of base construction.
9. **VERIFICATION OF SUBGRADE**
   1. Construction will not proceed until the subgrade has been inspected and approved by the Commissioner. Compacted subgrade to be compacted to 98% Standard Protector maximum dry density.
10. **DRAINAGE**
    1. If poor draining soil is found during excavation a 150mm diameter pipe sub drain shall be installed at the lowest elevations and connected to storm structures as specified in OPSD 809.010 [date].
11. **SURFACE DRAINAGE**
    1. Gradients and cross falls are to have a minimum value of 2% and are to be channeled to appropriate drains away from any unrestrained edge.
12. **LEVELING COURSE**
    1. The No. 8 stone as per ASTM D448 is to be spread loose in a uniform layer to give a depth after compaction of the paving units.
    2. The spread No. 8 stone as per ASTM D448 will be carefully maintained in a loose condition and protected against pre-compaction by traffic or rain both prior to and following delivery. Neither pedestrian nor vehicular traffic will be permitted on the No. 8 stone as per ASTM D448 bedding.
13. **INSTALLATION OF PAVERS**
    1. Pavers with excessive chips, cracks, voids, discolorations or other defects are not to be installed.
    2. Pattern: The pavers are to be laid in pattern as indicated on drawings unless otherwise instructed by the Commissioner.
    3. Joints: In order to maintain the desired pattern, joint spacing must be consistent. For maximum interlock, joint spacing of 2 mm to 4 mm (is to be maintained. This spacing must also be provided for the first row abutting the edge restraint for final infill jointing sand.
    4. Alignment: All pattern lines are to be straight and true as per the contract drawings.
    5. Cutting: The gaps at the edge of the paving surface are to be filled with manufactured edge pavers or with pavers cut to fit. Cutting will be accomplished to leave a clean edge to the traffic surface using a mechanical hydraulic or guillotine cutter or masonry saw. Where there are gaps remaining of less than 50mm larger pavers are to be cut and used to fill the required gap.
    6. Dust: Make every effort to minimize dust pollution from cutting.
    7. Sweeping Clean: Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure pavers are not damaged during compaction.
    8. Inspection of Installed Pavers: After sweeping and prior to compaction, the paved area must be inspected by the Commissioner to ensure satisfactory installation.
14. **POLYMERIC JOINTING SAND**
    1. Unit paver joints to be filled with polymeric jointing sand. The sand shall be installed using the installation method described by the manufacturer. Contractor to follow manufacturer’s procedure for cleaning pavers prior to sand installation using the “Wetting In” installation process. Excess sand shall be removed from the pavement surface and the pavers are to be compacted to settle the jointing sand.
15. **COMPACTION OF PAVERS**
    1. After jointing sand has been installed and the pavement surface swept clean, final compaction will be accomplished by not less than two passes of a vibratory plate compactor. All plate compactors must be fitted with a protective pad designed for compacting unit pavers.
    2. Final compaction will proceed as closely as possible following installation of jointing sand and prior to the acceptance of any traffic.
    3. Inspection by the Commissioner will determine whether an additional application of jointing sand and compaction is required.
16. **CLEAN UP**
    1. Sweep clean all paved areas of excess sand and dirt. After everything is cleaned the unit pavers are to be watered as per the polymeric sand manufactures specifications and recommendations.
    2. Pick-up and remove from the site all surplus materials, equipment and debris resulting from the Work.

1. **TOLERANCE OF SURFACE PROFILE** 
   1. All surface and pavement structures will be true to the lines, levels, grades, thickness and cross sections as shown on the drawings.
   2. All pavements will be finished to lines and levels to ensure positive drainage at all drainage outlets and channels.
   3. The surface elevation of pavers shall be 3mm to 6mm above adjacent drainage inlets, concrete collars or channels.
   4. The pavement surface will not deviate by more than 7mm in 2 m from a straight edge laid in any direction.
   5. There shall be no more than 3 mm difference in height between adjacent pavers.
2. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner
3. **MAINTENANCE DURING WARRANTY** 
   1. During year one (1) and two (2) of the warranty period the contractor is to remove all weeds that may grow within the paver joints. All weeds that are found growing in the joints are to be pulled by hand so that all the roots are removed. And any voids in the unit paver joints are to be filled with the exact same type, brand, and colour of polymeric sand as stated in the Contract.
4. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment at the applicable unit price shall be full compensation for all costs relating to the supply and installation of paving stones, granular base, drainage and the provision of maintenance during the two (2) year warranty period. Payment shall be made based on the actual area of material installed, calculated on a square metre basis.

# Item [No.] Vegetative Paving

1. **GENERAL**
   1. The following specification Vegetative Paving shall be read in conjunction with the Contract Drawings.
   2. Vegetative paving that have unsupported edges are to be laterally contained by the installation of a steel edge restraint as shown on the contract drawings.
   3. Available suppliers of vegetative paving products are but not limited to:
      1. Tufftrack™ Grass Pavers by NDS Inc. or approved equal.
      2. EZ Roll Grass Pavers Hanes Geo Components or approved equal.
      3. Lockgrid Surface
   4. Vegetative paved slopes shall not exceed 8%.
   5. The manufactures Product Guide Specification shall form part of this specification and the Contract Drawings.
   6. All vegetative paving shall meet live Highway H-20 Loading.
   7. The Contractor shall install a 2.0m x 2m mock-up section on site for testing and approval by the Commissioner prior to the placement of Vegetative Paving.
   8. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any work. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.
2. **TOLERANCE OF SURFACE PROFILE** 
   1. All surface and pavement structures will be true to the lines, levels, grades, thickness and cross sections as shown on the drawings.
   2. All pavements will be finished to lines and levels to ensure positive drainage at all drainage outlets and channels.
   3. The surface elevation of pavers shall be 3mm to 6mm above adjacent drainage inlets, concrete collars or channels.
   4. The pavement surface will not deviate by more than 7mm in 2 m from a straight edge laid in any direction.
   5. There shall be no more than 3 mm difference in height between adjacent pavers.
3. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
4. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment at the applicable unit price shall be full compensation for all costs relating to the supply and installation of paving, steel stakes, edge restraint, topsoil, granular base, bedding and drainage. Payment shall be made based on the actual area of material installed, calculated on a square metre basis.

# Item [No.] Concrete Edge Restraint for Unit Pavers

1. **GENERAL**
   1. The following specifications Concrete Edge Restraint for Unit Pavers shall be read in conjunction with the Contract Drawings.
   2. Unit pavers that have unsupported edges are to be laterally contained by the installation of a concrete edge restraint as shown on the contract drawings.
   3. The contractor is to install a 150mm wide by 300mm deep cast in place flush concrete edge restraint along the edge of the paver area to support the pavers.
   4. Concrete to be class C1 exposure with 5-7% air entrainment and 35MPa strength at 28 days.
   5. Exposed concrete shall have a broom finish.
   6. The Contractor shall install a 2.0 m mock-up section on site for testing and approval by the Commissioner prior to the placement of Concrete Edge Restraint.
   7. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any formwork. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.
2. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
3. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment for this item will include all materials, labour and equipment necessary to complete the work. Measurement for the work will be by the linear metre.

# Item [No.] Steel Edge Restraint for Unit Pavers

**1. GENERAL**

* 1. The following specifications for Steel and Concrete Edge Restraint for Unit Pavers shall be read in conjunction with the Contract Drawings.
  2. Unit pavers that have unsupported edges are to be laterally contained by the installation of a galvanized steel edge restraint angle. The steel angle shall be as noted on the drawings and be hot dipped galvanized and will be anchored into the concrete sub-slab with 12mm diameter Hilti HI 5 anchors spaced at 305mm on centre maximum.
  3. Where the vertical distance from sub-slab to top of pavers is less than the leg length due to installation conditions and the vertical leg of the angle will protrude above the surface of the unit pavers, the contractor to field modify the vertical leg length in the field or install a shorter angle leg section that will not be exposed, at no additional cost to the Region.
  4. The Contractor shall install a 2.0 m mock-up section on site for testing and approval by the Commissioner prior to the placement of Steel Edge Restraint for Unit Pavers.
  5. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any formwork. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.

1. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment for this item will include all materials, labour and equipment necessary to complete the work. Measurement for the work will be by the linear metre.

# Item [No.] Cast-In-Place Median Planter Wall with Form Liner

1. **GENERAL**
   1. Supply and installation of cast-in-place concrete planter walls at 35 MPa 5-7% air entrained at twenty eight (28) days, Exposure Class C-1 in accordance with the Contract Drawings.
   2. The following specifications for Cast-In-Place Median Planter Wall shall be read in conjunction with the Contract Drawings.
2. **REFERENCE PUBLICATIONS** 
   1. This Specification makes reference to the following publications and where such reference is made, it shall be to the latest edition of the publication as listed below.

|  |  |  |
| --- | --- | --- |
| .1 C.S.A. Standards |  | |
| A5 - M88 [date] | Portland Cements | |
| A362 - M88 [date] | Blended Hydraulic Cements | |
| A363 - M88 [date] | Cementitious Hydraulic Slag | |
| A23.1 - M90 [date] | Concrete Materials and Methods of Concrete Construction | |
| A23.5 – M8 [date] | Supplementary Cementing Materials | |
| A266.1–M78 [date] | Air-Entertaining Admixtures for Concrete | |
| A266.2 – M78 [date] | Chemical Admixtures for Concrete | |
| A266.4 – M78 [date] | Guidelines for the use of Admixtures in Concrete | |
|  | | |
| .2 Canadian General Standards Board | | |
| 51.20 – M87 | Thermal Insulation, Polystyrene, Boards and Pipe Covering | |
|  | |
| .3 Reinforcing Steel Institute of Canada | | |
| RSIO | Manual of Standard Practice | |
|  | | |
| .4 Epoxy Coated Reinforcing Steel Bar OPSS 905 [date] | | |
|  |  | |

1. **SITE CONDITIONS** 
   1. The Contractor shall make itself aware of all factors which shall affect the Work including existing installations, underground services, use and access of adjoining property by the Region, private property owners and the general public. Failure to take note of any factor will not be a cause for a claim for additional payment by the Contractor over and above the bid price.
   2. The Contractor shall comply with requirements of the National Building Code [date].
2. **PRODUCTS** 
   1. **FORM LINER** 
      * 1. Architectural form liner to be by Greenstreak Inc. or approved equal.
        2. Install in strict accordance with the manufacturer’s specifications.
        3. Provide rigid plastic and elastomeric form liners for texturing architectural concrete.
        4. Provide form liner accessories including, but not limited to, fasteners, sealants, rustication and backup strips, form release agents, and sealers.
3. **FORM LINER MATERIAL:** 
   1. Greenstreak Uni-Cast®, Multi-Cast®, or Dura-Cast® thermoformed rigid polymer alloy sheets, or approved equal.
   2. Greenstreak Ultra-Cast® urethane elastomer form liners, or approved equal.
   3. Form liners for Textured Finish Concrete: Provide special forming materials to produce form surfaces with face design, texture, arrangement, and configuration as shown on the Drawings.
   4. Liners to accommodate form pressures to a maximum of 1000 pounds per square foot (psf). Comply with the manufacturer's recommendations for support of large or deep patterns which may deform under pressure.
4. **FORM LINER ACCESSORIES** 
   1. Provide Greenstreak 7000 Release Agent or approved equal, verified to be compatible with the form liner material, or approved equal.
   2. Other materials shall be as specified by CSA specification A-23.
5. **CONCRETE:** 
   1. To conform with the requirements of the OPSS 1350 [date] Specification for Concrete Materials and Production
   2. Ready-mix design shall be based on the Canadian Standards Association (CSA) specification A‑23.
   3. Water shall be clean and potable.
   4. The maximum water/cement materials ratio shall be 0.45.
   5. The slump shall not exceed 100mm.
   6. No steel trowels, steel floats or power trowels are to be used on exterior concrete.
6. **STEEL:** 
   1. To conform to the requirements of OPSS 905 [date] Epoxy Coated Reinforcing Steel Bar
7. **JOINT FILLER:**
   1. Expansion and control joints shall be filled with polysulphide filler to match the planter wall colour.
8. **DRAINAGE COMPOSITE**
   1. Drainage composite is to be CCW MiraDRAIN 9800 or approved equal.

Planters and installed as per the manufacturer’s installation guide and as per below:

1. Place the CCW MiraDRAIN in the planter so that the fabric on the vertical and horizontal surfaces face the soil.
2. Utilize the installation procedures and attachment method appropriate for the type of substrate.
3. Overlap the fabric of the vertical panel onto the horizontal panel at the transition point.
4. If the panels require cutting, exposed cuts must be covered with supplemental pieces of filter fabric to prevent soil intrusion. A minimum 6” (150 mm) piece of filter fabric will be required to cover cut sections
5. **SUBMITTALS:** 
   1. Manufacturer's installation instructions and product data which indicates compliance with the Specifications.
   2. Shop Drawings indicating the form liner layout and termination details. Indicate backup, rustication, reveal, and chamfer strip locations. Include jointing, form tie location and pattern of placement.
   3. The Commissioner will review the shop drawing submittal for, among other things, aesthetic criteria. The Contractor shall be responsible for the design of formwork and back-up of form liner for structural stability and sufficiency.
   4. Mock-up of the planter wall with form liner and cap at the dimensions of one concrete form or 2m long by the height and width specified on the contract drawings.
   5. Compliance Certification by the release agent manufacturer for local regulations controlling volatile organic compounds (VOC's).
6. **EXECUTION**
   1. Place sub drains according to OPSS 405 [date] and the contract drawings.
   2. Place concrete in accordance with the requirements of CAN3-A23.1-M90.
   3. Ensure that reinforcement and inserts are not disturbed during concrete placement.
   4. Maintain accurate records of cast-in-place concrete items to indicate the date, location of pour, air temperature and test samples taken.
   5. Before placing concrete, verify that the lines and levels of formwork and form liner patterns are within the allowable tolerances. Horizontal lines on form liner stonework pattern to be level and plumb.
   6. On multiple use liners, clean the liner before each use. Replace any damaged liner whose continued use or repair would negatively impact the aesthetics of the concrete finish
   7. Apply a release agent compatible with the form liner at the rate recommended by the manufacturer. Attempt to schedule concrete pour soon after application of the release agent to avoid precipitation, dust, and debris.
   8. Protect reinforcing steel from exposure to release agents.
   9. Apply a gloss free Saltguard® or approved equal to all roadside and salt exposed surfaces of the planter walls.
7. **SITE PREPARATION**
   1. **COLD WEATHER CONCRETE REQUIREMENTS**
   2. When the air temperature is below 5 ºC. or when, in the opinion of the Commissioner, there is a probability of it falling below 5 ºC within twenty-four (24) hours of placing concrete, protection for the concrete shall be required for the duration of the curing period by means of heated enclosures, coverings, insulation, or a suitable combination of these methods.
   3. **BASE COURSE**
   4. Place Granular base course of Class A material to the depth shown on the Drawings. Place and spread base course in layers not to exceed 100 mm, compacting each layer at its optimum moisture content to a density of not less than 98% Standard Proctor Density. Finished surfaces of Granular base course shall be smooth and shall conform to the lines, grades and cross-sections shown on the Drawings. Tolerance of the cross-section or longitudinal profile shall not exceed 13 mm when measured with a 3,000 mm straight edge.
8. **INSTALLATION**
   1. **FORMWORK**
      1. Backfilling: Backfill the underside of the curbs, walls, etc. with Granular A as per OPSS 314 [date].
      2. Placing Formwork: The design, fabrication, erection and use of concrete formwork shall conform to the requirements of CSA Standard S269.3.
      3. Forms shall be constructed with temporary ports or openings at the bottom of all deep units such as columns and walls to facilitate cleaning and inspection.
   2. **FORM LINER INSTALLATION**
      1. Seal form liner joints, form liner accessories' joints, and tie holes to prevent cement paste from bleeding.
      2. Provide solid backing at form liner butt joints to prevent deflection.
      3. Construct form liner and accessories to the sizes, shapes, lines and dimensions shown on the Drawings.
      4. Provide openings, offsets, keyways, recesses, chamfers, blocking, and screeds as required to achieve architectural concrete textured finish.
      5. Drill or pierce liner to accommodate form ties.
      6. Anchor liner to the form on centers not to exceed 457mm. Decrease centers as necessary to accommodate form stripping pressures.
      7. Install backup strips as required to prevent deflection of the liner due to form pressures.
   3. **EXPANSION AND CONTROL JOINTS**
      1. On all vertical concrete walls, saw cuts are to be made on each side of the wall at a maximum interval of 3 metres at a minimum depth of 50mm.
      2. Install expansion joints around and along the length adjacent to concrete curbs, planter walls, or permanent structures or elements as per OPSS.PROV 920 [date] and OPSS.PROV 904 [date]
      3. When making control and expansion joints adjacent to curb, make the control joints of curb, gutter, splash strip and planter wall line up with each other.
      4. Install colour matched polysulfide joint filler in all control and expansion joints as per as per OPSS.PROV 920 and OPSS.PROV 904 [date]. Provide a mock-up to the contract administrator for approval prior to installation.
   4. **CONCRETE POURING**
      1. Thoroughly vibrate concrete to achieve good consolidation, and to eliminate entrapped air thereby minimizing voids. Internally vibrate through to the previous lift to avoid lift lines. Avoid vibrator contact with the form liner.
      2. Any honeycombing or other defects after the side forms have been removed shall be repaired. If in the opinion of the Commissioner, the defect is too serious, the defective section of the planter wall shall be replaced.
      3. All concrete shall have control joints sawn within four (4) to eighteen (18) hours after placement
   5. **SANDBLASTING** 
      1. The finish shall be light sand blasted. Forming and pouring of concrete shall be closely controlled to provide a high degree of accuracy.
      2. Provide a mock-up to the Contract Administrator for approval prior to installation.
   6. **CURING**
      1. Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least one (1) day after placing.
      2. Where burlap is used for moist curing, place two pre-wetted layers on the concrete surface and keep continuously wet during the curing period.
      3. Apply the curing compound evenly to form a continuous film in accordance with the manufacturer’s requirements.
9. **SUBMITTALS** 
   1. The Contractor shall provide a full-scale mock-up using actual job specific materials, methods and workmanship. These shall include concrete mix [cement type, aggregate gradation, slump, water/cement ratios, colourants, plasticizers and additives], forming system [ties, liner, and formwork], form release agents, placement rate, form pressures, joint sealing, and vibrating and stripping practices. In addition, the mockup shall demonstrate patching and repair procedures for spalled concrete, and voids caused by honeycombing or bugholes. If the mock-up panel is not satisfactory, the Contractor shall erect a further mock-up or mock-ups, at the Contractor’s own expense, until it is satisfactory to the Commissioner.
   2. Incorporate formwork accessories and a minimum of one vertical and one horizontal form liner joint in the mock-up.
   3. An accepted mock-up is a prerequisite to beginning job formwork. Submit any variations from the mock-up materials or techniques for the Commissioner’s approval prior to use. The accepted mock-up will be standard by which remaining Work will be evaluated for technical and aesthetic merit.
10. **MEASUREMENT AND BASIS OF PAYMENT**
    1. Payment shall be at the unit price and shall include all labour, materials and equipment necessary to carry out the Work as specified in the Contract Documents.

# Item [No.] Architectural Precast Median Planter

1. **REFERENCES**
   1. OPSS.MUNI 905 [date] Construction Specification for Steel Reinforcement for Concrete
   2. OPSS.MUNI 920 [date] Construction Specification for Deck Joint Assemblies, Preformed Seals, Joint Fillers, Joint Seals, Joint Sealing Compounds, and Waterstops - Structures
   3. OPSS.MUNI 1010 [date] Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
   4. OPSS.MUNI 1350 [date] Material Specification for Concrete - Materials and Production
2. **GENERAL**
   1. The following specifications for Architectural Precast Median Planter shall be read in conjunction with the Contract Drawings.
   2. Under this item the Contractor shall install architectural precast median planter in the locations indicated on the Contract Drawings and details. The median planter shall be reinforced precast concrete.
   3. Concrete shall be reinforced with epoxy coated steel and conform to the requirements of OPSS.MUNI 1350 [date] and OPSS.MUNI 905 [date] except as noted otherwise in this Specification.
   4. All surfaces of concrete to be architectural grade with a smooth finish, free of air pockets and voids greater then 5mm, stains, roughness, chips and with no colour variations.
   5. Precast Architectural Median Planter to be installed on cast-in-place concrete foundation wall and footings as detailed in the contract drawings.
   6. Reinforced cast in place concrete foundation and footing shall be included in this item and will be as per the detail drawings.
   7. All concrete to be class C1 exposure with 5-7% air entrainment and 35MPa strength.
   8. The Contractor shall provide shop drawings, mix designs and a mock-up for the median planter to the Commissioner for review prior to commencing with this Work. The mock-up shall be the size of one form or 2m long by the height and width as specified on the contract drawings.
   9. An accepted mock-up is a prerequisite to beginning job formwork. Submit any variations from the mock-up materials or techniques for the Commissioner’s approval prior to use.
   10. The accepted mock-up will be standard by which remaining Work will be evaluated for technical and aesthetic merit.
   11. Apply a gloss free white Saltguard® or approved equal to all roadside and salt exposed surfaces of the planter walls. Before applying provide a mockup on the planter wall mock up for approval by the Commissioner.
   12. Drainage composite is to be CCW MiraDRAIN 9800 or approved equal.

Planters and installed as per the manufacturer’s installation guide and as per below:

1. Place the CCW MiraDRAIN in the planter so that the fabric on the vertical and horizontal surfaces face the soil.
2. Utilize the installation procedures and attachment method appropriate for the type of substrate.
3. Overlap the fabric of the vertical panel onto the horizontal panel at the transition point.
4. If the panels require cutting, exposed cuts must be covered with supplemental pieces of filter fabric to prevent soil intrusion. A minimum 6” (150 mm) piece of filter fabric will be required to cover cut sections
5. **WARRANTY** 
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
6. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be at the unit price and shall include all labour, materials and equipment necessary to carry out the Work as specified in the Contract Documents.

# Item [No.] Cast-In-Place Median Planter

1. **REFERENCES**
   1. OPSS.MUNI 905 [date] Construction Specification for Steel Reinforcement for Concrete
   2. OPSS.MUNI 920 [date] Construction Specification for Deck Joint Assemblies, Preformed Seals, Joint Fillers, Joint Seals, Joint Sealing Compounds, and Waterstops - Structures
   3. OPSS.MUNI 1010 [date] Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
   4. OPSS.MUNI 1350 [date] Material Specification for Concrete - Materials and Production
2. **GENERAL** 
   1. The following specifications for Cast-In-Place Median Planter shall be read in conjunction with the Contract Drawings.
   2. Concrete shall conform to the requirements of OPSS.MUNI 1350 [date] except as noted otherwise in this Specification.
   3. All surfaces of concrete to be architectural grade with a smooth finish, free of air pockets and voids greater then 5mm, stains, roughness, chips and with no colour variations.
   4. Concrete surfaces shall not be treated with cement slurry or paste.
   5. Under this item the Contractor shall install a median planter in the locations indicated on the Contract Drawings and details. The median planter shall be reinforced cast in place concrete with \_\_\_\_\_\_\_\_\_ colouring with control and expansion joints as per OPSS.MUNI 920 [date].
   6. All expansion joints shall have minimum 10mm preformed joint filler, Type A, non-extruding and resilient bituminous colour matched with polysulfide sealant flush with all face, top and back of walls and joints.
   7. Concrete strength shall be a minimum of 35 MPa with 5-7% air entrainment and Type C1 exposure class.
   8. Concrete shall bear on a minimum 300mm depth of compacted Granular ‘A’ base Granular equal to, or greater than, the roadway curbs Granular compaction.
   9. Place sub drains according to OPSS 405 [date] and the contract drawings.
   10. The Contractor shall provide shop drawings, mix designs and a mock-up for the median planter to the Commissioner for review prior to commencing with this Work. The mock-up shall be the size of one form or 2m long by the height and width as specified on the contract drawings.
   11. The mock-up shall include all items shown on the median planter detail in the Contract Drawings, such as but not limited to rebar, coping, control joints and drainage composite.
   12. An accepted mock-up is a prerequisite to beginning job formwork. Submit any variations from the mock-up materials or techniques for the Commissioner’s approval prior to use.
   13. The accepted mock-up will be standard by which remaining Work will be evaluated for technical and aesthetic merit.
   14. Apply a gloss free white Saltguard® or approved equal to all roadside and salt exposed surfaces of the planter walls. Before applying provide a mock up on the planter wall mock up for approval by the Commissioner.
   15. Drainage composite is to be CCW MiraDRAIN 9800 or approved equal.

Planters and installed as per the manufacturer’s installation guide and as per below:

1. Place the CCW MiraDRAIN in the planter so that the fabric on the vertical and horizontal surfaces face the soil.
2. Utilize the installation procedures and attachment method appropriate for the type of substrate.
3. Overlap the fabric of the vertical panel onto the horizontal panel at the transition point.
4. If the panels require cutting, exposed cuts must be covered with supplemental pieces of filter fabric to prevent soil intrusion. A minimum 6” (150 mm) piece of filter fabric will be required to cover cut sections
5. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
6. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Concrete Planter Curb

1. **GENERAL**
   1. The following specifications for Cast-In-Place Concrete Planter Curb shall be read in conjunction with the Contract Drawings.
   2. Concrete shall conform to the requirements of OPSS.MUNI 1350 [date] except as noted otherwise in this Specification. The Contractor shall be responsible for the concrete mix design as specified in subsection 1350.07.07.01 and for providing concrete of the required properties.
   3. Concrete strength shall be a minimum of 35 MPa with 5-7% air entrainment and Type C1 exposure class.
   4. Cement shall be Type 10 - normal cement and the cement content shall conform to the minimum cement content specified in Table 1 of OPSS.MUNI 1350 [date]. The nominal minimum size of the coarse aggregate is 19.0 mm and the required air content is 6% ± 1.5%. Slump of the concrete shall conform to Table 3 of OPSS.MUNI 1350.’
   5. Apply a gloss free Saltguard® or approved equal to all roadside and salt exposed surfaces of the planter walls.
   6. Concrete surfaces shall not be treated with cement slurry or paste.
   7. Within 3 Days following the removal of forms or curing materials, all holes left in the concrete surface with any dimension greater than 10mm shall be filled with mortar or a proprietary patching material. The holes shall be moist at the time of filling. Mortar shall be tamped into place. Proprietary patching materials shall be placed according to manufacturer’s instructions.
   8. Surfaces with cavities with any dimension greater than 5mm or with honeycombing are considered deficient and shall be repaired. The Contractor shall submit a repair proposal to the Contract Administrator for approval.
   9. The Contractor shall install a 2.0 m mock-up section on site for testing and approval by the Commissioner prior to the placement of concrete planter curb.
   10. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any formwork. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.
2. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete Planter Curb. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
3. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Coloured Concrete Splash Strip

1. **GENERAL** 
   1. The following specification shall be read in conjunction with the Standard Drawing SS-105 [or SS-106 depending on if the project has mainly CB or SICB i.e. on street bike lane or boulevard cycle facility], OPSS 351 and MUNI 1350.
   2. Under this item the contractor is to install the coloured concrete where indicated on the drawings and details. The Contractor shall be responsible for the supply and installation of integral coloured concrete on boulevard splash strips as specified on the Contract Drawings. The Contractor shall place 150 mm minimum depth of Granular ‘A’ as a base course for the splash strip. Granular ‘A’ shall be compacted to a minimum of 98% Standard Proctor Density. The minimum thickness of splash strip shall be 150 mm in depth.
   3. Installation shall be in conformance with the Drawings, concrete Specifications, the pigment manufacturers mixing specifications, and shall be 35MPa, 5-7% air entrained.
2. **Products** 
   1. Boulevard Colourant: Colour to be integral. Pigment shall be Colour Code BN-1703R “Copper” (3-bags/m3) by Interstar Pigments or approved equal that matches the existing coloured concrete within the contract.
3. **Submittals** 
   1. The Contractor will be required to prepare a 2m long mock-up of the coloured concrete splash strip for testing and approval of the Commissioner prior to any placing of the concrete. Likewise the Contractor shall prepare and furnish a record of the mixing formula to permit the Region to make future replacements in a manner consistent with the original installation.
   2. The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any formwork. Submit any variations from the mock-up materials or techniques for approval of the Commissioner prior to use.
4. **Execution** 
   1. The concrete is to have a “broom” finish and edged as per OPSS 351 [date].
   2. The Contractor must follow the manufacturer’s specifications with respect to mixing, curing, and handling of coloured concrete in order to ensure colour consistency.
   3. The Contractor shall take care to ensure that the placement of expansion and contraction joints is completed in accordance with the jointing locations/patterns specified on the Contract Drawings.
   4. The Contractor shall protect adjacent curb and gutter and planter wall from staining during the operation.
   5. Contraction joints to be laid out with joints at 1500mm off centre (o/c) with an expansion joint at every 4th joint.
   6. Provide an expansion joint at the junction of concrete paving with all raised walls/curbs and fixed structures including utility covers and/or frames as per OPSS 351[date] and OPSS 1308 [date].
   7. Contraction joints are to be as per OPSS 351[date]
   8. If the area to be paved exceeds 2.5 m in width, an intermediate contraction joint will be introduced at the mid-point at right angles to all other contraction and expansion joints.
   9. The maximum water/cement materials ratio shall be 0.45.
   10. The slump shall not exceed 100 mm.
   11. No steel trowels, steel floats or power trowels are to be used on exterior concrete.
   12. All concrete shall have contraction joints sawn within 4 to 18 hours after placement.
   13. Apply a gloss free CCI-1000 Sealer by Concreation Canada Ltd or approved equal to all surfaces of the coloured concrete splash strip.
   14. During year one (1) and two (2) of the warranty period the contractor is to remove all weeds that may grow between the splash strips and curb. All weeds that are found growing in the joints are to be pulled by hand so that all the roots are removed.
5. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
6. **Payment** 
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Pervious Coloured Concrete Splash Strip

1. **General**

* 1. Under this item, the Contractor shall pour the Pervious Coloured Concrete Splash Strip as specified in OPSS 356 [date] and Detail SS-105A.
  2. Boulevard Colourant: Colour to be integral. Pigment shall be Colour Code \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (2-bags/m3) by Interstar Pigments or approved equal.
  3. Apply a gloss free CCI-1000 Sealer by Concreation Canada Ltd or approved equal to all surfaces of the coloured concrete splash strip.
  4. During year one (1) and two (2) of the warranty period the contractor is to remove all weeds that may grow between the splash strips and curb. All weeds that are found growing in the joints are to be pulled by hand so that all the roots are removed.

1. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
2. **Measurement and Basis of Payment**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Coloured Concrete

1. **GENERAL**
   1. The following specifications for Coloured Concrete applies to coloured concrete medians intersection quadrants and splash strip and shall be read in conjunction with the Contract Drawings, OPSS 351 [date] and MUNI 1350 [date].
   2. Under this item the contractor is to install the coloured concrete where indicated on the drawings and details.
   3. Coloured concrete pigment shall be Colour Code BN-1703R “Copper” (2-bags/m3) by Interstar Pigments or approved equal that matches the existing coloured concrete within the contract.
   4. Contractor to submit manufacturer’s complete technical data sheets for the following:
      1. Colored admixture.
      2. Curing compound.
      3. Design Mixes: For each type of integrally colored concrete.
      4. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.
   5. Contractor to provide a 2 meter long integrally colored mock-up. For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic metres (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck) and should always be in full cubic metre increments. Construct mock-up using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control and expansion joints in sample panels.
   6. Mock-up shall remain through completion of work for use as a quality standard for finished work.
   7. Comply with manufacturer's instructions. Deliver colored admixtures in original, unopened packaging. Store in dry conditions.
   8. Schedule placement to minimize exposure to wind and hot sun before curing materials is applied.
   9. Comply with professional practices described in American Concrete Institute (ACI) 305R and ACI 306R.
   10. Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturer’s written recommendations.
   11. The concrete is to have a “broom” finish with no edge treatment.
   12. Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.
   13. Apply a gloss free CCI-1000 Sealer by Concreation Canada Ltd or approved equal to all surfaces of the coloured concrete splash strip.
2. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
3. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Precast Concrete Cap on Planter Walls

1. **GENERAL**
   1. The Contractor shall be responsible for the supply and installation of precast concrete caps on median planters, concrete toe walls, and planters as specified on the Contract Drawings.
   2. The precast cap is a custom product to be cast in accordance with the Drawings.
2. **PRODUCTS:**
   1. Finish is to match approved samples in all respects.
   2. Non-exposed surfaces of units in their final location shall be smooth form finish.
   3. Aggregate is to be 9.5mm.
   4. Sand to be concrete sand.
   5. Cement colour is to be grey.
   6. Air entraining agents shall conform to CSA CAN 3-A2666.1-M78 and the use of such ad mixtures shall conform to CSA CAN 3-A2666.4-M78.
   7. Water shall be in accordance with CSA A23.1
   8. Reinforcing shall contain the following:
3. Welded wire mesh shall be 6x6x6/6, galvanized and conform to

CSA A23.1

1. Reinforcing bars shall be deformed and a minimum of 10 mm diameter.
2. Reinforcing bars shall conform to CSA G30.12-M-1977
3. Any welding of reinforcing shall comply with CSA W 186-1970
4. Reinforcing bars shall be epoxy coated.
5. Placement of all reinforcement shall be in accordance with CSA A23.1
   1. Connecting hardware shall be 16mm diameter 150mm long galvanized rods at 600mm on center and heavy duty adhesive or mortar. The connecting hardware shall be shown on the approved shop drawings.
   2. Concrete shall have a minimum compressive strength of 35 MPa, shall be air entrained to 5% to 7% and shall comply with the minimum/maximum acceptable results for air entrainment and compressive strength tests as per CSA A23.4.
   3. Finish shall be an acid wash or light sand blast finish. Two samples shall be presented to the Region for review and acceptance.
   4. Forms are to be constructed of approved steel, fiberglass or high density overlaid plywood conforming to CSA 0121-1973. CSA A23.4 shall govern all aspects of the manufacture, use and maintenance of all form Work.
   5. Precast concrete units shall match approved samples in all respects. Colour and texture shall be uniform and consistent throughout; free from air pockets, imperfections, blemishes and discolorations.
   6. Fabricate units to the profiles and sizes detailed and in accordance with the approved shop drawings.
   7. Executed Work shall be accurate, true to dimensions, square in true planes, free from waves, twists, cracks and broken edges. Warped, cracked, chipped or broken units shall be rejected. Edges shall be straight, clean and accurate.
   8. Placing of materials in forms, vibrating, curing, stripping and handling shall be in accordance with CSA A23.4
   9. Dimensional tolerances shall be no greater than 3mm over a 1m maximum horizontal or vertical span.
   10. Manufacture units in moulds designed to withstand vibration and all forces resulting from casting. Vibrate continuously during casting until the casting is complete.
   11. Curing shall be in accordance with CSA A23.1 generally and with CSA 23.4 specifically.
6. **REJECTION OF UNITS**
   1. Any concrete units containing concrete which has failed to meet the requirements of this Specification and or the shop drawings may be rejected and replaced at the Commissioner’s discretion. Any costs associated with this shall be borne by the Contractor.
   2. Damaged, chipped or discoloured units shall be replaced. Patched or refinished units will not be accepted. The Commissioner will be the sole judge of the acceptance of the units.
   3. Except for hair-line cracks, which are defined as cracks of a minute width which are visible but not measurable by ordinary means, units which have been cracked or broken will be rejected and shall be replaced at the Contractor’s expense.
7. **SUBMITTALS** 
   1. Manufacturer's installation instructions and Product Data which indicates compliance with the Specifications.
   2. Shop Drawings indicating precast concrete cap layout, method of connection to the wall, and termination details. Indicate level installation, joint locations, and placement.
   3. The Commissioner will review the shop drawing submittal for, among other things, aesthetic criteria.
   4. Provide a mock-up of one complete unit of the concrete precast cap.
8. **EXECUTION** 
   1. The Contractor to ensure the secure connection of the precast concrete cap to the wall structure in accordance with the approved shop drawings.
9. **SUBMITTALS**
   1. Precast units shall be fabricated by an experienced and recognized manufacturer of precast concrete Products whose plant and facilities are being operated in accordance with CSA A251.
   2. Manufacturers must submit references indicating a history of successful work in the field of precast concrete.
   3. A prepared sample of one complete unit shall be the benchmark against which all units shall be compared. Natural variations in colour and texture will be acceptable to the extent that they can be attributed to differences in the aggregate, sand or cement specified and/or any colour difference as a result of the curing process.
   4. Visible surfaces (in final locations) shall be those resulting from casting against approved forms using good industry practice in the cleaning of forms, design of the concrete mix, placing, and curing.
   5. Non-visible surfaces (in final locations) shall be those resulting from the use of a vibrating screed, or from hand finishing, or from casting against approved forms using good industry practice. Minor indentations, minor chips and spalls will be tolerated. No imperfections honeycomb or defects will be permitted.
   6. This guarantee is subject to the following limitations:
      1. Damage as a result of vehicular collision
      2. Careless operation of maintenance equipment
10. **LABORATORY OR FIELD MIXED BATCH OF CONCRETE**
    1. The test data shall include compressive strength tests consisting of at least one (1) set of standard cylinders tested at seven (7) days, and one (1) set of standard cylinders tested at twenty eight (28) days. For mixes with cementitious hydraulic slag, the compressive strength tests shall also include one (1) set of standard cylinders tested at three (3) days. The air content, temperature and slump of the samples of concrete used to fabricate the test cylinders shall be stated.
11. **WARRANTY**
    1. Provide warranty on the precast concrete units against spalling, visible cracking, splitting, deformation or loosening of aggregate for a period of five (5) years, effective from the date of Total Performance of this Contract. Precast units showing such defects shall be replaced and or repaired at the discretion of the manufacturer at no cost to the Region. Any such replacement shall be governed by the same terms, conditions, restrictions, and specifications as were in force for the original precast units.
12. **MEASUREMENT AND BASIS OF PAYMENT**
    1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Concrete Banding c/w Concrete Base

1. **GENERAL** 
   1. The Contractor shall be responsible for the supply and installation of concrete banding as specified on the Contract Drawings.
2. **EXECUTION** 
   1. Installation shall be in conformance with the Drawings, concrete Specifications and shall be 32MPa and 5-7% air entrained.
   2. The concrete is to have a “broom” finish and edged as per OPSS 351[date].
   3. The Contractor shall take care to ensure that the placement of expansion and control joints is completed in accordance with the jointing patterns specified on the Contract Drawings and OPSS 351[date].
   4. Control joints to be laid out with joints at 1500 mm o/c with an expansion joint at every third (3) joint.
   5. Provide an expansion joint at the junction of concrete paving with all raised walls/curbs and fixed structures including utility covers and frames.
   6. Control joints are to be 25 mm deep.
   7. If the area to be paved exceeds 2.5 m in width, an intermediate control joint will be introduced at the mid-point at right angles to all other control and expansion joints.
   8. The maximum water/cement materials ratio shall be 0.45.
   9. The slump shall not exceed 100 mm.
   10. No steel trowels, steel floats or power trowels are to be used on exterior concrete.
   11. All concrete shall have control joints sawn within four (4) to eighteen (18) hours after placement.
3. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
4. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Sandblasting / Engraving on Concrete Paving

1. **GENERAL** 
   1. Finish shall be a smooth float surface.
   2. Engraving on concrete surface is to be performed by sandblasting method. The contractor will be responsible for the engraving of all text.
   3. Provide mock-up with varying depths (5-6mm) and obtain approval prior to engraving.
   4. All masking templates must be reviewed and approved prior to the actual engraving work. Provide a lead-time of minimum ten (10) working days for York Region review.
   5. Design templates for lettering will be provided in AutoCAD file format by the Region for the preparation of the masking templates.
   6. Engravings must be performed to the satisfaction of the Commissioner.
   7. Rejected samples shall be removed and disposed off-site, and replaced with new medium materials and new engraving by the Contractor at no additional cost to the Region.
   8. Approved engraved text shall be stained/painted with a water reducible concentrate (WRC) coloured stain.
2. **WARRANTY**
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against cracking, inconsistent discoloration, spalling, settlement and shifting.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in Concrete. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
3. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Banner Pole and Concrete Footing

1. **GENERAL**
   1. The following specifications for Banner Pole and Concrete Footing shall be read in conjunction with the Contract Drawings.
   2. The Contractor shall supply and install the banner poles, including arms, concrete footings, fittings and fasteners as detailed on the Contract Drawings. Banner flags will be supplied by Other Contractors.
   3. In accordance with OPSS 905 [date], the Contractor shall prepare and submit shop drawings for the sizing and placement of reinforcement of the concrete footings. The shop drawings shall be stamped by a licensed Professional Engineer in the Province of Ontario. Shop Drawings should also show general layout, jointing, anchorage, support systems, and accessories.
2. **PRODUCT** 
   1. AM6 pole complete with banner arms by Lumec or approved equal.
3. **FINISHES:**
   1. A. Metal Finishes, General: Comply with National Association of Architectural Manufacturers’ (NAAMM) “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.
   2. Finish Specifications (Satin, Anodized, and Powder Paint Finishes). Note: Aluminum Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
      1. Natural Satin Finish: Provide directional-sanded satin finish (AA-M33); buff complying with AA-M20.
      2. Anodized Finishes: Provide Class 1 finish complying with AA M32-C22 A41 (Clear Anodized) or AA M32-C22-A42 (Color Anodized Finishes) in thicknesses ranging from 1 to 3 mils.
      3. Powder Coated Finish: Thermo-set Polyester Powder Coated Finish, with a minimum thickness of 1-½ mils. Application shall be in a closed loop automated powder coating system to insure uniformity and quality of finish.
4. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

# Item [No.] Permanent Aggregate Reinforced Thermoplastic System

**GENERAL**

* 1. This item refers to a permanent aggregate reinforced thermoplastic surfacing system that provides a textured and durable topical treatment to the surface of asphalt pavement. The system shall be installed on asphalt surfaces to create an enhanced pedestrian crosswalk facility.
  2. The permanent aggregate reinforced thermoplastic system shall be applied to the final surface course in the locations shown on the Contract Drawings and in accordance Standard Drawing SS-110 and the manufacturer’s specifications.
  3. The Contractor shall provide premarking to establish the position of the permanent aggregate reinforced thermoplastic system in accordance with OPSS 710 [date].

1. **SCOPE OF WORK**
   1. The Contractor shall supply and apply the permanent aggregate reinforced thermoplastic system.
   2. Included under the Work of this item, the Contractor shall ensure that all freshly applied panels are protected from being damaged by the travelling public as per the manufactures instructions.
   3. The System must be able to be applied in temperatures down to 45ºF (7ºC) without any special storage, preheating or treatment of the material before application of the permanent aggregate reinforced thermoplastic panels.
   4. The aggregate reinforced thermoplastic System shall be applied to asphalt pavement using patented asphalt pavement reheating equipment acceptable to the manufacturer. The asphalt surface shall be covered with 600mm x 600mm panels of aggregated reinforced thermoplastic then heated to the required liquefac­tion temperature. Sand shall be applied at the end of the melting process to achieve added friction properties on the surface. As the material is cooling, it shall be imprinted with a template made from 9.5mm flexible wire rope in the required design to create crisp, clean lines to define the pattern specified on Standard Drawing SS-110. For crosswalks, apply white preformed thermoplastic transverse lines on either side of the installation.
2. **OPERATIONS**
   1. The Contractor shall ensure that all aggregate reinforced thermoplastic system Work is carried out in accordance with OPSS 710 [date], as amended herein:
      1. Traffic control shall be maintained in accordance with the requirements of the Ontario Traffic Manual, Book 7. The Contractor shall ensure that freshly applied panels are not damaged by motorists.
      2. All Work shall be carried out in compliance with the Occupational Health and Safety Act, Highway Traffic Act and Environmental Protection Act and all applicable Regulations of these statutes.
      3. Actual application operations shall be restricted to the hours between 9:00 a.m. and 4:00 p.m. These hours of work may be extended only with the prior written approval of the Commissioner.
      4. Qualified operators/applicators are provided who have all of the necessary licensing requirements to carry out the Work.
      5. Aggregate reinforced thermoplastic shall be applied when the temperature of both the ambient air and pavement is above 10 ̊ C and the pavement is completely dry, as determined by the Commissioner.
      6. Any workmanship that does not conform to the requirements of OPSS 710 [date], as amended herein, shall be corrected at the Contractor’s expense.
3. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Bridge Plaque

1. **GENERAL**
   1. The following specifications for Bridge Plaque shall be read in conjunction with the Contract Drawings.
   2. Under this item the Contractor shall supply and install insert number of plaques typically two per bridge two bronze plaques including fastening, as shown on the drawings. The locations of the plaques shall be at recesses on the parapet walls which will be shown on the Contract Drawings.
   3. Bronze bridge plaque fabrication and installation details are to follow Detail SS-300 and the fabricators instructions.
   4. The maximum size of the plaques shall be 305mm x 457mm.
   5. Each plaque shall include the applicable information as shown on Detail SS-300; if the construction completion date differs the plaque shall be adjusted accordingly.
2. **SUBMITTALS** 
   1. Manufacturer's installation instructions and Product Data which indicates compliance with the Specifications.
   2. Shop Drawings indicating plaque layout and method of connection to the wall.
   3. The Commissioner will review the shop drawing submittal for, among other things, aesthetic criteria.
   4. Provide a mock-up of one complete unit.
3. **WARRANTY** 
   1. This work shall be warrantied for two (2) years from the date of Total Performance of the Work against defects such as cracking, oxidizing, staining, loss of colour or texture and corrosion.
   2. All materials and workmanship shall be warrantied for a period of two (2) years from the date of substantial completion of the work against defects in plaque. All deficiencies as noted by the Contract Administrator or Commissioner are to be repaired by the Contractor at no additional cost to the Region and shall be executed within one (1) week from the date of receipt of written notification from the Contract Administrator or Commissioner.
4. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Typical Armour Stone Retaining Wall

1. **GENERAL**
   1. This Item consists of supply and placing of the armour stone retaining wall, with 19mm clear stone backfill, filter cloth and sub drain.
   2. The following specifications for Typical Armour Stone Retaining Wall shall be read in conjunction with the Contract Drawings.
2. **MATERIALS**
   1. All materials shall be supplied by the Contractor for the armour stone, filter blanket, sub-drain and Granular in the specified size range by mass of individual rock or gradation limit, as indicated in the Contract Documents.
   2. The armour stone retaining wall shall be rock that is clean hard, sound, durable, resistant to weathering and degradation in water, free of Overburden, spoil, shale and organic material and having a density of not less than 2.6 t/m3.
   3. Individual rock shall be consistent in size, rectangular and each rock shall have both thickness and breadth greater than or equal to one-half of its length.
   4. Rock with visible planes of weakness and/or subject to marked deterioration will not be accepted.
3. **SUBMITTALS**
   1. The Contractor shall notify the Commissioner, in writing, for approval of the source of supply of rock as well as a sample and mock-up of 3 stones, at least twenty eight (28) days in advance of obtaining material from the source proposed. The 3 stone samples and mock-up will set the precedence of all armour stones within the contract.
4. **CONSTRUCTION**
   1. The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Commissioner.
   2. The Contractor shall place the armour stone retaining wall as indicated in the Contract Documents and/or in accordance with the Standard Drawing SS-205.
   3. The Contractor shall notify the Contract Administrator as soon as the base course is graded, compacted and ready for the first course of armour stone. No armour stone shall be laid until the base is approved by the Commissioner.
   4. The Contractor shall place the armour stone retaining wall such that the underlying materials and any abutting Structures are not damaged.
   5. The Contractor shall be responsible at his/her own expense to repair any such damage to the Work.
   6. The armour stone retaining wall shall be placed such that each rock is stable, secure, staggered and supported by rocks below and the placement shall be controlled to ensure that a uniform and continuous cover results.
   7. No pushing or dumping of armour stone shall be permitted during placement.
5. **MEASUREMENT AND BASIS OF PAYMENT**
   1. Payment shall be made at the applicable unit price and shall be full compensation for all labour, equipment and materials required to complete this work as specified in the Contract Documents.

Item [No.] Landscape Maintenance during Construction Period

1. **GENERAL**

Work Included: Carrying out the maintenance of sod and existing grass boulevards within the Contract, soil under tree grates, median and boulevard planter topsoil for the duration of the Contract:

* Mowing of grass.
* Prevention and removal of weeds from topsoil in medians, boulevard planters and tree grate pits.
* Addition of topsoil due to settlement and weather.

1. **DEFAULT**

In the event that the Contractor fails to respond to maintenance and warranty requests within 14 Days from the Region’s written notification, the Region may have this work performed by Other Contractors and will deduct the costs thereof from any monies owing to the Contractor.

1. **EXECUTION**

* After topsoil has been installed and settlement has occurred in planting beds, fill beds back to the specified grade with the specified planting soil mixture.
* Mowing of grass to a height of 50mm between pedestrian and cyclist facility and curb and ROW line to pedestrian facility where sod is installed. Mowing is to be carried out once every two weeks of the growing seasons during the construction period.
* Remove all weeds from topsoil filled planters in median and boulevard once a week.
* All weeds shall be removed by hand and shovel so that the entire root system is removed. No motorized weed trimmers permitted.
* The Contractor may cover all topsoil beds and tree grates with a nonwoven filter cloth to prevent weed growth after the installation of topsoil. If this cover method is chosen proper anchorage shall be performed through steel staples and weights so that the filter cloth does not blow away.

* The Contractor shall report in writing to the Region the maintenance Work performed and a schedule of the Work to be performed on a seasonal basis: Spring Report by May 1, Summer Report by September 1, and a Fall Report by November 1.

1. **MEASUREMENT AND BASIS OF PAYMENT**

Payment at the applicable unit price shall be full compensation for all costs relating to the Landscape Maintenance During Construction Period. Payment shall be made based on a lump sum basis.

Item [No.] 150 mm Diameter Pipe Sub drain with Geotextile, OPSS.PROV 405

OPSS 405 shall apply except as modified below:

**405.05 MATERIALS**

**405.05.01 General** is amended by replacing the first paragraph with the following:

Subdrain pipe shall be perforated and none perforated dual wall and polyethylene pipes with smooth inner surface, having a minimum stiffness of 320kPa. Sub drains shall also be wrapped in non-woven geotextile as specified in OPSS 1860 (Apr. 2012) Table 1 Class II Non-Woven.

**405.07 CONSTRUCTION**

**405.07.06.02.02 Marking of Outlets** is deleted.

**405.07.06.02.01 Outlets - General** is addended by the additional of the following

Subdrains for all planter boxes shall be connected to the road catch basin a minimum of every individual planter or as directed on the Contract Drawings.

**405.09 MEASUREMENT FOR PAYMENT**

**405.09.02 Plan Quantity Measurement** is amended by the addition of the following:

The 100 mm diameter pipe sub drain into storm structures as specified in OPSD 809.010 shall be part of this item.

**405.10 BASIS OF PAYMENT**

**405.10.01 Pipe Subdrain – Item** is amended by the deletion of the second and third paragraphs and the addition of the following:

The Contract unit price for this item shall include excavation and material disposal, clear stone, bedding and backfill, and geotextile. The Contract unit price shall also include coring into maintenance holes and catch basins where necessary and all other requirements to complete the work.

Item [No.] Mass Concrete (Extract to be added in Bridge and Concrete Retaining Wall Specifications)

* All surfaces of concrete to be architectural grade with a smooth finish, free of air pockets and voids greater then 5mm, stains, roughness, chips and with no colour variations.
* All exposed and accessible portions of concrete to be sealed with Sure Klean® Weather Seal Blok-Guard® & Graffiti Control II or approved equal and shall be applied as per the manufactures directions.
* All concrete shall be pressure washed and cleaned of all oil and other containments prior to any sealing.

* The Contractor shall install a 2 meter long mock-up on site for approval by the Commissioner prior to the pouring of any concrete. The mock-up shall be complete with rebar, column, column cap and parapet wall.
* The accepted mock-up will be the standard by which the remaining Work will be evaluated for technical and aesthetic merit. An accepted mock-up is a prerequisite to beginning any formwork. The Contractor shall submit any variations from the mock-up materials or techniques to the Commissioner for approval prior to their use.