

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Section 04 22 00 – Concrete Unit Masonry
- .2 Section 06 10 00.01 – Rough Construction
- .3 Section 07 13 26 – Self adhesive waterproofing
- .4 Section 22 11 16 - Domestic water piping
- .5 Section 22 13 17 - Drainage Waste and Vent Piping
- .6 Section 23 05 05 - Installation of Pipework
- .7 Section 26 05 00 – Common Work Results -Electrical
- .8 The General Contractor shall provide the Vendor with scaffolding, boom lift, scissor lift or power swing stage for the installation of the waterproofing, internal air diffusers and growth media.
- .9 The General Contractor shall provide the Vendor with space adjacent to the living wall to act as a staging area for the installation of the living wall.
- .10 The General Contractor shall provide the Vendor a power swing stage, scaffolding, boom lift or scissor lift for the installation of the plants.
- .11 The General Contractor will provide a system to access the Biofilter after installation for routine maintenance.
- .12 All utilities (electricity, water, lighting and heat) required by the Vendor during this work shall be provided by the General Contractor.
- .13 Unless otherwise agreed by both parties, the installation will occur during regular work hours. The General Contractor will provide the Vendor reasonable access to the site.
- .14 Required dimensions of the system will be provided by the General Contractor with the acceptance of the offer.
- .15 The Vendor will photograph the installation as part of normal record keeping and may use these and other photographs of the system for marketing purposes unless written notification is received from the General Contractor.
- .16 Installation to be scheduled on dates to be mutually acceptable to the General Contractor and the Vendor.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)

- .1 CSA-A Plumbing.
- .2 CSA A Electrical
- .3 CSA-A Mechanical

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation meetings: comply with Section 01 31 19 - Project Meetings. Conduct pre-installation meeting one week prior to commencing work of this Section and on-site installations to:
 - .1 Verify project requirements, including mock-up requirements.
 - .2 Verify substrate conditions.
 - .3 Co-ordinate products, installation methods and techniques.
 - .4 Sequence work of related sections.
 - .5 Co-ordinate with other building subtrades.
 - .6 Review manufacturer's installation instructions.
 - .7 Review warranty requirements.
- .2 Sequencing: sequence with other work in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM). Comply with manufacturer's written recommendations for sequencing construction operations.
- .3 Scheduling: schedule with other work in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM).

1.4 ACTION SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, limitations and colours.
 - .2 Provide two copies of Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS) in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Samples:
 - .1 Provide samples as follows:
 - .1 Two of growth material specified, supplemented with specific requirements in Section 13.80.00 .
 - .2 Two lists of plant material to be used along with photographic examples of the material alone and in representative Biofilter.
 - .3 Two of each typical internal air distribution system, described in section 13.80.00.
 - .4 Two of each type of masonry anchorage, supplemented by specific requirements.

- .5 Samples: used for testing and when accepted become standard for material used.
- .4 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00
 - .2 The drawing will include a complete set of standard details for the waterproofing, internal diffuser systems, rooting material and mechanical components. The package will also include a plant list and a control sequence for BAS (if required)

1.5 INFORMATION SUBMITTALS

- .1 Certificates: provide manufacturer's product certificates certifying materials comply with specified requirements.
- .2 Test and Evaluation Reports:
 - .1 Test reports to certify compliance of growth media with specified performance characteristics and physical properties.
- .3 Vendor Instructions: provide manufacturer's installation instructions, including storage, handling, safety and site conditions.
- .4 Manufacturer's Reports: provide written reports prepared by manufacturer's on-site personnel to include:
 - .1 Verification of compliance of work with Contract.
 - .2 Site visit reports providing detailed review of installation of work, and installed work.
- .5 Written verification that the Vendor and manufacturer having rights to the technology. Failing to have these rights will expose the Vendor, General Contractor, other consultants and client to legal action.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide manufacturer's instructions for care, cleaning and maintenance of Biofilter into manual specified in Section 01 78 00 - Closeout Submittals.

1.7 MAINTENANCE

- .1 Provide manufacturer's instructions in accordance with Section 01 78 00 - Closeout Submittals covering maintenance requirements and parts catalogue, with cuts and identifying numbers.
- .2 A system to allow maintenance workers safe access to Biofilter must be provided by the General Contractor.
- .3 Initial maintenance period of 12 months will commence with substantial completion of the building or installation of the plants whichever is later.

- .4 The site will be visited at least 12 times during the first 12 month period. Included in these visits are the following; maintenance of water circulating system, replacement of dead plants, pruning of plants, control of pest insects and maintenance of plant nutrient status.
- .5 Maintenance reports will be submitted to the General Contractor prior to substantial completion, outlining the actions carried out as per the maintenance requirements above, as well as dates, personnel at each visit, and notes on growing conditions.
- .6 Prior to substantial completion, reports shall be signed by maintenance contractor and verified by Owner.
- .7 Prior to substantial completion, copies shall be submitted to Owner and General Contractor.

1.8 **QUALITY ASSURANCE**

- .1 Qualifications:
 - .1 Manufacturer: capable of providing field service representation during construction and approving application method.
 - .2 Vendor: experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - .3 Vendors: company or person specializing in Biofilter installations with 3 years documented experience with biofiltration work similar to this project.
 - .1 Vendors employed on this project must demonstrate ability to reproduce mock-up standards.
- .2 Mock-ups (Optional):
 - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Construct mock-up panel of Biofilter construction 1200 x 1800 mm (4' by 6') showing water proofing, diffusers, growth media, use of fasteners, ties and workmanship.
 - .3 Mock-up used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .2 For testing to determine compliance with performance requirements. Perform following tests.
 - .1 Pressure drop under the 0.01 m³ air per m² Biofilter per second
 - .4 Construct mock-up where directed by General Contractor.
 - .5 Provide 4 days notice to General Contractor of readiness of mock-up for inspection.
 - .6 Allow 24 hours for inspection of mock-up by General Contractor before proceeding with work.
 - .7 When accepted General Contractor, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

- .8 Start work only upon receipt of written approval of mock-up by General Contractor.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Storage of Plant Materials
 - .1 The General Contractor must provide an area where the Plant materials can be stored, near the Biofilter, protected from outside conditions and maintained at a temperature of no greater than 26° C and no cooler than 8°C. Plants must be protected from direct sunlight. If the plants are to be stored for more than 3 days than the General Contractor must provide lighting (natural or artificial similar to 2.6.9.1)
- .4 Packaging Waste Management:
 - .1 In accordance with Section 01 74 19 - Construction/Demolition Waste Management.

1.10 SITE CONDITIONS

- .1 Environmental Requirements:
 - .1 No installation of waterproofing shall be performed if surfaces to be treated are below 10°C
 - .2 No installation of waterproofing shall be performed if surfaces are not clean and dry.
 - .3 No installation of waterproofing shall be performed if concrete surfaces have not cured for a minimum of 30 days
 - .4 No installation of plants shall be performed if temperatures below 13°C or above 25°C
- .2 The General Contractor must ensure the area to be waterproofed or treated is ready to receive treatment. Basin shall be clean of stains, debris and dirt, free from cracks in excess of 5 mm (1/4"), and shall be free from protrusions, holes or uneven concrete or mortar greater than 10 mm (1/2"). The wall shall be free of honey combing and spalling. Tolerance to imperfections in concrete work and structural wall must at least meet those outlined in Division 03 and Division 04.
- .3 Protection: Temporary protection of the waterproofing shall be provided by the General Contractor to prevent mechanical damage or damage from spillage of oil or solvents until such time as permanent protection is provided.
- .4 Post installation treatment of the plants
 - .1 After the plants are installed in the Biofilter, the General Contractor must ensure the building temperature remains between 13°C and 25°C

- .2 The Biofilter Vendor may cover the Biofilter with plastic for up to two weeks after installation of the plants is complete to facilitate establishment of plants.
- .3 The General Contractor shall ensure that air is not drawn through the Biofilter for 3 weeks after the installation of the plants
- .5 The installation of the plants is to occur no earlier than 3 weeks before substantial completion of the building
 - .1 If the installation of plants occurs earlier than 3 weeks before the actual substantial completion of the building, the General Contractor agrees to pay the Vendor an additional \$XXX per month or fraction thereof, for the additional maintenance of the system.
 - .1 This time will be calculated as the actual date of substantial completion of the building minus the date of completion of the planting of the Biofilter minus 21 days.
 - .2 The Biofilter is planted when 75% of the wall is covered with plants.

1.11 WARRANTY

- .1 Biofilter Vendor warrants that the equipment manufactured and services furnished are free from defects in material and workmanship under normal use and service and, without charge, equipment found to be so defective in material or workmanship will be repaired or replaced, if written notice of failure is received by Vendor within one (1) year after substantial completion, provided said equipment has been operated in accordance with Vendor's instructions and provided such defects are not due to abuse, power failure, fire or decomposition by chemical or galvanic action.
- .2 Biofilter Vendor warrants all vegetation for one (1) year from the date of substantial completion provided all maintenance requirements have been conducted as per this specification and carried out by personnel recognized by the Vendor as part of the general contract for the Biofilter which covers the maintenance requirements outlined in this specification and provided said plants has been maintained in accordance with Vendor's instructions and provided such failure is not due to abuse, power failure, fire or decomposition by chemical action, extreme temperature or lack of light.
- .3 The Biofilter Vendor warrants the growing medium for five (5) years from substantial completion allowing for a 10% degradation of the material per year, provided all maintenance requirements have been conducted as per this specification and carried out by a Nedlaw Living Walls Inc. recognized personnel under a maintenance service contract covering the maintenance requirements outlined in this specification and provided said plants has been maintained in accordance with Vendor's instructions and provided such failure is not due to abuse, power failure, fire or decomposition by chemical action, extreme temperature.
- .4 In the event that any work is required on any component of the building under, behind or above the Biofilter system, including the waterproofing, any removal and replacement of the Biofilter system must be performed by a Nedlaw Living Wall Inc approved personnel and will be an extra to the maintenance contract covering the maintenance requirements outlined in this specification.

Products**1.12 Vendor**

- .1 Ensure the Vendor has a minimum of 5 years experience in manufacturing components similar to or exceeding requirements of project.
- .2 The Vendor will submit documentation clearly indicating legal right to use proprietary technologies included in this project.
- .3 PREFERRED Vendor

Nedlaw Living Walls
232B Woolwich St. S
Breslau, ON N0B 1M0
519-648-9779

1.13 MATERIALS

- .1 Biofilter materials are specified elsewhere in related Sections:
 - .1 Internal Air Diffusers
 - .2 Growth Media
 - .3 Plants

Part 2 Execution**2.1 INSTALLERS**

- .1 Experienced and qualified installers to carry out installation and planting of Biofilter work.

2.2 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

2.3 EXAMINATION

- .1 Examine conditions, substrates and work to receive work of this Section.
- .2 The Vendor of the Biofilter will meet with the necessary parties at the jobsite to review and discuss project conditions and co-ordination of the placement of Biofilter components and plant materials.
 - .1 Inform General Contractor of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation after receipt of written approval from General Contractor.

- .3 Verification of Conditions:
 - .1 Verify that:
 - .1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of Biofilter.
 - .2 The General Contractor must ensure the area to be waterproofed or treated is ready to receive treatment. Basin shall be clean of stains, debris and dirt, free from cracks in excess of 5 mm (1/4"), and shall be free from protrusions, holes or uneven concrete or mortar greater than 10 mm (1/4"). The wall shall be free of honey combing and spalling. Tolerance to imperfections in concrete work and structural wall must at least meet those outlined in Division 03 and Division 04.
 - .3 Field conditions are acceptable and are ready to receive work.
 - .4 Built-in items are in proper location, and ready for roughing into Biofilter work.
 - .2 Commencing installation means acceptance of existing substrates.

2.4 PREPARATION

- .1 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations.
 - .1 The General Contractor must ensure the area to be waterproofed or treated is ready to receive treatment. Basin shall be clean of stains, debris and dirt, free from cracks in excess of 5 mm (1/4"), and shall be free from protrusions, holes or uneven concrete or mortar greater than 10 mm (1/2"). The wall shall be free of honey combing and spalling. Tolerance to imperfections in concrete work and structural wall must at least meet those outlined in Division 03 and Division 04.
- .2 Establish and protect lines, levels, and coursing.
- .3 Protect adjacent materials from damage and disfiguration.

2.5 CONSTRUCTION

- .1 Supply labour, materials, plants, tools and equipment to complete the Work as shown on the Architectural Drawings as specified herein including, but not limited to the following:
 - .1 Supply metal basin (if required)
 - .2 Waterproofing of structural wall and basin.
 - .3 Internal air diffuser and support system mounted to structural wall.
 - .4 Connection to building return air system if required (return air system by Division 23 05 05)
 - .5 Supply built in fans to draw air through Biofilter (if required)
 - .6 Installation of growing medium
 - .7 Installation of aspects of water circulating system

- .8 Installation of plant material
- .2 Waterproofing of wall
 - .1 Structural Wall onto which single sided Biofilters are mounted will be covered with water tight metal panels by Biofilter Vendor.
 - .1 A layer self-adhesive SBS modified bitumen membrane may be installed to act as a galvanic barrier.
- .3 Biofilter basin
 - .1 Cement base (provided by Division 03 30 00) to be waterproofed by Biofilter Vendor with liquid membrane in accordance with manufacturer's instruction
 - .2 Options:
 - .1 **Either:** Basin shall have two levels
 - .1 Immediately adjacent the structural wall (to +/- 800 mm (+/- 32") in front of structural wall) shall be lower and act as a collection basin for the water circulating through system.
 - .2 A separate higher level (from +/- 800 mm to 1500 mm (32" to 60") in front of structural wall) shall have drain connected to sewer by Division 22 13 17.
 - .1 Drain to sewer shall be installed flush with bottom of raised section
 - .2 Sloped towards drain (+ 5%)
 - .3 Drain shall have trap
 - .4 To be confirmed by Architect and Mechanical Consultant
 - .3 Both levels of the basin shall be covered by entrance way grating by Division 09.
 - .2 **Or :** Single basin (to +/- 1500 mm (60")) in front of structural wall)
 - .1 Basin shall act as a collection basin for the water circulating through system.
 - .2 This basin may be raised or recessed relative to finished adjacent flooring
 - .3 Area surrounding basin (+/-1500 mm (60")) should be tolerant of moisture and slip resistant
 - .3 NOTE: Depth of these basin(s) is determined by placement of circulating pumps. Circulating pumps may be installed as follows:
 - .1 **Either:** Submerged within basin (by Division 22 10 10).
 - .1 Typically 450 mm (18") of depth is required
 - .1 To be confirmed Mechanical and Vendor
 - .2 A pit (typically 1000 mm long by 800mm wide by 450mm deep (40"x 32" x 18")) may be installed to accommodate pumps rather than a single flat bottom
 - .2 **Or:** Installed in separate space, connected to Biofilter (by Division 22).
 - .4 Internal air distribution system

- .1 A series of perforated internal vertical diffusers at +/- 400 mm (16") intervals shall be mounted as panels to structural wall with biological inert fasteners.
 - .2 Horizontal Manifolds will collect air from the vertical ducts at the top of Biofilter for Biofilters less than 6 m in height
 - .1 Manifolds are typically located on every floor of multi-floor Biofilters
 - .3 **Either:** the Biofilters are connected to HVAC
 - .1 Connection points to the building's HVAC shall be installed in the manifold(s) associated with the Biofilter
 - .2 Moisture tolerant ducts from the return system of the building HVAC extending at least 150 mm (6") into the Biofilter from the structural wall to be provided by Division 23 05 01
 - .1 Connecting ducts shall have a slope of at least -5° towards Biofilter
 - .2 Connection ducts shall be designed not to exceed air speeds of 5 m/s.
 - .3 Dimensions and placement of connection duct determined by Mechanical consultants and agreed to by Biofilter Vendor.
 - .4 **Or :** The Biofilters are Stand alone
 - .1 The Biofilter may be stand alone (not directly connected to the HVAC) in terms of its air handling
 - .1 To be determined by Mechanical Consultant
 - .2 Air shall be drawn through Stand Alone Biofilter by built-in fan(s)
 - .1 Fans shall be mounted into horizontal manifold of Biofilter
 - .1 Used to create negative pressure within Biofilter duct work
 - .2 Expel air into space surrounding wall
 - .3 No ductwork from the Biofilter will be provided by the Vendor to diffuse the cleaned air into the space
 - .4 Typically install one FANTECH, Fade 12-4 fan for every 10 to 20 m² of Biofilter
 - .1 To be confirmed with Biofilter Vendor and Mechanical consultant
 - .2 Speed controller for fan(s) to be provided by Biofilter Vendor
 - .3 May be controlled by BAS
 - .5 The size and spacing of the diffusers, the perforations and dimensions of the manifolds will ensure even air flow through the face of the Biofilter
 - .1 Maximum flow rate through Biofilter will be 0.07 m/s
 - .2 Pressure drop between the interior of the manifolds and the room housing the system will not exceed 0.2" of water.
 - .6 All manifolds and plenum must be constructed of inert material such as marine grade aluminium and must have structural strength to support the planted rooting media (+/- 70 kg per square metre (16 lbs per square foot)).
- .5 Rooting media

- .1 Rooting material used in this work will be TBS supplied by Nedlaw Living Walls Inc..
 - .2 The rooting media will be fixed to the crests the diffusers using suitable fasteners such as stainless steel pins or screws.
 - .3 The rooting material will be installed as two layers, each +/- 25 mm (1") thick.
- .6 Water system
- .1 The Biofilter will function as a vertical hydroponic garden.
 - .2 The basin will
 - .1 **EITHER:** Function as a collection pool for the circulating water.
 - .1 Water from this basin will flow to water reservoir located elsewhere.
 - .1 Connections and reservoir by Division 22
 - .2 Submersible or inline pumps will circulate the water (by Division 22 10 10).
 - .3 Overflow from reservoir shall be provided to sewer (by Division 22 13 17)
 - .4 Size of reservoir to be determine by Mechanical consultant and Biofilter Vendor
 - .2 **OR:** Function as a reservoir for the circulating water.
 - .1 Submersible or inline pumps (by Biofilter Vendor) will circulate the water
 - .3 Basin possess an overflow with stand pipe (WATTS FD-WD 100 or 200 or equivalent) (by Division 22 13 17) connected to the sanitary sewer.
 - .1 Location of the overflow to be confirmed with Biofilter Vendor and Mechanical consultant.
 - .2 Drain shall have a trap.
 - .3 The higher section of the basin(s) (if present) will function as an overflow; an additional catchment for drips from the Biofilter and a trap to prevent materials from adjacent floor from entering the Biofilter as described in Section 2.5.3.2.1.2
 - .4 The circulating system will lift the water from basin or reservoir to a emitter-pipe at top of Biofilter.
 - .5 An emitter-pipe, on top of the media, will deliver water evenly across the width of the rooting media,
 - .1 The water trickles down evenly through the interior of the Biofilter at a rate of ___ litres per minute. (+/- 6 litres per minutes for each metre of horizontal width of the Biofilter).
 - .6 The nutrients for the plants will be supplied via the circulating water.
 - .7 All plumbing must be inert.
 - .1 Copper piping and fittings are to be avoided for all components within the Biofilter.
 - .2 Piping within the Biofilter and used in association with pumps and reservoirs will be IPEX schedule 40 CPVC with solvent welded joints and fittings.

- .8 Water levels in reservoir
 - .1 **IF** basin is connected (by Division 22) to a reservoir located elsewhere.
 - .1 A system to provide make-up water to reservoir shall be provided by Division 22
 - .2 **ELSE** a system to provide make-up water to Biofilter Basin shall be provided by Vendor
 - .3 Water levels in the reservoir (if present) and basin shall be monitored by the BAS using ultrasonic levels sensors or mechanical floats sensors (connected to BAS by Division 23).
- .9 Two pumps will circulate the water in a lead-lag configuration (72h/24h duty cycle).
 - .1 Pumps shall be provided by Vendor unless located remotely
 - .1 To be confirmed by Mechanical, Architect and Biofilter Vendor
 - .2 Pumps shall have inert internal components such as stainless steel.
 - .3 Pump status sensors shall be installed by Biofilter Vendor
- .10 Water line connecting the pumps located elsewhere to the Biofilter shall be PEX or equivalent, and embedded in the structural wall supporting Biofilter (by Division 22)
 - .1 PEX shall terminate in the basin +/- 400 mm (16") from bottom of basin.
 - .1 Exact position and termination to be coordinated with Biofilter vendor
- .11 Each system shall be serviced with a 15 mm (¾") domestic cold water line with the following:
 - .1 A backflow preventer will be installed by Division 22.
 - .2 A shut off valve in an easily accessible area adjacent to the Biofilter or water reservoir (if present) by Division 22
 - .3 Capped with at least a 300 mm(12") stub and ¾" socket weld x ¾" FIP fitting. Located within Biofilter or adjacent water reservoir (if present) by Division 22.
 - .1 Location of termination shall be confirmed by Biofilter Vendor.
- .12 Desalinating of the water in each reservoir shall be completed by one of the following approaches
 - .1 **Either:** Activation of solenoid (installed by Biofilter Vendor) by BAS shall divert regulated amount of water from pump down the sanitary sewer at variable intervals.
 - .1 The water make-up system will make up the loss volume.
 - .2 **OR:** Activation of solenoid (installed by Biofilter Vendor) by BAS shall divert regulated amount of DCW water into reservoir at variable intervals.
 - .1 The excess water will overflow down sewer.
- .13 A water (DCW) line (installed by Division 22) is connected to the circulating pumps through an electronic solenoid regulated by BAS. This solenoid will become active in case of failure of both pumps.

- .1 Water line requires a Backflow preventer
- .14 All pipes and conduits which penetrate the basin or the Biofilter must be in place before the area is waterproofed.
- .15 All valves and solenoids installed by Vendor will be identified with tags by Vendor. All other valves and solenoids shall be identified and tagged by Division 22.
- .16 All pumps, electrical connection solenoids and controller systems located outside the Biofilter are to be supplied by others unless noted within this scope of work.
- .7 Cleaning indoor air
 - .1 Vendor shall provide a Biofilter with the following characteristics
 - .1 Air flow
 - .1 The wall shall have the capacity to move up to 20 cfm of air per square foot of Biofilter (0.1 cubic metre of air per square metre of Biofilter per second) with a pressure drop of 0.3"
 - .2 Typical flow of air through the Biofilter shall be 10 cfm of air per square foot of Biofilter (0.05 cubic metre of air per square metre of Biofilter per second) with a pressure drop of 0.1".
 - .3 Flow of air across the face of the Biofilter excluding areas adjacent horizontal manifolds shall not vary 20% from the prescribed rates.
 - .4 Target flow rates through the Biofilters will be determined by the Mechanical consultants and confirmed by Vendor.
 - .2 Contaminant Removal
 - .1 The Biofilter shall remove at least 50% of the air borne non-halogenated Volatile Organic Compounds per pass through the wall with air flux of 0.05 cubic metre of air per square metre of Biofilter per second.
 - .2 Removed contaminants shall be biologically oxidized within the Biofilter and shall not accumulate in the system.
- .8 Plants
 - .1 The plants to be added will be pre-grown in pots.
 - .2 Plants will be bare rooted and transplanted into the rooting matrix.
 - .3 The plants are selected for the following criteria
 - .1 Their ability to influence the performance of the Biofilter
 - .2 Their tolerance of the growth conditions of the hydroponic Biofilter
 - .3 Their ability to grow under the indoor conditions housing the Biofilter.
 - .4 The General Contractor is to provide the date for planting to the Vendor, 4 weeks in advance of the event. The Vendor must be notified 3 weeks prior to the date, if the General Contractor needs to modify planting date.
- .9 Lighting (By Division 26) (If Required)

- .1 Supplemental lighting shall raise the light level to a minimum of 125 FC typically using metal halide lamps.
- .2 Lamps should be focused to give the desired light intensity +/- 700 mm (28") in front of structural wall.
 - .1 Focus plan to be confirmed by Biofilter Vendor.
- .10 Lighting Controls (By Division 26) (If required)
 - .1 **EITHER:** Supplemental lighting control shall be based upon DAY LIGHT INTEGRAL (DLI).
 - .1 Depending on the size of the Biofilter, the Biofilter shall be divided into zones, each controlled separately.
 - .1 Each zone shall be monitored by a Pyranometer located in mid section of zone and +/- 700 mm (28") in front of structural wall.
 - .1 Position to be coordinated with Biofilter Vendor
 - .2 Each Pyranometer shall be individually interfaced with control system.
 - .3 Control system shall monitor daily accumulated light energy for each zone (DLI).
 - .4 If the daily value is below user input DLI value, supplemental lights associated with that zone shall be activated at a user defined time of day until target DLI is obtained
 - .2 **OR:** Supplemental lighting control shall be based upon time of day
 - .1 Typically 12 hours per day
- .11 Finishing of adjacent areas (by Others)
 - .1 Finishing of areas adjacent to the Biofilter shall be tolerant of moisture and humidity levels typically associated with interior plantscape

2.6 SITE TOLERANCES

- .1 Tolerances in notes to CSA-A371 apply.

2.7 FIELD QUALITY CONTROL

- .1 Site Tests, Inspection:
 - .1 Perform field inspection and testing in accordance with Section 01 45 00 - Quality Control.
 - .2 Notify inspection agency a minimum of 72 hours in advance of requirement for tests.

- .2 Vendor's Services:
 - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, and protection of its products, and submit written reports in acceptable format to verify compliance of work with Contract.
 - .2 Vendor's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
 - .3 Schedule site visits to review work at stages listed:
 - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
 - .2 Upon completion of work, after cleaning is carried out.
 - .4 Obtain reports within three days of review and submit immediately to General Contractor.

2.8 CLEANING

- .1 Clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Clean to consultant's approval, soiled surfaces, spatters, and damage caused by work of this section.
 - .2 The General Contractor shall check area drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site prior to the commencement of work.
- .2 Final Cleaning:
 - .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
 - .2 The Biofilter Vendor shall check area drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site during work and after completion of work.
 - .3 Waste Management: separate waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management.
 - .4 Divert unused or damaged components from landfill as specified in Section 01 74 19 - Construction/Demolition Waste Management.

2.9 PROTECTION

- .1 Temporary protection of the waterproofing shall be provided by the General Contractor to prevent mechanical damage or damage from spillage of oil or solvents until such time as permanent protection is provided.
- .2 Air Temperature Protection: protect completed masonry as recommended in 1.10 SITE CONDITIONS.

END OF SECTION