STANDARD SPECIFICATION FOR "CATCHBASIN INSERT" (CBI) STORMWATER QUALITY TREATMENT DEVICE WITH THIRD–PARTY TESTED TSS AND GROSS SOLIDS REMOVAL PERFORMANCE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, designing, maintaining, and installing a catchbasin insert (CBI) device for stormwater quality treatment into a new or existing catchbasin, **specifically a CBI device that has been third–party tested for Total Suspended Solids (TSS) and Gross Solids (GS) capture and retention capability.** Work includes supply and installation of the catchbasin Insert technology on the project site.

1.2 IDENTIFICATION

The installer shall inspect the project plans and/or worksite to determine the quantity of each drainage structure casting type. The foundry casting number, exact grate size and clear opening size, or other information that will be necessary to finalize the CBI design and dimensions. This information will be sent to Info@enviropod.com for sizing of the CBIs.

Alternatively, the installer is to follow the instructions detailed in the measure up video (https://www.youtube.com/watch?v=qd5rhjt0jPA) and send the photos to Info@enviropod.com for sizing of the CBIs.

All CBIs are to be shipped to the installer and configured precisely to fit the identified drainage structure.

1.3 NEW CATCHBASIN INSTALLATION

If new catchbasins are to be installed with the project the following installation requirements are recommended to allow simple installation of the CBIs.

1.3.1 Catchbasin Installation Requirements:

1. Catchbasins shall be installed to manufacturer's specifications.
2. Catchbasins to be installed in accordance with all local, regional, provincial and federal regulations.
3. Catchbasin outlets need to be at least 700 mm below grade level.
4. Catchbasins shall be installed with no protruding pipe elements.
5. Precast Catchbasin riser sections shall be in line with frame and grate.
6. For curbside catchbasins, the frame shall be flush with the curb line.
7. For curbside catchbasins, the back opening shall be in line with the catchbasin frame.
8. Catchbasin sump shall be unobstructed and clear of pipework.
9. Catchbasins shall have a 100 mm diameter outlet or larger.
10. Any channel drains or roof drainage that is to be treated shall be connected to the center of either the side or front face of the catchbasin and have an invert level no lower than 300 mm below the grate.

If any of the above requirements cannot be achieved, alterations to the catchbasin or the CBI may be required. In such incidences photos of the catchbasin should be taken as per alternative identification procedure in Section 1.2 and sent to Info@enviropd.com for advice.

PART 2 – PRODUCTS

2.1 GENERAL

The CBI shall be comprised of the following components: support system, plastic seals, flow diverter, gross solids basket, energy dissipator, and adjustable bypass.

The sumped catchbasin with CBI shall employ three treatment processes:

1. Screening to capture gross solids
2. Flow distribution to enhance settling of TSS
3. Energy dissipation to minimize resuspension and washout of previously captured TSS

2.2 Component Materials and Performance

2.2.1 Seals and Flow Diverter

Seals shall be installed to seal the catchbasin, ensuring all particles greater than 5 mm are diverted into the CBI. The seals shall be manufactured of a suitable plastic that retains the physical and chemical properties within a temperature range of –20C to +40C.

The flow diverter shall ensure all flow enters the CBI, without bypass. The flow diverter shall be manufactured of a suitable plastic that retains its physical and chemical properties within a temperature range of –20C to +40C.

2.2.1 Support System

The support system shall be used to mount the CBI in the catchbasin. The support system shall be manufactured of a suitable material that retains its physical and chemical properties within a temperature range of –20C to +40C.

The design and material employed in the support system shall be capable of supporting the CBI when full of fine sediment (sediment bulk density of 1602 kg/m^3) and conveying the peak design flow for the catchment draining to the catchbasin.

The support system shall have finite element analysis (FEA) or other structural calculations performed to confirm the strength claim of the support system.

2.2. The Gross Solids Basket and Energy Dissipator

The CBI shall be designed with a gross solids basket (basket) to screen gross solids over 5 mm in diameter and store these pollutants above the permanent water level of the catchbasin.

The basket shall be designed to allow removal by hand when full and allow clear access to the catchbasin sump when removed.

The basket shall be designed and constructed of a suitable material to prevent expansion and must maintain a secondary flow path to accommodate design bypass flows.

The basket shall be manufactured of a suitable material that retains its physical and chemical properties within a temperature range of –20C to +40C.

The CBI shall be designed and manufactured with an energy dissipation mechanism to reduce the velocity of flow entering the catchbasin.

Adjustable Bypass
The CBI shall be designed and manufactured with an adjustable flow bypass mechanism. The flow bypass shall allow up to 300% of the catchbasin design flow to be bypassed when installed. The Engineer of Record shall specify the minimum bypass capacity of the CBI.

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The CBI shall have third-party independent testing of the pollutant removal capabilities

The CBI shall remove sediment and gross pollutants from stormwater runoff during frequent wet weather events and retain these pollutants during less frequent high flow wet weather events for later removal during maintenance.

The Manufacturer shall have at least twenty (20) years of experience and history of success in engineering design, manufacturing, and production and supply of stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 HYDROLOGY AND RUNOFF VOLUME

The catchbasin and CPI device shall be sized to treat a minimum of 90 percent of the average annual runoff volume, unless otherwise stated by the Engineer of Record, using historical rainfall data. Rainfall data sets should be comprised of a minimum 15-years of rainfall data or a longer continuous period if available for a given location, but in all cases a minimum 5-year period of rainfall data.

3.3 ANNUAL GROSS SOLIDs LOAD AND STORAGE CAPACITY

The CBI device shall have enough storage capacity for the calculated annual gross solids (GS) load and volume, without scouring previously captures pollutants prior to maintenance being required. Gross solids are to be stored above the permeant water level in the catchbasin, and in a manner that allows removal by hand.

The annual GS load and volume transported from the drainage area shall be calculated and compared to the CBI gross solids storage capacity by the Engineer of Record to ensure adequate capacity between maintenance cycles (> 6 months).

Gross solids loading shall be determined by land use and defined as a minimum of 3.5 m^3 of gross solids per impervious hectare of drainage area per year, or greater.

3.3 ANNUAL (TSS) SEDIMIMENT LOAD AND STORAGE CAPACITY

The catchbasin with the CBI device installed shall have enough storage capacity for the calculated annual total suspended solids (TSS) mass load and volume, without scouring previously captured pollutants prior to maintenance being required.

The annual (TSS) sediment load and volume transported from the drainage area shall be calculated and compared to the sump volume of the catchbasin with the CPI device by the Engineer of Record to ensure adequate capacity between maintenance cycles.

Sediment loadings shall be determined by land use and defined as a minimum of 450 kg of sediment (TSS) per impervious hectare of drainage area per year, or greater, based on land use, as noted in Table 1 below.

Annual sediment volume calculations shall be performed using the projected average annual treated runoff volume, a typical sediment bulk density of 1602 kg/m^3 and an assumed Event Mean

Concentration (EMC) of 125 mg/L TSS in the runoff, or as otherwise determined by the Engineer of Record.

Example calculation for a 1000 m^2 (0.1 hectare) catchbasin drainage area in a parking lot site:

- 1.28 meters of rainfall depth, per year
- 1000 m^2 of 100% impervious drainage area
- EMC of 125 mg/L TSS in runoff
- Treatment of 90% of the average annual runoff volume
- Target average annual TSS removal rate of 50% by CBI

Annual Runoff Volume:

- 1.28 m rain depth x 0.1 ha x 10,000 m^2/ha= 1280 m^3 of runoff volume
- 1280 m^3 x 1000 L/m^3 = 1,280,000 L of runoff volume
- 1,280,000 L x 0.90 = 1,152,000 L to be treated by CBI unit

Annual Sediment Mass and Sediment Volume Load Calculation:

- 1,152,000 L x 125 mg/L x kg/1,000,000 mg = 144 kg annual sediment mass
- 144 kg x m^3/1602 kg = 90 L annual sediment volume in runoff
- 90 L x 50% TSS removal rate by CPI = 45 L minimum expected annual storage requirement in catchbasin with the CBI installed.

As a guideline, the U.S. EPA has determined typical annual sediment loads per drainage area for various sites by land use (see Table 1). Certain States, Provinces and local jurisdictions have also established such guidelines.

Table 1 – Annual Mass Sediment Loading by Land Use

	Commercial	Parking Lot	Residential			Highways	Industrial	Shopping Center
			High	Med.	Low			
(lbs./acre/yr.)	1,000	400	420	250	10	880	500	440
(kg/hectare/yr.)	1,124	450	472	281	11	989	562	494

Source: U.S. EPA Stormwater Best Management Practice Design Guide Volume 1, Appendix D, Table D–1, Burton and Pitt 2002

3.4 SIZING METHODOLOGY

The CBI device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 50% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in Table 2, Section 3.5, and based on third-party performance testing in accordance with the Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. Sizing shall be determined using historical rainfall data (as specified in Section 3.2) and a sediment removal performance curve derived from the actual third-party laboratory testing data.

The catchbasin with the CBI device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 3.3.

If an alternate CBI device is proposed, supporting documentation shall be submitted that demonstrates:

- Third-party performance testing for TSS and Gross Solids removal.
- Equal or better sediment (TSS) removal of the PSD specified in Table 2 at equivalent surface loading rates, as compared to the CBI device specified herein.
- Equal or better gross solid removal and retention when tested with the Caltrans Test Trash mixture with a composition as detailed in table 3 at a surface loading rate of 2500 l/min/m^2 for the design catchbasin, as compared to the CBI device specified herein.

- Equal or greater sediment storage capacity, as compared to the catchbasin and CBI device specified herein.
- Equal or greater gross solids storage capacity, as compared to the CBI device specified herein.
- Supporting documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.5 PARTICLE SIZE DISTRIBUTION (PSD) FOR SIZING

The CBI device shall be sized to achieve the Engineer-specified average annual percent sediment (TSS) removal based solely on the test sediment used in the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** This test sediment is comprised of inorganic ground silica with a specific gravity of 2.65, uniformly mixed, and containing a broad range of particle sizes as specified in Table 2. No alternative PSDs or deviations from Table 2 shall be accepted.

Table 2
Canadian ETV Program Procedure for Laboratory Testing of Oil-Grit Separators
Particle Size Distribution (PSD) of Test Sediment

Particle Diameter (Microns)	% by Mass of All Particles	Specific Gravity
1000	5%	2.65
500	5%	2.65
250	15%	2.65
150	15%	2.65
100	10%	2.65
75	5%	2.65
50	10%	2.65
20	15%	2.65
8	10%	2.65
5	5%	2.65
2	5%	2.65

3.6 GROSS SOLID CAPTURE AND RETENTION TESTING

The CBI device shall be independently tested for gross solids capture and retention. The CBI device shall be tested with the Caltrans Test Trash mixture as detailed in Caltrans document **Laboratory Testing of Gross Solids Removal Devices** – CTSW-RT-05-73-18.1 and as listed in Table 3. The CBI must be tested for gross solids capture and retention at a minimum catchbasin surface loading rate of 2500 l/min/m^2 and be held at this flow rate for a minimum of 1 hour. The CBI must be preloaded to 85% of the gross pollutant storage capacity for the 1-hour test.

Table 3
Caltrans Trash (Gross Solid) Composition
From
Laboratory Testing of Gross Solids Removal Devices – CTSW-RT-05-73-18.1

Component	Description	Dimensions	% by Mass
Cigarette Filter	OCB regular cigarette filters 9.15 g/100 filters Bulk density = 900 filters/1L	7 mm diameter x 15 mm	14
Newspaper	Standard news print sheet cut in strips	28 cm x 5 cm	17
Wood	Popsicle sticks	11 cm x 0.95 cm x 0.2 cm	11
Plastic-Moldable	10 oz. PETE plastic cup cut in strips	9 cm x 2.5 cm	23
Plastic-Film	Plastic shopping bag split in half and cut in strips	40 cm x 8 cm	8
Cardboard/Chipboard	Cardboard box cut in strips	23 cm x 2.5 cm	10
Cloth	Cotton linen fabric cut in strips	35 cm x 5 cm	6

Metal – Foil, Molded	Aluminum drink can cut in strips	10 cm x 2.5 cm	7
Styrofoam	Standard "S"-shaped peanut packing material	3 mm x 3.5 mm x 1.5 mm	4

3.6 SCOUR TESTING

The CBI device shall be third-party tested for scour resistance in accordance with the scour testing provisions within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. This scour testing is conducted with the device pre-loaded with test sediment comprised of the particle size distribution (PSD) illustrated in Table 2.

To be acceptable, the CBI device must demonstrate an average scour test effluent concentration less than 20 mg/L at each surface loading rate tested, up to and including 2500 L/min/m^2.

Data generated from laboratory scour testing performed with a CPI device pre-loaded with a coarser PSD than in Table 2 shall not be acceptable for the determination of the device's suitability for on-line installation.

3.7 DESIGN ACCOUNTING FOR BYPASS

The CBI device shall be specified to achieve the TSS removal performance and water quality objectives without washout of previously captured pollutants.

The CBI device shall have sufficient hydraulic conveyance capacity to convey the peak storm event, in accordance with hydraulic conditions per the Engineer of Record with a minimum safety factor of 3 to allow for partial blockage.

If an alternate CPI device is proposed, supporting documentation shall be submitted that demonstrates equal or better hydraulic conveyance capacity as compared to the CBI device specified herein. This documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.10 SURFACE LOADING RATE SCALING OF DIFFERENT MODEL SIZES

The reference device for scaling shall be a CBI device that has been third-party tested. Other model sizes of the tested device shall only be scaled such that the claimed TSS removal efficiency of the scaled device shall be no greater than the TSS removal efficiency of the tested device at identical **surface loading rates** (flow rate divided by settling surface area).

PART 4 – INSTALLATION

4.1 HEALTH AND SAFETY

A Site-Specific Safety Plan for installation must be prepared before undertaking any installation or maintenance. Personal Protection Equipment (PPE) is required when installing or maintaining a LittaTrap™. Standard PPE includes gloves, long sleeves, long pants, Hi-Viz clothing and closed shoes.

4.2 CATCHBASIN PRE-CLEANING

Catchbasins shall be pre-cleaned before installation of CBIs. The requirements of the pre-cleaning are as follows:

1. Catchbasins shall be cleaned using a "Vactor Truck" or other such vacuum pump machinery.
2. All solidified material within the Catchbasin shall be broken out and removed.
3. All debris inside the Catchbasin shall be removed.
4. All water shall be removed.

4.3 CBI Installation.

The manufacture shall supply an installation manual and/or other guidance media. For an example, please see https://www.enviropod.com/products/littatrap. The contractor shall follow all instructions, including the sequence for installation as detailed in the manufacturer's installation manual.

Once installed, the CBI shall not cause the catchbasin grate to protrude above the road surface level to ensure no trip or other hazards are created from the installation.

PART 5 – INSPECTION & MAINTENANCE

The CBI manufacturer shall provide an Owner's Manual upon request. The catchbasin and the CBI are to be inspected every 3 months during the first year of operation to determine seasonal and annual maintenance requirements

CBI enhanced catchbasin maintenance involves two activities:

1. Routine removal and emptying of the gross solids
2. Periodic vacuum of oils and sediment from the catchbasin sump.

A Quality Assurance Plan that provides inspection and maintenance for a minimum of 5 years shall be included with the CBI stormwater quality device and written into the Environmental Compliance Approval (ECA) or the appropriate State/Provincial or local approval document.

The CBI device and catchbasin inspection shall include determination of sediment depth in the catchbasin sump and volume retained in the gross solids basket. Inspection shall be conducted from finished grade by removing the catchbasin grate.

Gross solid pollutants will be removed as a periodic maintenance practice. Gross solids will be removed by hand or by using a standard maintenance truck and vacuum apparatus

Pollutant removal from the catchbasin sump shall be conducted as a periodic maintenance practice using a standard maintenance truck and vacuum apparatus and shall be easily conducted from finished grade.

No confined space entry shall be required for sediment removal or inspection of internal components under normal operation, annual inspection or maintenance activity.