

708 – Sediment Traps & Basins

708.03 Floating Outlet – “Skimmer” (Dewatering Device)

Definition:

A floating outlet (skimmer) is a dewatering device for temporary wet or dry sediment basins (708.02) and meets the requirement to withdraw from the surface of the water column (the least sediment-laden water).



Orifice holes in a permanent outlet structure of a stormwater basin have been temporarily plugged to implement the floating outlet.

Exhibit 708.03-A.
Source: IDEM

Purpose:

- Floating outlets allow for water to be drained from the surface of the water column, ensuring the most turbid water to be retained longer which provides better sediment removal.
- Floating outlets have better sediment removal efficiency than Perforated Riser Outlet (708.04) or Rock Horseshoe (708.05) dewatering devices that do not withdraw water from the surface of the water column.

Limitations for Use:

- The SWP3 needs to provide alternative dewatering practices if the project anticipates using the floating outlet during freezing conditions. Measures that are not as impacted by freezing conditions are Perforated Riser Outlet (708.04) or Rock Horseshoe (708.05).
- Floating outlets are unlikely to be used from November 1st to March 1st due to the high potential for freezing conditions and alternative practices should be specified. The time periods may need to be adjusted according to the project location in the state.

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Specifications:

Design Considerations:

Floating outlets can be implemented with the permanent basin outlet structure. In the event the permanent spillway does not have an appropriate outlet structure, then a temporary outlet structure/riser pipe will need to be installed/implemented to facilitate the use of a floating outlet.

Discharge Capacity:

The floating outlet should meet requirements for Temporary Sediment Basins (708.02).

$$\frac{\text{Dewatering zone volume}}{\text{Dewatering time}} = \text{Required flow rate of skimmer}$$

$$\frac{\text{Dewatering zone volume}}{\text{Dewatering time}} = \text{Required flow rate of floating outlet}$$

Floating Outlet Considerations:

- Pipe Size: Typical pipe sizes range from 1½ inches to 8 inches in diameter. Additional holes in the larger pipe allow more flow.
- Orifice Location: The orifice is best located near the floating perforated inlet area which will provide a constant head pressure to facilitate the calculation of the discharge rates and dewatering time. This location will also provide for a larger orifice diameter (larger orifices are less likely to clogging). The orifice can also be located in the outlet pipe. Head pressure will fluctuate as the basin dewateres and appropriate methodology is needed to calculate the dewatering time.
- In general, the larger the orifice holes the lower the clogging potential. Clogging with floatable debris is a significant concern of this device.
- Best to locate floating outlet devices where they can be easily accessed to facilitate maintenance activities and to be appropriately tethered or restrained to prevent flexible boom damage.
- Floating boom must be able to freely rise to the maximum pool elevation without breakage.
- Floating boom guides/restraints: The flexible boom of a floating outlet requires restraints to prevent damage from kinking, twisting, breakage, or disconnection of the boom piping. The flexible connection is more prone to damage during cold weather when it can be more brittle and easier to crack or break.
 - Side to side movement prevention: Restraints such as guide bars or rope tethers can prevent damaging side to side boom movements.
 - Back bending prevention: When there is a need to prevent back bending a landing device such as an aggregate pad, concrete block(s), gabion baskets (minimizes aggregate cleanup efforts) or fabricated props can be specified. This will prevent cracking or kinking damage to the flexible connection/hose. When guide bars are used a bottom elevation wire could be implemented in lieu of a landing device pads or props.
 - Landing devices are needed prevent the floating inlet and boom from becoming trapped in sediment deposits or plugging of the inlet perforations.

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- Dry or wet pool use considerations:
 - Dry pools: For pooling areas that are designed to completely dewater between run-off events the floating outlet shall be prevented from becoming entrapped in sediment deposits by implementing a landing device under the floating outlet to allow it to rest at the bottom of the dewatering zone elevation.
 - Wet pools: Pooling areas that are designed to have a water filled sediment storage area typically do not require a landing device for the floating head. Implementing a landing device is recommended if a wet basin dries out to prevent back bending damage to the flexible boom connector. Angling floating boom direction towards shallow shoreline areas allows for implementation of a landing device versus pointing the boom out into deeper water areas.
- Freezing Conditions: If ice formation is a concern install boom and inlet at an incline to maintain positive drainage through the device to minimize clogging from ice formation. Temporary landing pads can be used to keep the boom at an incline (not flat) to maintain positive drainage. Prop materials should not inhibit sediment clean out activities and reuse of the materials should be considered in the installation.

Structure Life:

Typically, 2 years or less. Floating outlets are reusable if site conditions are right, are not damaged, and without signs of deterioration/weathering.

Materials:

If using a propriety product follow/see the product required material list or if using the contractor assembled device see exhibit 708.03-E.

Typical Installation:

- For proprietary manufactured devices follow the manufacturer’s recommended installation specifications for the specific floating outlet dewatering device being implemented.
- All floating outlet device joints or connection shall be securely fastened, watertight or glued where required according to the manufacture’s requirements. Install the flexible boom with watertight connections to the basin principal outlet structure depending upon the type of designed basin discharge outlet.
 - When connecting to a permanent basin outlet structure the height may need to be modified and any additional unused orifice holes will require a temporary watertight plug.
 - When the use of the Perforated Riser Outlet (708.04) or Rock Horseshoe (708.05) is anticipated due to land disturbing activities that will not be completed prior to winter weather then install the alternative dewatering device with basin construction but keep it offline until onset of potential freezing time periods.
- Floating outlets are recommended to be restrained to prevent damage from excessive side to side movement that can result in kinking, twisting, cracking breaking or disconnection of the flexible boom connector. Restraint methods such as ropes tied to the floating head anchored to posts on shore or on basin floor or guide bars located along either side of the rigid boom piping to limit side to side movement. When using rope restraints maintain appropriate

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tension and use ropes that float to prevent ropes from being covered or buried by sediment deposits.

- When plans specify more than one floating outlet device install and restrain such that the floating boom structures do not drift into the other’s boom float reach.
- Dry Basin Landing device: Provide a landing device such as an aggregate pad, concrete block(s), gabion baskets (minimizes aggregate cleanup efforts) or fabricated props or other suitable material that will allow the floating outlet to rest at the bottom of the dewatering zone elevation. The landing device is required to keep the floating outlet above sediment deposits and to protect the boom from back bending. For use during potential freezing conditions the top elevation of the landing device shall be slightly higher than the invert of the riser connection to allow for complete device draining to prevent damage from freezing.

Typical Maintenance:

- The floating inlet is designed to drain the dewatering zone in no less than 48 hours and no longer than 72 hours for the minimum required storage volume. If the floating inlet is not performing as required (too fast or too slow) the orifice size and/or inlet hole size or number shall be modified to achieve the design goal/requirement
- For proprietary manufactured devices follow the manufacturer’s recommended maintenance requirements for the specific floating outlet implemented.
- Floating outlets shall be inspected at a minimum weekly, prior to anticipated rain events, and within 24 hours after each run-off event. Floating outlets require vigilant maintenance since malfunction can result in basin failures and/or excessive sediment discharges.
- If flow is restricted, then inspect device for debris clogging and remove any obstructions.
- Where tethered by rope: If basin is not draining properly sometimes a tug on the rope tether will cause the inlet to bob up and down to dislodge clogging debris and restore inflow. Avoid violent yanking on the rope or pulling with machinery to prevent damage to the inlet unit and the flexible connector.
- Floating inlet areas can frequently clog. Ensure that the head is level with water surface. Where excessive floating debris is a concern implement Basin Baffles (708.06) that extend above the pooling elevation to trap floatable debris away from inlet zone.
- Ensure that the floating outlet cannot be stuck in sediment deposits and can freely float with basin fill.
- Excessive back bending of flexible boom: Install support pads or props to prevent boom from back bending lower than the dewatering design elevation. Where guide bars are implemented a, cross wire can be located at the required landing elevation.
- Sediment removal is required when deposits impact proper function of the dewatering device. The landing device elevation must be maintained above the level of sediment deposition.
- If rapid basin sediment buildup occurs near the device boom, implement baffles to trap sediment further away from the device refer to Basin Baffles (708.06).
- If unit does not float check to see that the inlet head, barrel/boom, or ropes are free from sediment deposits or plant growths. Clear sediment, debris, and plants away from device. Also check floating section or floatation devices for sufficient buoyancy and/or for cracking/leaks.
- Check to ensure that the head components, piping, pipe connections and flexible connector are free of cracks, leaks, and deteriorations.

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- Freezing conditions can result in clogging of the inlet and boom. Avoid use of this practice during prolonged cold weather periods. If ice formation is a concern maintain landing device elevation to result in an incline to maintain positive drainage through the device to minimize clogging from ice formation.
- If vandalism is a problem, more frequent inspection may be necessary.
- Make needed repairs immediately.
- Removal: The floating outlet practice shall only be removed when the contributing drainage area has been properly stabilized and no longer contributing sediment-laden run-off or when freezing conditions are anticipated.
- When permanent stormwater basins have been modified to function as a temporary sediment basin and the contributing watershed has been permanently stabilized, remove sediment from the pooling area to meet the basin design requirements, remove all temporary dewatering devices, or features and make functional all required permanent outlet features.

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Exhibit 708.03-B. A floating outlet has been temporarily connected to the permanent outlet structure of a storm water basin for sediment control during the construction phase of this project. The post-construction outlet orifices have been temporarily plugged for the construction phase. Below the floating outlet is a shallow pit that allows the basin to completely dewater such that a landing device was not implemented. Implementing a landing device minimizes the potential for floating inlet and boom becoming trapped/impacted by sediment deposits.

Source: IDEM



Exhibit 708.03-C. A floating outlet is becoming trapped in sediment deposits since a landing device was not implemented. Also, the restraint rope has become entrapped in sediment deposits that will likely not allow the inlet to float. Restrain ropes need to be tight enough to prevent drooping into sediment.

Source: IDEM

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Exhibit 708.03-D

FLOATING OUTLET DEWATERING DEVICE PRACTICE SPECIFICATIONS TABLE

1 Basin No.	2 Emergency Spillway Flow Depth Elevation (ft.)	3 Flexible Hose/Tubing Attachment Elevation (ft)	4 Boom Length* (ft.)	5 Boom Diameter (in.)	6 Orifice Size** (in.)	7 Top of Landing Device Elevation (ft.)	8 Flexible Hose/Tubing Length (ft.)
<p>* Minimum Boom Length = (Elevation Column 2 – Elevation Column 3) x 1.414 (for 45-degree angle)</p> <p>** Must be equal to or less than boom diameter.</p>							

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EXHIBIT 708.03-E

CONSTRUCTION OF THE CONTRACTOR ASSEMBLED FLOATING OUTLET

Construction Notes (see Exhibits 708.03-F and G):

- (1) Flotation section shall be solvent welded to ensure an airtight assembly. Contractor to conduct a test to check for leaks prior to installation. Attaching the perforated outlet pipe to the flotation section will be done in a manner that will not compromise the airtight qualities of the flotation section.
- (2) The attachment bands between the flotation section and the perforated inlet section must allow movement to ensure the flotation section can remain level with the water surface for proper inlet function and to minimize clogging from floating debris.
- (3) Perforated inlet section shall have adequate opening such as 12 rows of ½ inch diameter holes, 1¼ inch on center. To achieve this spacing each row of holes should be offset from the row above and below.
- (4) Boom length: 4-foot-long minimum or by design however longer booms result in less bending damage or wear to the flexible boom connector.
- (5) Flexible pipe: Corrugated non perforated plastic tubing or flexible rubber hose. Secure watertight connectors are required from the discharge outlet to the boom piping.
- (6) Orifice: Install orifice as shown in construction drawings.

Materials:

Typical materials to construct a four (4) inch floating dewatering device (see Exhibits 708.03-E and F). Pipe size will be based upon plan requirements.

- Solid pipe (boom) - 4-inch Schedule 40 PVC.
- Boom length – as shown on the construction drawings.
- Perforated pipe (inlet) - 4-inch Schedule 40 PVC (drilled holes or manufactured perforated pipe according to design or meets design requirements) (Minimum of 12 rows of ½ inch diameter holes, 1¼ inch center to center).
- 90° Tee (1 ea.) - 4-inch Schedule 40 PVC.
- 90° Elbow (2 ea.) - 4-inch Schedule 40 PVC.
- Cap (4 ea.) (for floating head) - 4-inch Schedule 40 PVC.
- Flexible pipe - 4-inch corrugated plastic tubing (non-perforated) or heavy-duty flexible hose.
- Orifice: Orifice location and opening size as show on construction drawings.
- Pipe to corrugated tubing fittings (2 ea.) - Corrugated plastic tubing connection adapter is recommended to connect the tubing to the Schedule 40 PVC boom and a connector compatible to the riser pipe connection. Corrugated connector must provide a strong watertight connection that is not prone to disconnection.
- Attachment bands - Attachment bands that connect the flotation section to perforated inlet piping shall be one (1) inch steel strapping or equivalent.
- Guide bars or posts: Rebar or T fence posts of sufficient length to accommodate anticipated boom height movement. Wire stop is required at the top of the guide bars for guide bar stability.

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- Landing device options: Aggregate pad, concrete block(s), gabion baskets, attach a bottom wire stop to guide bars, or other immovable object/material that allows it to rest at the desired elevation.

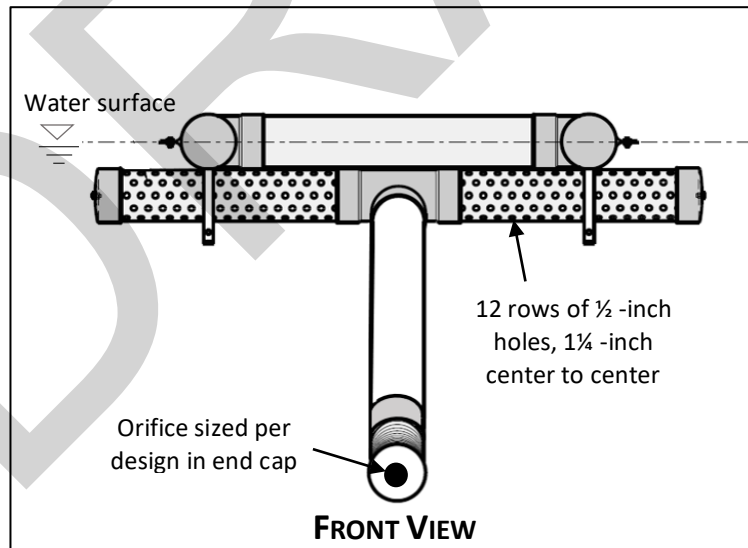
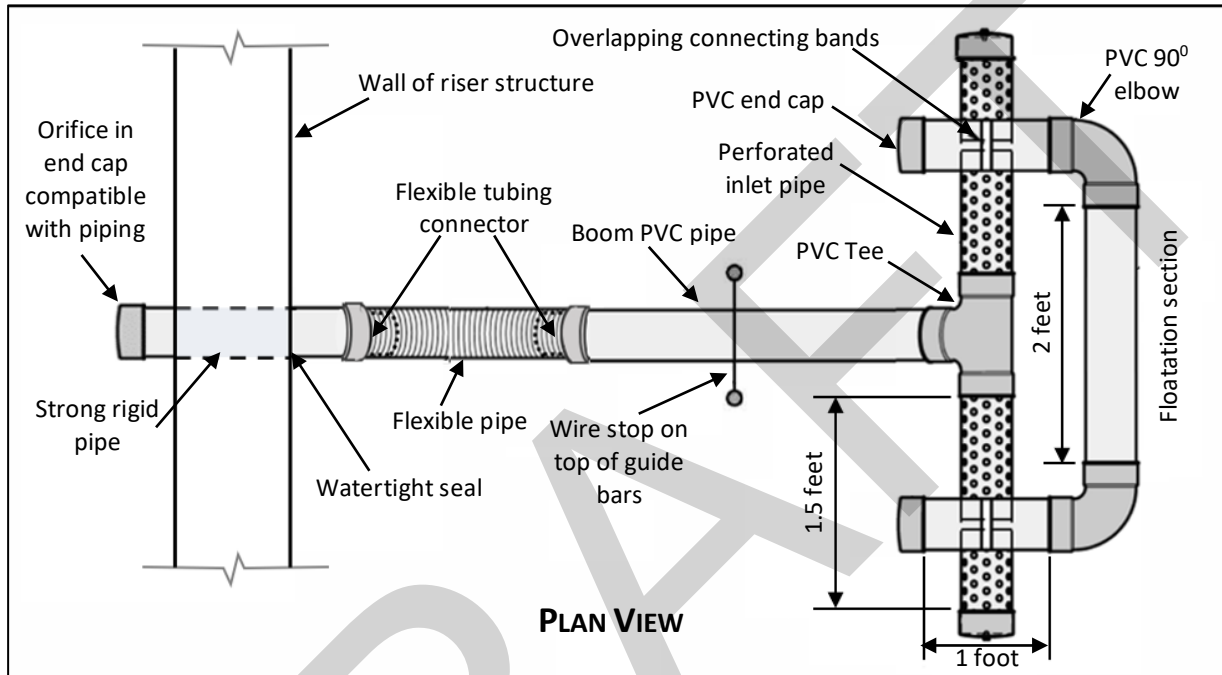
Source: Adapted from Delaware Erosion and Sediment Control Handbook: Skimmer Dewatering Device
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EXHIBIT 708.03-F

CONTRACTOR ASSEMBLED FLOATING OUTLET TYPICAL PRACTICE DIAGRAM (NOT TO SCALE)



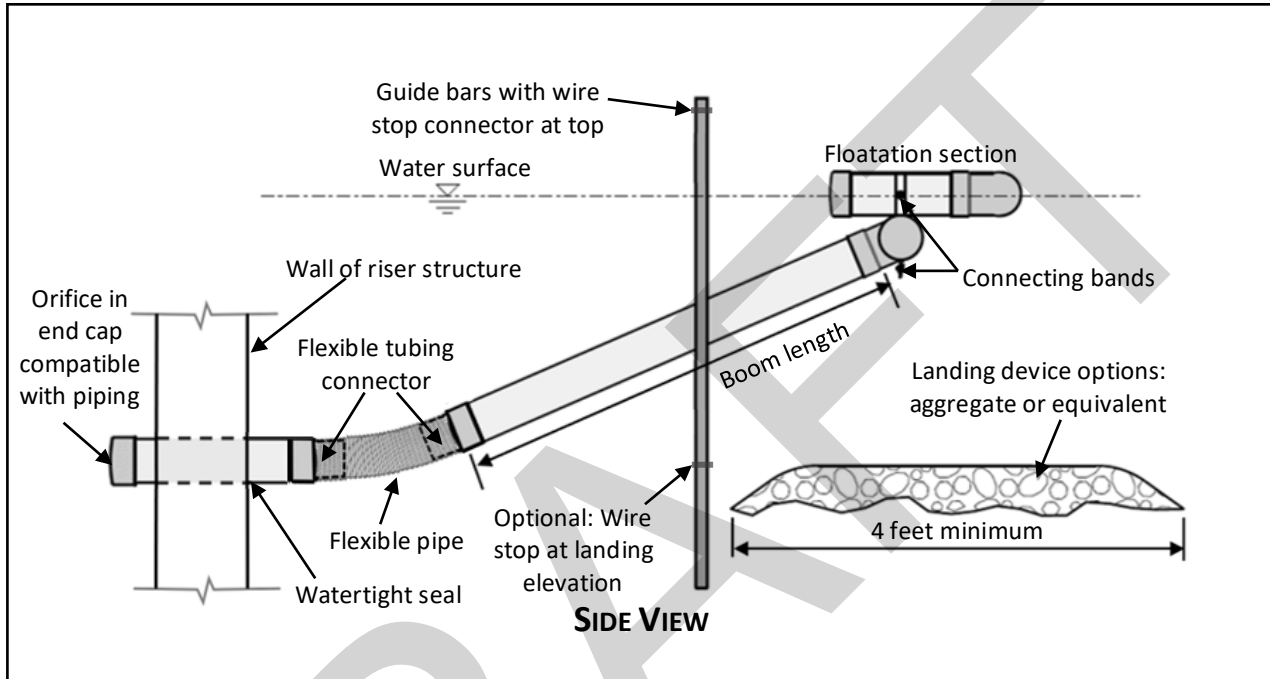
Note: The illustrations in this exhibit are not intended to serve as construction drawings. The diagrams are to be used to communicate the concepts for implementation of this control measure.

Source: Adapted from Delaware Department of Transportation: Skimmer Dewatering Device E-8(2014)

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EXHIBIT 708.03-G

CONTRACTOR ASSEMBLED FLOATING OUTLET TYPICAL PRACTICE DIAGRAM (NOT TO SCALE)



Note: The illustrations in this exhibit are not intended to serve as construction drawings. The diagrams are to be used to communicate the concepts for implementation of this control measure.

Source: Adapted from Delaware Department of Transportation: Skimmer Dewatering Device E-8(2014)