



# Envirologics BluKote Lining Overview and Specifications

## Tomahawk Overview

The patented Tomahawk™ System is a trenchless pipe cleaning technology that injects abrasives into a high-volume, low-pressure airstream to remove internal encrustation, corrosion, biofilms and old bitumen or tar lining materials from pipes. The Tomahawk process quickly prepares the pipe for liner application by providing a clean, dry, bondable surface. Immediately following cleaning, the BluKote airborne lining process uses the same high-volume, low-pressure airstream and aerodynamically engineered distributive bodies (DB) to deliver lining material to the pipe wall for a continuous barrier coating to resolve water quality issues.



## Lining Module

The standard lining module is a low cost, low barrier to market entry unit that utilizes minimal equipment. The equipment modules can be integrated into a customer's truck or trailer (minimum size – 7.5'x16'). The truck/trailer unit will require climate control (AC) in ambient temperature conditions over 28°C.

BluKote airborne lining requires the pipe to be cleaned and prepared using a Tomahawk cleaning unit. The Tomahawk cleaning unit must also have an integrated powered winch that is specifically designed for the Tomahawk cleaning and BluKote lining processes. The winch uses aircraft cable to tether and control the distance and linear speed of the distributive body (DB) which applies the lining material to the pipe wall using directed airstreams. The DB has no moving parts for simplicity and robustness.

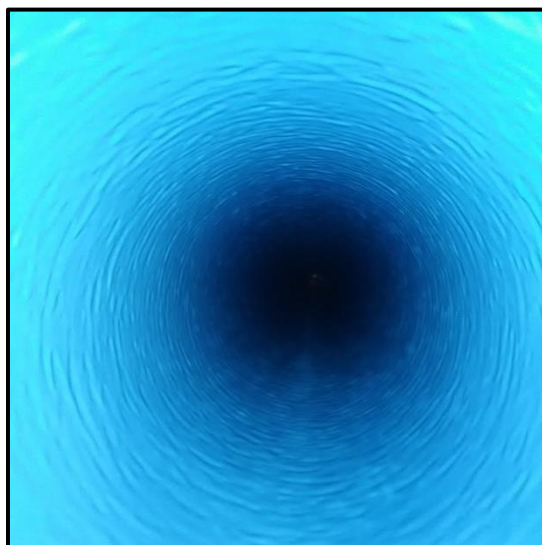
The Envirologics BluKote™ lining material is hand measured, mixed and poured into the pipe airstream through the Material Inlet (MI) which is connected directly to the pipe inlet.

The Material Outlet (MO) is coupled to the vacuum end of the pipe. The vac truck hose is connected directly to the MO to complete the airstream circuit. The MO removes excess liquid liner material from the airstream to eliminate entry into the vacuum hose. A simple vented coupler is included with the MO to control airflow rate through the pipe. Low cost, disposable filter elements are required for use in the MO and can be bought at most hardware stores.

The low cost lining module does not require computer control adding to its simplicity and robustness. The material consumption rate is determined based on pipe size and history. Application spreadsheets, forms and procedures are provided to ensure a quality lining and that QA/QC is taken into consideration at all stages of the process.

### Lining Material, Mixing and Metering

The Envirologics BluKote™, two-part lining material is a polymeric polyurethane and polyurea hybrid and is specially formulated for the airborne process. The blue material provides an attractive application for water pipes. Please refer to the BluKote technical datasheet and SDS forms for more details.



If required, the material can accept a second coat over the first to build liner thickness. The second coat (pass) can be applied once the first coat is dry to the touch and tack free.

Approximate BluKote consumption rates (based on 100m of pipe) are:

<u>Pipe Diameter</u>	<u>Consumption Rates</u>
100mm (4")	0.40 to 0.47 l/m
150mm (6")	0.60 to 0.70 l/m
200mm (8")	0.80 to 0.93 l/m

The information above is approximate only and a history of consumption rates is to be used for in-field lining calculations.

The addition of Cabosil (fumed silica) into the lining material is required across the application temperature range to help maintain consistent lining results.

Envirologics BluKote is sold in 15L kits.

## Lining Capability

The BluKote System can be used to coat metallic pipes 100mm (4") up to 100m (330') long, 150mm (6") and 200mm (8") up to 120m (400') long with average coating thickness of approx. 0.75mm 1.0mm per pass. The pipe segment must be of uniform diameter. An application chart will provide process parameters to ensure a consistent lining.

The lining unit comes complete with DB's, hoses and couplers required to line the various pipe sizes. The standard module lines 150mm (6") and 200mm (8") pipe, with 100mm (4") being optional.

Service connections that protrude into the pipe interior more than 19mm (0.75") may need to be trimmed back to allow the DB to travel freely within the pipe.

It is imperative that the pipe is dry prior to liner application. The Tomahawk™ System is "best-in-class" at removing pipe moisture during pipe preparation. However, water inflow issues (leaks) at service connections, joints or other trouble locations must be rectified prior to lining to ensure a consistent, bonded liner application. A plan to deal with these issues should be in place to ensure operational efficiency. The BluKote material must be applied when the ambient dew point is below the in-ground pipe temperature to ensure a dry environment is maintained during application. Refer to BluKote™ technical data sheet for more details.

In order to help ensure the long-term liner bond and liner integrity, a soluble salts rinse is required after cleaning, prior to lining. A fresh water rinse, Chlor-Rid™ rinse, swab pass followed by a final Chlor-Rid™ rinse completes this task. See Chlor-Rid™ website: <http://www.chlor-rid.com/>

Since BluKote is an AWWA class I barrier coat application, any holes discovered in the pipe must be remediated with a structural repair. Internal repairs can be accomplished using an NSF61 certified QuickLock Pipe Point Repair clamp and installation equipment prior to lining with BluKote. QuickLock items can be found at several websites including [https://rauschusa.com/products/quicklock/point\\_repair](https://rauschusa.com/products/quicklock/point_repair)

Other methods of structural point repair prior to lining may be a certified external clamp or by replacing the bad section of pipe with PVC. PVC pipe can be lined through if the surface is first etched with stone to ensure sufficient bond. Never line through an un-etch PVC pipe.

Cut edges of pipe should always be coated with BluKote to ensure a continuous coating within the pressurized pipe zone that contacts water.

## Vacuum Source (not included with Envirolitics System)

A vac truck with positive displacement (PD) blower is required in addition to the Envirolitics equipment. The vac truck generates the airstream within the pipe during the lining process. It is crucial to have access to reliable trucks with performance that meets the requirements listed below. The air filters must be kept clean daily to ensure optimum performance of the blowers.

Envirolitics recommends vacuum units specified with a minimum 8,800 m<sup>3</sup>/h (5,200 cfm) PD blower, capable of 880 to 950 mbar (26 to 28 "Hg) vacuum pressure for 150mm and 200 mm (6" to 8") pipe lining.

The required vac truck connection is an 8" Vactor Flange or 8" Bush Hog (Ring Lock) fittings. Smaller fittings may compromise the airflow for lining 200mm (8") pipe.

It is best to have a hose boom on the vac truck to allow for easier reach into the access pit. For lining, the boom can also be very beneficial for lifting the MO box (approx. 150 Lbs) into and out of the vac end pit.

## Access Pits

Access pits may need to be covered to prevent dust and direct sunlight on the material during injection into the pipe. Maintaining good ventilation within the pit remains crucial. The pit may need to be conditioned with heat or with cooling in extreme temperature conditions.

A minimum of 1.22m (48") long pipe section must be removed in each access pit to allow for the set-up of the MI and MO. Refer to the Tomahawk System Cleaning Overview document for additional Access Pits details.

## Manpower

The BluKote airborne lining process can be accomplished with good planning and a 3 man crew plus a single vac truck operator. You can expect the lining of a pipe section with a single pass including soluble salts rinse, drying a leak free pipe, lining set-up, application, clean-up, take down and final video inspection to be approximately 4 to 5 hours in duration for a well-trained crew. Repairing leaks, service connection or installing repair clamps are not included and should be considered an extra.

The operational requirements of the vac truck operator during lining are not taxing, ie. on/off/higher rpm/lower rpm/disconnect and can be easily handled by the single operator. It is preferred to have the vac truck operator able to operate the vac truck as well as connect/disconnect hoses, install, operate, remove and clean the MO at the vac end. The vac truck is not operating while conducting these activities.

The crew team leader and an operator, as a minimum, must be trained and certified for airborne lining operations by Envirolitics.

A highly skilled individual is required for data entry, QA/QC verification, operation and interpretation of Excel spreadsheets and proper file storage to ensure the correct material amounts, viscosity, airflow and DB properties are determined in preparation for lining and records are kept for each application.

A full or part time (shared with civil works crew) site supervisor/team lead may be considered an asset to ensure job site efficiencies are maintained.

## Clean-up and Waste Plan

Clean-up of devices and equipment following lining should be 1.25 to 1.5 man hours in total.

The crew will require a proper waste control and disposal plan for items such as disposable PPE items, excess material, MO filters, empty material containers, clean-up thinner and rags. Properly mixed Tomahawk BluKote™ resin and catalyst material is not considered hazardous material and can be disposed of at most landfill sites.

### Standards and Performance Specifications

- AWWA M28, Class I lining
- NSF/ANSI 61 -5 certification for drinking water

Meets requirements for;

- Single coat thickness >0.50mm according to AWWA C222 using SSPC-PA 2
- Water Immersion according to AWWA C210
- Tensile adhesion >500 psi using ASTM D4541

Refer to the Envirologics BluKote™ technical datasheet for additional details.

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For additional information about the Tomahawk™ System cleaning and BluKote airborne lining, please visit our website at: [www.envirologics.ca](http://www.envirologics.ca)

Please reference “Tomahawk System Cleaning Overview and Specifications” document for pipe cleaning and preparation.

Only licensed operators can use the Envirologics equipment and practice the BluKote lining processes which are protected by the Envirologics License Operator Agreement and the following patents: CA2902708, US9713824, EP3001827, AU2014391443. Other patents are pending.

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