

Cem-Kote Flex ST

in

Waste-Water and Potable Water Facilities in Southwestern Ontario

Report

Inspection of Cem-Kote Flex ST performance,
conducted on 15 and 16 August 2005

Projects inspected and report prepared

by

Ivan Razl, Ph.D., P.Eng
Technical Director, Gemite Products Inc.
1787 Drew Road, Mississauga, Ontario, L5S 1J5
Phone: 905 672-2020
Fax: 905-672-6780
e-mail: ivan@gemite.com

CONFIDENTIAL

For the contact names and phone numbers of companies mentioned in this report
please contact Gemite Products Inc.

Introduction:

Cem-Kote Flex ST is a flexible polymer modified cement composition, used in positive or negative side waterproofing of reinforced concrete structures of wastewater or potable water facilities. All projects reviewed and reported in this document have been specified by:

Stantec Consulting Ltd. – Windsor, 3260 Devon Drive, Windsor, Ontario, N8X 4L4, Canada.

The product data sheet on Cem-Kote Flex ST can be found on Gemite website www.gemite.com.

City of Windsor

Lou Romano Water Reclamation Plant
4155 Ojibway Pkwy.
Windsor, Ontario
N9C 4A5

The plant was constructed in 1970. Cem-Kote Flex ST was applied in 1993 by London Caulking Ltd. during repairs of the facility. Cem-Kote Flex ST was applied to walls of chambers at the grit removal and screening building (further primary filtration station for short). The primary filtration station is shown in Figure 1. The chambers areas that have been coated with Cem-Kote Flex ST are shown in Figures 2-6. Note deeper chemical and erosion damage to concrete shown at the top of water level area shown in Figure 2. These areas were patched using Gem-Plast TC prior to application of Cem-Kote Flex ST. Figures 4 and 5 show the application of Cem-Kote Flex ST in progress. In addition to the concrete chambers, the reinforced concrete effluent channels leading to the primary settling tanks (further channels), have been also coated with Cem-Kote Flex ST. These are shown in Figures 7-10. These structures carry the wastewater and at this point the flocculent (alum – aluminum sulphate) is introduced in the water stream. In the areas adjacent to the alum entry, the depth of deterioration was approximately ¼ in (6 mm). These areas were repaired with Gem-Plast TC prior to application of Cem-Kote Flex ST. Photo 11 and 12 show high-pressure wash surface preparation.



Figure 1: Primary filtration station



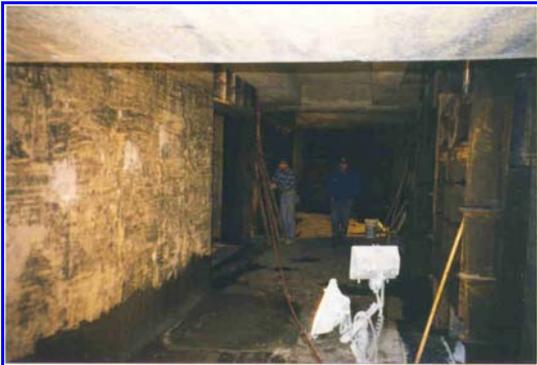
Figure 2: Chambers at the primary filtration station

We were able to inspect Cem-Kote Flex ST at the top of the concrete chambers, at the primary filter - Figure 6. There was no visible deterioration or de-bonding of Cem-Kote Flex ST. It must be noted that the area at the water level is most severely exposed due to presence of oxygen and gasses emitted from the wastewater.



Figure 3: Chambers at the primary filtration station

Figures 4: Cem-Kote Flex ST application in the chambers at the primary filtration station



Figures 5: Cem-Kote Flex ST application in the chambers at the primary filtration station



Figure 6: Chambers at the primary filtration station – 12 years later – no visible deterioration, cracking or de-bonding of Cem-Kote Flex ST was observed, just some discoloration

There have been two concrete channels coated with Cem-Kote Flex ST. One of the channels is a “spare” one, which is very rarely used. Figure 7 shows Cem-Kote Flex ST shortly after application in 1993 and Figure 8 shows the same area after 12 years of exposure. Figures 9 and 10 show the channel that is used all the time.

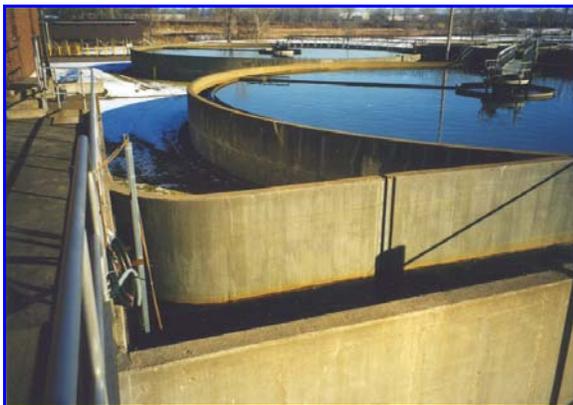


Figure 7: The little used (the “spare”) channel shortly after the application of Cem-Kote Flex ST coating



Figure 8: The little used (the “spare”) channel 12 years after the application of Cem-Kote Flex ST coating

There was no visible deterioration, cracking or de-bonding of Cem-Kote Flex ST. The only noticeable difference was a whitish color due to lime and other deposits on the surface of Cem-Kote Flex ST.



Figure 9: The continuously used channel before the repair – note the rail s where the alum is introduced into the stream – concrete deterioration at this area was approximately ¼ to 3/8 in (6 – 9 mm) deep



Figure 10: The channel, the same as shown in Figure 9 after 12 years. There is no deterioration, cracking or de-bonding of Cem-Kote Flex ST. Deposits of salts in the area where the alum is discharged form the white discoloration.

This is the “oldest”, the 12 years old, Cem-Kote Flex ST project in South-Eastern Ontario. The inspection has proven an excellent durability, long-term bonding, crack and chemical resistance of Cem-Kote Flex ST in this application.



Figure 11: Surface preparation using 3,500 psi (23 MPa) water



Figure 12: The channel surface after surface preparation, prior to application of Cem-Kote Flex ST

Caron Avenue Pumping Station in Windsor

For reference regarding this facility, please contact:

Stantec Consulting Ltd. (Windsor)

The facility is shown in Figure 13. The main part of the station is a large reinforced concrete tubular well. The concrete well developed some cracking. In 2002 the concrete well was repaired from the negative side using Fibre-Patch WP to stop the active leaks and then Cem-Kote Flex ST was applied to provide the negative side waterproofing. Gem-Cote WA ST – an acrylic water-borne coating was applied to Cem-Kote Flex ST for aesthetic reasons. Cem-Kote Flex ST was installed by London Caulking Ltd.



Figure 13: Caron Avenue pumping station

Amherstburg

This facility located on MacLeod Road, was built in 2001. The project was inspected in the presence of:

Amherstburg Water Treatment Plant, McLeod Road
Ontario Clean Water Agency
415 Front Road N.
Amherstburg, Ontario
Canada, N9V 2V5

In this facility Cem-Kote Flex ST was applied to grit channels partly shown on Figures 14 and 15 - north and south view respectively. The interior of the channels was coated with Cem-Kote Flex ST to provide a crack resistant waterproofing. Even though the project in terms of Cem-Kote Flex ST application is relatively small; it is



Figure 14: South side view of the grit channel (trough) – no leaks are visible



Figure 15: North side view of the grit channel (trough) – no leaks are visible.

significant, since it shows after 4 years the resistance to penetration of hairline cracks in the concrete channels. There is no deterioration cracking or de-bonding visible on Cem-Kote Flex ST.

Kingsville (Gosfield prior to amalgamation)

This facility, shown in Figure 17 and 18, was built in 1998. The inspection was carried out in the presence of:

Ontario Clean Water Agency
Lakeshore West WPCP
690 Heritage Road
Kingsville, Ontario
Canada, N9Y 3B2

This project has utilized a Cem-Kote Flex ST in several areas. The main areas are the aeration tanks, shown in Figures 18, 19, 20 and 21. One wall of the tanks is also a separation between the mechanical rooms of the facility and the tanks. Application of Cem-Kote Flex ST, including the Reinforcing Fabric HD is shown in Figure 22. The Figures 23 and 24 show the current status in the mechanical tanks. There has never been a penetration of water or leakage into the mechanical rooms from the adjacent tanks.



Figure 17: The Kingsville facility in 2005 August inspection

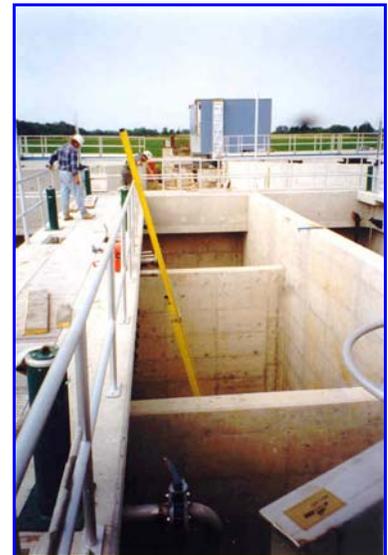


Figure 18 (right): The Kingsville facility - aeration tanks under construction in the summer of 1998 – forefront wall of the tank (not visible on this photo) is separating the tanks and the mechanical rooms, shown in Figures 22 and 24



Figure 19 (left): Aeration tanks in use, August 2005



Figure 20 (right): Aeration tanks – the “blue” building contains the mechanical rooms



Figure 21 (left):
Walls of the
mechanical rooms



Figure 22 (right):
Installation of Cem-
Kote Flex ST in the
aeration tanks



Figure 23: No leaks to the mechanical
rooms. Wall on the left is the wall of the
aeration tanks



Figure 24: No leaks to the mechanical
rooms. Wall
on the left is the wall of the aeration tanks.

An additional area coated, was the grit channel shown in Figures 25-28. There is no deterioration, de-bonding or cracking in Cem-Kote Flex ST waterproofing liner. The Figures 26 and 28 show the north and south side of the troughs respectively. The concrete trough exhibits drying shrinkage cracking, but there is no water leaking through the cracks indicating, that the Cem-Kote Flex ST waterproofing liner is functioning very well.



Figure 25: A view of the concrete grit channel waterproofed
with Cem-Kote Flex ST reinforced with the Reinforcing Fabric
HD



Figure 26: The "south side" view of the grit channel
(trough) at the pump station – no leaks are visible



Figure 27: View into the grit channel wells, waterproofed with Cem-Kote Flex ST and reinforced with the Reinforcing Fabric HD. Cem-Kote Flex ST is the light grey material in the well.



Figure 28: The "north side" view of the grit channel trough) at the pump station – no leaks are visible

Leamington

This facility, shown in Figures 29-35 was constructed in 2002. The person to contact in respect to this project is:

Leamington Pollution Control Centre
c/o 38 Erie Street North
Leamington, Ontario
Canada, N8H 2Z3

In this project two areas were coated: the grit channel and the clarifiers. Figure 30 shows the Cem-Kote Flex ST coating applied to the concrete surface of the channel, and also shows the surface of concrete after surface preparation with high-pressure water. Figures 31-35 show the current situation of the facility. There is no deterioration, cracking or de-bonding of Cem-Kote Flex ST. The examination of the channel exterior shows no water leaks.



Figure 29: Inspection of Cem-Kote Flex ST application in 2002



Figure 30: Cem-Kote Flex ST, brush applied – please note the prepared surface after a high-pressure wash, just above the Cem-Kote Flex ST.



Figure 31: The same area as shown in Figure 29, during inspection in August 2005. No deterioration, delamination or cracking of Cem-Kote Flex ST observed.



Figure 32: The same tanks as shown in Figures 29, 31 and 33 – outside view. There are no leaks visible in the walls of the tank.



Figure 33: The same tank as shown in Figures 29, 31 32 – a different view – again no deterioration, delamination or cracking of Cem-Kote Flex ST observed,



Figure 34: Exterior view of the grit channels after 3year use. No leaking is visible.



Figure 35: Interior view of the grit channels after 3 years of use. No deterioration due to chemical attack or abrasion, delamination or cracking was observed

Ruthven

There was an addition built to the existing structure, Figure 36, of this potable water treatment facility in Ruthven in 1998. Cem-Kote Flex ST was used to waterproof the new concrete tanks. The inspection of the facility was conducted in the presence of:

Union Water System
P.O. Box 340
Ruthven, Ontario
N0P 2G0

The original tanks were coated with Cem-Kote Flex ST as shown in Figures 37-40. Figure 41 shows the same tanks at the time of inspection in August 2005. Figure 42 shows the exterior sides of the same concrete tanks showing no leaking. The cleaning of the Cem-Kote Flex ST surface, according to the operator, is no different

from cleaning of the original concrete tanks in operation. In both cases the cleaning is easy by washing the tanks once a year with sodium hypochlorite solution, 25 ppm concentration and with water.



Figure 36: The front of the Ruthven potable water treatment facility.



Figure 37: Cleaning the surface of the tanks prior to application of Cem-Kote Flex ST



Figure 38: Spray application of Cem-Kote Flex ST. This simple hopper gun equipment for later changed for a more efficient pump.



Figure 39: Brushing of Cem-Kote Flex ST to eliminate pinholes.



Figure 40: Cem-Kote Flex ST waterproofed tank



Figure 41: The tanks constructed in 1998 as they are seen in August 2005



Figure 42: Exterior wall of the tanks – no leaks are visible

Windsor – Little River Pollution Control Plant

This project was not visited during the inspection, since it was under operation during the inspection. For reference to this project please contact:

Stantec Consulting Ltd. (Windsor)

This project was completed in 2000. The tank is used as a collection and storage of leachate water from the nearby landfill site for treatment at the Little River Pollution Control Plant. Cem-Kote Flex ST was used not only to waterproof the reinforced concrete underground structure, but also to provide chemical protection and thus increase the longevity of the tank. Figures 43 and 44 shown below were taken during the inspection of the tank prior to application of Cem-Kote Flex ST



Figure 43: The bottom of the tank



Figure 44: The wall and ceiling was also treated with two coats of Cem-Kote Flex ST.

Wheatley potable water – Gem-Crete CR

Municipality Chatham
Wheatley Water Plant
Wheatley
Ontario

This facility, shown in Figure 45 was built in 1993. At that time Gem-Crete CR, a fiber-reinforced, microsilica enhanced mortar was used in these applications. The original tanks were waterproofed using $\frac{1}{2}$ in (12 mm) thick layer. Figure 46 shows the tanks at present. The inspection of the exterior of the tank walls, Figure 47, shows no leaks. It was confirmed by the operator, Mr. Thomas that the tanks have never leaked.



Figure 45: Wheatly (Municipality of Chatham) potable water treatment facility



Figure 46: Fibre-reinforced Gem-Crete CR, $\frac{1}{2}$ in (12 mm) thick, applied to the walls and bottom of several concrete tanks.



Figure 47: Exterior of concrete tanks shows no sign of leaking

Conclusions:

The inspection of waste and potable water projects in Southwestern Ontario, constructed over the period of 12 years, has clearly proven the following:

1. Cem-Kote Flex ST exhibits a long-term durability and chemical resistance.
2. Cem-Kote Flex ST exhibits a superior bonding. No de-bonding of Cem-Kote Flex Plus has ever been reported or observed during the inspection.
3. Cem-Kote Flex ST system exhibits very good waterproofing over drying shrinkage cracks in concrete, especially when reinforced with the Reinforcing Fabric HD.
4. Cem-Kote Flex ST exhibits an excellent abrasion resistance. In the secondary treatment of the Kingsville facility, the concentration of solids in the wastewater varies between 2,000 – 5,000 mg/L. There is no sign of abrasive wear in the grit channels.
5. Cem-Kote Flex ST can be applied over water-saturated concrete, unlike polymer coatings, such as epoxies or polyurethanes, which are very sensitive to moisture presence in the substrate.
6. The bond of Cem-Kote Flex ST to concrete in wet environment is unaffected by the capillary or osmotic pressures at the concrete/coating interface. The polymer coatings very often de-bond from concrete in wet environment, due to these types of pressure.

Cem-Kote Flex ST has been used with great success in Canada, USA, Europe and Asia. Please contact Gemite Products Inc. for further Case Histories or other information you may require.

For the contact names and phone numbers of the companies mentioned in this report please contact Gemite Products Inc.