REPAIR/REPLACEMENT OPTIONS FOR CONCRETE LINED IRRIGATION CHANNELS

CASE STUDY

JOINT REPAIR WITH XYPEX SPRAY MEMBRANE

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Case Study – "Xypex" Spray Membrane

1 Background

This case study is based on a method employed in the Burdekin River Irrigation Area (BRIA) in North Queensland for repair of concrete lined channels.

This document describes the installation procedure employed on concrete trapezoidal channel. This repair option required the use of a putty like material for joint and crack filling followed by a waterproofing over spray. This repair option is suitable for joint repair where there is also significant cracking of the channel sections and spot-patching is not a viable alternative.

2 The Problem

The problem of failing joints in concrete lined irrigation channels in the older sections of the BRIA is quite significant and directly contributes to loss of irrigation water and loss of potential revenue. The deterioration of the channel discussed in this case study was first highlighted as a problem by local maintenance staff noticing losses in water supply. The deterioration of the channel was caused primarily by aging/weathering of the concrete. Joints have failed and a network of fine cracks had developed in sections of concrete lining. The options considered for the repair of this channel were as follows:

- Complete replacement with new concrete lining;
- Polyethylene lining;
- Spot patching;
- Patch and seal method employed herein.

A specific problem with the repair option selection for this channel was the previous placement of permanent extensions to the channel (cast concrete freeboard extension) which reduced the economic viability of the poly lining option in this case. It was decided to select the patch and seal option as a 'trial only' to gauge its effectiveness and its relative costs.

3 Solution

A 50 metre trial section of the Millaroo Main Channel, a total area of 300 m^2, has been subject to a trial of a repair/waterproofing product. Xypex Australia supplied the product and the installation/application was carried out by Contract Building Services of Townsville.

The step by step method used by Contract Building Services to complete the repair and waterproofing was as follows:

Step 1.
The surface of the existing lining was cleaned using water blasting with pressures of 2500 to 3000 psi (17 – 21 MPa). The area was cleared of free-standing water prior to further repairs (a damp surface is preferred).

FIGURE 1

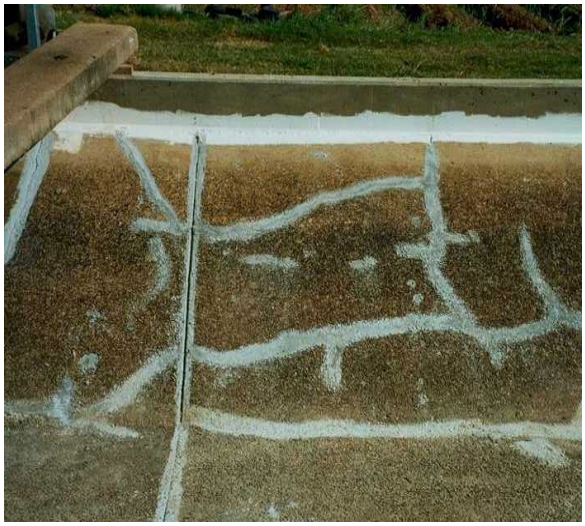

FIGURE 2

Step 2.
Cracks in the lining surface which were greater than 2mm were repaired (see Figure 1) using a putty type Xypex product, “Patch ‘n’ Plug”. This malleable material is pushed into cracks by hand, which has proven to be the most labour intensive part of this repair option. Hair-Line cracks were not treated in this way as it would have proven impractical and they are adequately sealed by the sealant and waterproofing steps.

Some joints and cracks where access could not be reasonably gained required mechanical excavation to enlarge the cavity and allow the placement of the sealant well into the crack/joint.

Step 3.
The sealing agent was then placed into all excavated joints (see Figure 2), ensuring that the cavity was thoroughly filled and that the material was struck off flush with the surface of the channel.

Step 4.
The surface was then coated with the waterproofing product, “Xypex Concentrate” (a powder mixed to the liquid state at a rate of 5 parts powder to 3 parts water) applied using a hopper gun spray method. This material is overcoated (as described in Step 5) as soon as it is firm to walk on and no longer than 24 hours unless kept moist.

FIGURE 3

FIGURE 4

Step 5.
Once the "Xypex Concentrate" has cured a final coating of sand/cement and "Xypex Admixture" (at an approximate rate of six litres per m^2) is placed over the material as a final sealing agent. The primary purpose of the "Xypex Admixture" is to retain moisture for the "Xypex Concentrate" so as to allow crystalline growth into the existing concrete structure to continue and to protect from external damage during this transition. A layer of wet hessian (see Figure 4) cloth is then layed over the material to aid in the curing process. This cloth was kept moist for 24 hours of the application.

4 Conclusions:

- Care needs to be taken when applying "Xpex Concentrate" to channels with a high degree of exposed aggregate present. It is important that the manufacturer's application rate is followed rather than basing application rates on an average coating thickness. For irregular surfaces such as exposed aggregate concrete, basing application rates on the achievement of a coating thickness can lead to an over-use of the "Xypex Concentrate". Because the concrete aggregate does not 'take up' the "Xypex Concentrate" any over application will not improve the waterproofing ability of the Xypex system. This means that increased application will result in increased material costs without any added benefit.

- The cost of using the Xypex system can range from 1-2 times the cost of a flexible geomembrane liner (ie. HDPE lining). HDPE liners and other flexible geomembrane liners do however have their limitations and there will be situations where the Xypex system is a viable alternative. The Millaroo Main Channel, as discussed in this case study, is a good example of this situation. The existing channel was raised using cast concrete freeboard extensions which would make the installation and fixing of HDPE more complicated and hence more expensive. HDPE may not prove to be a viable option for this particular channel.

- The material used for re-sealing the joints is quite rigid (cement based) and therefore may not be suitable for areas where there is a possibility of high foundation movements.

5 References/Acknowledgments:

Xypex Australia, Lavington, NSW Australia

Alan Church, Manager, Contract Building Services, Townsville, QLD

Peter Paulette, Marketing Representative, Xypex Australia, Aitkenvale, QLD

Further Information

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