

## **DIFFERENTIATING BETWEEN FREEZE/THAW DETERIORATION AND OTHER FORMS OF CONCRETE DETERIORATION.**

### **Why concrete deteriorates from freeze thaw actions?**

Deterioration of concrete from freeze thaw actions occurs when the concrete is critically saturated, which is when approximately 90% of its pores are filled with water. When water freezes it occupies 9% more volume than that of water. If there is no space for this volume expansion in porous, water containing material like concrete, freezing causes distress in the concrete. Distress to critically saturated concrete from freezing and thawing will commence with the first freeze-thaw cycle and will continue throughout successive winter months resulting in repeated loss of concrete surface.

Concrete with high water content and high water to cement ratio is less frost resistant than concrete with lower water content.

### **Macro- & microscopic appearance**

Deterioration of concrete by freeze thaw actions may be difficult to diagnose as other types of deterioration mechanisms often go hand in hand with Freeze Thaw. Often it may be difficult to evaluate which mechanism caused the initial damage, however, if all other mechanisms can be excluded the typical signs of Freeze Thaw are:

- Spalling and scaling of the surface
- Large areas (cm size) are coming off
- Exposing of aggregate
- The exposed aggregate are not cracked
- Surface parallel cracking
- Gaps around aggregate

### **Concrete Repair**

Once the correct diagnosis has been made, the concrete can be repaired by removing the entire affected concrete surface to expose a clean, stable sub-straight suitable to be repaired with sprayed concrete or polymer modified repair mortars depending on the circumstances.



**Concrete Repairs to the freeze thaw damage at Fosdyke Sluice**