

# Use of Washwater

## NZRMCA Technical Note 2



### Introduction

As environmental pressures regarding the discharge of contaminated water waste increases, it is likely that all ready mix concrete plants will need to reuse washwater from holding tanks.

The question facing the industry is what effect does this have on the properties of concrete in both its fresh and hardened state?

After an overseas reference search

produced only limited information, it was decided to conduct a first stage evaluation of some of the fresh and hardened state properties. This work was carried out by J.R. Mackechnie, at Canterbury University, under the fellowship arrangements existing with the Cement & Concrete Association of New Zealand.

The full research report is titled "Influence of Recycled Water on Fresh Properties of Concrete (September 2004)".

### Key Points

The following are key points that emerged from the report:

#### 1. Specific Gravity (SG) of the Liquid

SG of liquid in the holding tank will vary during the day/over a weekend etc. Values measured ranged from 1.07 to 1.20. Tests were carried out on concretes containing 1.07 to 1.16 SG washwater. Town water has SG 1.00.

#### 2. Washwater

Immediately washwater was substituted for town water the initial setting time for the concrete was shortened see Fig 1. The initial set was used as the indicator of the end of any open time for finishing. 17.5 MPa mix initial set time was reduced by max 2 hours in the winter and 1½ hours in the summer. A 40 MPa had shortened open time by up to 1½ hours in winter and 1 hour in the summer. A self levelling concrete had shortened open time by 1 hour in winter.

#### 3. Delivery/Placing Open Times

Open times were considerably reduced for summer and winter conditions irrespective of washwater dosage i.e. 17.5 MPa reduced from nearly 8 hours to 5 hours, 40 MPa reduced from 6½ hours to 5 hours.

#### 4. Slump Losses

Only a limited study was carried out within the test programme but the rate of slump loss between mixes using recycled washwater and tap water was very similar e.g. Tap 120 mm slump decreased to 60 mm in 1 hour. Washwater 120 mm slump to 75 mm in 1 hour.

#### 5. Strength

The 28 day strengths of concrete appear to be not significantly effected by the SG levels of the washwater. It is not possible to carry out a full statistical evaluation because of the limited number of results.

### Practical Implications

In theory every time the SG of the washwater changes, the mix quantities need to be changed to account for the change in order to maintain w/c ratio and yield. At the Napier Annual Conference a paper by Arthur Kyriazis

entitled "Recycled Water" was given illustrating the complications of achieving full control.

This is not seen as warranted on the majority of New Zealand plants.

However some understanding and adjustment is needed if the industry is going to be able to supply concrete with consistent fresh properties to the concrete placing industry.

Water adjustments required for SG variations are higher than permitted changes at the delivery position and hence must be dealt with at the plant.

The Specific Gravity can be measured by weighing a litre of water. Town water will weigh a 1000 grams, washwater will weigh over the 1000 grams e.g. 1050 to 1150 grams having an SG 1.05 to 1.15. Overseas experience has been that no significant finishing problems in the fresh concrete properties occur when the SG is 1.07, hence the adoption of the 1.07 threshold.

The following recommendations are made:

1. Concrete plants using **clear washwater only** i.e. no continuous agitation/stirring.

Periodic weekly check that SG has not risen over 1.07.

2. Concrete plants using **agitated washwater** but without detailed frequent SG measurement.

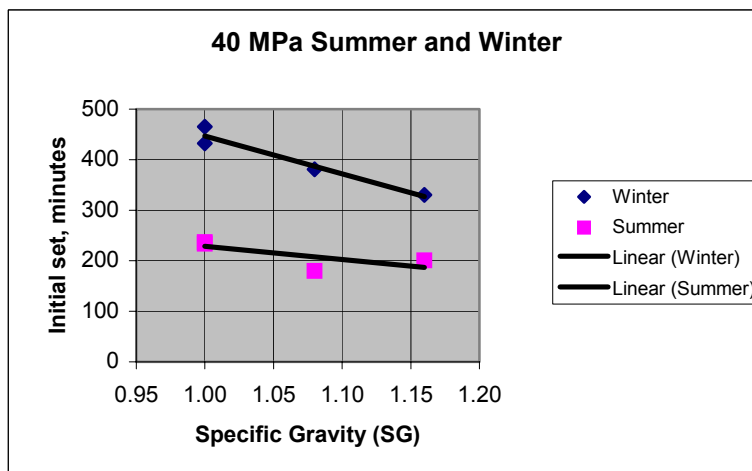
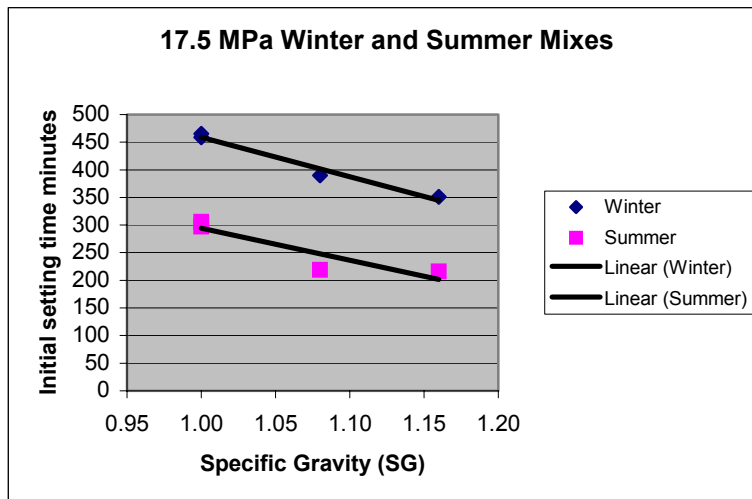
**AM:** Check that washwater has SG 1.07 or less (mix designs based on 1.07).

**PM:** Check that washwater has SG 1.07 or less. If more than 1.07, use proportion of town water, e.g.:

- SG 1.10, 30% town supply, 70% washwater.
- SG 1.15, 50% town supply, 50% washwater

3. Concrete plants using **agitated washwater but with detailed SG measurement.**

Continuous working slurry washwater/town supply based on actual SG.



**Prepared by the NZRMCA Technical Committee  
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