

# Study on The Basic Investigation for The Commercialization of Acid Resistant Concrete Made from Sewage Sludge Slag

Whole term

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## (Purpose)

In recent years, effective use for sewage sludge is requested from the lack of the final disposal dump, and the formation of the recycling society as the number of sewage sludge increases by the spread of the sewer-system. In addition, concrete structure of the sewerage is deteriorated by sulfuric acid by the microorganism, and as a social infrastructure, durability of the important concrete structure decreases before reaches to standard durable years service life. And the cost of maintenance to repair the reinforcement which relate to life increase, so the high durable conversion with the improvement of resistance to acid is required.

In this study, aimed to arrange a basic performance of acid resistant concrete as a main material on a melted slag that made from minute powder of sewage sludge, so effective use of sewage sludge, and improvement of durability for the sewerage.

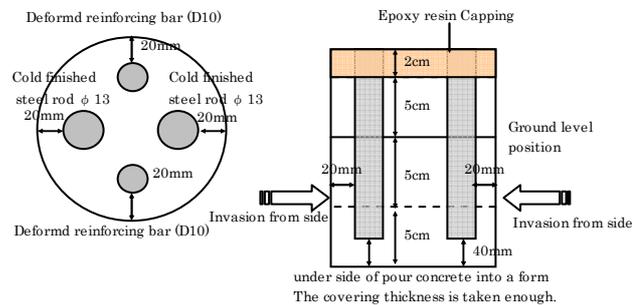
## (Results)

### (1) Outline of the study

This study executed the field exposure examination about acid resistant concrete for 3 years at Unzen city in Nagasaki Prefecture where the high temperature and an acid soil, so Unzen district is the causticity environment of a domestic maximum level. The following is the outline of the field exposure examination and test piece (table-1 and figure-1).

Table-1 Outline of the field exposure examination

Concrete types	acid-resistant concrete and conventional concrete
Reinforcing bar covering thickness(mm)	2sizes (10 and 20mm)
As to the quality of reinforcing bar	cold finished steelrod and deformed reinforcing bar (the same test specimens)
Three exposure periods	6,12 and 18 months
⇒For each of the above-mentioned conditions,three test specimens were prepared(a total of 36 test pieces)	



(Test pieces  $\phi 100 \times 170 \text{mm}$ )

Figure-1 Outline of exposure test piece (Reinforcing bar covering thickness 20mm)

The following is the performance evaluation of the test piece.

To begin with, measured up the position where the diameter cut the test piece, the ground outcrop part, a surface of the ground boundary part, and the underground part. Secondly, measured up the area of making to the neutral where atomized the Phenolphthalein solution. Thirdly, evaluated by the corrosion diagnosis and the corrosion grade of the reinforcing bar that was taken out of the cut part, 'Corrosion control technology and anti-corrosive technology indicator and this manual of a drainage concrete structure' (*Japan Sewage Works Agency*).

### (2) Results of the field exposure examination

#### 1) Externals of test piece(corrosion situation on surface)

An acid resistant concrete confirmed the durability to the invasion, because the surface of test piece was rough respect a little at the ground outcrop. But the surface of a conventional concrete invaded greatly for the exposure period 12 months and 18 months, so the surface of the ground boundary side became white, made to gypsum, exposed coarse aggregate.

2) Situation of area of making to neutral

An acid resistant concrete did not reach the reinforcing bar position in the area of making to the neutral. But a conventional concrete reached to the reinforcing bar position area of making to the neutral, because the surface of test piece was invasion of concrete in the putting on 10mm while the alkali area at the reinforcing bar position was maintained.

3) Corrosion evaluation of reinforcing bar (corrosion situation of reinforcing bar)

The deformed bar in an acid resistant concrete did not have rust .But the deformed bar in a conventional concrete had rust from the disappearance of the reinforcing bar covering concrete.

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Key words

Effective use for sewage sludge, Sewage sludge slag, Acid resistant concrete