



The Use of Recycled Aggregates in Concrete

Objectives

- To develop a technique for utilizing higher percentages of recycled aggregates in concrete
- To study the fresh properties of recycled aggregate concrete
- To study the effect of steam curing on the hardened properties of recycled aggregate concrete
- To study the effect of class F fly ash on the properties of recycled aggregate concrete
- Based on the results of research findings, recommend a broader scope for the use of recycled aggregates in structural and non-structural concretes

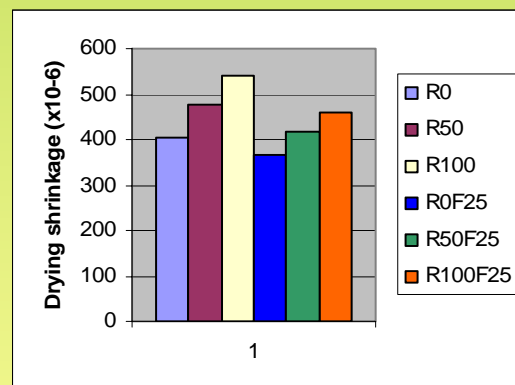


Test Results

Compressive strength (MPa)

| Curing | Age | Compressive strength (Mpa) | | | |
|----------------------|--------|----------------------------|--------|--------|---------|
| | | R0F25 | R20F25 | R50F25 | R100F25 |
| Standard water cured | 1-day | 17.6 | 13.2 | 11.6 | 11.1 |
| | 4-day | 32.6 | 28.9 | 25.7 | 21.4 |
| | 7-day | 39.9 | 34.1 | 31.3 | 28.6 |
| | 28-day | 54.4 | 49.7 | 44.3 | 39.5 |
| Steam cured | 90-day | 69 | 58.7 | 55.2 | 47.3 |
| | 1-day | 37 | 29.3 | 28 | 24.8 |
| | 4-day | 41.9 | 34.1 | 32.5 | 29.7 |
| | 7-day | 46.2 | 38.2 | 35.6 | 31.6 |
| cured | 28-day | 55.3 | 48.6 | 45.3 | 39.1 |
| | 90-day | 68.4 | 60.1 | 53 | 46.7 |

Drying shrinkage



R0 – natural aggregates; R20 – 20 % recycled aggregates; R50 – 50% recycled aggregates; R100 – 100% recycled aggregates
 R0F25 – R0 + 25% fly ash; R20F25 – R20 + 25 % fly ash; R50F25 – R50 + 25% fly ash; R100F25 – R100 + 25% fly ash

Conclusions

- The results demonstrate that one of the most practical ways to utilize higher percentages of recycled aggregates in concrete is “pre-casting” with an initial steam curing stage immediately after casting
- The results also demonstrate that another practical way to utilize higher percentages of recycled aggregates in structural concrete is by using additional fly ash in the concrete mixtures