

Experimental Study and Analysis of Concrete by Replacement of Cement with Fly Ash

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ABSTRACT

Fly ash a waste generated by thermal power plants is as such a big environmental concern. In modern decades, the industrialization and urbanization are the two phenomena that are spreading all over the world. Apart from the requirement of these phenomena, there should also be investigation into their negative impacts on the worldwide environment and common life. Most important poor effect of these international processes has been the production of large quantities of industrial wastes. Therefore, the problems related with their safe management and dumping has turned into a major test to environmentalists and scientists. Another issue is the strain on land, materials and resources to sustain development activities, including infrastructure. The thermal power plants produce considerably large amounts of a solid by-product, namely fly ash.

Keywords:- Cement, fly ash, concrete, fly ash concrete

INTRODUCTION

A variety of studies have been conducted to examine the effects of using fly ash as an additive in cement, an admixture in concrete and as a cement substitute in concrete. The compressive strength of concrete has been tested by replacing different proportions of cement with appropriate amounts of fly ash and the results have been found to be the most effective and applicable. Incidentally, most of the research has only been done for a limited percentage of cement substitutes, even for a lower grade of concrete. It is therefore necessary to carry out extensive investigations into the compressive

strength of different concrete qualities and different proportions of fly ash with different curing times. Here below the various methods of using the fly ash as a cement substitute in concrete are vividly discussed.

CHEMICAL COMPOSITION OF FLY ASH

The chemical composition of fly ash depends upon the type of coal used and the methods used for combustion of coal. Table 1: Chemical composition of fly ash of different coals.

Table 1:-Chemical composition

Component	Bituminous Coal	Sub bituminous Coal	Lignite Coal
SiO ₂ (%)	20-60	40-60	15-45
Al ₂ O ₃ (%)	5-35	20-30	20-25
Fe ₂ O ₃ (%)	10-40	4-10	4-15
CaO (%)	1-12	5-30	15-40
LOI (%)	0-15	0-3	0-5



Fig.1:- Fly Ash

Fly ash is a fine gray powder composed primarily of spherical, glassy particles that are a by-product of coal-fired power plants. Fly ash has pozzolanic properties, which means that it reacts with lime to form cement-like compounds. It is commonly known as a supplementary cementitious material.

CONCLUSION

Fly ash concrete is most important building material for the sustainable construction and consumption of large volumes of fly ash. Literature discussed in the present paper has given an overview of advantages of fly ash concrete to increase workability and durability of concrete.

The literature reviewed has also listed slower strength gain at young age as a major problem in the manufacture of fly ash concrete in the Indian construction industry, which only focuses on short-term strength gain.

A detailed mix design process is required along with confirmation of the results for fly ash concrete design to achieve the required 28 day strength. It is a must to shift the focus of contractors towards economical and durable fly ash concrete,

even when a longer curing time is required.

REFERENCES

1. Diamond, S. (1984). The utilization of fly ash. *Cement and Concrete Research* 14, 455-462.
2. Dolen, T. P. (1987). Performance of fly ash in roller compacted concrete at upper stillwater dam. *Proceedings: Eighth International Ash Utilization Symposium*.
3. Dunstan, M. R. H. (1983). Development of high fly ash concrete. *Proceedings Inst. Civil Engineers*, 74, 495-513.
4. Joshi, R. C, Day, R. L., Langan, B. W., and Ward, M. A. (1987). Strength and durability of concrete with high proportions of fly ash and other mineral admixtures. *Durability of Building Materials* 4, 253-270.
5. Mather, B. (1956). The partial replacement of portland cement in concrete. *Cement and Concrete*, 37-73.
6. Mehta, P. K. (1985). Influence of fly ash characteristics on the strength of portland- fly ash mixtures. *Cement and Concrete Research* 15, 669-674.

7. Mukherjee, P. K., Loughborough, M. T., and Malhotra, V. M. (1982). Development of high-strength concrete incorporating a large percentage of fly ash and superplasticizers. *Cement, Concrete, and Aggregates* 4(2).
8. Naik, T. R. (1987). Setting and hardening of high fly ash content concrete. Paper presented at American Coal Ash 8th International Coal Ash Utilization Symposium.
9. Ravina, D., and Mehta, P. K. (1986). Properties of fresh concrete containing large amounts of fly ash. *Cement and Concrete Research* 16, 227-238.
10. Sivasundaram, V., Carette, G. G., and Malhotra, V. M. (1990). Long term strength development of high-volume fly selection.
11. Thomas, M. D. A. (1989). The effect of curing on the hydration and pore structure of hardened cement paste containing pulverized fuel ash. *Advances in Cement Research* 2, 181-188.