CHAPTER 3

SCOPE AND OBJECTIVES OF THE PRESENT INVESTIGATION

3.1 GENERAL

The present study attempts to develop SCC using RHA and MK as an SCM in binary and ternary systems. The key properties of SCCs and their binder paste and mortar components have been determined in this study.

In particular, the effects of RHA, MK, and RHA+MK on various properties of different binder pastes, mortars, and SCC have been examined. A simplified mixture proportioning process for SCC was developed according to EFNARC (2005) guidelines and previous studies. General test approaches were applied to determine several properties of binder pastes, mortars, and SCCs.

In addition, test apparatus was developed to measure the filling ability, passing ability, and segregation resistance of the SCCs. The outcome of this study will extend the scope of SCC, and thus, generate new opportunities for the construction industry. The findings of the present study will also be useful for cement- and rice-producing countries such as India.

3.2 SCOPE OF THE PRESENT STUDY

While many studies have been carried out on the use of RHA and MK, most of the studies have focused on improving the physical and
mechanical properties of RHA and MK in SCC. The Bureau of Indian Standards for concrete IS 456-2000 already included RHA and MK as mineral admixtures, and RHA was treated as one of the pozzolanic admixtures that could be blended with cement. In addition, only a few studies (almost none) have been reported on the use of RHA in combination with MK as partial cement replacement material in cement mortars and SCC.

Although many studies have reported on the binary blended SCC with RHA and MK, there is a need to study specifically the performance of RHA in combination with MK to increase the replacement level, strength, and durability properties of SCC. In the previous studies, very little information is available on the chemical resistance, chloride impermeability, and corrosion resistant properties of SCC blended with these combinations.

In the present research, an experimental investigation is considered to evaluate RHA, MK, and RHA+MK (1:1) prepared as cement replacement materials and to assess the optimal replacement level in the blended SCC system for strength and resistance against chemical and chloride penetration and steel corrosion. Optimal level refers to the maximum favorable percentage of replacement of the OPC with RHA, MK, or RHA+MK at which the strength, impermeability, and corrosion resistance properties of the SCC are equivalent to or more than that of OPC SCC.

Comprehensive and systematic evaluation of RHA, MK, and RHA+MK blended SCC (binary and ternary systems) could lead to its widespread application in strength and durability reinforced concrete structures.
3.3 OBJECTIVES

The main objective of this study was to develop binary and ternary blended SCCs with RHA and MK to investigate experimentally their performance in their fresh and hardened states. The sub-objectives of this study were as follows:

1. The development of various pastes (blended cements) and mortar components containing RHA and MK (for both binary and ternary systems).

2. The development of a simple mix design approach for the mixture proportioning of SCC.

3. The development of simplified and single-operator test apparatus for assessing the filling ability, viscosity and passing ability of the SCC.

4. To gain an understanding and knowledge of the effects of the physical and chemical properties of RHA and MK on the fresh, mechanical, and long-term properties of SCC.

5. Establish interrelationships between various properties of binary and ternary blended SCC through regression analysis.

6. Determination of the optimum level of replacement of the blended SCC incorporating RHA or MK (for both binary and ternary systems).

To achieve these objectives, it is proposed to carry out the experiments as stated in Figure 3.1.
Materials for this study

Testing of selected materials

Mix design (for trial mixes) with basic principle of EFNARC guidelines (Figure 1.3)

Select suitable proportion (NSCC), which is much satisfied with strength and fresh properties among trial mixes

Development of RHA, MK and their combination blended SCC from NSCC (100% OPC)

Fresh properties of blended SCC

Mechanical properties of blended SCC

Durability properties of blended SCC

Identifying of maximum, minimum and optimum replacement level of RHA, MK and their combination in SCC

Interrelationships among various properties through correlations

Discussion for obtained results

Conclusion & Future study

Figure 3.1 Overall research program