PREFACE

According to recent survey in the year 2015, the world population has reached 7.3 billion, implying that the world has added approximately one billion people in the span of the last twelve years. 100 years back this is around 1.5 billion only. Out of 7.3 billion people almost 50% of the people now live in and around the cities. Due to this rapid urbanization enormous quantities of raw materials are required for the construction of housing, factories, commercial buildings, drinking water and sanitation facilities, dams and canals, bridges, tunnels, and other parts of the infrastructure. The concrete is a fundamental material to fulfill the industrial, domestic housing and basic infrastructural needs of our society. Concrete is the largest consumer of natural resources and the industrial by products available in the world. However, the current concrete construction practice is considered un-stainable because of; it consumes huge quantities of natural stone, sand, drinking water and cement. Every year this industry consumes approximately 33 billion tons of concrete globally, the raw materials that include are 27 billion tons of rock and sand, 3.7 billion tons of cement and 2.7 billion tons of water for mixing of concrete. Their effects on ecology are beyond our imagination. This abnormal usage results to create lot of problems to the growing infrastructure industry. The major usage is natural rock. In these circumstances it is very essential to investigate an alternative source to the conventional aggregate.

On the other side, increasing the deposits of industrial by-products and emitted wastes in nature has become a major environmental problem. Shortage of land to fill these materials also adds up to this problem. Further, to minimize the problems like health hazards etc. caused by these by-products, their disposal is posing a big problem. The main aim of non-governmental organizations, professional bodies, environmentalists and government organizations is to re cycle the industrial wastes.

In these circumstances, it is planned to manufacture the cold bonded pelletized aggregates by using industrial by products like fly ash, Metakaoline and silica fume etc. So, making use of artificial aggregate solves two problems, one is it saves environment from pollution and another is it prevents natural resources from depletion, thereby giving way to sustainable development.
This thesis mainly throws light on the manufacturing process of pellets by pelletization process, strengths aspects and applicability of these pellets as aggregate in construction industry.

In this experimental work the effect of replacing the conventional aggregate by light weight aggregate i.e. Pelletized cold bonded aggregate (Fly ash, Metakaoline and Silica fume) in different percentages and also effects of addition of different percentages of crimped steel fiber to fly ash aggregate and Metakaoline aggregate is studied. Further examining the durability of fly ash aggregate concrete and Metakaoline aggregate concrete has been attempted. The study using the digital analysis like X-Ray Diffraction (XRD) and Scanning Electron Microscope (SEM) is also attempted. This study is expected to throw some light on better understanding of strength properties along with mode-II fracture behavior of pelletized light weight aggregate concrete with an addition of steel fiber. This research mainly throws light on the manufacturing process, properties, strength aspects and applicability of these categories of aggregates in civil engineering industry. The following are the order of chapters.

Chapter 1 contains an Introduction
Chapter 2 contains Literature review
Chapter 3 containing the over view of various materials and their properties
Chapter 4 contains brief studies on strength properties including mode-II fracture properties of cold bonded pelletized fly ash (FA) aggregate concrete with and without fibres, durability aspects of cold bonded pelletized fly ash (FA) lightweight aggregate concrete, and micro structural analysis of powdered sample of cold bonded fly ash aggregate concrete has been studied.

Chapter 5 contains brief studies on strength properties including mode-II fracture properties of cold bonded pelletized Metakaoline light weight aggregate concrete with and without fibers, an experimental investigation on durability, and digital analysis of powdered sample of cold bonded Metakaoline aggregate concrete.

Chapter 6 contains brief studies on strength properties including mode-II fracture property of cold bonded pelletized silica fume artificial light weight aggregate concrete, and digital analysis of powdered sample of cold bonded silica fume aggregate concrete.

Chapter 7 contains summary, conclusions and scope of future work.