ABSTACT

Ordinary concrete is very popular construction material all around the world but Failure of concrete structures cause deaths and create hazardous environmental conditions if the composition or the engineering design has not been made accordingly. The one issue that the following thesis is going to explore is the ASR reactive chemistry and the development strength of waste material based concrete structures. Concretestructures fail due to excessive deformation, chemical and hazardous gelling effects and materials reaction that is, the deformation is more than the tolerance level of the structure. The causes for failures are rarely external but mostly occur due to internal causes. One of the major causes that are being discussed here is the Alkali-Silica Reaction (ASR). It is a reaction that enables the silica crystals to form and grow into a binding structure. The crystals grow through the pores of the concrete and filters thus creating a strong interlocked structure that can support multiple floors or heavy vehicles and etcetera. The ASR can also harm the structures if not controlled well.

Over crystallization process leads to forcing the concrete structures from the inside and overcoming their compressive loading to create cracks in the lateral direction. The colliding expansive and compressive forces lead to structures getting brittle and ultimately crumbling under load. The aim of the research is supposed to be controlled by controlling the ASR and the number of other building materials used. Reducing the alkalinity can cause crystallization to slow down. The finding ASR effects on concrete waster material is challenging in this study because applied manual chemical reaction on concrete by short time. The use of Natural Aggregates or gravel with a concrete mix can strengthen the building. The higher used of waste concrete material is creating environmental improvement through sustainability and effects fewer chemical reactions. The department zero waste south Australia promote to use this material and help the atmosphere and development of concrete strength.

The performing study has been conducted to use of Recycled Aggregate

Concrete (RAC) with Natural Aggregates (NA) or gravel. The various types of construction waste materials used in this study as a replacement with ordinary concrete materials such as glass sand, glass powder, fly ash, GGBS, recycled coarse aggregates. Also used the combination of different percentage of new and old materials for finding the development of strength of concrete element. The RAC is much cheaper and practically free to get if properly collected. NA are another kind of aggregate that can be mixed with the RAC or independently used to build structures. The operational and loading conditions are an important pointto consider before the use of the RAC and is an engineering problem. The research helps to get the knowledge regarding every concrete element closely with tests of particle size distribution, specific gravity classification and surface saturated dry tests of each material. The following thesis performing tests 5 mixes of different compositions to test and analyses how ASR on RCA performs with respect to other material compositions. Moreover, the thesis not only ponders over the composition but also takes into consideration the strength of concrete by used of destructive concrete tests and find the capability of waste material-based concrete.

The research aims to investigate the mechanical performance of waste material-based concrete under the threat of ASR effect, and the performance is dividing in 7 days and 28 days of manual ASR applied reaction. Throughout this research project a total of 130 liters of concrete was made, but some of failed at the initial stage, middle or hardening stage and lots of concrete cylinders used for a testing purpose. This study includes different chemical preparation methodologies and techniques such as HCL and hydro pallets formation according to Australian standards to applied ASR reaction in some period. In general, the performance of the waste material concrete mixes was equal or better than traditional natural concrete on some parameters. The GGBS (ground glass furnace slag) were also found the high compressive strength and water absorption. Furthermore, the waste glass materials that is typically unmatched at many stages of testing of ASR concrete. The primary advantages of concrete where natural materials are substituted with the waste concrete material after the ASR effects are the sustainable.