

Design of Precast Concrete Cover Slab for Pedestrian Walkways

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Abstract

Pedestrians need to experience safety, comfort, accessibility, and efficient mobility. Walkways are often needed in rural and suburban areas to provide access to schools, parks, community centers, local businesses, employment centers, transit stops and stations, and Residential areas. In some areas, when no sidewalks, walkways, or shared use paths are available, pedestrians might be seen walking on roadside shoulders. Sidewalks and walkways separated from the roadway contribute greatly to pedestrian safety. Therefore whenever possible, it is necessary to furnish a sidewalk or walkway for the safety and convenience of the pedestrians.

According to the Federal Highway Association, sidewalks require a minimum width of 5.0feet if set back from the curb, or 6.0feet if at the curb face to meet the minimum requirements for people with disabilities. For any two people to walk together, 5.0 feet of space is the bare minimum. According to RDA regulations minimum width of sidewalk is 1.5m.

In most of the urban areas in Sri Lanka, drain area also has used as a part of the sidewalk. Sidewalks have been constructed with tactile and interlocking blocks along with precast concrete cover slabs as to cover the drain and for the mobility of pedestrians. This is mainly due to the lack of land in Sri Lankan Roadways. The existing precast concrete cover slab is designed with a hollow at the edge of the slab as to make a lengthy void when two slab panels are interconnected together. Surface water is drained out through this void strip. However the problem is these holes may be a disturbance for the pedestrians because some valuable things may fall through the voids. After having some reviews from Municipal councils and RDA, it was confirmed that more than 10 inquiries were reported weekly. Therefore people tend to cover these holes using gunny bags or some other material to avoid these disturbances. And there is a possibility of entering surrounding solid waste which would cause to block the drainage. Then the rain water will get collected on the roads and the sidewalks, and will lead to a flood. In this research, our aim is to modify the existing cover slab so as to give a safe and convenient mobility to the pedestrians.

The research presented in this thesis is aimed at a novel design of a cover slab, which is being developed as a composite section of reinforced concrete and a porous concrete layer. Then the problem of draining out rain water and the inconvenient mobility of pedestrians will be solved. A cover slab model was designed using SAP2000 and the stress development was checked. Then samples were casted and tested for strength and permeability at the laboratory.

Porous concrete exhibits reduction in permeability due to clogging by particulates, which severely limits service life. This research also includes the clogging mechanism and mitigating strategies of porous concrete. Samples of new cover slabs with different sized aggregates were casted using different types of compaction methods. Clogging potential of

the cover slab was determined by the infiltration test (ASTM C1701). Infiltration was tested on a series cover slab samples which were clogged with topsoil, collected from the field, landscape fine compost and silt clay slurry, to simulate worse case clogging in the field. Comparison of surface texture was done according to the results of the sand patch test and clay patch test. Construction methods and practical issues related to application and mitigation techniques are discussed in this thesis

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