Effects of Moisture Ingression In Building Envelope Through Moisture Index (MI) And Wind Driven Rain Index (WDRI)

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Abstract

Moisture ingression in building envelopes offers significant structural integrity and performance challenges, leading to costly rehabilitation repairs and reduced comfort for residents. Building moisture can cause Inadequate Ventilation, fungal growth and other microbial contamination, corrosion, salt crystallization, and other moisture-related deterioration. This study investigates the effect of moisture ingress due to rainwater infiltration and its diffusion into the building facades. In addition, this research utilizes moisture modelling using moisture index (MI) and wind-driven rain index (WDRI). Furthermore, Indian standard codes and instructions were used for WDRI computations. Finally, hygrothermal analysis was conducted using WUFI simulation software, concentrating on 2D elements (slabs and walls) found in various locations with varied MI and WDRI values. This research highlights the importance of climate change when constructing structures and the potential benefits of sustainable construction techniques to reduce moisture-related problems.

Keywords: Moisture index (MI); wind driven rain index (WDRI); relative humidity(RH); dry-bulb temperature(DBT); wet-bulb temperature(WBT); climate change; sustainable construction; building comfort.

1 Introduction

The building envelope is an essential aspect of architecture and construction that demarcates the border between a structure's interior and the external environment. This dynamic interaction is critical in assuring structures' comfort, energy efficiency, and integrity. Among the various issues that building envelopes encounter, moisture ingression is a dangerous adversary. Moisture diffusion through the building envelope compromises structural integrity, degrades interior air quality, improves energy inefficiency, and increases maintenance costs [1]. Extreme weather events, such as heavy and wind-driven rain, occur more frequently and with greater severity as climate change accelerates [2]. As a result, architects, engineers, and construction experts must have the utmost care for how well building envelopes resist moisture penetration. This concern has inspired a growing interest in studies that use cutting-edge methods and indices to quantify, recognize, and mitigate the impacts of moisture ingression. The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) provides more severe problems caused by decisions made by members of various professions [3]. However, these problems can be prevented by employing methods based on water ingress behaviour of buildings. The Moisture Index (MI) and the Driven Rain Index (WDRI) have distinguished themselves among these indices as crucial measures for determining how susceptible building envelopes are to moisture-related problems [4-6]. The importance of this study relies on its ability to offer a thorough framework for tackling the various issues that cause moisture ingress. Researchers may develop a system to

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