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1. Maximizing natural ventilation by design in low-rise residential buildings using wind catchers in the hot arid climate of United Arab Emirates

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Maximizing natural ventilation by design in low-rise residential buildings using wind catchers in the hot arid climate of United Arab Emirates

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Abstract: This research studies natural ventilation in a residential building using different wind catcher sizes and exhausts to maintain a comfortable environment that would reduce energy consumption in a hot arid zone. All the simulated airflow tests were performed on a 1:48 scale model of a building 14 feet wide, 28 feet long and 10 feet high. A wind catcher with three different sizes was built and tested. All three sizes had the same section but varying lengths, which represented 1/3, 1/2 and all of the windward façade. The leeward façade was used as an exhaust in two general configurations: the first configuration used the entire façade as an outlet (10 feet x 14 feet), while the second used an opening of 4 feet x 14 feet placed at varying locations. A Helium Bubble Generator was used to investigate the air speed and pattern inside the model. The device produces neutrally buoyant bubbles filled with helium. The tests were recorded using a Digital camcorder. All the wind catcher sizes showed an acceptable air speed inside the model. The major distinction was in the plan exposure area, where it becomes narrower as smaller wind catcher is used. On the other hand, this type of wind catcher can not provide sufficient air flow for cooling the ceiling. In addition, if the same exhaust was used with different fan speeds the air pattern will remain the same.

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