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Exposing The Invisible

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Abstract : According to the Council on Tall Buildings, there has been a rapid increase in the construction of tall or “megatall” buildings over the past two decades. Simultaneously, the New England Journal of Medicine has reported that there has been a steady increase in climate related natural disasters since the 1970s; the eastern expansion of the USA's infamous Tornado Alley being just one of many current issues. In the future, this could mean that tall buildings, which already guide high speed winds down to pedestrian levels would have to withstand stronger forces and protect pedestrians in more extreme ways. Although many projects are required to be verified within wind tunnels and a handful of cities such as San Francisco have included wind testing within building code standards, there are still many examples where wind is only considered for basic loading. This typically results in and an increase of structural expense and unwanted mitigation strategies that are proposed late within a project. When building cities, architects rarely consider how each building alters the invisible patterns of wind and how these alterations effect other areas in different ways later on. It is not until these forces move, overpower and even destroy cities that people take notice. For example, towers have caused winds to blow objects into people (Walkie-Talkie Tower, Leeds, England), cause building parts to vibrate and produce loud humming noises (Beetham Tower, Manchester), caused wind tunnels in streets as well as many other issues. Alternatively, there exist towers which have used their form to naturally draw in air and ventilate entire facilities in order to eliminate the needs for costly HVAC systems (The Met, Thailand) and used their form to increase wind speeds to generate electricity (Bahrain Tower, Dubai). Wind and weather exist and effect all parts of the world in ways such as: Science, health, war, infrastructure, catastrophes, tourism, shopping, media and materials. Working in partnership with a leading wind engineering company RWDI, a series of tests, images and animations documenting discovered interactions of different building forms with wind will be collected to emphasize the possibilities for wind use to architects. A site within San Francisco (due to its increasing tower development, consistently wind conditions and existing strict wind comfort criteria) will host a final design. Iterations of this design will be tested within the wind tunnel and computational fluid dynamic systems which will expose, utilize and manipulate wind flows to create new forms, technologies and experiences. Ultimately, this thesis aims to question the amount which the environment is allowed to permeate building enclosures, uncover new programmatic possibilities for wind in buildings, and push the boundaries of working with the wind to ensure the development and safety of future cities. This investigation will improve and expand upon the traditional understanding of wind in order to give architects, wind engineers as well as the general public the ability to broaden their scope in order to productively utilize this living phenomenon that everyone constantly feels but cannot see.

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