

# SYNTHETIC MANUFACTURING Resilient Modular Systems (RMS)

Wendy W Fok  
University of Houston

RMS (temporal + structural) is a multi-disciplinary research proposal to forge the synergy and efforts between three different colleges/departments within the University of Houston: College of Architecture, Department of Industrial Engineering, and Department of Material Studies and Engineering, designed into a modular system that could be applied as urban interventions within the context of temporary and permanent settings.

The topics and fields of research will include, but will not be limited to: Architecture/Design, Industrial Engineering and Prototyping (Digital/Analogue), Patents, and the Material Sciences. Within the larger understanding of the design-research, all conducted research will require a high level of computational science and bio-engineering support. Each collaborator/Faculty member is a key asset to the development of this project and is an expert within their respective fields. The division of research and development will be as follows: Prof Wendy W Fok (Architecture/Design/Prototyping), graduate student (Architecture/Design/Prototyping), Prof Ali Kamrani (Patent/Industrial Engineering/Modular design aspects for form and fit analysis), and Prof Ramanan Krishnamoorti (Material Sciences/Bio-related engineering).

Using both eco-intelligent architectural design objectives, the knowledge and technique of manipulating sustainable materials ultimately pursues a positive impact on the planet as a growth opportunity and engenders a focus on enhancing benefits (not only reducing costs) through its decision-making and actions—taking an approach of optimization rather than minimization. This project can understand the perspective of “people, planet and profit,” as expansionist and enabling leadership through the achievement of advanced success metrics. For example, the concept of effective design of products and services should move beyond typical measures of quality—cost, performance and aesthetics—to integrate and apply additional objectives addressing the environment and social responsibility.

Through both digital and analog (physical) prototyping at both architectural and design scales and migrating the opportunity of a full-cycle

cradle-to-cradle design process into a Design-Fabrication project—with real-world contextual testing, and use of both repurposed construction waste and biodegradable materials (specifically, biodegradable soy-based polyurethanes, ceramic fillers, and composite plastics)—RMS (temporal + structural) is to find a dualistic opportunity into sourcing ecological solutions of constructing temporary structures within the built environment in locations of need.

The RMS (temporal + structural) proposal is two-fold. The purpose of the proposal is to:

- A) investigate the opportunities that allow for temporary and biodegradable structures, which could be utilized for temporary construction sites within the built environment, and to
- B) explore the structural significance and integrity of a modular structure utilising repurposed construction waste.
- C) The idea of the RMS (temporal) is the ability of it to become an ecological and resilient modular construct for the built environment that could be subsequently dissolved, yet, in an effort of full-cycle design, also contribute to nourishing the natural landscape.
- D) While the secondary research for the RMS (structural) will be research for repurposing construction waste, as a mixture for the remediation of the structural testing and joint detailing, the same modular structure will be utilized to further the innovate on studying the structural form/fix/analysis of the RMS (structural) modular.

Collaborating Faculty / Departments:

Dr. Ali Kamrani  
(associate Professor)  
Industrial Engineering-University of Houston

Dr. Ramanan Krishnamoorti  
(Endowed Professor)  
Material Science-University of Houston

Digital Media & Design Program  
Research Assistants (2011-2013):  
Jose Aguilar / Megan Hartensteiner

