



Beyond Guns, Guards, and Gates: A Systems Approach to Homeland Security

Susan M. Mitchell¹ and Elizabeth C. Bristow²

¹*Mary Kay O'Connor Process Safety Center, Artie McFerrin Department of Chemical Engineering,
Texas A&M University System, College Station, Texas, 77843-3122, USA*

²*Department of Civil Engineering, Texas A&M University, College Station, Texas 77843-3136, USA*

Abstract

Presently, engineers and scientists face numerous challenges in the design of engineered infrastructures and systems. The complexity and interdependence of these systems has resulted in the potential for catastrophic consequences should unanticipated events occur. Current world events have necessitated that designers focus on the challenge of protecting these systems from one important source of unanticipated events, potential terrorist attacks.

The current government and public focus on these systems heavily relies on a physical approach to the protection of infrastructure. While actions such as adding stronger perimeter access protection, adding more guards, and installing more sophisticated security cameras are relatively easy to fund, implement, and communicate to the public, designers must not simply rely on these solutions and must move past these end-of-the-line approaches to ensure our systems are adequately protected.

We should design engineered systems with the assumption that no physical security is impenetrable. Simply implementing physical barriers are not enough – we must also include scientific and engineered solutions. Systems security must consist of multiple layers – while we must limit physical access to systems, we must also make systems resistant to potential attacks, and prepare systems to best handle attack consequences. Resistant or resilient approaches must also consider interactions with other systems. System faults must be isolatable to prevent domino effects from disabling multiple infrastructure systems through a single entry point.

This paper will present background into different types of infrastructures and their interdependencies along with some current trends in systems protection from a homeland security approach. Two specific systems, chemical processing facilities and water systems, will be further analyzed. Current and historical research and trends will be presented for each system along with current protection methods and

opportunities for greater protection via the development of more resistant systems through future development and research opportunities.