

"hypar-nature" — A precast concrete design for wildlife crossings

by Angela Kociolek, Western Transportation Institute at Montana State University

Concrete, an old material cast in a new way, claimed top position in the ARC International Wildlife Crossing Infrastructure Design Competition. Calling for “New Methods, New Materials, New Thinking,” the competition presented a mighty challenge to the world’s design community: Develop a feasible, buildable, context-sensitive, and compelling design solution for a safe, efficient, cost-effective, and ecologically responsive wildlife crossing structure.

HNTB Engineering with Michael Van Valkenburgh Associates Inc. and Applied Ecological Services Inc. (HNTB+MVVA) responded to the engineering and ecological challenge and won with “hypar-nature”—a hyper (hyperbolic paraboloid) vault. Their design may set the precedent for the next generation of infrastructure that re-connects wildlife habitats bisected by roads.

The “hypar-nature” bridging system consists of precast modules that serve as abutment, beam, and deck—all in one. This single element—created using straight line, commercially available formwork—is the key to cost-effectiveness, speed of construction, and modularity. Two modules are joined at the midspan acting as a three-hinged arch, eliminating the need for a center pier. No on-site concrete work is required. Instead, the hyper modules are optimized for being efficient to transport, erect, combine, and recombine as needed. The same modules, oriented differently, can also incorporate bicycle paths separated from traffic and the wildlife crossing above.”

The five-expert jury, chaired by Charles Waldheim of Harvard University’s Graduate



Model depicting the construction process. Note temporary falsework in place as a central pier, the one-crane operation using a balanced pick point, and maintenance of traffic flow along one side of the roadway. All images: ARC.

School of Design, determined that HNTB+MVVA’s proposal “marries well a simple elegance with a brute force. It effectively recasts ordinary materials and methods of construction into a potentially transcendent work of design. . . it could be credibly imagined as a regional infrastructure across the inter-mountain west.” One juror summed up the jury’s collective thoughts, “The winning proposal by HNTB+MVVA is not only eminently possible; it has the capacity to transform what we think of as possible.”

The ARC Competition concluded in January 2011, but the ARC Partnership continues to collaborate in support of wildlife crossing infrastructure for improved landscape connectivity and highway safety (www.arc-competition.com).

* Specifications about “hypar-nature” were drawn directly from HNTB+MVVA’s submission.

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HNTB+MVVA’s winning design offers hope that mobility for people and wildlife does not have to be mutually exclusive.



In an artist’s rendition, the “hypar-nature” design appears to seamlessly connect habitats on both either sides of the roadway. Best management practice is to install 8-ft-tall wildlife fencing in combination with crossing structures. This reduces wildlife-vehicle collisions on the roadway while guiding animals towards the structure.