Abstract: Construction engineering for major infrastructure projects covers a wide range of activities to evaluate and select the techniques for assembling materials and components. Construction engineering inherently presents a very challenging opportunity for creative design, particularly on infrastructure projects. This construction engineering activity can be described as one of creating and developing workable, cost-effective, low-risk technical solutions for an array of infrastructure construction problems that must be solved from the plans and specifications stage through facility completion. The purpose of this paper is to illustrate a 10-step construction engineering process and define important knowledge requirements to foster creative design solutions using four case studies, including:

* Positioning and holding a concrete bridge caisson in a 7-knot tidal current for a 4-month period;
* Skidding a 55,000-ton immersed tube tunnel element 200 meters on dry land from casting site to launch site;
* Building a major dam without use of river diversion or on-site dewatering systems; and
* Building underwater bridge piers without the use of conventional bottom founded cofferdams.

The creative design process was able to successfully devise a plan for solving highly technical construction challenges using a process-based approach. The key requirements of knowledge, skill, and experience necessary to perform these activities are presented to assist construction engineers in preparing for these creative opportunities.