



**US Army Corps  
of Engineers**  
Engineer Research and  
Development Center

# SACON<sup>®</sup> Shock-Absorbing Concrete



## Technology

Shock-Absorbing Concrete (SACON<sup>®</sup>) is medium-density fiber-reinforced concrete developed by GSL researchers for use as an energy-absorbing material. When cast into blocks and panels and used as a building material, SACON<sup>®</sup> offers the unusual advantages of absorbing projectiles and eliminating ricochets. SACON<sup>®</sup> buildings have been constructed as live-fire training facilities for military operations in urban terrain exercises. Also, SACON<sup>®</sup> facilities have been used at several Army live-fire training villages and as an assault house for the Drug Enforcement Administration in Los Angeles, CA.

SACON<sup>®</sup> consists of portland cement, sand, water, preformed foam, and fibers. It was developed to prevent ricochets from 5.56-mm ammunition and to contain fragments from fragmentation hand-grenades. The medium-density material allows projectiles and blast wave forms to be attenuated to a regulated depth. The fibers form a network system to absorb projectiles, reduce spalls, and minimize cracks. SACON<sup>®</sup> facilities can be constructed by engineer troops or through conventional construction contracts, or purchased from a vendor.



SACON<sup>®</sup> offers several unusual advantages as a building material

By combining SACON<sup>®</sup> with another GSL-developed product (GEL-COR<sup>™</sup>), GSL researchers developed a new environmentally friendly bullet-trapping system. The system uses SACON<sup>®</sup> as the frame around the outside of the trap and GEL-COR<sup>™</sup> as the interior bullet-trapping medium. A separate [fact sheet on GEL-COR<sup>™</sup>](#) is available.

## Problem

Military and law enforcement training ranges and recreational shooting ranges face a number of serious safety, environmental, and cost issues. Shooting ranges have traditionally used soil berms for outdoor ranges; however, the lead contamination associated with runoff from such berms has made soil structures an expensive system with costly cleanup requirements. The major bullet-trap systems in use today are metal deceleration traps and rubber-based traps, both of which have serious drawbacks.

## Expected Cost To Implement

SACON<sup>®</sup> concrete is a nonstandard concrete mixture and typically can be manufactured for 50 to 75 percent above the costs of conventional concrete. SACON<sup>®</sup> is generally ordered as precast blocks or panels; thus, the cost of shipping must be factored into the budget for outfitting a range.

## Benefits/Savings

The ERDC-developed bullet-trap system provides both military and commercial shooting ranges the safest, most environmentally friendly and cost-effective system available. In early 2005, the Army estimated that its use of the system saved \$180 million per year.

SACON<sup>®</sup> offers unusual advantages as a building material that absorbs projectiles and eliminates ricochets. Furthermore, it offers advantages over conventional wooden

construction; it is noncombustible, insect proof, and does not have to be treated with preservatives. SACON<sup>®</sup> barriers are superior to soil berms because the alkalinity of concrete typically slows the rate of corrosion of metal debris and reduces the rate of leaching of metals into the surrounding soil. SACON<sup>®</sup> firing berms do not erode and typically do not require the application of dust-control agents. SACON<sup>®</sup> can be crushed, sieved, and recycled to make more of the product. SACON<sup>®</sup> also has sound-absorbing characteristics that make it more desirable than steel-plate backstops or sandbags at training sites where noise must be minimized.

#### **Status**

The federal team has worked with industry partners through Cooperative Research and Development Agreements (CRADAs) to market the new material. This interaction resulted in three patents being issued. In 2004, GSL issued a license to Mississippi Prison Industries Corporation, making SACON<sup>®</sup> economically available to law enforcement groups across the country. The GEL-COR<sup>™</sup> and SACON<sup>®</sup> patents have both been licensed by ERDC to Super Trap, Inc., which is actively marketing the products. Super Trap is also the commercial promoter of the new bullet-trap system, which uses both materials.

Current SACON<sup>®</sup> investigations focus on field methods of repairing and patching impaired areas, recycling of the product, and use of other military and law enforcement weapons and ammunition in facilities constructed with SACON<sup>®</sup>.

#### **ERDC POC**

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#### **Distribution Sources**

SACON<sup>®</sup> concrete has been licensed to a number of organizations and can be manufactured independently for Federal projects. The number of available sources has been increasing with demand and with the increased skill of local precasting operations in handling this type of concrete. A current list of sources known to be supplying materials that meet the Corps' specification for SACON<sup>®</sup> can be obtained from the ERDC POC at the address given above.