STRUCTURAL APPLICATIONS
Range of civil engineering applications now possible with FRP systems

USED WITH INCREASING effectiveness since their introduction to the aerospace industry in the early 1960s, composite materials are now used in numerous applications to solve challenging construction problems. From the early days of acceptance of composites in the construction industry to today, this technology now offers

CONFINEMENT
Confinement is generally applied to members in compression, with the aim of enhancing their load-carrying capacity or in cases of seismic upgrading, to increase their ductility. SikaWrap® FRP composite materials are reliable confinement devices for reinforced concrete elements.

SHEAR STRENGTHENING
The flexibility of the SikaWrap® fabric allows application to irregular cross sections which can be present in RC beams and columns. The combination of a shear strengthening with high-modulus carbon fiber fabrics together with a flexural strengthening with CFRP plates Sika® CarboDur® is optimal.

SEISMIC STRENGTHENING
This is often a combination of seismic, shear and dynamic loads. An important field historically is the wrapping of bridge columns to prevent premature failure in a seismic event.

IMPACT STRENGTHENING
SikaWrap® fabrics can absorb the high energy rates caused by an impact of a car or a major vessel in order to protect the column from collapsing.
practical solutions to an array of applications such as seismic upgrade, confinement, blast mitigation, masonry strengthening, etc. This product group continues to evolve, mature and transform into one of the most exciting and key product segments for the repair industry.

**FLEXURAL STRENGTHENING**
Structural elements may be strengthened in flexure not only with steel or Sika® CarboDur® CFRP plates but also with SikaWrap® fabrics, especially if substrate properties are low. Special attention has to be given to the correct alignment of the load-carrying fibers in the case of long fabrics for flexural strengthening.

**BLAST MITIGATION**
Embassies, airports, government buildings, bridges and other sensitive structures are often a target for terrorists to create mass destruction and mayhem. FRP Composite materials are a proven means to blast harden existing structures without changing the usefulness of the facility.

**MASONRY STRENGTHENING**
FRP Composite Materials are an excellent means to upgrade and rehabilitate masonry structures. FRP combines the positive attributes of high tensile capacity with the load bearing capabilities of masonry walls to form a composite action. They also work extremely well for rehabilitating unreinforced masonry (URM) walls, especially in seismic zones where ductility can be increased.

**PIPE STRENGTHENING**
Due to the aging infrastructure in the United States, it is not uncommon for pipes to burst causing flooding and catastrophic damage to major cities. SikaWrap® fabrics have been used to re-line the inside or outside of concrete and steel pipes which have been degraded due to corrosion damage, distress, overload or seismic events.
PRODUCT PORTFOLIO

Product Mix that covers all your strengthening needs with FRP systems

<table>
<thead>
<tr>
<th>CARBON WRAPS</th>
<th>PRODUCT NAME</th>
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</thead>
</table>
| - Complete portfolio
- ICC Evaluation Report
- Uni and Bidirectional
- Hi Mod, heavy weight and ± 45 |
| ■ SikaWrap® 103C
■ SikaWrap® 117C
■ SikaWrap® 230C
■ SikaWrap® 103C HM
■ SikaWrap® 1200C |

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<tr>
<th>GLASS WRAPS</th>
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| - Bidirectional
- Unidirectional & lightweight
- ICC Evaluation Report
- Economical |
| ■ SikaWrap® 100G
■ SikaWrap® 430G |

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<tr>
<th>CARBODUR STRIPS</th>
<th>PRODUCT NAME</th>
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</table>
| - Pultruded CFRP laminate
- External reinforcement
- Easy overhead applications
- Custom lengths |
| ■ Sika® CarboDur® S512
■ Sika® CarboDur® S812
■ Sika® CarboDur® S1012 |

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<tr>
<th>SIKA CARBODUR RODS</th>
<th>PRODUCT NAME</th>
</tr>
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</table>
| - Pultruded CFRP laminates
- Negative moment reinforcing in slabs |
| ■ Sika® CarboDur® 1/4”
■ Sika® CarboDur® 3/8” |
**SIKAWRAP PRESATURATED SYSTEM**
- No need to saturate fabrics on site
- Fast & easy applications reduce labor
- Drop in replacements for current FRP systems
- Factory controlled quality

**SIKA CARBODUR L BRACKETS**
- Unique L-shape CFRP plates
- Effective anchorage of stirrup forces
- Externally applied
- Multiple width options

**POST TENSIONING**
- Active reinforcement
- High strength CFRP laminate
- Reduces tensile strain in steel reinforcement
- Anchored System

**SIKADUR EPOXY**
- Different viscosities that fit your application
- Dry and wet lay up resins
- Paste material for strips, rods
- Produced in ISO Approved facility

**SIKACRETE FIRE PROOFING**
- Dry mix fire protection mortar
- Protects FRP/epoxy from high heat
- 4 hour fire resistance over FRP
- Spray applied

**PRODUCT NAME**
- SikaWrap® Presaturated 100G
- SikaWrap® Presaturated 103C
- SikaWrap® Presaturated 117C
- SikaWrap® Presaturated 430G

**PRODUCT NAME**
- Sika CarboDur® L 4/20/50
- Sika CarboDur® L 4/30/70
- Sika CarboDur® L 4/50/100

**PRODUCT NAME**
- Sika CarboStress®
- Sikadur® 30

**PRODUCT NAME**
- Sikadur® 30
- Sikadur® 330
- Sikadur® 300

**PRODUCT NAME**
- Sikacrete® 213F
PROJECT GALLERY
Structures that have trusted Sika’s product solutions and services

OHIO HORSESHOE STADIUM
Owner: Ohio State University
Location: Columbus, Ohio
Year: 2001
Product: SikaWrap® 103C
Application: Strengthening of columns
Significance: Meet the building code / time sensitive repair
Awards: ICRI Project of the Year - 2001

I-80 BRIDGE (25 BRIDGES)
Owner: UTAH DOT
Location: Salt Lake City, Utah
Year: 2002
Product: SikaWrap® 103C
Application: Strengthening of columns
Significance: Seismic upgrade prior to Salt Lake City Olympics
Awards: ICRI Award of Excellence - 2002

LAGUARDIA AIRPORT
Owner: Port Authority of NY/NJ
Location: Flushing, NY
Year: 2003
Product: Sika® CarboDur®
Application: Strengthening of deck
Significance: Time sensitive project using CFRP with success for one of the busiest airports in the nation
Award: ICRI Award of Excellence - 2005

ALCATRAZ
Owner: National Park Services
Location: San Francisco, CA
Year: 2005
Product: SikaWrap® 100G / 103C
Application: Strengthening of columns / roof support / seismic strengthening
Significance: 1.4 million visitors annually / historic landmark
Award: ICRI Award of Excellence - 2005
**Office Building**

**Owner:** Private Owner  
**Location:** Washington DC Metro  
**Year:** 2006  
**Product:** SikaWrap® 103C, Sika® CarboDur®  
**Application:** Blast Mitigation  
**Significance:** Blast hardened office building

**Miami City Hall Building**

**Owner:** City of Miami  
**Location:** Miami, FL  
**Year:** 2008  
**Product:** SikaWrap® 230C  
**Application:** Strengthening of columns  
**Significance:** Renovation of the 1927 Old Miami City Hall Building - A Historic Landmark  
**Award:** ICRI Award of Merit - 2008

**Camp Verde Wastewater Treatment Plant**

**Owner:** Camp Verde Sanitary District  
**Location:** Camp Verde, AZ  
**Year:** 2010  
**Product:** SikaWrap®  
**Application:** Strengthening of walls  
**Significance:** A new construction structural defect, successfully addressed using CFRP  
**Awards:** ICRI Award of Excellence - 2010

**Culver Line Viaduct**

**Owner:** NYCT  
**Location:** Brooklyn, NY  
**Year:** 2012  
**Product:** SikaWrap® 100G  
**Application:** Confinement  
**Significance:** Continued operation of a significant transit system by the viaducts confining

*Image courtesy of www.flickr.com*
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