STRUCTURAL STRENGTHENING SYSTEMS

CarbonWrap™

DowAksa

CARBONWRAP COMPOSITE SYSTEMS

INTENDED USE

Need for strengthening as a result of increased load capacity

- Increase load capacity of bridges inconsequence of growing axial load
- Increase load capacity of floors and beams in factories because of heavy machine assembly

Repair of damages composed by harmed building elements

- Reinforcement corrosion, fire, earthquake

Need for strengthening as a result of changes in structural system

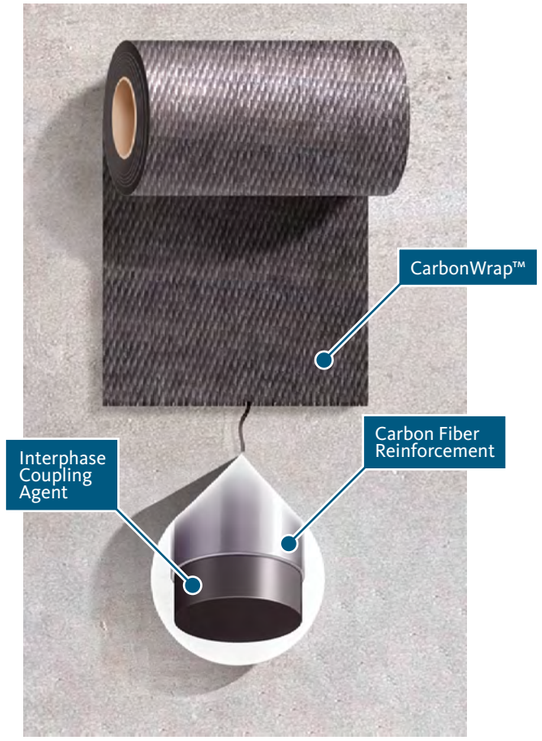
- Removal of walls or columns, carving out some parts of floor

Need for strengthening as a result of changes in standards

- Changes in earthquake regulations, changes in design methods

Need for strengthening as a result of design or construction errors

- Insufficient reinforcement



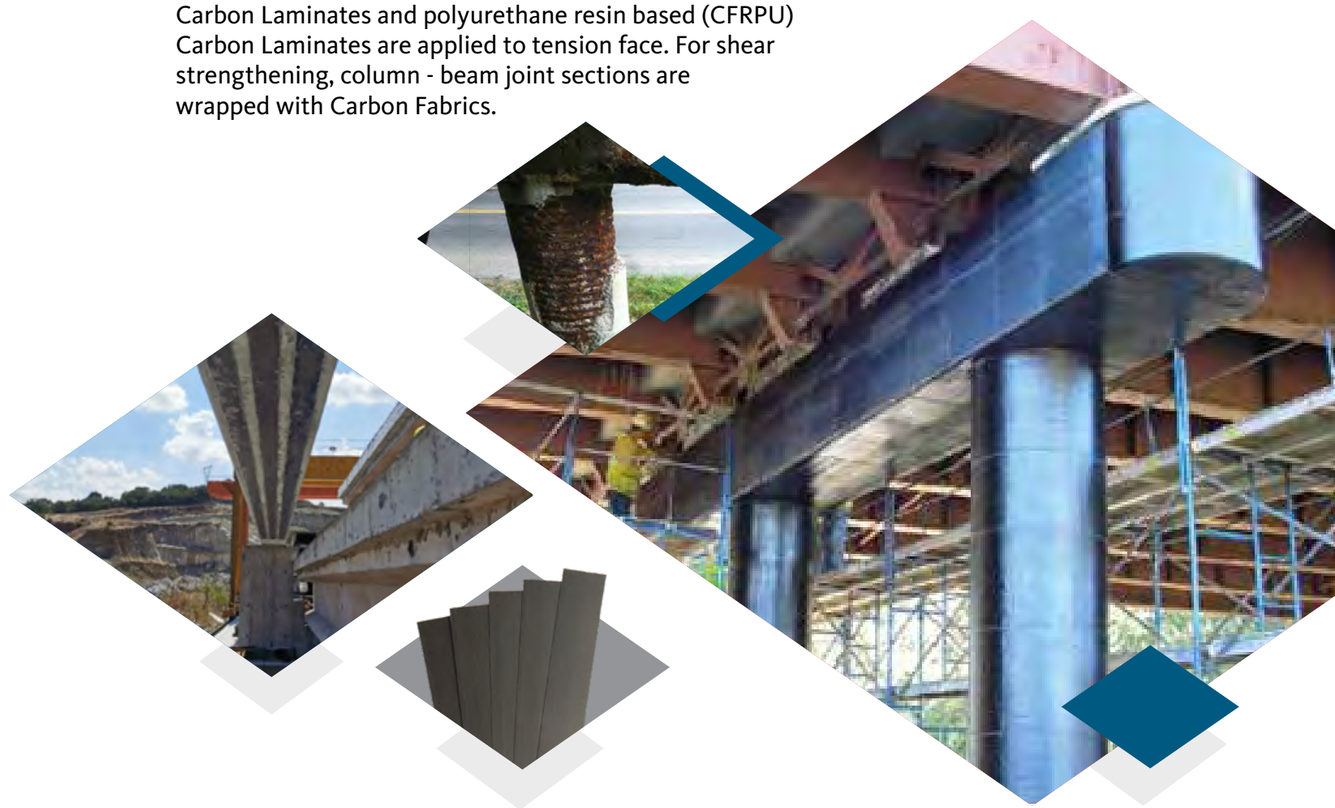
ADVANTAGES

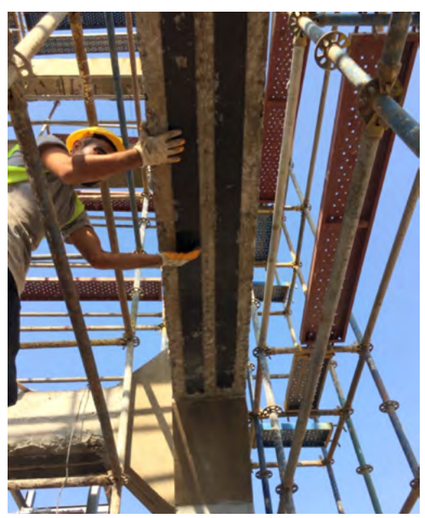
- **Easier and faster** to apply comparing to conventional methods like steel or concrete jacketing
- **Doesn't add more weight** to structure due to being extremely light
- **No need for evacuation of facility** during reinforcement application. Applications can be made with partial arrangements while facility still operates
- **Structure's area of use doesn't change.** Area of use decreases with conventional methods
- **Anti-corrosive**
- Application does not require expensive heavy machinery or equipment

BEAM STRENGTHENING

BEAMS - CONCRETE

CarbonWrap™ can increase flexural and shear strength of concrete beams. For flexural strengthening epoxy resin based Carbon Laminates and polyurethane resin based (CFRPU) Carbon Laminates are applied to tension face. For shear strengthening, column - beam joint sections are wrapped with Carbon Fabrics.





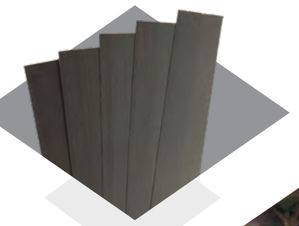
ADVANTAGES

- Increases flexural strength
- Increases shear strength
- Does not reduce overhead clearance
- Lightweight and easy to install
- Costs less than alternatives

COLUMN STRENGTHENING

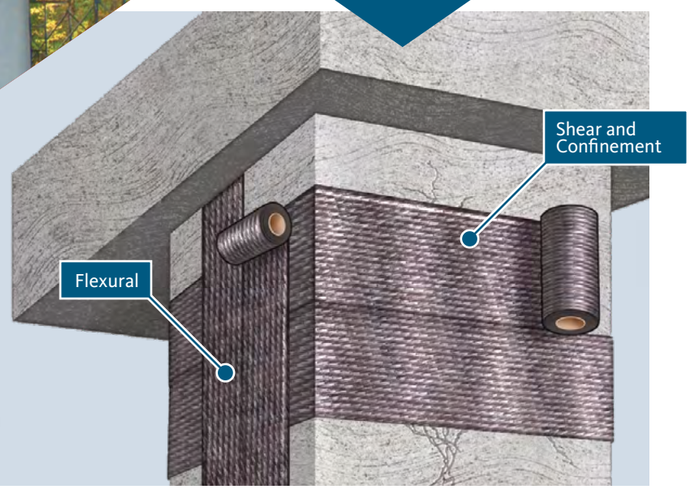
Columns - Concrete

CarbonWrap™ is used to increase the strenght of concrete columns. Due to the beneficial effects of confinement, the column ductility is significantly increased. In addition, CarbonWrap™ helps to make up for an inadequate amount of, or improperly detailed, lateral ties and increases the shear strength of the columns significantly.



ADVANTAGES

- Increases ductility
- Increases shear strength
- Increases axial load carrying capacity
- Lightweight and easy to install
- Can be wrapped along columns with varying cross section
- Costs less than alternatives such as steel jacketing



SLAB STRENGTHENING

Concrete Slabs

CarbonWrap™ epoxy resin based Carbon Laminates and polyurethane resin based (CFRPU) Carbon Laminates are applied to the bottom of slabs (positive moment regions) or to the top of the slabs (negative moment regions) to increase flexural capacity.

ADVANTAGES

- Increases flexural strength
- Reduces deflections
- Lightweight and easy to apply
- Protects slab from further environmental damage
- Costs less than alternatives

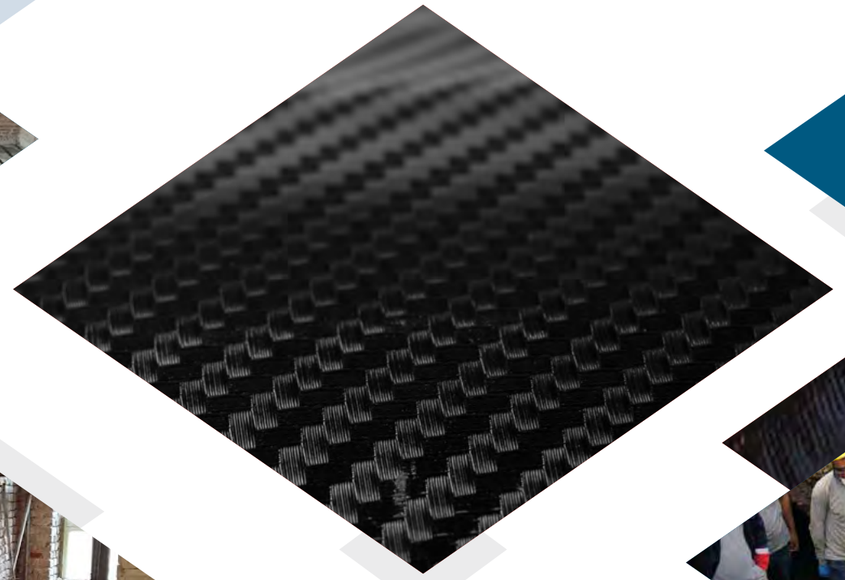
HERITAGE AND MASONRY WALL STRENGTHENING

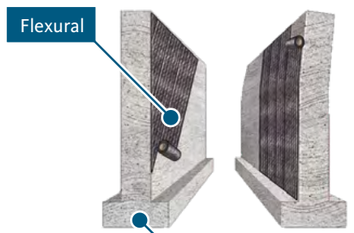
Concrete Masonry and Brick Walls

Historical buildings can be retrofitted for potential earthquakes

Masonry walls can gain properties of shear walls by wrapping

Since sections of the building won't change, authenticity of the building isn't destroyed strength of the columns increases significantly.





PIPE STRENGTHENING

Concrete Pipes

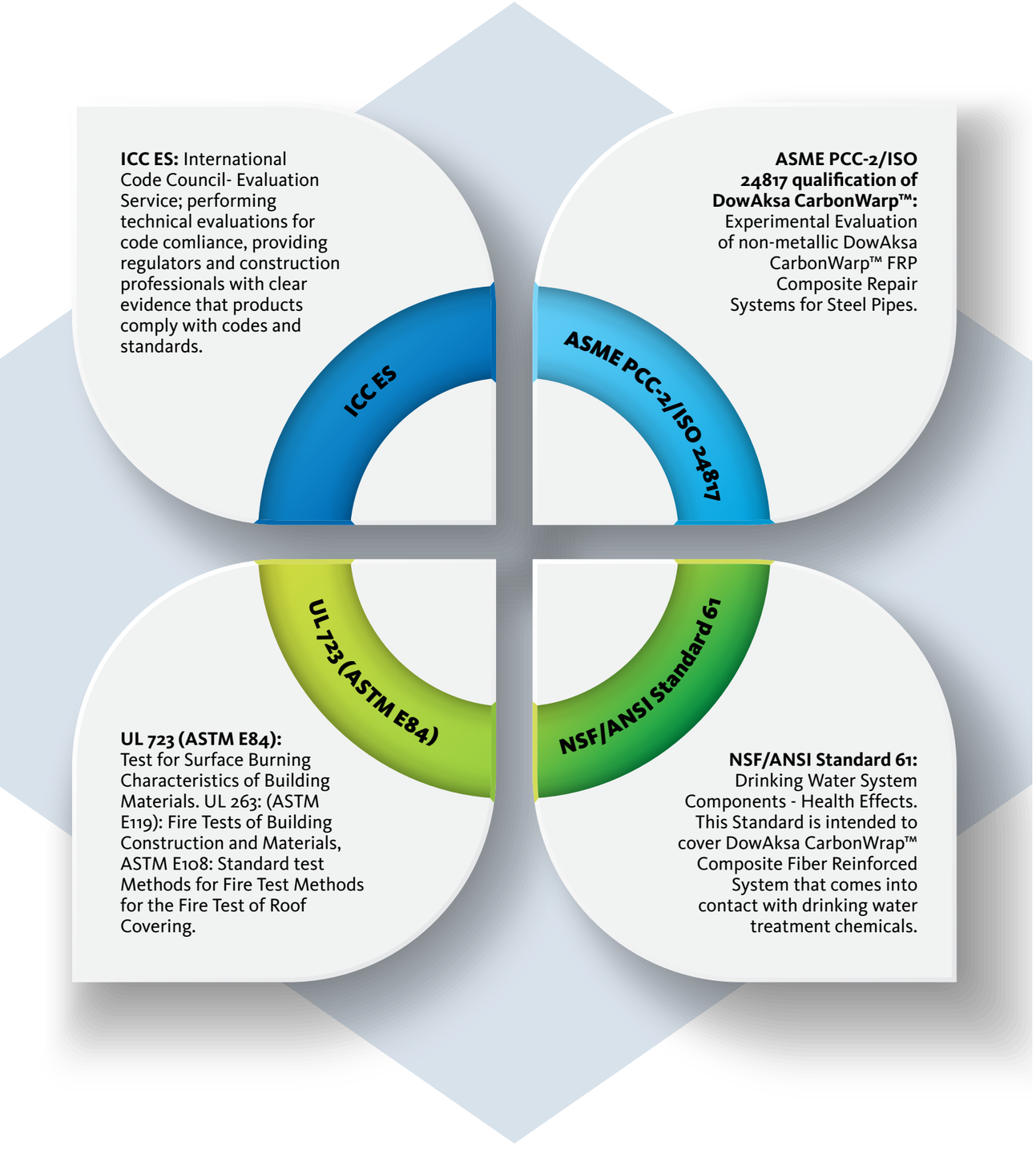
Applicable for every pipe both from inside and outside

Original strength of steel pipes lost due to corrosion can be regained

It is possible to avoid excessive excavation costs in repair of buried pipes because of being applicable from inside

Application can be implemented without interrupting operations of facility.

CERTIFICATES



ICC ES: International Code Council- Evaluation Service; performing technical evaluations for code comliance, providing regulators and construction professionals with clear evidence that products comply with codes and standards.

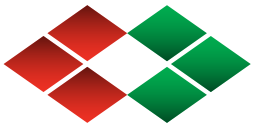
ASME PCC-2/ISO 24817 qualification of DowAksa CarbonWarp™: Experimental Evaluation of non-metallic DowAksa CarbonWarp™ FRP Composite Repair Systems for Steel Pipes.

UL 723 (ASTM E84): Test for Surface Burning Characteristics of Building Materials. UL 263: (ASTM E119): Fire Tests of Building Construction and Materials, ASTM E108: Standard test Methods for Fire Test Methods for the Fire Test of Roof Covering.

NSF/ANSI Standard 61: Drinking Water System Components - Health Effects. This Standard is intended to cover DowAksa CarbonWrap™ Composite Fiber Reinforced System that comes into contact with drinking water treatment chemicals.

CF STRENGTHENING - PRODUCT SUGGESTION TABLE

Structural Strengthening	Products								
Application	Carbonbond Epoxy Resin	CarbonWrap Epoxy Resin 530+	CarbonWrap UnderWater Epoxy Resin	CarbonWrap Resin Laminate Adhesive Putty	CarbonWrap CF 300UD Undirectional Carbon Fabric	CarbonWrap CF 600BD Bidirectional Carbon Fabric	CFRPU Laminate Width: 60-180mm Thickness:4.9mm	CarbonWrap Carbon Laminate Systems	CarbonWrap Mesh Systems
Building Strengthening									
Increasing Columns Shear Capacity	√	√			√	√			
Increasing Columns Ductility	√	√			√	√			
Increasing Beams Shear Capacity	√	√			√	√			
Increasing Beams Flexural Capacity				√			√	√	
Increasing Slabs Flexural Capacity				√			√	√	
Increasing Shear Walls Shear Capacity	√	√		√	√	√	√	√	
Strengthening Infillwalls									√
Viaduct and Bridge Strengthening									
Increasing Columns Shear Capacity	√	√			√	√			
Increasing Columns Ductility	√	√			√	√			
Increasing Beams Shear Capacity	√	√		√	√	√			
Increasing Beams Flexural Capacity				√			√	√	
Increasing Slabs Flexural Capacity				√			√	√	
Port and Harbour Strengthening									
Increasing Piles Shear Capacity			√		√	√			
Increasing Piles Ductility			√		√	√			
Increasing Beams Shear Capacity			√		√	√			
Increasing Beams Flexural Capacity				√			√	√	
Increasing Slabs Flexural Capacity				√			√	√	
Historage Strengthening									
Strengthening İnfillwalls									√
Pipe Retrofitting	√	√	√	√	√	√	√		



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