

195mm

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### Intermediate modulus TORAYCA® FABRICS

This TORAYCA® FABRICS performs equivalent reinforcing effect as high modulus type CF sheet.

#### 〈1.Improvement of fatigue durability for RC slab〉

It has been reported in accordance with official guidelines (see below) that intermediate modulus type TORAYCA® FABRICS (Product name: UM46-34G) has the equivalent reinforcing effect as the high modulus type CF sheet.

According to the results of fatigue tests jointly conducted by the Public Works Research Institute of the former Ministry of Construction and the Carbon Fiber Repair & Reinforcement Construction Technology Research Institute using wheel-load running testing machine, the tensile rigidity of the CFRP using the standard reinforcement amount for RC slabs [carbon fiber areal weight : 300 g/m<sup>2</sup>, Young's modulus : 245 kN/mm<sup>2</sup>, two layers each in the direction of main rebar direction and distributed rebar direction] was 82 kN/mm width in each direction. When using different types of carbon fiber sheets such as a intermediate modulus type or a high-modulus type of carbon fiber sheet, it is better if the tensile rigidity (Ecf x Acf) calculated from Young's modulus and design thickness of the CFRP sheet is equivalent to the above standard reinforcement amount of 82 kN/mm.

\*Reference: "Joint Research Report on the Repair and Reinforcement of Concrete Members (III) (Design and Construction Guidelines for the Repair and Reinforcement of Road Bridge Concrete Members using Carbon Fiber Sheet Bonding Method (draft))," December 1999, p.38

	Type	Model	Young's modulus (kN/mm)	Carbon fiber areal weight (g/m <sup>2</sup> )	Design thickness (mm)	Amount of layers (main rebar direction x distributed rebar direction)	Tensile rigidity* (kN/mm width)	Tensile strength (N/mm)
Toray	Intermediate modulus (PAN Type)	UM46-34G	440	340	0.185	1×1	82	2,400≦
Other company's product (Reference)	High modulus (Pitch Type)	EA82-3	640	270	0.128	1×1	82	1,900

\*Tensile rigidity is calculated by the following equation: tensile rigidity = Young's Modulus × design thickness × amount of each directional layers

#### 〈2.Improvement of bending strength〉

Intermediate modulus type TORAYCA® FABRICS is suitable for reducing stress of rebar.

Toray has three types of this model (UM46-30G, UM46-34G, UM46-40G). Optically combining them, economical design is achieved.

	Type	Model	Young's modulus (kN/mm)	Carbon fiber areal weight (g/m <sup>2</sup> )	Design thickness (mm)	Tensile rigidity per layer* (kN/mmwidth)	Tensile strength (N/mm)
Toray	Intermediate modulus (PAN Type)	UM46-40G	440	400	0.217	96	2,400≦
Other company (Reference)	High modulus (Pitch Type)	C8-30 M6-30 UHM300	640	300	0.143	92	1,900

\*Tensile rigidity is calculated by the following equation: tensile rigidity = Young's Modulus × design thickness × amount of each directional layers

210mm

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### Specifications of TORAYCA® FABRICS

Type	Unidirectional high strength fabric					Unidirectional intermediate modulus typed fabric			Bidirectional high strength fabric	
	UT70-20G	UT70-30G	UT70-40G	UT70-45G	UT70-60G	UM46-30G	UM46-34G	UM46-40G	BT70-20	BT70-30
Carbon fiber areal weight (g/m <sup>2</sup> )	200	300	400	450	600	300	340	400	Vertical 100 Horizontal 100	Vertical 150 Horizontal 150
Design thickness (mm)*1	0.111	0.167	0.222	0.250	0.333	0.163	0.186	0.217	Vertical 0.056 Horizontal 0.056	Vertical 0.083 Horizontal 0.083
Carbon fiber density(g/cm <sup>3</sup> )	1.80	1.80	1.80	1.80	1.80	1.84	1.84	1.84	1.80	1.80
Tensile strength JIS A1191 (N/mm <sup>2</sup> )*2	4,686	4,751	4,838	4,809	4,166	3,848	3,607	3,813	Vertical 4,515 Horizontal 4,396	Vertical 3,899 Horizontal 3,951
Young's modulus JIS A1191 (kN/mm <sup>2</sup> )*2	258	252	254	260	250	440	451	445	259	229
Width (cm)	25,33,50	25,33,50	50*3	50	50	25	25	25	100	100

\*1. Values are set based on actual cross-sectional area of the carbon fiber. The thickness after application including resin is 0.6 to 1.5 mm per layer.

\*2. Tensile strength and Young's modulus are shown by average values and was evaluated according to JIS A 1191.

\*3. The widths of 25cm and 33cm for UT70-40G, 45G, and 60G are available made-to-order.

• A special misalignment prevention process is applied to help prevent fraying of the cut thread.

• All products are packed in rolls of 50m.

#### Handling Precautions of TORAYCA® FABRICS

1. Be sure to read the safety information [Safety Data Sheet (SDS)] before using TORAYCA® FABRICS Also, please check the "TORAYCA® FABRICS Method Safety Precautions" in the TORAYCA® FABRICS method technical material.
2. Fuzz and lint can easily occur while handling TORAYCA® FABRICS, which in turn may cause irritation and itching if contact is made with skin, and can possibly cause respiratory problems if breathed into the throat, trachea, or lungs.
3. TORAYCA® FABRICS is conductive. As such, the user could suffer an electric shock should the cloth come into contact with a power source. Further, fuzz, lint, and cut waste of the carbon fiber can get into electrical outlets and plugs, potentially resulting in a short circuit, whereby potentially causing damage to electric appliances. Therefore, be sure to keep away from power supplies and take care to ensure that no carbon fibers get into electrical outlets, plugs, and electrical appliances.
4. If fuzz and dust will be generated during cutting and processing TORAYCA® FABRICS, be sure to provide local exhaust equipment at the work site in question. Be sure to use a filter for exhaust and use equipment in a way to prevent dust and fuzz from being directly discharged into the atmosphere. Wear protective equipment such as protective glasses, protective gloves and dust masks while working. If the carbon fibers adhere to the skin, rinse with soap and water. If carbon fiber fuzz gets into a worker's eyes or other medical situations occur, please seek medical attention immediately.

TORAYCA® is a registered trademark of Toray.

Manufacturer

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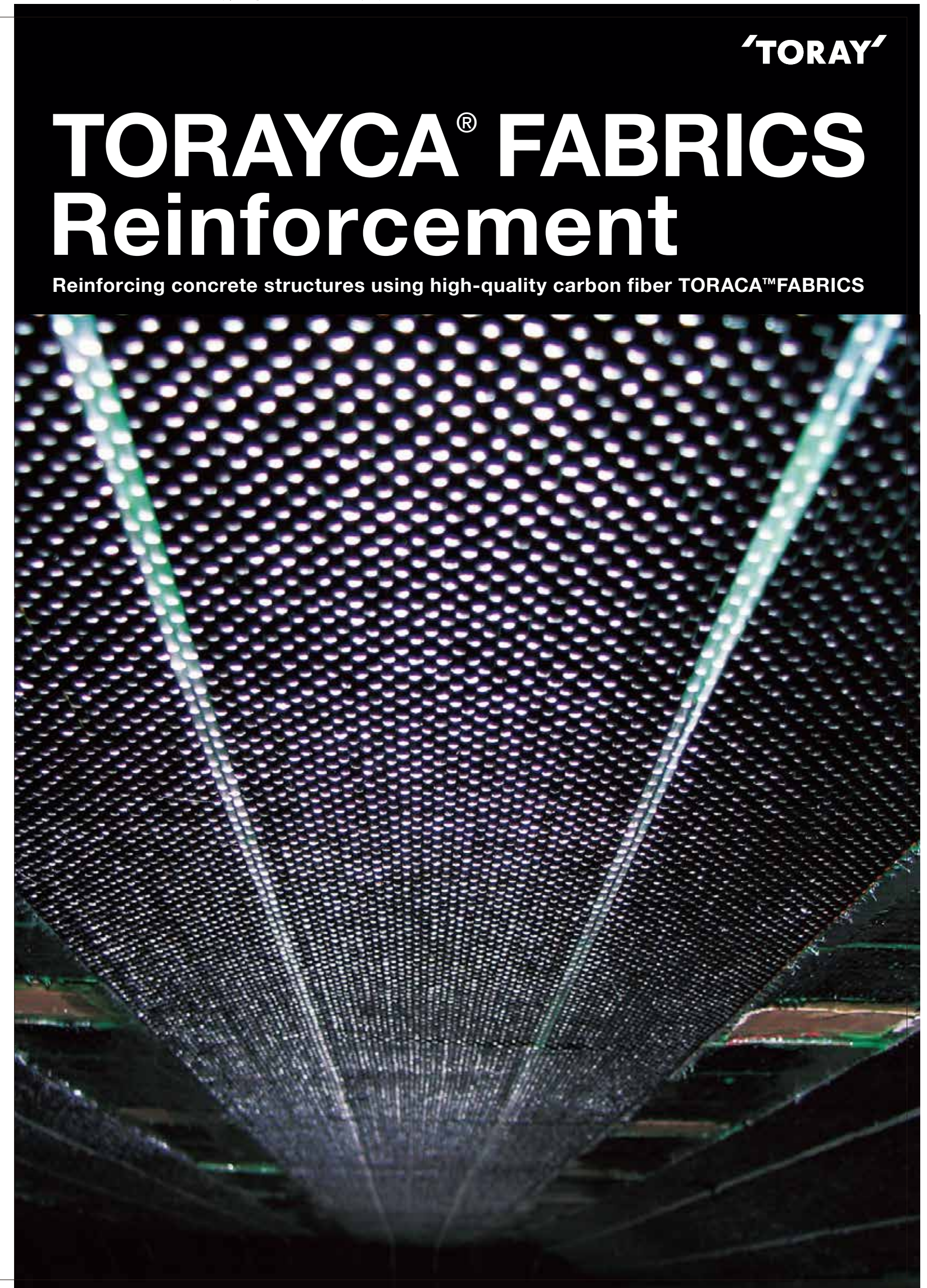
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210mm (表紙の面です)

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'TORAY'

# TORAYCA® FABRICS Reinforcement

Reinforcing concrete structures using high-quality carbon fiber TORAYCA™ FABRICS

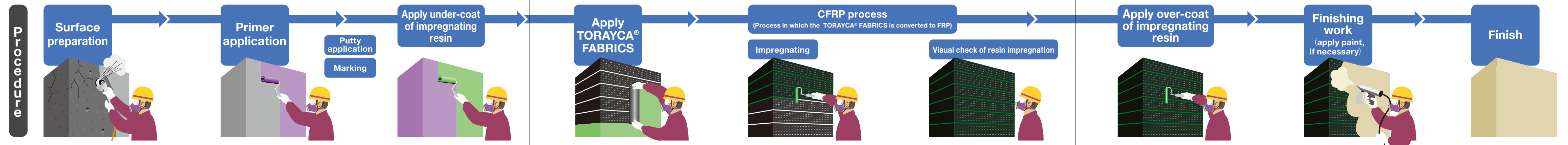
210mm (表紙の裏面です)

C'

# TORAYCA® FABRICS Reinforcement

TORAYCA® FABRICS has a special function of checking resin impregnation.

- The color changes from white to transparent as the resin is impregnated, making it possible to visually check impregnation as the cloth is installed.
- Easy preventing from human error.

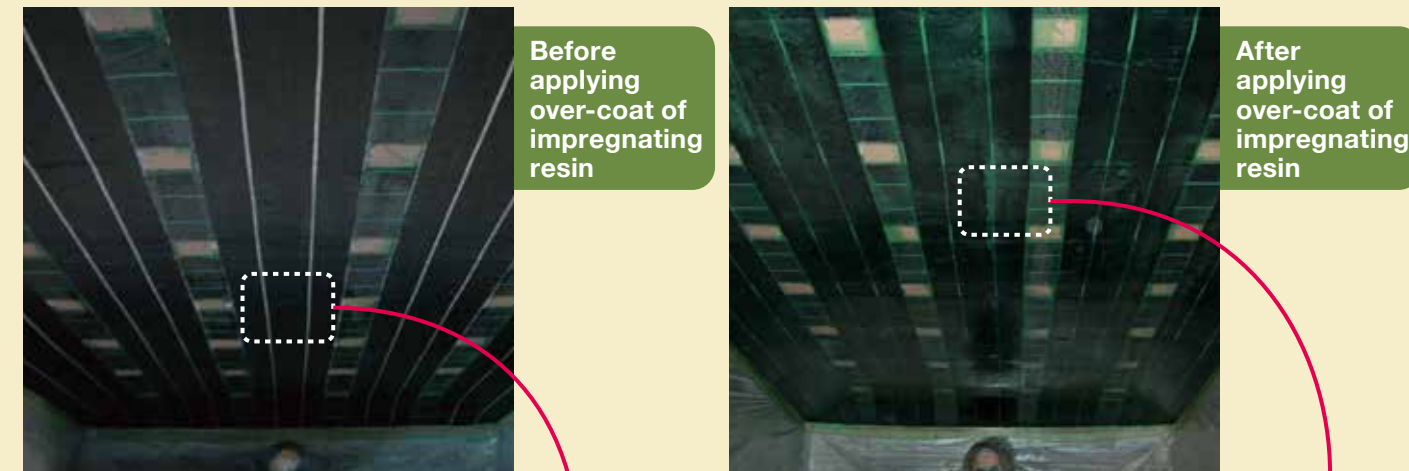


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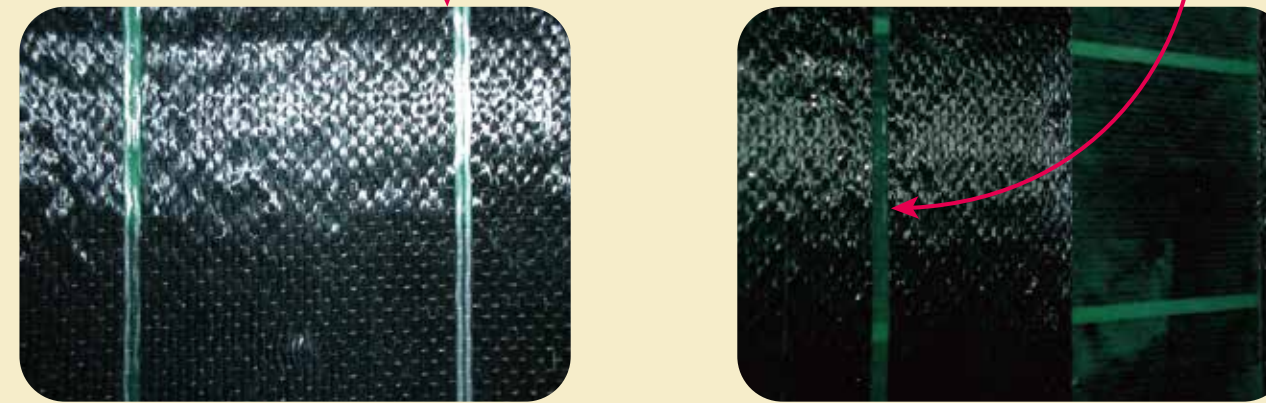
B'

## Case of working

Site name: Shirokaizu overpass bridge beam repair work  
Project owner: Higashi Mikawa Construction Office, Aichi Prefectural



The glass roving becomes transparent, making it possible to visually check the status of impregnation.

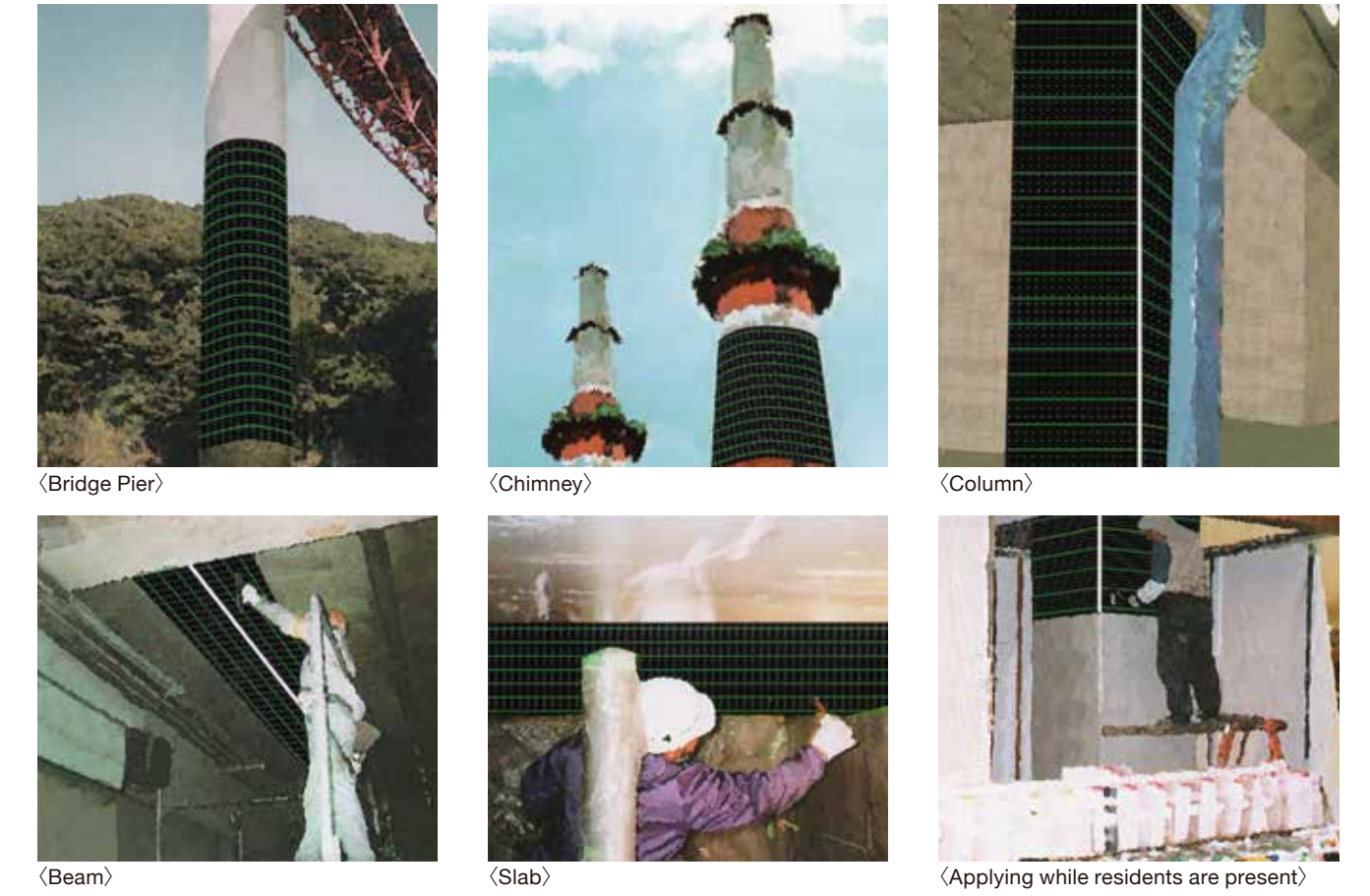


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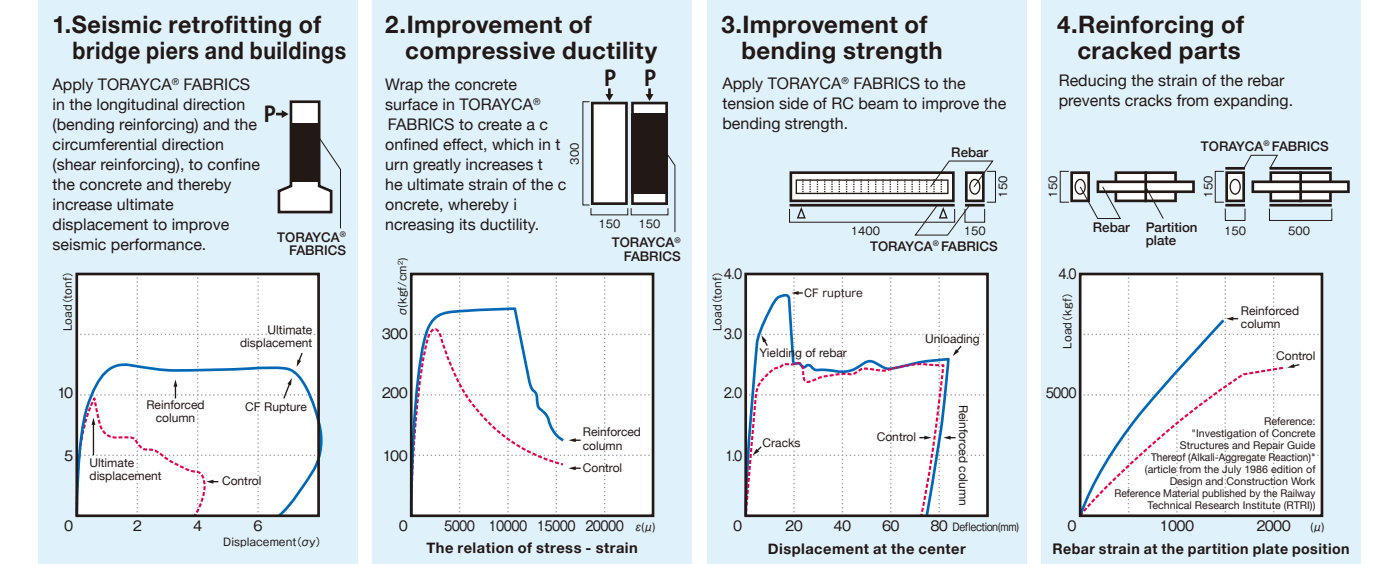
A'

## Applications

(The following images are for purposes of illustration only)



## Effect of reinforcing



Reference:  
"Investigation of Concrete Structures and Repair Guide (Series of Alkali-Aggregate Reaction)"  
Articles from the July 1998 edition of Design and Construction Work Reference Material published by the Railway Technical Research Institute (RTRI)