

Japanese, U.S., Chinese, Russian, Korean and Taiwanese Patent Issued
Patent pending in other countries / Application for International Patent Cooperation Treaty

Deflective Anchor Bolts / Anchor-integrated Liner

(Adhesive, concrete-embedding, deflective anchor bolt) (Simple jig for equipment installation/centering work)

The Deflective Anchor Bolts have been developed so they can be installed without any change in the installation position, even if the bolt encounters a re-bar. Using the Deflective Anchor Bolts can eliminate improper construction caused by oblique driving of anchor bolts, cutting of re-bar, and so on. Thus, we believe that the contractor can earn their client's complete trust.

- (1) Environmentally-friendly, energy-saving anchor bolts, without requiring chipping → Reduction in CO₂ emission
- (2) The Deflective Anchor Bolts can notably shorten the construction period (by approx. 14 to 28 days).
- (3) The Deflective Anchor Bolts can improve construction quality, while notably reducing construction costs.
- (4) Generally, the deflective anchor provides higher pull-out strength than a conventional straight, full-thread, adhesive, concrete-embedding anchor.

The anchor-integrated liner has been developed to shorten the liner adjusting time when the liner is used for conventional equipment installation/centering work, and to improve the work accuracy.

- (1) The screw-type liner simplifies centering work with an accuracy of between 1/1000 and 5/100. (During installation, centering time can be shortened by 50%.)



Suehiro System Co., Ltd.

<Deflective Anchor Bolts>

1. Release of Deflective Anchor Bolts (Adhesive, concrete-embedding, deflective anchor bolts)

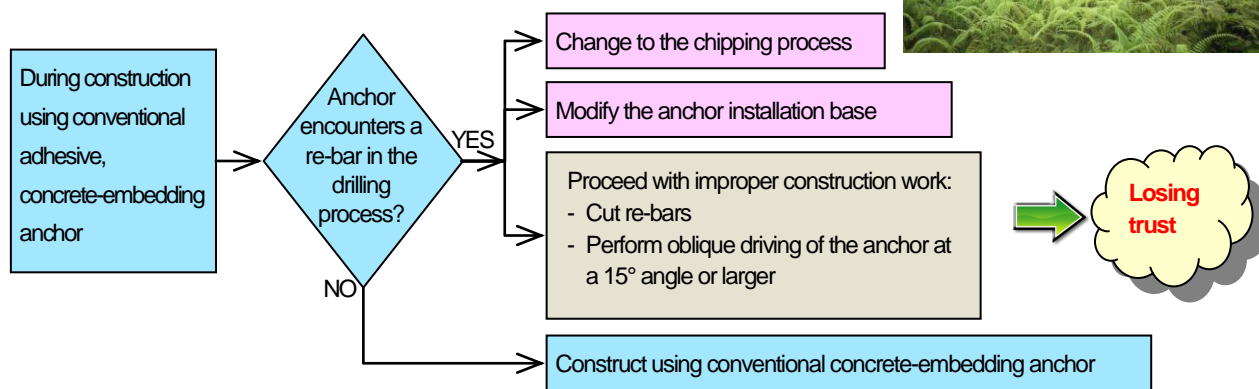
The Deflective Anchor Bolts have been developed based on the policy that “spread of the adhesive, concrete-embedding anchor installation method without requiring the chipping process serves as a global warming preventive measure”.

Conventionally, straight concrete-embedding anchor bolts cannot be used when the bolt encounters a re-bar in the drilling process.

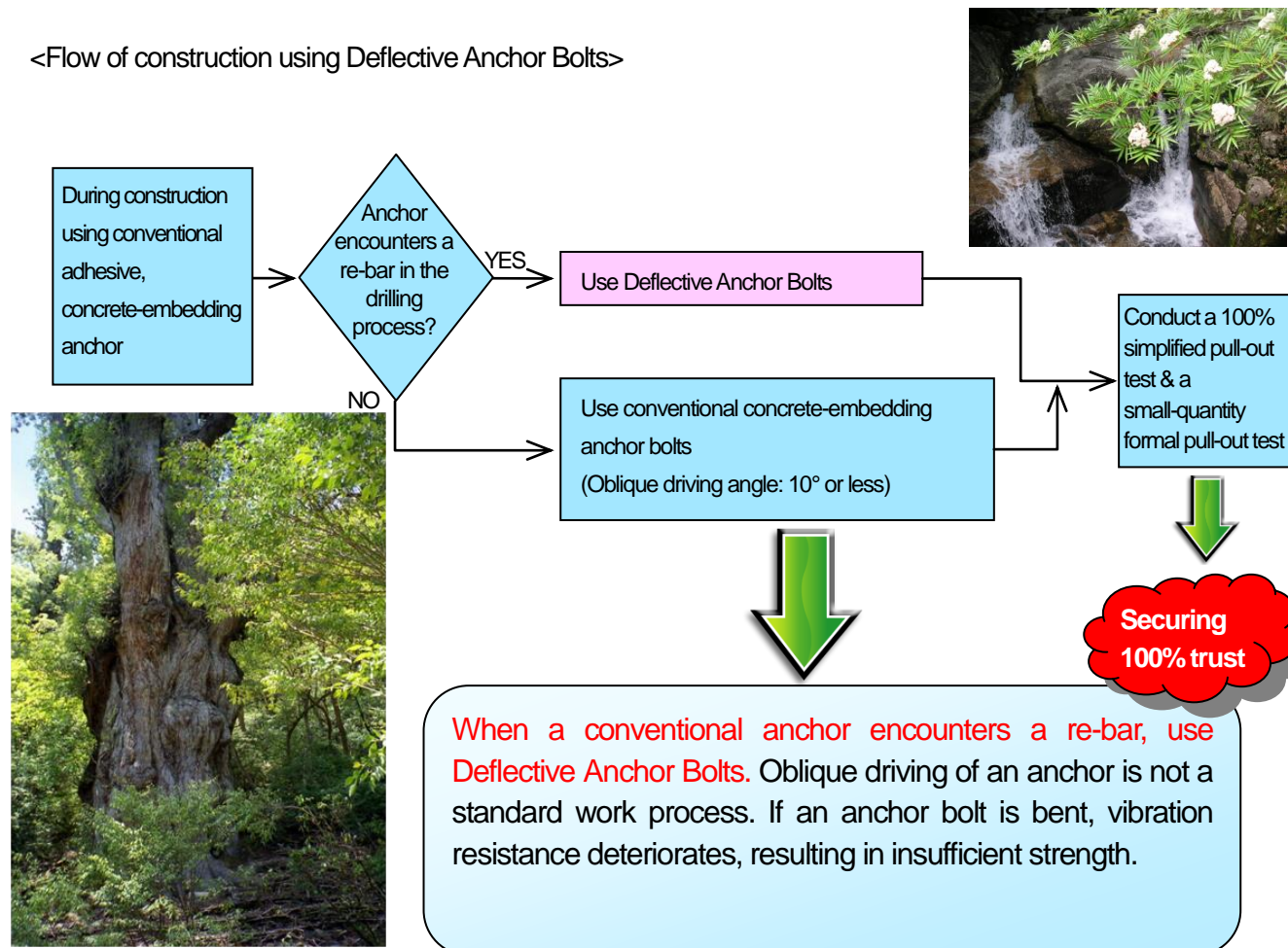
The newly-developed adhesive, concrete-embedding, deflective anchor bolts, (referred to as “Deflective Anchor Bolts”) provide deflection so that they can avoid a re-bar without changing the installation position. Even if a re-bar exists at the installation position, the adhesive, concrete-embedding anchor bolts can be easily and correctly installed.



<Flow of conventional construction>



<Flow of construction using Deflective Anchor Bolts>

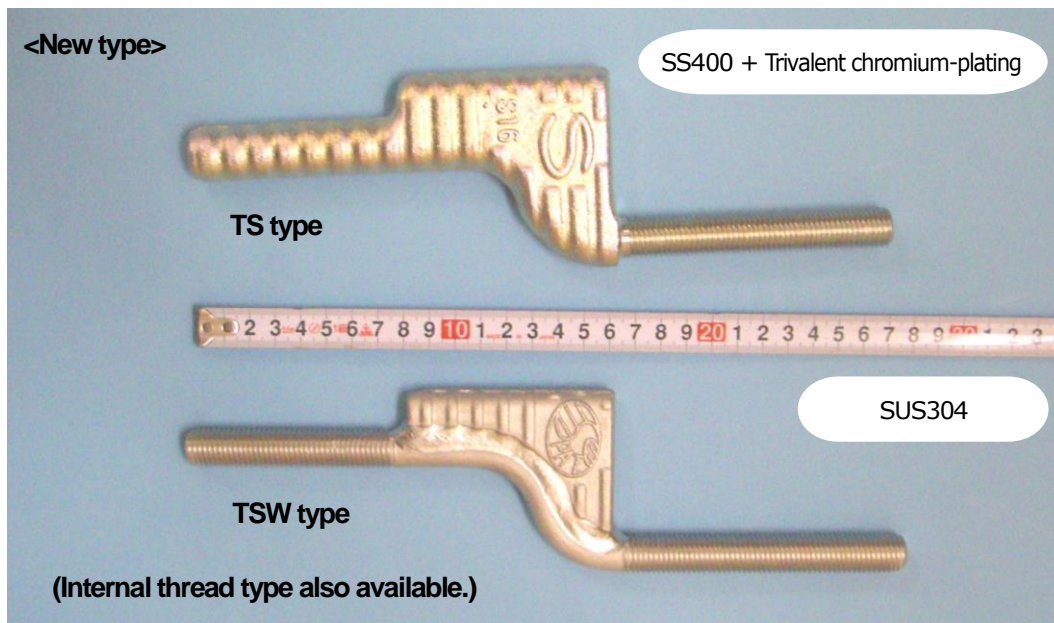


2. Product Lineup

1) TS12xD40 Deflective Anchor Bolt (Mounting thread: M12, Deflection: 40 mm)



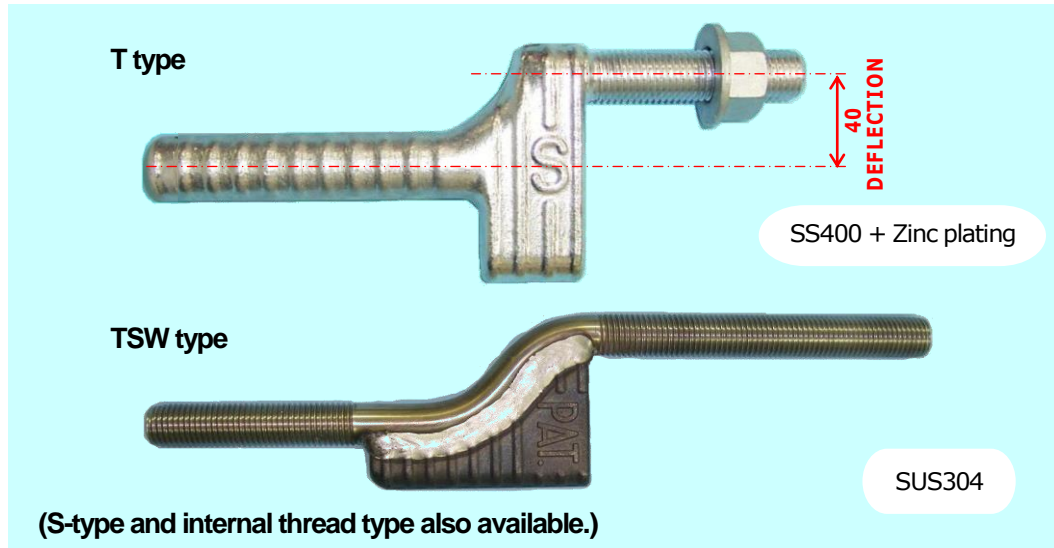
2) TS(TSW)16xD40 Deflective Anchor Bolt (Mounting thread: M16, Deflection: 40 mm)



S16xD25, S16xD40		Deflective Anchor Bolt		M16, full-thread, D13 re-bar
Material	SUS304 / SS400		SUS304 / SS400	
Allowable tensile load (short-term) kN·(kgf)	Calculation value	Experiment value	Commercially-available driven type bolt with standard length	
	36.1 (3681)	41.0 to 44.5 (4181 to 4538)	34.4 to 25.2* (3508 to 2570)*	
Allowable tensile load (long-term) kN·(kgf)	24.1 (2458)	27.3 to 29.7 (2784 to 3029)	22.9 to 16.8* (2335 to 1713)*	

* indicates reference values.

3) T(TSW)20×D40 Deflective Anchor Bolt (Mounting thread: M20, Deflection: 40 mm)

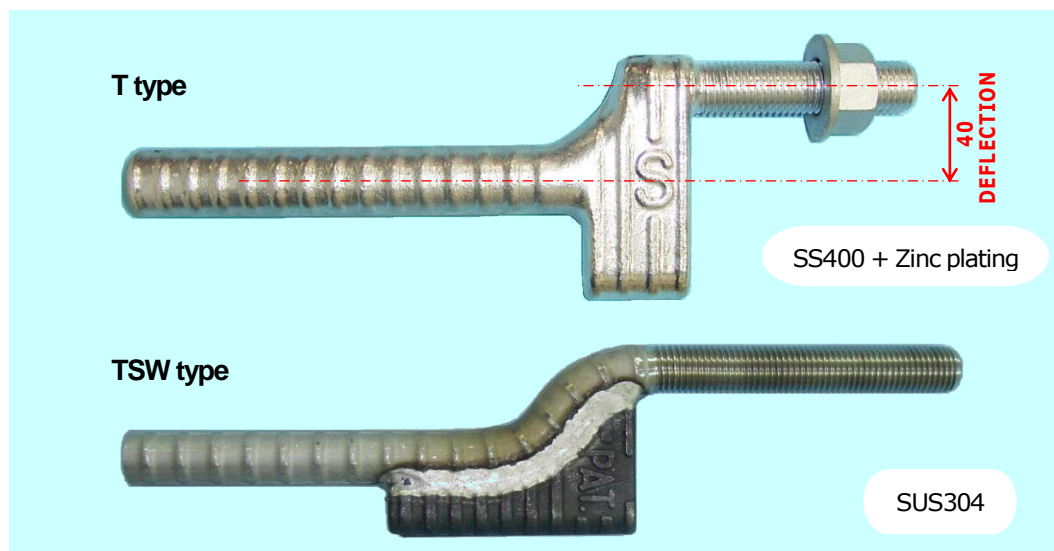


	Deflective Anchor Bolt		M20, full-thread, D19 re-bar
Material	SUS304 / SS400		SUS304 / SS400
Allowable tensile load (short-term) kN·(kgf)	Calculation value	Experiment value	Commercially-available driven type bolt with standard length
	56.5 (5761)	77.0 to 80.3 (7852 to 8188)	40 to 50* (4079 to 5099)*
Allowable tensile load (long-term) kN·(kgf)	37.6 (3834)	51.3 to 53.5 (5231 to 5455)	26.6 to 33.3* (2712 to 3396)*

* indicates reference values.

4) T(TSW)22×D40 / T(TSW)24×D40 Deflective Anchor Bolt

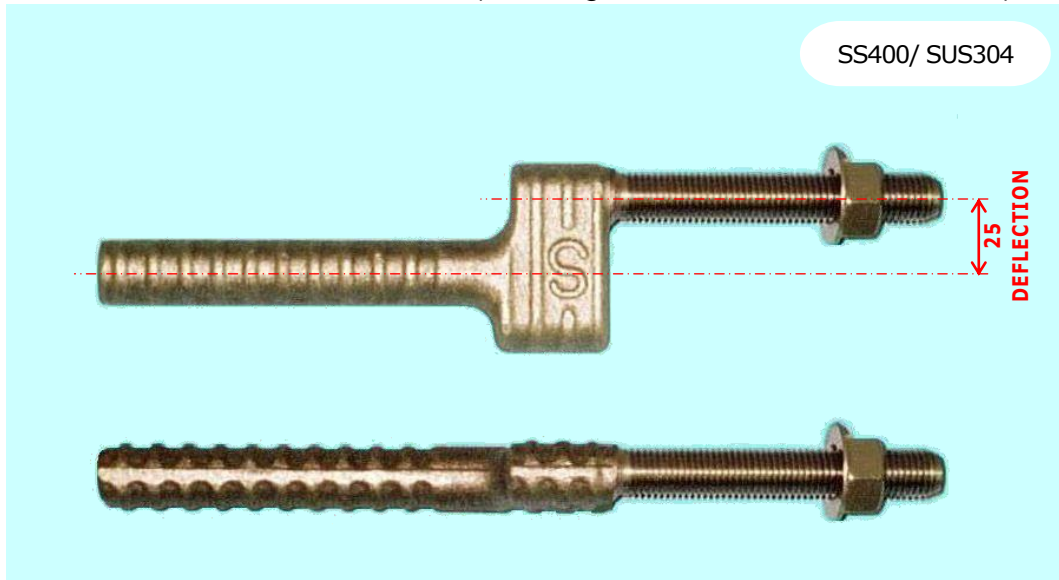
(Mounting thread: M22/M24, Deflection: 40 mm)



	Deflective Anchor Bolt		M24, full-thread, D25 re-bar
Material	SUS304 / SS400		SUS304 / SS400
Allowable tensile load (short-term) kN·(kgf)	Calculation value	Experiment value	Commercially-available driven type bolt with standard length
	81.3 (8290)	89.0 to 91.0 (9075 to 9279)	60 to 75* (6118 to 7648)*
Allowable tensile load (long-term) kN·(kgf)	54.2 (5527)	59.3 to 60.7 (6047 to 6190)	40 to 50* (4079 to 5099)*

* indicates reference values.

5) T16xD25 Deflective Anchor Bolt (Mounting thread: M16, Deflection: 25 mm)



6) TSW16xD40 Deflective Anchor Bolt for Embedding

(Mounting thread: M16, Deflection: 40 mm)

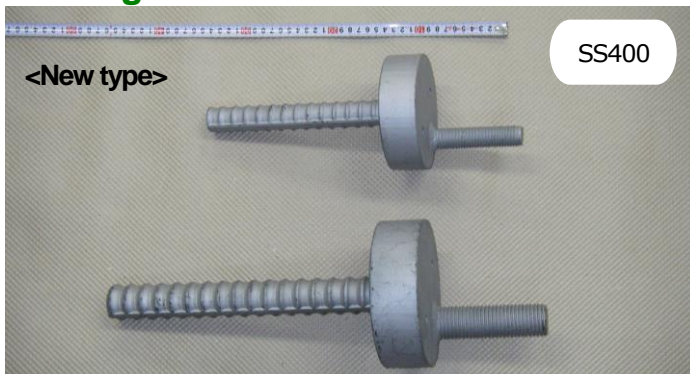


7) D16 Reinforcement Joint Deflective Anchor Bolt

(For seismic-resistant reinforcement, expansion of wall/floor/beam reinforcement, and foundation of equipment)



8) WD Large-size Deflective Anchor Bolt

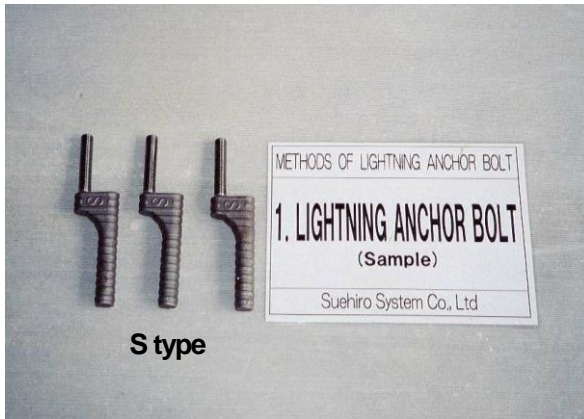


(Mounting thread: M24, M30, M36)
Dimensions can be freely selected.
Applicable as a reinforcement joint.

3. Procedure for Construction Work Using Deflective Anchor Bolts

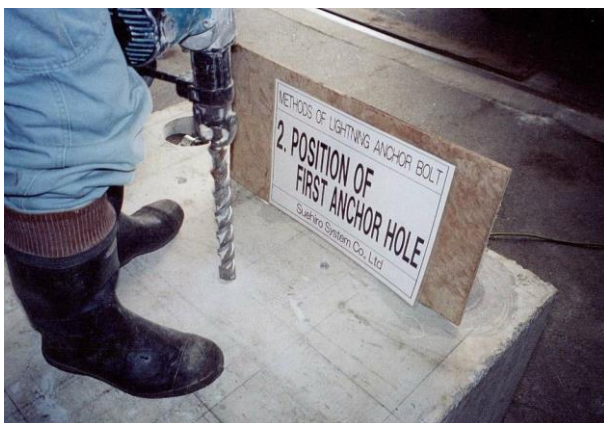
(Construction work using concrete-embedding anchor bolts without interference with re-bars)

- 1) Prepare Deflective Anchor Bolts and adhesive.
(Adhesive is included in the product package for deflective anchor bolts.)



<Sample>

- 2) Drill an anchor hole at the marked position. There is a re-bar at the drilling position. (The 1st anchor bolt hole encounters a re-bar.)



<Marking and drilling of anchor bolt hole>

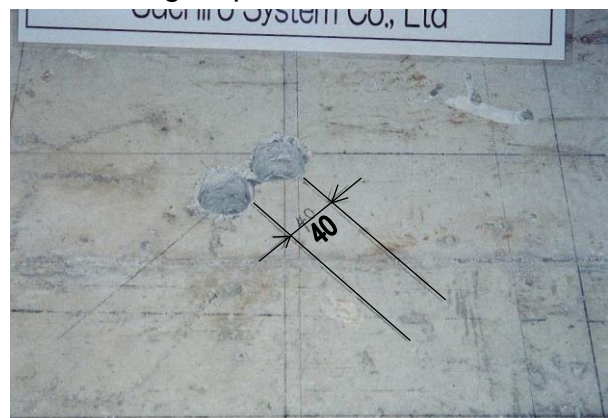


<Re-bar at drilling position>

- 3) Mark the 2nd anchor bolt hole position at a diagonal deflection distance* (40 mm) from the 1st anchor bolt hole, and drill the 2nd anchor bolt hole. → Drilling at specified dimension



<Drilling of 2nd anchor bolt hole>



<Drilling of 2nd anchor bolt hole at 40 mm deflection distance>

* Deflective Anchor Bolt S20 provides a deflection distance of 40 mm.

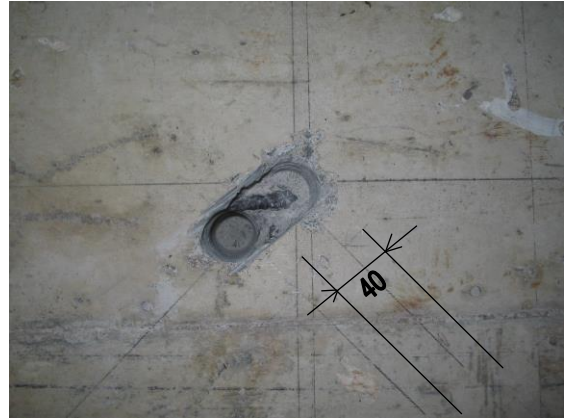
4) Connect the two anchor bolt holes.

Cut the concrete surface with a diamond cutter, and chip the concrete surface by moving the cutter, while moving the cutter edge right/left.

Make a hole in which the joint part of the defective anchor bolt is thoroughly embedded (approx. 5 mm below the concrete surface). (Before pouring adhesive into the hole, insert the defective anchor bolt into the hole to ensure that the anchor bolt is thoroughly embedded in the hole.)



<Cutting the concrete surface with a cutter>



<Connecting anchor bolt holes>

5) Brush the drilled surface.

6) Clean the drilled surface with a blower.

7) Brush the drilled surface again.

8) Clean the drilled surface with a blower.

Cleaning of the drilled surface is the key point to anchor bolt adhesion strength.

Repeat brushing and cleaning twice.

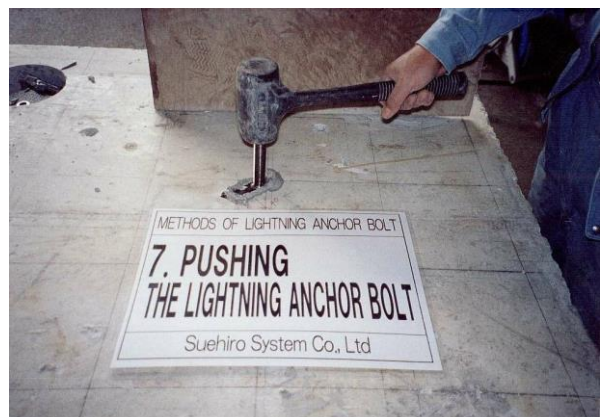
Dry up moisture.

9) Pour adhesive into the hole.
(Use our specified product.)

10) Drive a defective anchor bolt with a cushion hammer or equivalent tool. (You may push the bolt head by hand, while protecting it with cushion material.)



<Pouring adhesive>



<Installation of Defective Anchor Bolt>

11) Installation of Deflective Anchor Bolt is completed.



<Completion of Deflective Anchor Bolt installation>

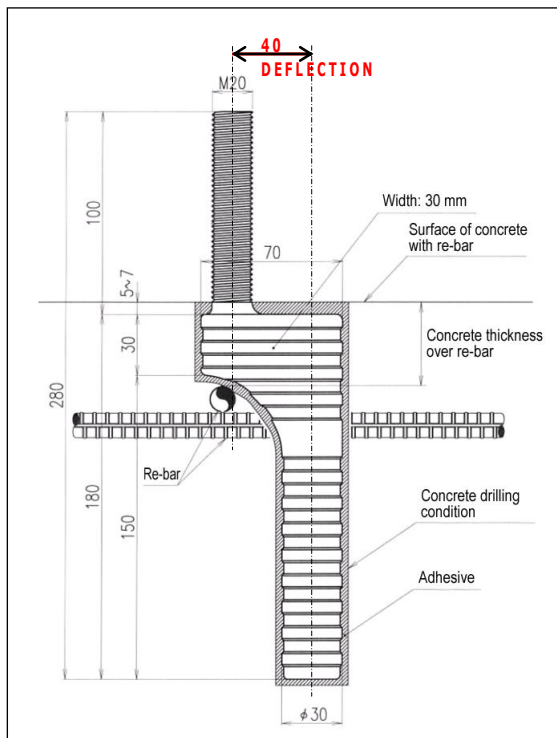
Level the adhesive so that it becomes flush with the concrete surface or wall surface. Remove surplus adhesive with a spatula or the like. After curing the adhesive for 24 hours, the Deflective Anchor Bolt installation procedure is completed. The joint part of the Deflective Anchor Bolt should be recessed from the concrete surface by 5 mm to 7 mm.

12) Pull-out test

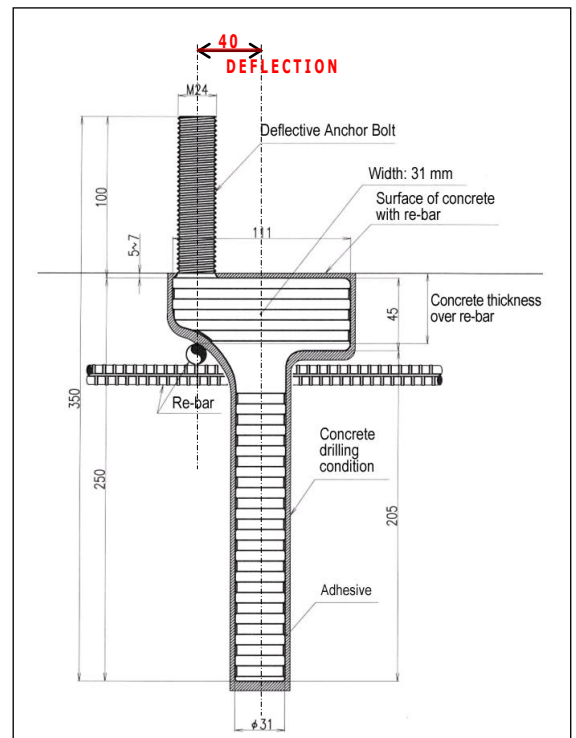


<Pull-out test>

After curing for 24 hours, conduct anchor bolt pull-out test. During this test, provide a space above the joint part.



<S20 installation condition>
(Mounting thread: M20)



<T22/T24 installation condition>
(Mounting thread: M22/M24)

4. Examples of Construction Work Using Deflective Anchor Bolts

Example of construction work 1) : Slab reinforcement (20 t) at sewage disposal plant of Nara Prefecture

Example of slab reinforcement work completed in 2 days



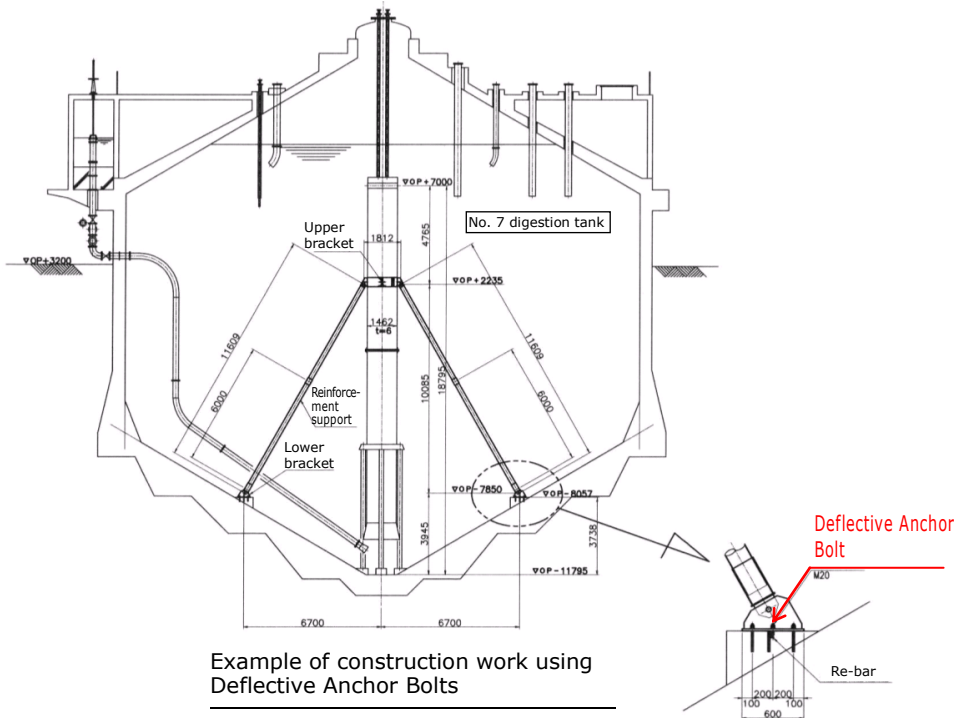
<Using H-200x600>



<Deflective Anchor Bolts are used at seven points out of eight points>

Example of construction work 2) : Installation of draft tube seismic-resistance reinforcement support at sewage disposal plant of Osaka City

For installation in an anti-corrosion layer, epoxy resin adhesive is used. This is an example of construction work using the Deflective Anchor Bolts, which was completed in one day. The anti-corrosion lining need not be repaired.



Example of construction work 3) : Slab reinforcement at sewage disposal plant of Shiga Prefecture

Example of large gate base slab reinforcement work completed in 2 days



<Driving anchor>



<Mounting bracket>

Example of construction work 4) :
Seismic-resistant reinforcement at pump
plant of Tokyo Metropolis

Example of use for 80-ton large frame base anchor



<Driving anchor>

Example of test 1) :
At pump plant of Tokyo Metropolis

PASS



<Anchor pull-out test>

Example of construction work 5) :
Construction method without chipping a pillar or beam
At sewage disposal plant of Saitama Prefecture

Example of installation of bearing anchor bolts to a pillar
(S24 Deflective Anchor Bolts are used for 40% of the total
number of bearings (48 points in total)).



<Driving anchor>

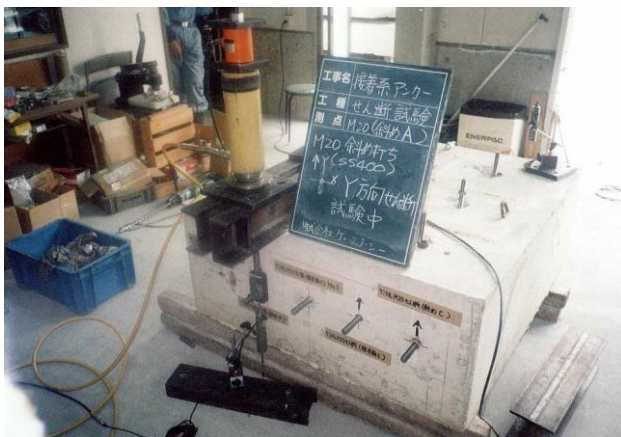
Example of test 2) :
At Sewage disposal plant of Saitama Prefecture

PASS



<Anchor pull-out test>

Example of test 3) :
Destructive test at KFC company's site



Judged OK

Example of test 4) : Destructive test at
NIHON DECOLUXE company's site



Judged OK

Example of construction work 6) :
Sludge collector bearing anchor bolt at sewage disposal plant of Chiba Prefecture

For all bearings and brackets, Deflective Anchor Bolts and conventional chemical anchor bolts are used.



Chipping, welding and non-shrinkage mortar filling processes can be eliminated, resulting in a notable reduction in material cost and work period.

New-type Deflective Anchor Bolt



<Material>



Upper: Chemical anchor M16
Lower: Marking for Deflective Anchor Bolt at a position where there is a re-bar.



<Temporary insertion of M16 new-type Deflective Anchor Bolt>
Example of test 5)



<Completion of M16 new-type Deflective Anchor Bolt installation>



<Test of M16 new-type Deflective Anchor Bolt in the presence of bureau staff>



<No abnormality under 25 kN pull-out load>

Example of construction work 7) :
 Construction method without chipping anti-corrosion water tank
 At sewage purifying center of Nagasaki Prefecture

Conventionally, a water tank that has undergone anti-corrosion treatment is very chipped. After anchor bolts are welded, concrete is added to the chipped part and anti-corrosion treatment is provided afterward. However, with the Deflective Anchor Bolts, the construction is completed only with local drilling for anti-corrosion treatment. Twelve M24 anchor bolts are used.



<Material>



<Installation of Deflective Anchor Bolt>

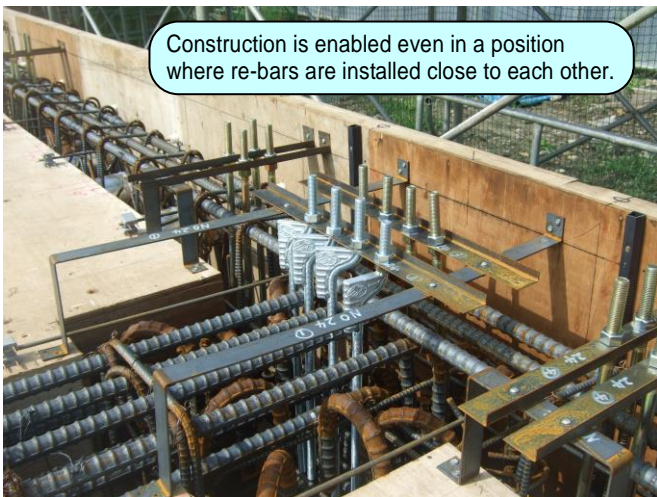


<Test in the presence of client>



<Anchor pull-out test>

Example of construction work 8) : Using Deflective Anchor Bolts as insert
 At construction site in Iwate Prefecture



<Installation of anchor bolts in beam: Side view>



<Top view>

Defective Anchor Construction Record

Date of construction	Job name	Client	Original constructor	Type of work	Material (size)	Place of construction (Re-bar interference ratio)
1 Nov. 2003	Nara Pref. Purifying Center hopper renewal work	Civil Engineering Dept., Nara Pref.	Hitachi Plant Construction	Slab reinforcement (H-steel) <H-200x600>	M 20SUSxD40	Beam, Stress-proof wall (62.5%) Used together with chemical anchor 15 pcs (out of 24)
2 June 2004	Osaka City, Suminoe Sewage Disposal Plant No. 7 digestion tank draft tube reinforcement work	Osaka City	Hitachi Plant Construction	Installation of draft tube seismic-resistant reinforcement support	M 20SUSxD40	Bottom of digestion tank (8%) Anti-corrosion coating Used together with chemical anchor 2 pcs (out of 24)
3 June 2005	Shiga Pref. Biwako North-East Purifying Center Water treatment plant No. 10	Japan Sewage Works Agency	Hitachi Plant Construction	Large gate (size) base slab reinforcement	M 20SUSxD40	Wall (50%) Anti-corrosion coating Used together with chemical anchor 8 pcs (out of 16)
4 Aug. 2005	Tokyo Metropolis Kohto Pump Plant Shinonome area sand basin equipment installation work	Bureau of Sewerage Tokyo Metropolitan Government	Kobelco Eco-Solutions	Large frame base wall anchor and seismic-resistant reinforcement	M 20SUSxD40 M 24SUSxD40	Base/Pillar (50%) Used together with chemical anchor 46 pcs (out of 96)
5 March 2006	Wakayama City Kishi Pump Plant Sand basin equipment installation work	Wakayama City	Hitachi Plant Construction	Large crane rail anchor	M 16SUSxD40	Beam top slab (32%) Used together with chemical anchor 75 pcs (out of 232)
6 Aug. 2006	Saitama Pref. Nakagawa Water Circulation Center Water treatment equipment installation work	Saitama Pref.	Hitachi Plant Technologies / Maezawa Industries	Final sand basin collector bearing	M 22SUSxD40	Pillar/beam (50%) Used together with chemical anchor 92 pcs (out of 192)
7 Sept. 2006	(Same as above)	(Same as above)	(Same as above)	First sand basin collector bearing	M 24SUSxD40	Pillar/beam (65%) Used together with chemical anchor 115 pcs (out of 192)
8 June 2007	Ohmura-bay South Basin Sewage Purifying Center Sludge digestion plant equipment installation work	Ohmura-bay South Basin Sewage Purifying Center	Hitachi Plant Technologies / Kyowakiden Industry	Sludge digestion tank draft tube support base anchor bolt	M 24SUSxD40	Anti-corrosion coating at bottom of oval digestion tank (75%) Used together with chemical anchor 12 pcs (out of 16)
9 Aug. 2007	Chiba Pref. Teganuma Final Disposal Plant Equipment installation work (Half of water treatment equipment, out of 6 systems)	Teganuma Sewage Disposal Bureau, Facility/Equipment Section	Ebara Engineering Service	Final basin collector drive shaft /follower shaft bearing	M 16SUSxD40	Pillar/beam (9%) Used together with chemical anchor 15 pcs (out of 176)
10 Feb. 2008	Yamanashi Pref. Kofu City Purifying Center Dewatering equipment renewal work	Kofu City	Hitachi Plant Technologies	Dewatering equipment frame base anchor bolt	M 20SUSxD40	Floor/anti-corrosion coating (17%) Used together with chemical anchor 4 pcs (out of 24)
11 April 2008	Miyazaki City, Sado River Purifying Center Water treatment plant No. 3	Japan Sewage Works Agency	Kobelco Eco-Solutions	Installation of sewage disposal equipment	M 16SUSxD40 M 20SUSxD40	Equipment base S20: 9 pcs, S16: 7 pcs Interference ratio: Unknown
12 Nov. 2008	Kobe City, Tarumi Disposal Plant	Kobe City	Mitsubishi Kakoki Kaisha	Installation of large water gate (Installation to stress-proof wall)	M 36SUSxD60 ↓ M 36SUSxD130	Water gate anchor bolt (98%) (Large-size Defective Anchor Bolt) 129 pcs (out of 132)

5. Deflective Anchor Bolt Selection Chart

<When both tensile force and shear force are applied to a single anchor bolt>

Select anchor bolts by referring to the following selection chart (graph).

1) **TS16**.....Same characteristic curve for both 25 mm and 40 mm deflection distances.

1. Material and allowable stress level

Anchor bolt SS400 Mounting thread M16, Shaft cross-section area: $a = 201 \text{ mm}^2$
 SUS304

- Standard strength $F = 23.5 \text{ kN/cm}^2$
- Allowable stress level (Resistance to long-term stress)

Tensile	$L_{ft} =$	12 kN/cm^2
Bending	$L_{fb} =$	$F/1.5 = 15.6 \text{ kN/cm}^2$
Shear	$L_{fs} =$	9 kN/cm^2
	$\tau_{max} =$	$4/3 \times (Q/a)$
- Allowable stress level (Resistance to short-term stress)

Tensile	$S_{ft} =$	18 kN/cm^2
Bending	$S_{fb} =$	$F = 23.5 \text{ kN/cm}^2$
Shear	$S_{fs} =$	13.5 kN/cm^2
	$\tau_{max} =$	$4/3 \times (Q/a)$

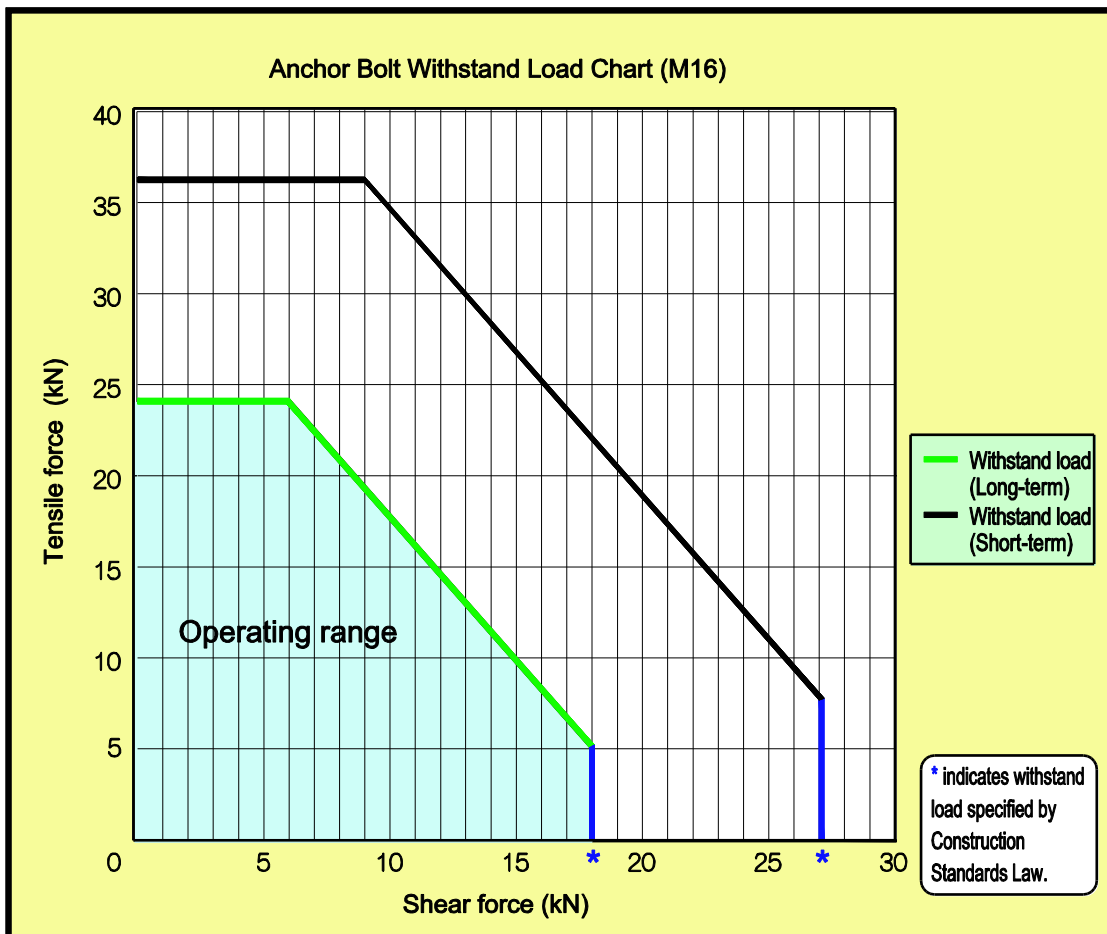
Concrete $F_c = 21 \text{ N/mm}^2$

- Allowable stress level (Resistance to long-term stress)

Compression	$L_{fc} =$	$F_c/3$
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- Allowable stress level (Resistance to short-term stress)

Compression	$S_{fc} =$	$2F_c/3$
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Maximum tensile strength of anchor bolt Long-term 24.1kN Short-term 36.1kN



2) T20

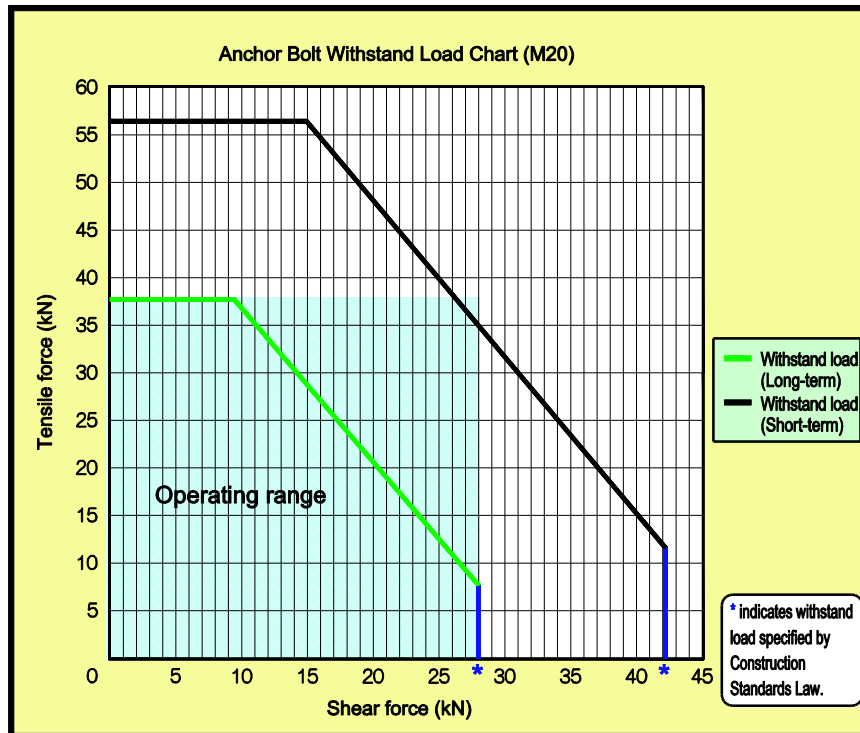
1. Material and allowable stress level

Anchor bolt SS400 Mounting thread M20, Shaft cross-section area: $a = 314 \text{ mm}^2$
SUS304

Anchor bolt maximum tensile strength

Long-term 37.6kN

Short-term 56.5kN



3) T24

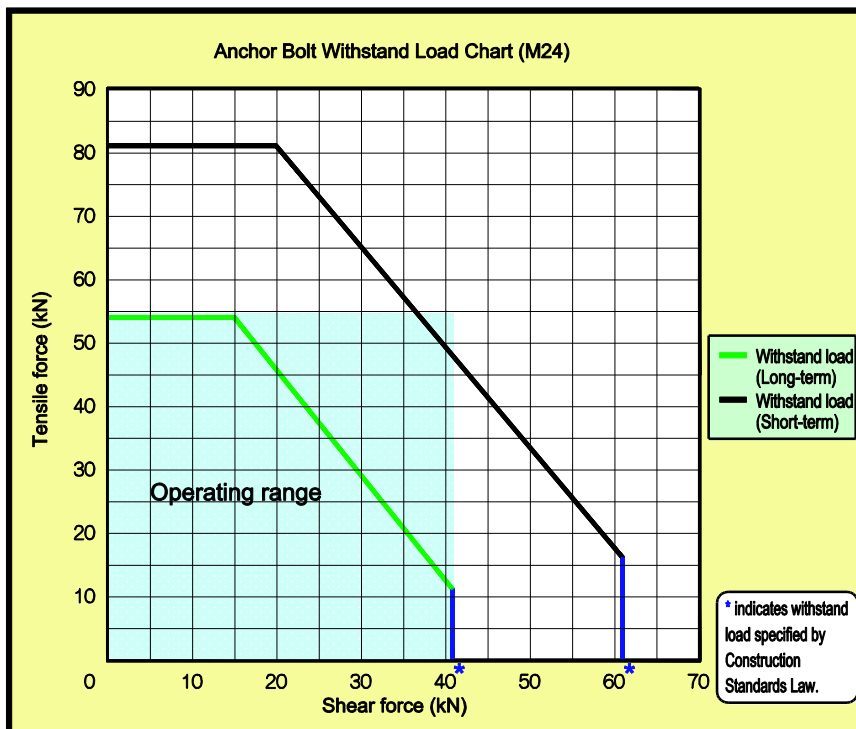
1. Material and allowable stress level

Anchor bolt SS400 Mounting thread M22, M24, Shaft cross-section area: $a = 452 \text{ mm}^2$
SUS304

Anchor bolt maximum tensile strength

Long-term 54.2kN

Short-term 81.3kN



<Anchor-integrated Liner>

1. Revolution in Liner (lining pad) Adjustment Work

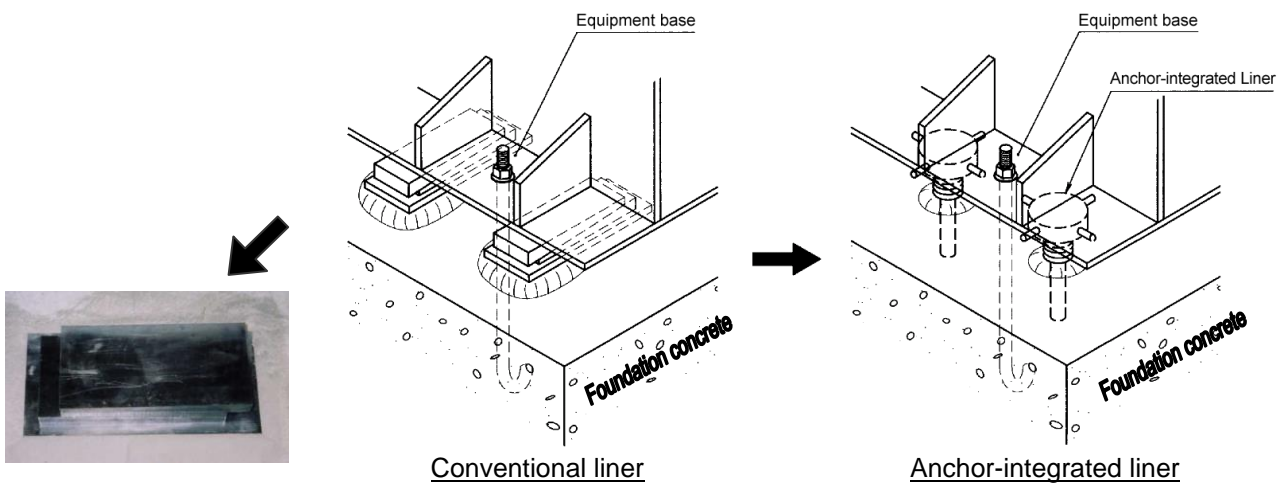
Have you ever given up on the installation of flat liners and taper liners (slope liners) because it is troublesome, costly, and requires experienced, skilled workers?

Have you ever used thin taper liners (for 2 ton to less than 6 ton), one-face smooth-finished taper liners, warped liners (because they are too thin), or roughly-machined liners (dummy liner products), because formal flat liners and taper liners are expensive? Generally, it is recommended that a maximum of up to four flat liners and taper liners can be stacked. Have you ever stacked more liners than this?

In consideration of the above, it is very expensive to prepare and install flat and taper liners correctly.

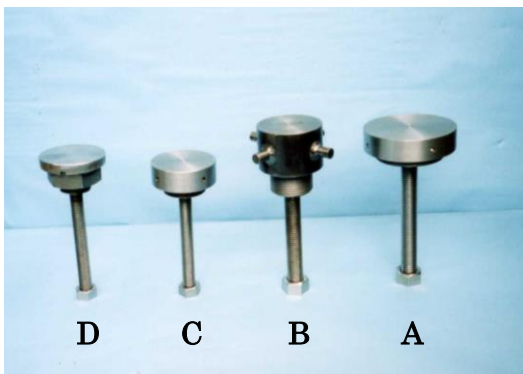
Rather than using the technology developed over 100 years ago, why not try the new-type anchor-integrated liners that enable installation work at a lower cost in a shorter period, and ensure high reliability, quality and accuracy? We believe that if you use them just once, you will be surprised with these new products. With these new liners, you will complete installation and centering work for an engine of 2-ton class in about two days (excluding material loading and grout filling processes), although it would take four or five days for this work using conventional liners.

Shift from conventional liners to anchor-integrated liners



2. Product Lineup

2-1. Anchor-integrated liners for horizontal (slope) installation equipment



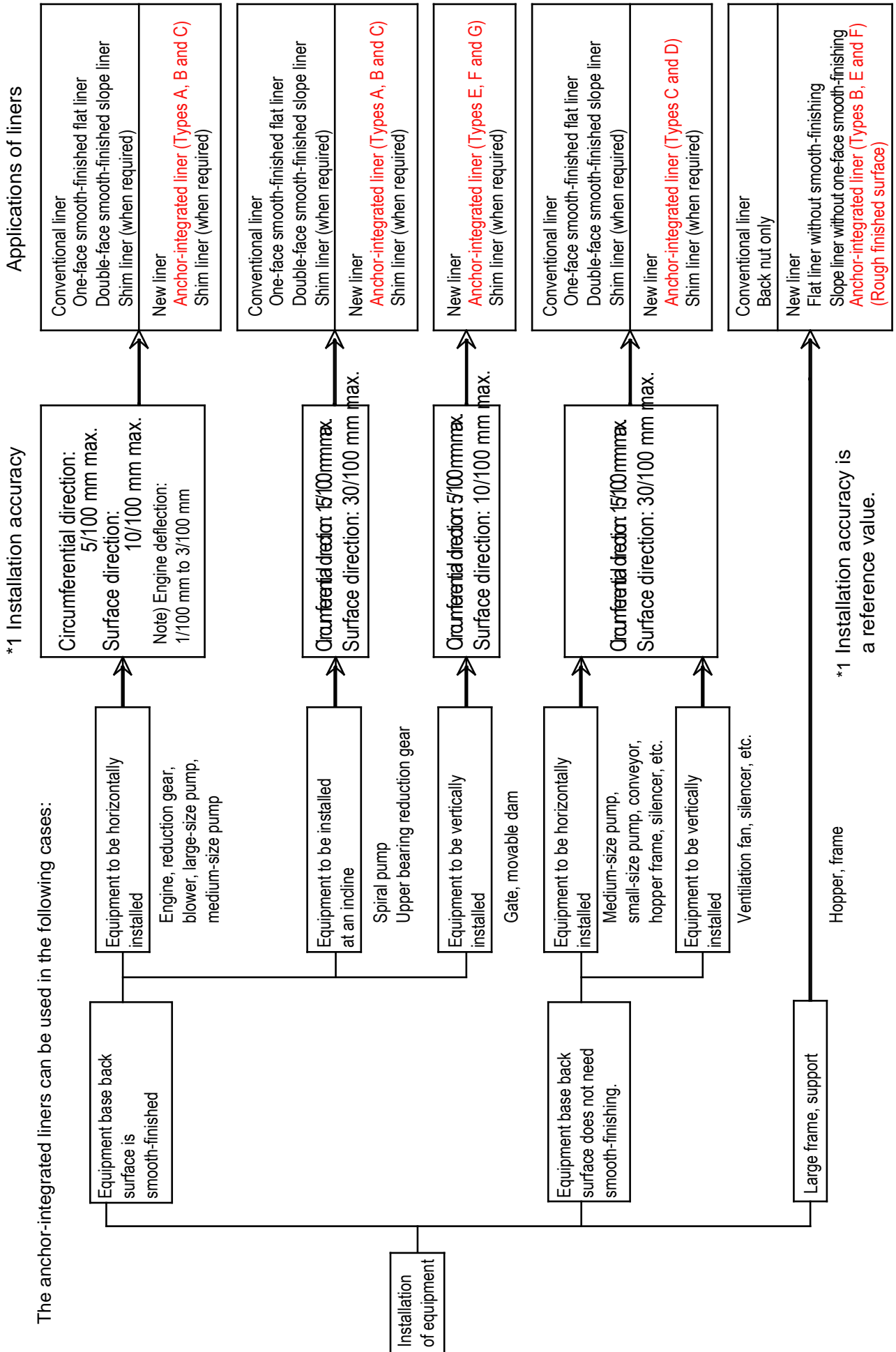
Anchor-integrated liner (Types A, B, C and D)

2-2. Anchor-integrated liners for gate and movable dam



Anchor-integrated liner (Type E)

3. Applications of Anchor-integrated Liners

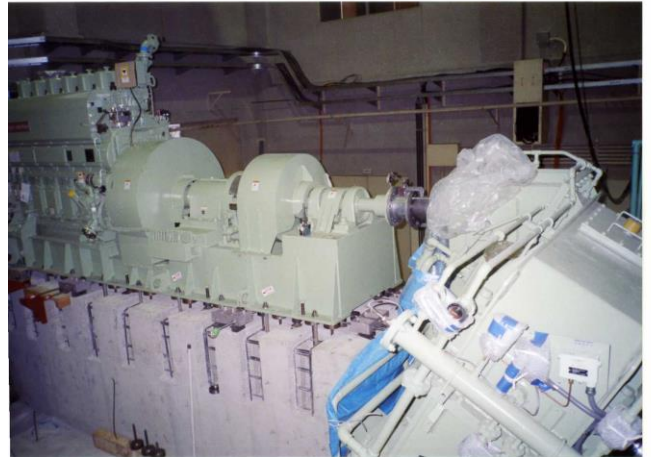


4. Examples of Installation

(1) Examples of installation for general equipment (Engine, reduction gear)

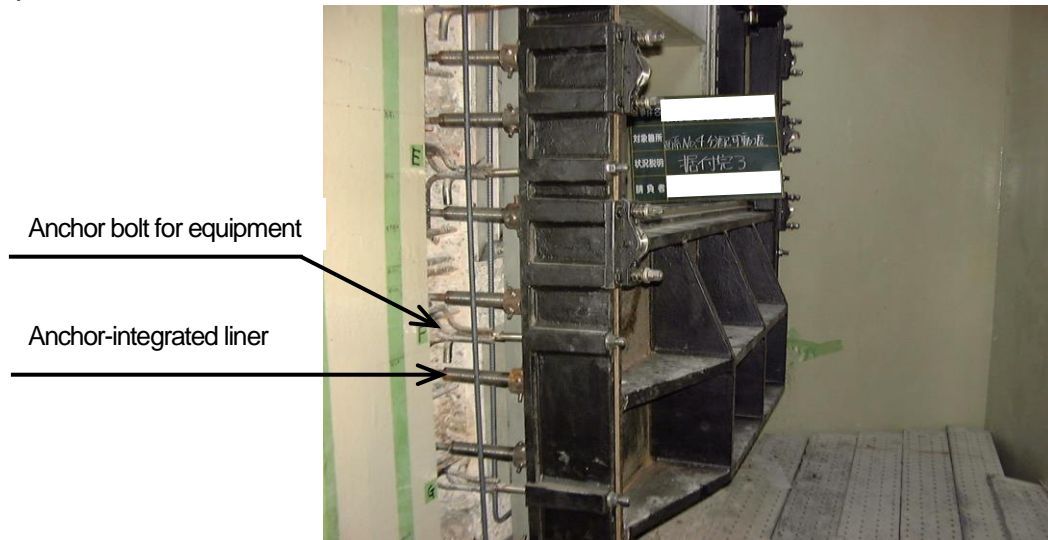


Arrangement of anchor-integrated liners for 9.5-ton engine



Adjustment of 200-ps engine and reduction gear
(Centering time can be reduced by 50%.)

(2) Example of installation for movable dam



(Centering time can be reduced by 50%.)

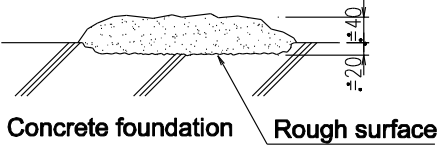
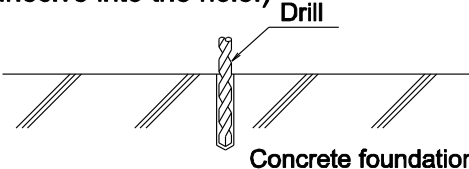
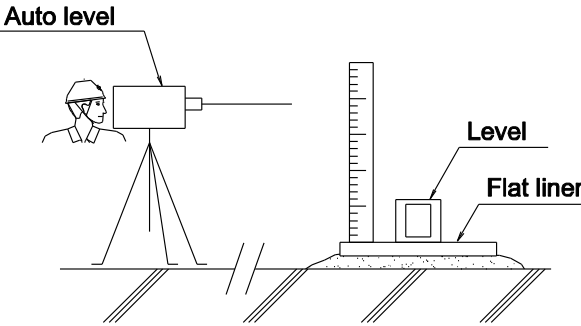
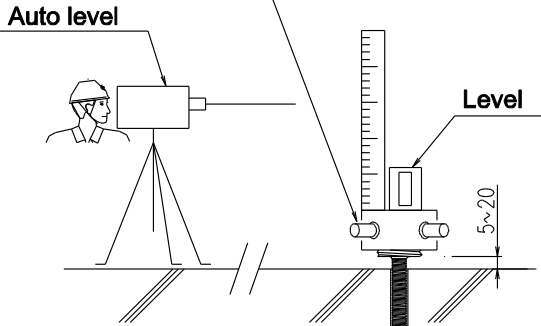
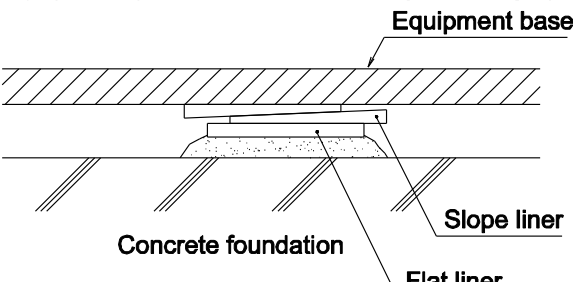
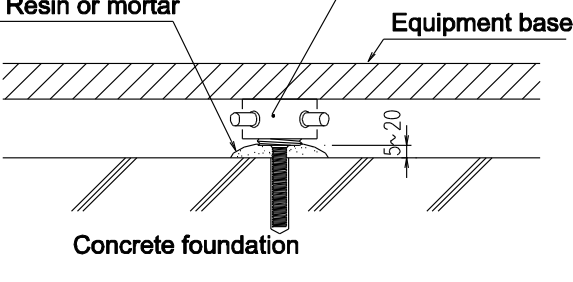
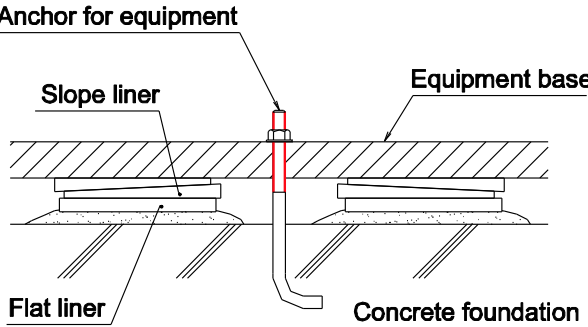
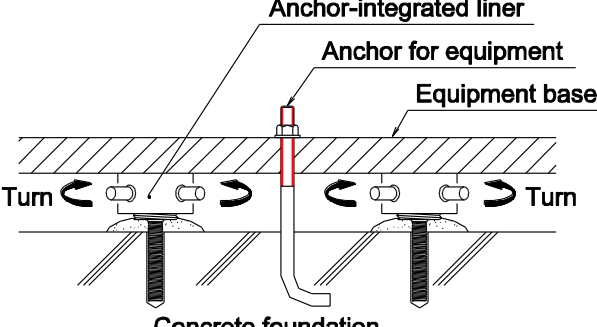
(3) Example of installation for internal gear (Connecting two divisions of gear)



Anchor-integrated liner

5. Construction Work Procedure (in comparison with conventional liner)

Conceptual image

Construction work using conventional liner	Construction work using new anchor-integrated liner
<p>1) Prepare a clod of mortar with high compressive strength.</p>  <p>Concrete foundation Rough surface</p>	<p>1) Drill an anchor hole. (After drilling, clean the hole, and pour adhesive into the hole.)</p>  <p>Drill Concrete foundation</p>
<p>2) Place a flat liner horizontally. (Determine the approximate base height.)</p>  <p>Auto level Level Flat liner Concrete foundation</p>	<p>2) Set an anchor-integrated liner. (Place the liner horizontally by tapping the side of the liner with a hammer, while adjusting the height with a level.)</p> <p>Anchor-integrated liner</p>  <p>Auto level Level Concrete foundation</p>
<p>3) Stack a slope liner on the flat liner to adjust the height. (Tap the slope liner with a hammer to adjust the height.)</p>  <p>Equipment base Slope liner Flat liner Concrete foundation</p>	<p>3) Fasten the anchor-integrated liner with quick-hardening resin or quick-hardening mortar with high compressive strength.</p>  <p>Resin or mortar Anchor-integrated liner Equipment base Concrete foundation</p>
<p>4) Completion</p>  <p>Anchor for equipment Slope liner Equipment base Flat liner Concrete foundation</p>	<p>4) Completion of height adjustment (Turn the knob right/left to adjust the height.)</p>  <p>Anchor-integrated liner Anchor for equipment Equipment base Turn Concrete foundation</p>

6. Work Procedure for New Construction Method



Drill the frame structure, and adjust the height of the anchor-integrated liner.



Fill the hole with resin. After the resin hardens, conduct level adjustment in the X and Y directions.



Same as above.



After checking the level, remove the liner, and fill the cracks in the concrete with resin.



Smooth the resin surface with a spatula.



Remove surplus resin.

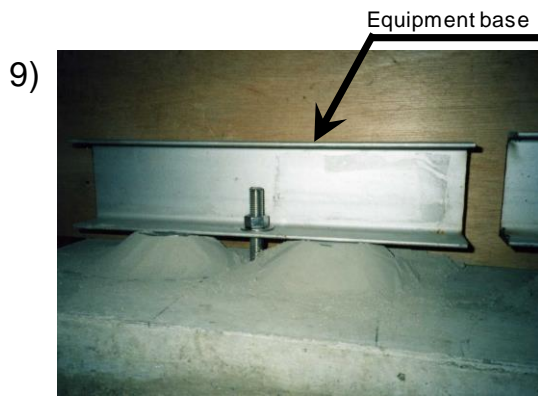


With the equipment placed on the liner, adjust the height. (Centering work)



After completion of the above adjustment with the equipment placed on the liner, fill the cracks under the liner with resin.





After completion of the above adjustment, harden the surrounding area with non-shrinkage concrete.

New construction method <Installation of gate, etc.>



Drive an anchor into the side wall.



Adjust the anchor so that it is horizontal to the gate valve element.



To complete the above step, tap the anchor with a hammer.



Fill the cracks in the concrete with resin.



Smooth the resin surface with a spatula.



Completed.

7. Anchor-integrated Liner Selection/Price Table

(1) Equipment to be horizontally installed

○ : Standard (Stock)
 △ : Customized

Diameter of anchor bolt included in equipment	Foundation - base grout margin (mm)	Liner surface area (A) (cm ²)	Anchor fastening shaft force (B) *1 (Force supported by liner) (kg·f)	Liner surface pressure (B/A) *2 (kg·f/cm ²)	Dimensions of anchor-integrated liner φ 1x φ 2x φ 3xH1xH2xH3xL	Relationship between anchor and liner positions (Coaxial) (Deflection)		Type of thread		Price (Type A)	Adhesive volume required (When SR-TIGHT is used)
						○	△	AA-class	A-class		
1	M16 30 to 40 40 to 55	43.00	3969kg·f; z=2=1985	46.2	75x48x16x25x15x18xapprox. 140 75x48x16x35x25x28xapprox. 140	○	△	○	×	Current price	100cc (70cc)
								○	×		
2	M20 30 to 40 40 to 55	43.00	6194kg·f; z=2=3097	72.0	75x48x16x25x15x18xapprox. 140 75x48x16x35x25x28xapprox. 140	○	△	○	×	Current price	100cc (70cc)
								○	×		
3	M24 30 to 45 40 to 55	84.90	8924kg·f; z=2=4462	52.6	105x80x20x25x13x18xapprox. 180 105x80x20x35x25x28xapprox. 180	○	△	○	×	Current price	170cc (130cc)
								○	×		
4	M30 30 to 45 45 to 60	84.90	14182kg·f; z=2=7091	83.5	105x80x20x25x13x18xapprox. 170 120x80x20x40x24x24xapprox. 180	○	△	○	×	Current price	170cc (130cc)
		111.20						○	×		
5	M36 45 to 60	111.20	20654kg·f; z=2=10327	92.8	120x80x20x40x24x24xapprox. 180 75x50x20x42x19x18xapprox. 180	○	△	○	×	Current price	210cc (170cc)
		111.20						○	×		
6	Temporary liner (Bearing type, Applied to heavy equipment weighing approx. 3 tons or more.)					○	△	○	×	Current price	170cc (130cc)

*1. Calculation assuming that thread strength level is 4.8.

*2. Concrete foundation compressive strength of 210 kg·f/cm² or less is judged OK.

*3. "Regular" means the price of regular thread type.

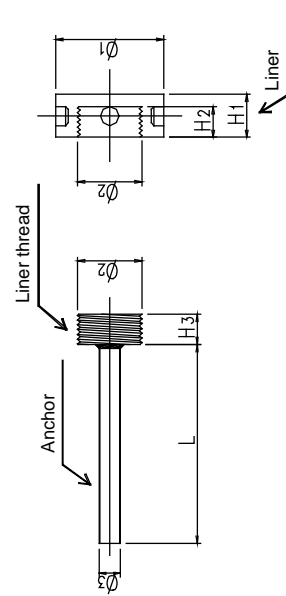
*4. Liner surface pressure should be 20 kg·f/cm² or less. (In case of calculation from equipment weight)

*5. Dimension tolerance: ±2.0 mm

*6. Transportation expense is an extra charge.

*7. When SR-TIGHT is used, the price of liner thread fastening adhesive is included.

*8. The above prices are subject to change without prior notice.



Dimensions of Anchor-integrated Liner

(2) Gate, movable gate, etc.

○ : Standard
△ : Customized

	Diameter of anchor bolt included in equipment	Distance between wall surface and valve element back surface (mm)	Liner surface area (A) (cm ²)	Anchor fastening shaft force (Force supported by liner at two points)kg·f	Blifter surface pressure (B/A) ² (kg·f/cm ²)	Dimensions of anchor-integrated liner (mm)	Fine adjustment method				Relationship between anchor and liner positions		Resin filling port	Price
							Pipe wrench	Recess	Extension rod	Adjustable wrench	(Coaxial)	(Deflective)		
1	M16 to M20	40 to 60	8	For M16 anchor 3969kg·f×25%=992.2 For M20 anchor 6194kg·f×25%=1548.5	124	40x24x12x40x0x40x0x150	○	△	○	△	○	○	Current price	
2	(Same as above)	60 to 80	(Same as above)			40x24x12x40x0x60x0x150	○	△	○	△	○	○	Current price	
3	(Same as above)	60 to 100	(Same as above)			40x24x12x60x0x60x0x150	○	△	○	△	○	○	Current price	
4	(Same as above)	100 to 140	(Same as above)			40x24x12x100x0x60x0x150	○	△	○	△	○	○	Current price	
5	M16	50 to 80	11.9	For M16 anchor 3969kg·f×25%=992.2	83.4	40x24x12x50x40x150x0x130 (Before use, cut out the H3 section.)	△	△	○	○	△	○	*3 Current price of regular thread type.	
6	(Same as above)	80 to 100				60x36x20x80x70x90x0x170	△	△	○	○	△	○	△	*3 Current price of regular thread type.
7	(Same as above)	150	27.3	For M24 anchor 8924kg·f×25%=2231	81.7	60x36x20x80x70x100x50x170	△	△	○	○	△	○	*3 Current price of regular thread type.	
8	M20 to M24	100 to 150				60x36x20x80x70x100x100x170	△	△	○	○	△	○	△	*3 Current price of regular thread type.
9	(Same as above)	150 to 200				60x36x20x80x70x100x100x170	△	△	○	○	△	○	△	*3 Current price of regular thread type.
10	(Same as above)	200 to 250				60x36x20x80x70x100x150x170	△	△	○	○	△	○	△	*3 Current price of regular thread type.
11	(Same as above)	250 to 300	Customized	Customized	—	Customized	△	△	○	△	○			
12	M30	200	Customized	Customized	—	Customized	△	△	○	△	○			
13	(Same as above)	250	Customized	Customized	—	Customized	△	△	○	△	○			
14	(Same as above)	300	Customized	Customized	—	Customized	△	△	○	△	○			

For medium/small-size gate or movable gate (Liner surface: Doughnut-shaped)
For medium/large-size gate or movable gate (Liner surface: Round)

*1. Calculation assuming that thread strength level is 4.8.
25% of anchor shaft force is defined as the force supported by the liner surface. (When the anchor is used for the gate)

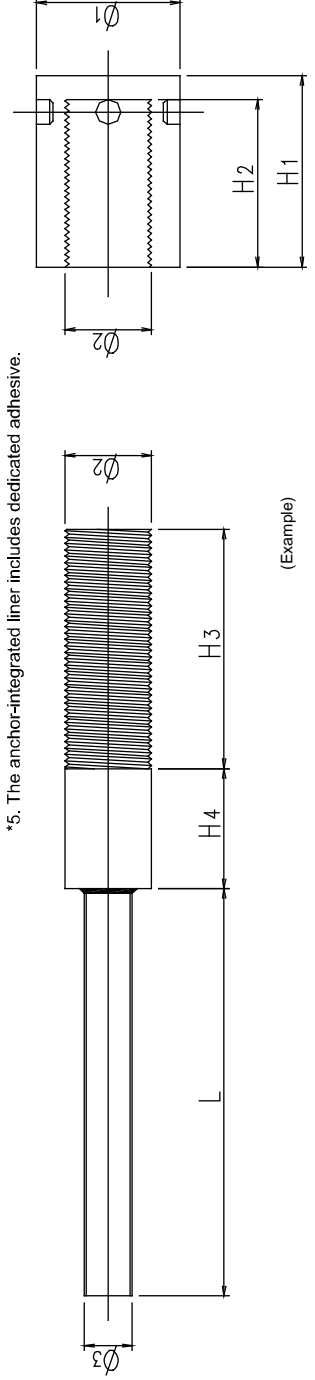
* Excluding adhesive price

*2. Liner surface pressure should be 210 kg·f/cm² (concrete foundation compressive strength) or less.

*3. If two anchor-integrated liners cannot be driven between adjacent anchors depending on chipping condition, sufficient strength can be obtained by using a single anchor-integrated liner.
(Since the target equipment is to be vertically installed, the anchor shaft force applied during installation is small.)

*4. The above prices are subject to change without prior notice.

*5. The anchor-integrated liner includes dedicated adhesive.



Precautions for Construction, Transportation and Storage

<Cautions for construction work>



CAUTION

- The drilling diameter and depth must meet the dimensions given in the catalog.
- If concrete strength is less than 21 N/mm², the design strength should be reduced.
- Brushing and cleaning conditions after drilling have a significant influence on adhesion strength. Be sure to conduct the brushing and cleaning steps carefully.
- During adhesive hardening time, be sure not to apply load to the anchor bolts and the anchor-integrated liners so that they will not move at all.
- Before drilling, check for cracks on the concrete surface.
- Provide a sufficient anchor bolt pitch and edge margin.
- Both tensile force and shear force are applied to an anchor bolt at once. Use anchor bolts within the operating range shown in the selection chart.
- When anchor bolts are set adjacent to each other, withstand load per bolt may decrease.
- During construction work, wear a protective mask, goggles and gloves.
- The hammer drill will shake when it encounters a re-bar in the drilling process, resulting in a large impact to your wrists. During drilling, grip the hammer drill securely, and maintain correct posture.



WARNING

<Warnings and cautions for handling adhesive>

- Do not store the adhesive in a place where it may be exposed to direct sunlight, or 40°C or higher temperatures.
- Do not place the adhesive near a fire. Do not throw the adhesive into a fire.
- If the adhesive touches your eyes, immediately rinse your eyes with tap water for about 20 minutes, and consult a doctor.
- If the adhesive touches your skin, immediately wipe it off, and wash the skin with soap.



CAUTION

- Store the adhesive in a cold dark place.
- Use the adhesive within the effective period.
- During installation to a side wall or ceiling, use particular caution not to splash the adhesive. Use a commercially-available stopper.



<Information>

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Anchor Business Division

(Person in charge of products and construction work: Suehiro)

To order Deflective Anchor Bolts and anchor-integrated liners, contact any of our company's reliable staff members: