

# Cushion Tank System

Performance at  
110km/h, 100km/h, 80km/h, 50km/h



Completely tested using EN1317-3 certificate at  
110km/h, 100km/h, 80km/h, 50km/h



# CONTENTS

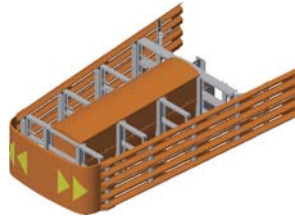
▶ Type of EU Cushion Tank System -----	▶ P. 02
▶ Drawing of EU Cushion Tank System 50 -----	▶ P. 03
▶ Drawing of EU Cushion Tank System 80 -----	▶ P. 04
▶ Drawing of EU Cushion Tank System 100 -----	▶ P. 05
▶ Drawing of EU Cushion Tank System 110 -----	▶ P. 06
▶ EN1317-3 Test Standard -----	▶ P. 07
▶ EN1317-3 Certificate -----	▶ P. 08
▶ CE Marking Certificate -----	▶ P. 09
▶ EN1317-3 & CE Marking – Cushion Tank System -----	▶ P. 10~12
▶ Installation Picture -----	▶ P. 13~14
▶ Installation Manual -----	▶ P. 15~23

# Cushion Tank System

## ◆ Cushion Tank System 50 (EU-CCS50)



EU – CCS50  
L3,594 x W800 x H1,010mm



EU – CCS50 (Large)  
L4,317 x W1,989(2,600) x H1,000

### 50km/h installation point

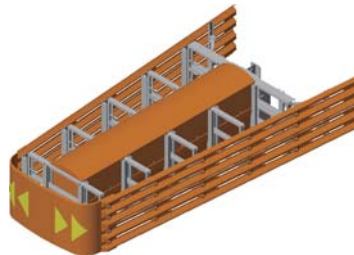
- Expressway Toll Gate, End of concrete & plastic barrier.
- Front Side of bridge post, Tunnel & underpass of Urban district street
- Narrow junction point



## ◆ Cushion tank System 80 (EU-CCS80)



EU – CCS80  
L4,474 x W800 x H1,010mm



EU – CCS80 (Large)  
L5,196 x W1,849(2,600) x H1,000

### 80km/h installation Point

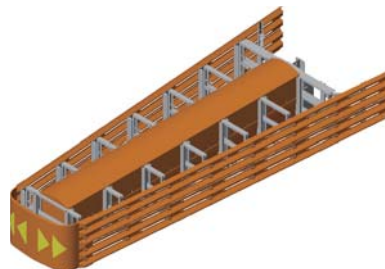
- Expressway Toll Gate
- Front side of bridge post
- Junction Point



## ◆ Cushion Tank System 100 (EU-CCS100)



EU – CCS100  
L7,994 x W800 x H1,010mm



EU – CCS100 (Large)  
L6,952 x W1,569(2,600) x H1,000

### 100, 110km/h installation Point

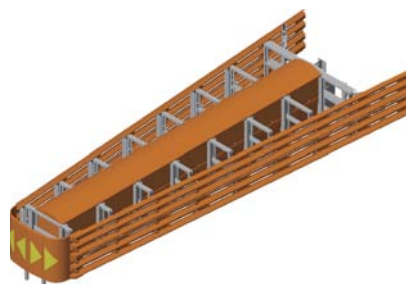
- Expressway junction
- Exit to Expressway



## ◆ Cushion Tank System 110 (EU-CCS110)



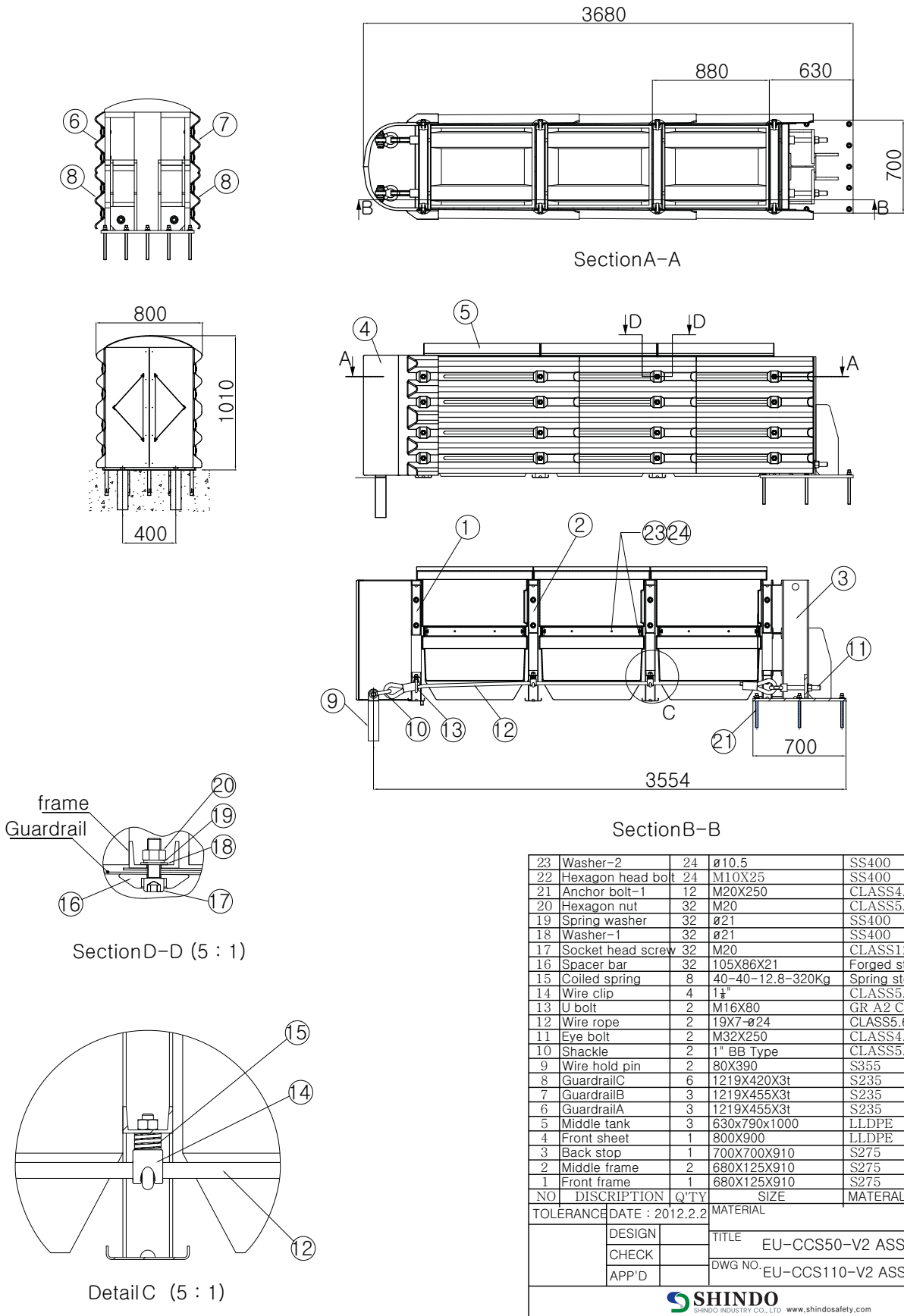
EU – CCS110  
L7,994 x W800 x H1,010mm



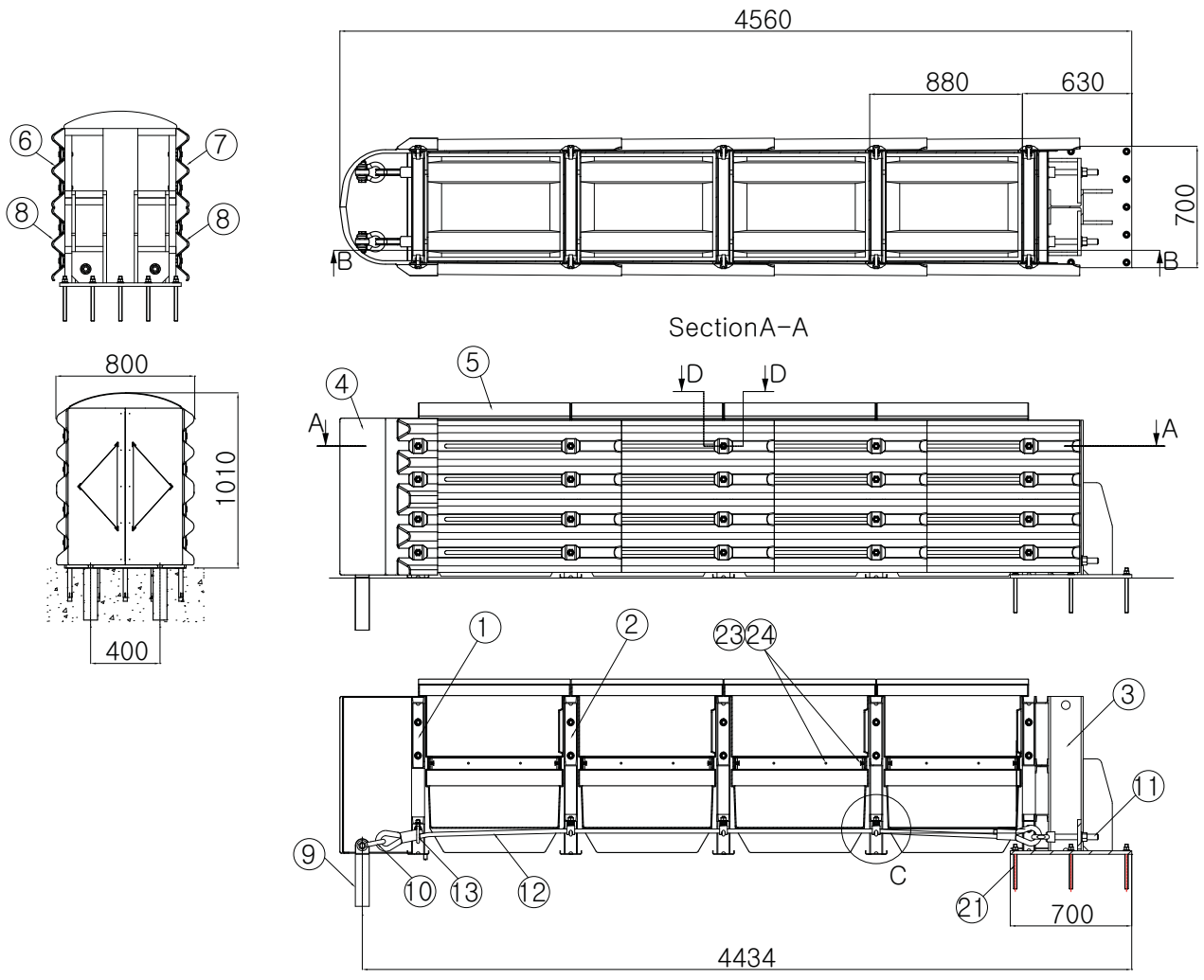
EU – CCS110 (Large)  
L7,829 x W1,429(2,600) x H1,000



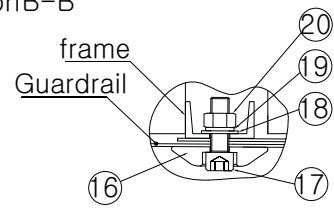
# EU CCS 50 Parallel Drawing



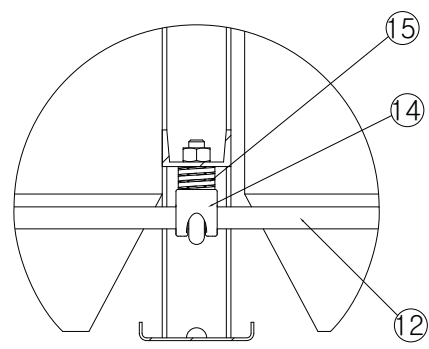
**EU CCS 80 Parallel Drawing**



Section B-B



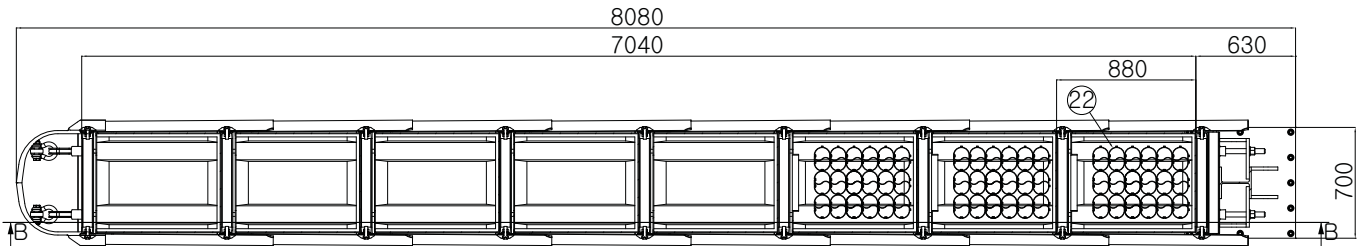
Section D-D (5 : 1)



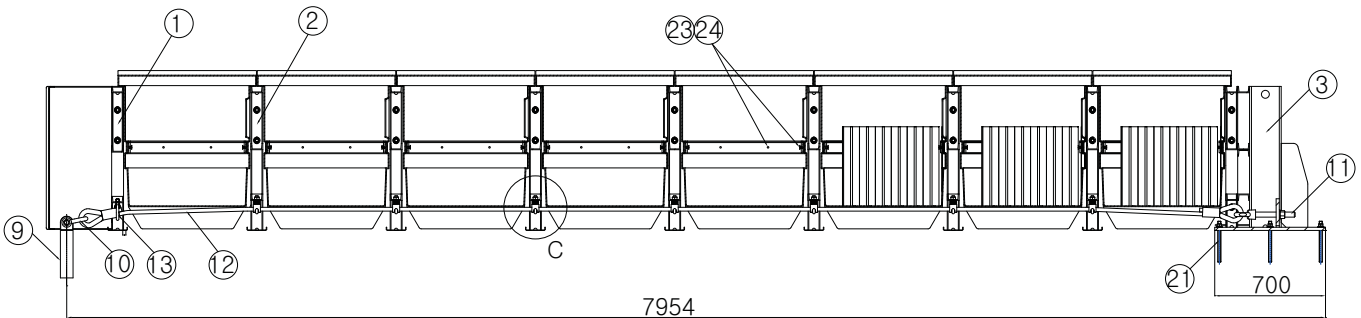
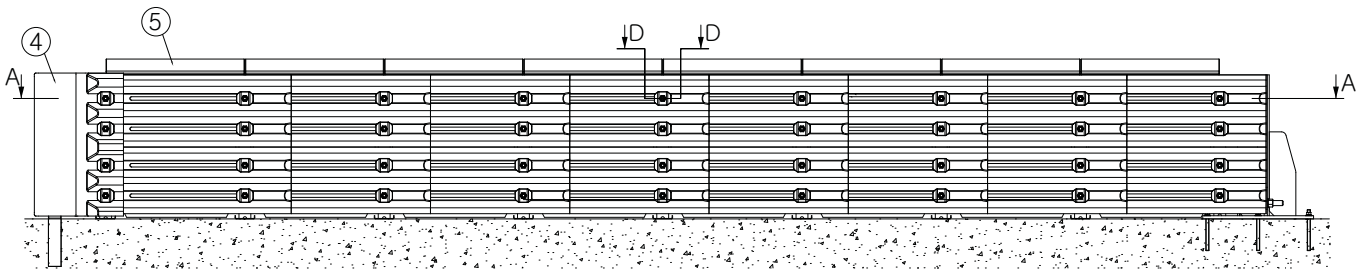
Detail C (5 : 1)

23	Washer-2	32	ø10.5	SS400	0.01kg
22	Hexagon head bolt	32	M10X25	SS400	0.01kg
21	Anchor bolt-1	12	M20X250	CLASS4.6	0.53kg
20	Hexagon nut	40	M20	CLASS5.6	0.03kg
19	Spring washer	40	ø21	SS400	0.013kg
18	Washer-1	40	ø21	SS400	0.02kg
17	Socket head screw	40	M20	CLASS12.9	0.23kg
16	Spacer bar	40	105X86X21	Forged steel	0.81kg
15	Coiled spring	12	40-40-12.8-320Kg	Spring steel	0.1kg
14	Wire clip	6	1 1/2"	CLASS5.6	0.96kg
13	U bolt	2	M16X80	GR A2 CL.7	0.47kg
12	Wire rope	2	19X7-ø24	CLASS5.6	30kg
11	Eye bolt	2	M32X250	CLASS4.6	3.2kg
10	Shackle	2	1" BB Type	CLASS5.6	2kg
9	Wire hold pin	2	80X390	S355	12kg
8	GuardrailC	8	1219X420X3t	S235	14kg
7	GuardrailB	4	1219X455X3t	S235	16kg
6	GuardrailA	4	1219X455X3t	S235	16kg
5	Middle tank	4	630x790x1000	LLDPE	17kg
4	Front sheet	1	800X900	LLDPE	5kg
3	Back stop	1	700X700X910	S275	200kg
2	Middle frame	3	680X125X910	S275	25.7kg
1	Front frame	1	680X125X910	S275	27kg
NO	DISCRIPTION	Q'TY	SIZE	MATERIAL	Weight
TOLERANCE DATE : 2012.2.2		MATERIAL			SCALE
DESIGN	TITLE EU-CCS80-V2 ASS'Y			1 / 1	
CHECK	DWG NO. EU-CCS110-V2 ASS'Y			SHEET	
APP'D				1	
					SHEETS

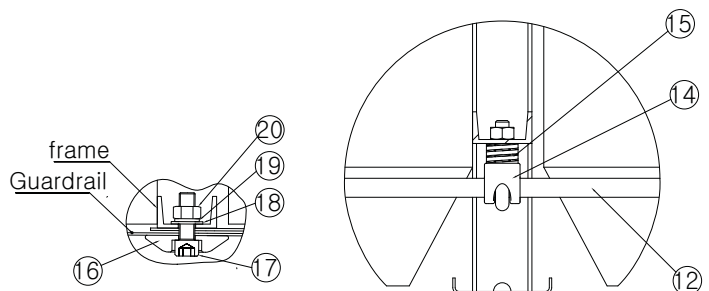
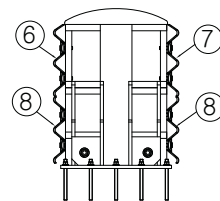
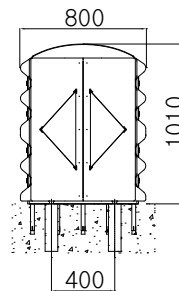
**EU CCS 100 / 110 Parallel Drawing**



Section A-A



Section B-B

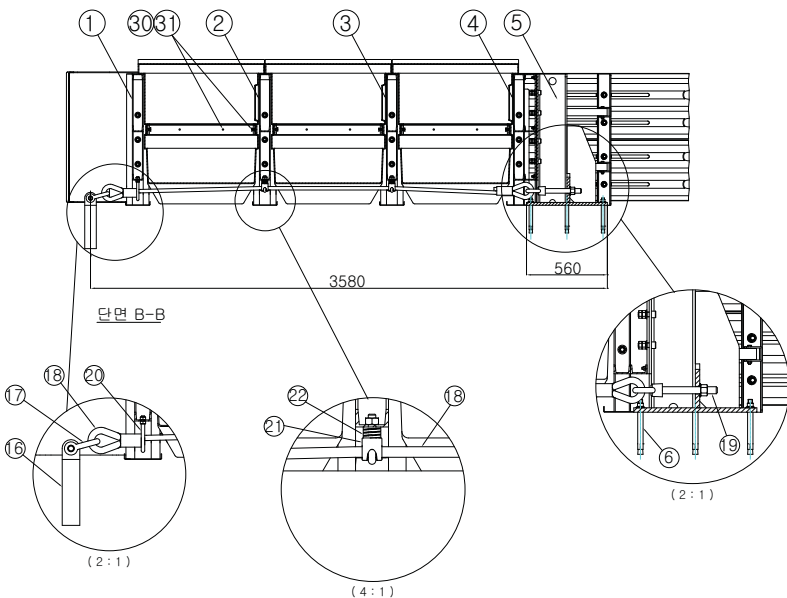
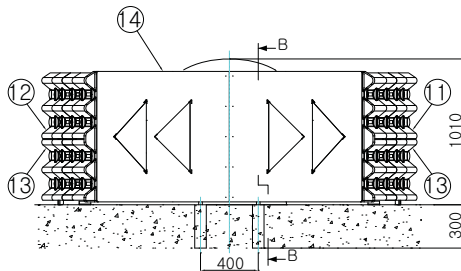
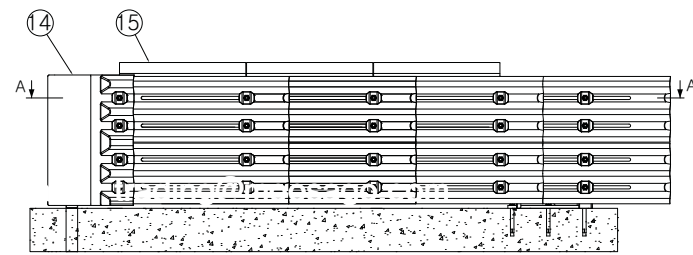
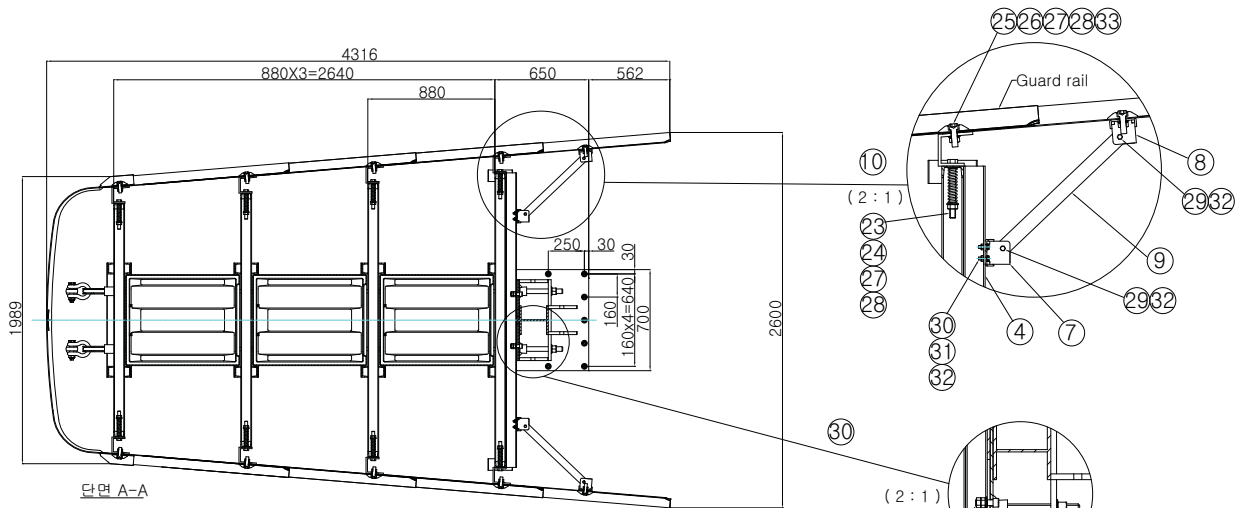


Section D-D (5 : 1)

Detail C (5 : 1)

24	Washer-2	64	ø10.5	SS400	0.01kg
23	Hexagon head bolt	64	M10X25	SS400	0.01kg
22	Al Absorber	54	157X107X500	Al	2.2kg
21	Anchor bolt-1	12	M20X250	CLASS 4.6	0.53kg
20	Hexagon nut	72	M20	CLASS 5.6	0.03kg
19	Spring washer	72	ø21	SS400	0.013kg
18	Washer-1	72	ø21	SS400	0.02kg
17	Socket head screw	72	M20	CLASS12.9	0.23kg
16	Spacer bar	72	105X86X21	Forged steel	0.81kg
15	Coiled spring	28	40-40-12.8-320Kg	Spring steel	0.1kg
14	Wire clip	14	1 1/2"	SS400	0.96kg
13	U bolt	2	M16X80	GR A2 CL.7	0.47kg
12	Wire rope	2	19X7-ø24	CLASS5.6	30kg
11	Eye bolt	2	M32X250	CLASS4.6	3.2kg
10	Shackle	2	1" BB Type	CLASS5.6	2kg
9	Wire hold pin	2	80X390	S355	12kg
8	GuardrailC	16	1219X420X3t	S235	14kg
7	GuardrailB	8	1219X455X3t	S235	16kg
6	GuardrailA	8	1219X455X3t	S235	16kg
5	Middle tank	8	630x790x1000	LLDPE	17kg
4	Front sheet	1	800X900	LLDPE	5kg
3	Back stop	1	700X700X910	S275	200kg
2	Middle frame	7	680X125X910	S275	25.7kg
1	Front frame	1	680X125X910	S275	27kg
NO.	DISCRIPTION	Q'TY	SIZE	MATERIAL	REMARK
TOLERANCE		DATE : 2012.2.2	MATERIAL		SCALE
DESIGN		TITLE	EU-CCS100,110-V2-PART		1 / 1
CHECK		DWG NO.	EU-CCS110-V2 ASS'Y		SHEET
APP'D					1
SHEETS					

# EU CCS 50 (Large) Drawing

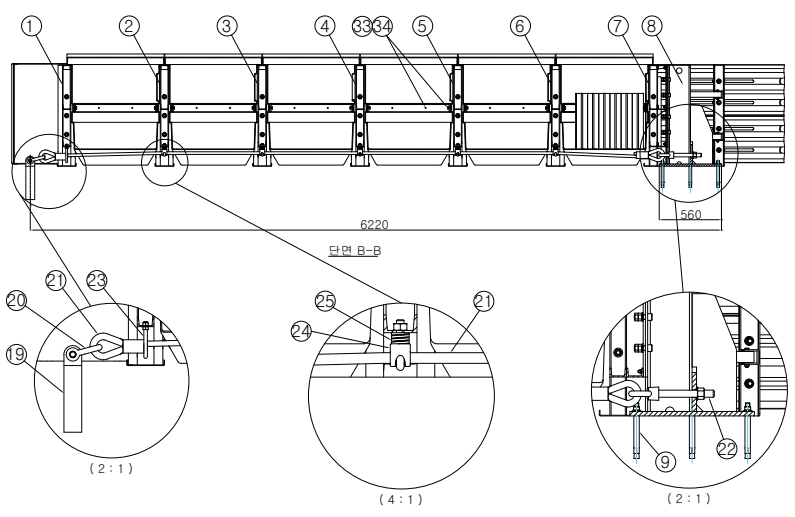
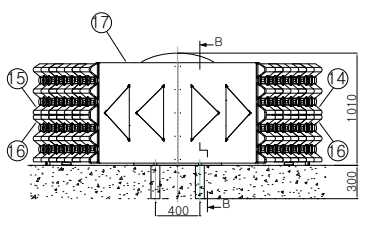
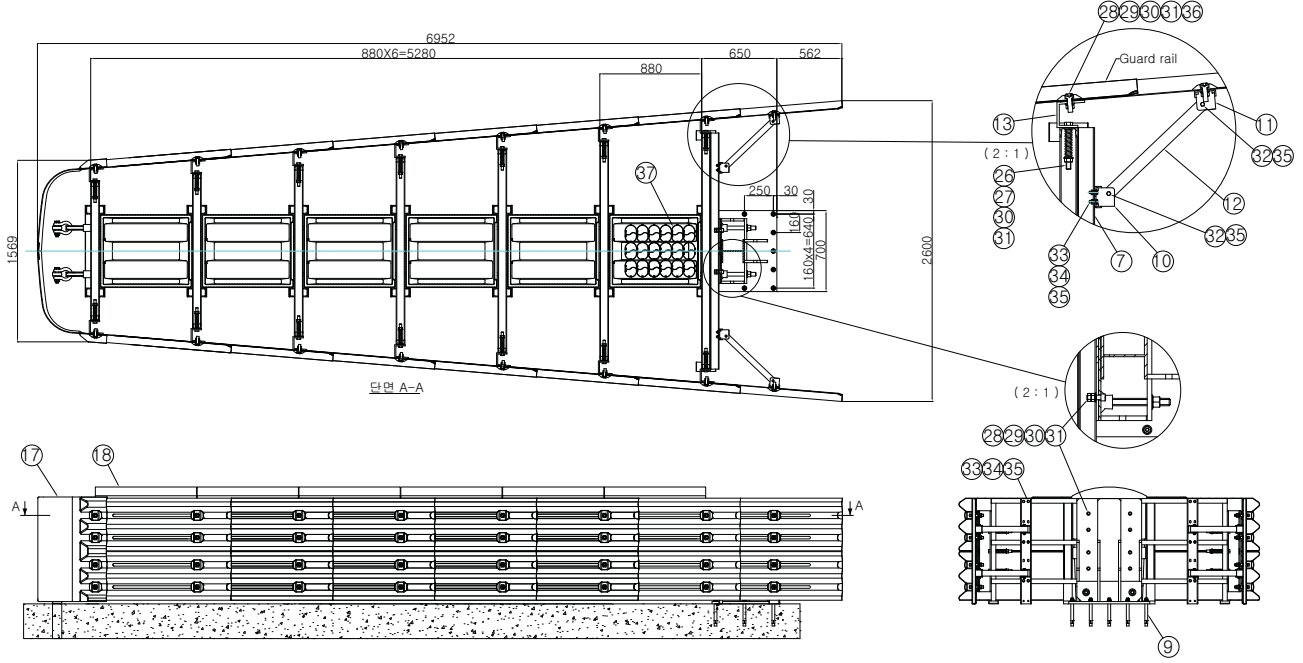


33	Spacer bar	40	105x86x21	Forged steel	10.8kg
32	Hexago nut-2	20	M10	CLASS5.6	0.01kg
31	Washer-2	36	ø10.5	SS400	0.01kg
30	Hexagon head bolt-3	36	M10x25	SS400	0.01kg
29	Hexagon head bolt-2	8	M10x90	SS400	0.01kg
28	Hexagon nut-1	80	M20	SS400	0.01kg
27	Washer-1	72	ø21	SS400	0.01kg
26	Spring washer	48	ø21	SS400	0.013kg
25	Socket head screw	48	M20x60	CLASS12.9	0.3kg
24	Hexagon head bolt-2	24	M20x190	CLASS12.9	0.56kg
23	Coil spring-2	24	22x32x155	Spring steel	0.2kg
22	Coil spring-1	8	21x40x40	Spring steel	0.1kg
21	Wire clip	4	1 1/2"	CLASS5.6	0.96kg
20	U-bolt	2	M16	GR A2 Cl.700	0.47kg
19	Eye bolt	2	M32	CLASS4.6	3.4kg
18	Wire rope	2	19x7-ø24	Carbon steel	22kg
17	Shackle	2	1" BB Type	CLASS5.6	2kg
16	Wire hold pin	2	ø80x300	S355	12kg
15	Middle tank	3	630x790x1000	LLDPE	17kg
14	Front sheet	1	1990x900	LLDPE	12kg
13	Guard rail-C	8	1219x420x3t	S235	14kg
12	Guard rail-B	4	1219x455x3t	S235	16kg
11	Guard rail-A	4	1219x455x3t	S235	16kg
10	Angle plate	8	700x110x10t	S275	15.7kg
9	End Rail fixing-3	4	50x50x600	S355	2.8kg
8	End Rail fixing-2	2	92x910x6t	S355	7.2kg
7	End Rail fixing-1	2	92x900x6t	S355	7.2kg
6	Anchor bolt-1	12	M20x250	CLASS4.6	0.53kg
5	Back stop	1	700x560x910	S275	208kg
4	Frame-8	1	2040x170x910	S275	146.8kg
3	Frame-7	1	1900x170x910	S275	75.3kg
2	Frame-6	1	1760x170x910	S275	72.4kg
1	Frame-5	1	1620x170x910	S275	69.5kg
NO	DISCRIPTION	Q'TY	SIZE	MATERIAL	REMARK
TOLERANCE			DATE:2012.2.2	MATERIAL	SCALE
±0.5%			DESIGN	TITLE	1 / 1
			CHECK	EU-CCS-W-50 Part	SHEET
			APP'D	DWG NO.	1
				EU-CCS-W-50 Part	SHEETS



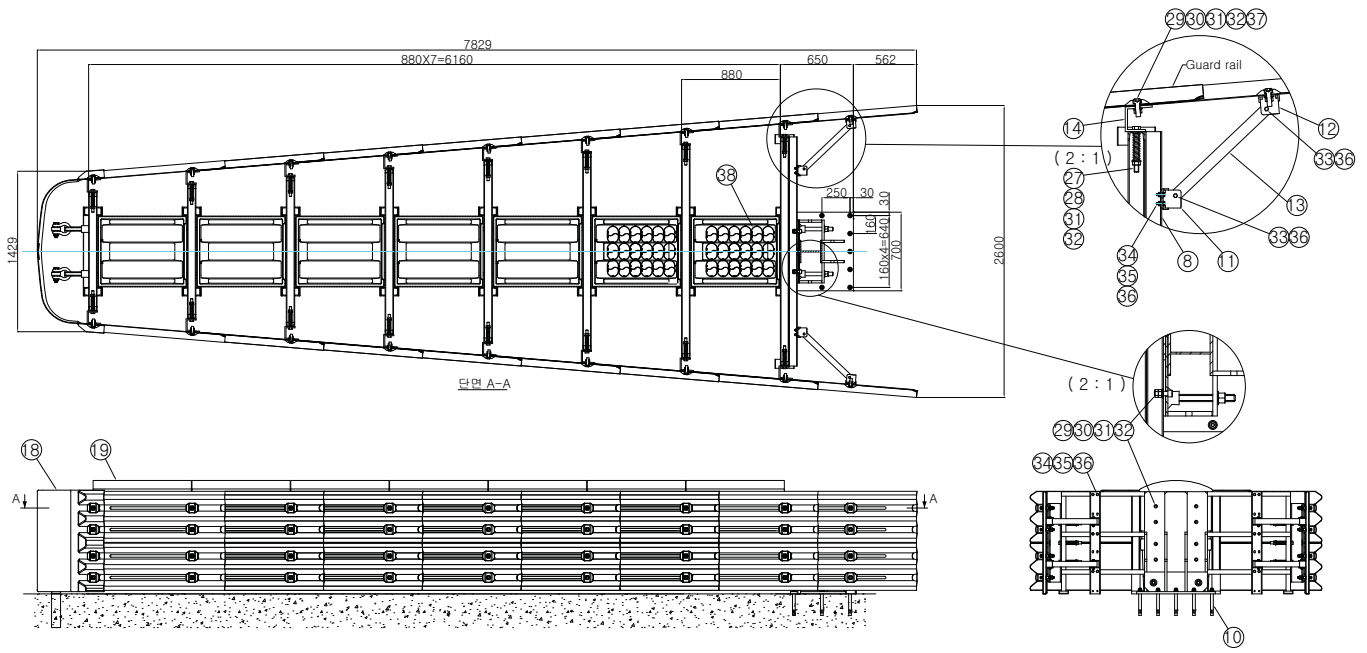


# EU CCS 100 (Large) Drawing

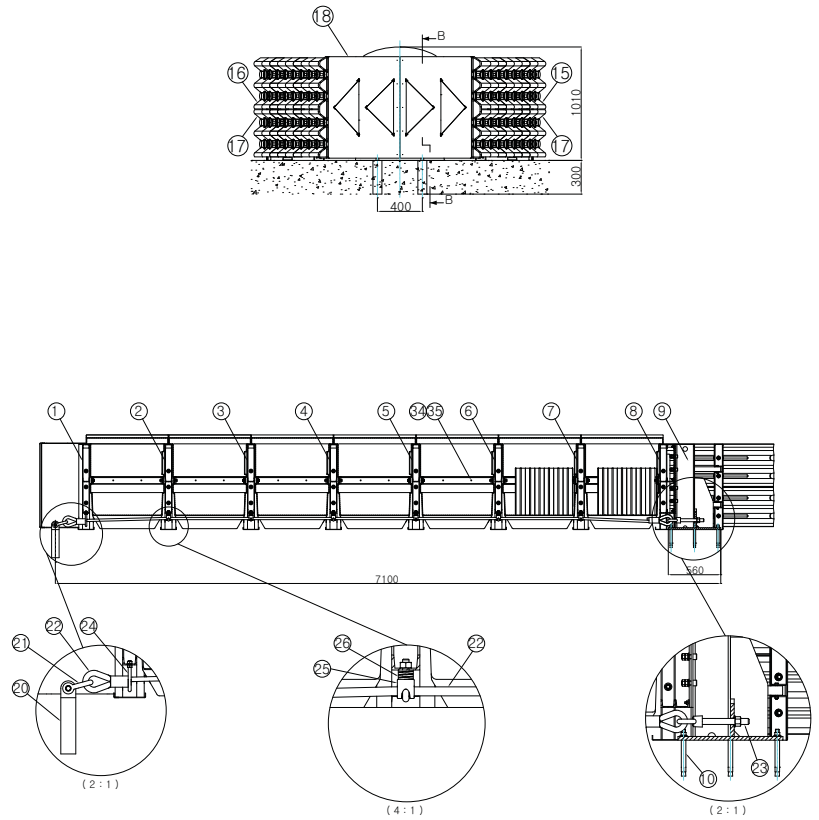


37	Al absorber	18	157x107x500	AL	2.2kg
36	Spacer bar	64	105x86x21	Forged steel	10.8kg
35	Hexago nut-2	20	M10	CLASS5.6	0.01kg
34	Washer-2	60	Ø10.5	SS400	0.01kg
33	Hexagon head bolt-3	60	M10x25	SS400	0.01kg
32	Hexagon head bolt-2	8	M10x90	SS400	0.01kg
31	Hexagon nut-1	122	M20	SS400	0.01kg
30	Washer-1	114	Ø21	SS400	0.01kg
29	Spring washer	72	Ø21	SS400	0.013kg
28	Socket head screw	72	M20x60	CLASS12.9	0.3kg
27	Hexagon head bolt-1	42	M20x190	CLASS12.9	0.56kg
26	Coil spring-2	42	22x32x155	Spring steel	0.2kg
25	Coil spring-1	20	21x40x40	Spring steel	0.1kg
24	Wire clip	10	1 1/2"	CLASS5.6	0.96kg
23	U-bolt	2	M16	GR A2 Cl.70	0.47kg
22	Eye bolt	2	M32	CLASS4.6	3.4kg
21	Wire rope	2	19x7-Ø24	Carbon steel	22kg
20	Shackle	2	1" BB Type	CLASS5.6	2kg
19	Wire hold pin	2	Ø80x300	S355	12kg
18	Middle tank	6	630x790x1000	LLDPE	17kg
17	Front sheet	1	1570x900	LLDPE	12kg
16	Guard rail-C	14	1219x420x3t	S235	14kg
15	Guard rail-B	7	1219x455x3t	S235	16kg
14	Guard rail-A	7	1219x455x3t	S235	16kg
13	Angle plate	14	700x110x10t	S275	15.7kg
12	End Rail fixing-3	4	50x50x600	S355	2.8kg
11	End Rail fixing-2	2	92x910x6t	S355	7.2kg
10	End Rail fixing-1	2	92x900x6t	S355	7.2kg
9	Anchor bolt-1	12	M20x250	CLASS4.6	0.53kg
8	Back stop	1	700x560x910	S275	208kg
7	Frame-8	1	2040x170x910	S275	146.8kg
6	Frame-7	1	1900x170x910	S275	75.3kg
5	Frame-6	1	1760x170x910	S275	72.4kg
4	Frame-5	1	1620x170x910	S275	69.5kg
3	Frame-4	1	1480x170x910	S275	66.7kg
2	Frame-3	1	1340x170x910	S275	63.9kg
1	Frame-2	1	1200x170x910	S275	61kg
NO	DISCRIPTION	Q'TY	SIZE	MATERIAL	REMARK
TOLERANCE DATE:2012.2.2			MATERIAL		SCALE
					1 / 1
±0.5%	DESIGN		TITLE Part		SHEET
	CHECK		EU-CCS-W-100 Part		1
	APP'D		DWG NO. EU-CCS-W-100 Part		SHEETS


**EU CCS 110 (Large) Drawing**



38	Al absorber	36	157x107x500	AL	2.2kg
37	Spacer bar	72	105x86x21	Forged steel	0.8kg
36	Hexago nut-2	20	M10	CLASS5.6	0.01kg
35	Washer-2	68	Ø10.5	SS400	0.01kg
34	Hexagon head bolt-3	68	M10x25	SS400	0.01kg
33	Hexagon head bolt-2	8	M10x90	SS400	0.01kg
32	Hexagon nut-1	136	M20	SS400	0.01kg
31	Washer-1	128	Ø21	SS400	0.01kg
30	Spring washer	80	Ø21	SS400	0.013kg
29	Socket head screw	80	M20x60	CLASS12.9	0.3kg
28	Hexagon head bolt-	48	M20x190	CLASS12.9	0.56kg
27	Coil spring-2	48	22x32x155	Spring steel	0.2kg
26	Coil spring-1	24	21x40x40	Spring steel	0.1kg
25	Wire clip	12	1+1"	CLASS5.6	0.96kg
24	U-bolt	2	M16	GR A2 Cl.700	0.47kg
23	Eye bolt	2	M32	CLASS4.6	3.4kg
22	Wire rope	2	19x7-Ø24	Carbon steel	22kg
21	Shackle	2	1" BB Type	CLASS5.6	2kg
20	Wire hold pin	2	Ø80x800	S355	12kg
19	Middle tank	7	630x790x1000	LLDPE	17kg
18	Front sheet	1	1430x900	LLDPE	12kg
17	Guard rail-C	16	1219x420x3t	S235	14kg
16	Guard rail-B	8	1219x455x3t	S235	16kg
15	Guard rail-A	8	1219x455x3t	S235	16kg
14	Angle plate	16	700x110x10t	S275	15.7kg
13	End Rail fixing-3	4	50x50x600	S355	2.8kg
12	End Rail fixing-2	2	92x910x6t	S355	7.2kg
11	End Rail fixing-1	2	92x900x6t	S355	7.2kg
10	Anchor bolt-1	12	M20x250	CLASS4.6	0.53kg
9	Back stop	1	700x560x910	S275	208kg
8	Frame-8	1	2040x170x910	S275	146.8kg
7	Frame-7	1	1900x170x910	S275	75.3kg
6	Frame-6	1	1760x170x910	S275	72.4kg
5	Frame-5	1	1620x170x910	S275	69.5kg
4	Frame-4	1	1480x170x910	S275	66.7kg
3	Frame-3	1	1340x170x910	S275	63.9kg
2	Frame-2	1	1200x170x910	S275	61kg
1	Frame-1	1	1060x170x910	S275	58.3kg
NO	DISRIPTION	Q'TY	SIZE	MATERIAL	Weight
TOLERANCE DATE:2012.2.2		MATERIAL		SCALE	
±0.5%		DESIGN		1 / 1	
		CHECK		SHEET	
		APP'D		1	
		TITLE Part		SHEETS	
		EU-CCS-W-110 Part		1	
		DWG NO		SHEETS	
		EU-CCS-W-110 Part		1	



## EN1317-3 Certificate from TRL





### Electronic Reporting

Test TC1.3.110, BSEN1317 Parts 1&3: 2000


**Test No: B4359**

**Cushion Tank System - Shindo Industry**  
(Opinions and interpretations do not form part of this report.)






TEST REPORT



VIDEO FOOTAGE



PHOTOGRAPHS

Test No: B4359 (Shindo Cushion Tank System)

Controller: A. Burton

1 of 18

Issue Date: 12.11.2010

**TEST TC 1.3.110, BS EN 1317 PARTS 1 & 3: 2000**

**CUSHION TANK SYSTEM**

Customer:  
**Shindo Industry Co. Ltd**

Test Date:  
**03 August 2010**


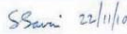
Test Number:  
**B4359**

Author:  
**A. Burton**

Report Issue Date:  
**12 November 2010**

If you have any questions relating to this test please contact your Facility Manager:  
Mr G Foskett direct line + 44 (0)1344 770460  
Fax: + 44 (0)1344 770356 email: [gfoskett@trl.co.uk](mailto:gfoskett@trl.co.uk)  
switchboard: + 44 (0)1344 773131  
website: <http://www.trl.co.uk/>

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Test Manager	A Burton 
Technical Referee	S J Savin 

Test No: B4359 (Shindo Cushion Tank System)

Controller: A. Burton




2 of 18

Issue Date: 12.11.2010

## EN1317-3 Test Video



# EN1317-3 Certificate from CSI

	
DIVISIONE: <b>MECCANICA</b>	LABORATORIO: <b>PROVING GROUND</b>
<b>RAPPORTO DI PROVA</b> (Test Report)	
Pag. 1/32 di/of pag.	
N° 0015\ME\HRB\12	
Data: 15/05/2012 Date:	
IDENTIFICAZIONE E DESCRIZIONE DEL CAMPIONE: SPECIMEN DESCRIPTION: <b>Attenuatore d'urto non parallelo in materiale metallico con sistemi BAG di assorbimento</b> <b>Metallic non parallel crash cushions with BAG absorption systems</b>	
EU-CCS-W-100 TC 1.1.100 ,900kg; 100km/h; 0deg	
DATI IDENTIFICATIVI DEL CLIENTE: CLIENT: SHINDO INDUSTRY CO. LTD 922-3 DONGPAE-RI, GYOHA-EUP 413834 PAJU-SI, GYEONGGI-DO SOUTH KOREA	
NORMA DI RIFERIMENTO: REFERENCE STANDARD: UNI EN 1317-1:2010 UNI EN 1317-3:2010	
DISTRIBUZIONE ESTERNA: OUTSIDE DISTRIBUTION:	DISTRIBUZIONE INTERNA: INSIDE DISTRIBUTION:
SHINDO INDUSTRY CO. LTD	
ENTE DI ACCREDITAMENTO: ACCREDITATION BODY: 	
LAB N°0205 Signatory of EA, IAF and ILAC Mutual Recognition Agreements	
GRUPPO 	
CSI s.p.a. Sede Legale - 13010 - L'Armenio V.le Lombarda, 20 - 20021 BOLLATE (MI) Tel. 02/9100111 - Fax 02/9197940 www.csi-igi.com	
R.E.A. 1460236 Registro Imprese 031748903076 C.F./P.I.: 11136010311 Cap. Soc. € 1.000.000	

		Pag. 7/32 di/of pag.
<b>RAPPORTO DI PROVA</b> (Test Report)		Data: 15/05/2012 Date:
0015\ME\HRB\12		
Prova ITT	TCL 1.100	Data/Date
Vel.	105.9km/h	Angolo/Angle
Barriera/Barrier	EU-CCS-W-100	0°
Scopo/Scope	UNI EN 1317-1:2010; UNI EN 1317-3:2010	
		
Vista generale dell'attenuatore prima della prova - General view before test		
		
Componenti principali dell'attenuatore prima della prova - Main components of crash cushion before test		
<b>6.2 DESCRIZIONE DEL DISPOSITIVO/DEVICE DESCRIPTION</b>		
La prova si è svolta nella zona di impatto Sud Ovest. Il dispositivo testato è un attenuatore d'urto la cui lunghezza totale è pari a 6952mm, la larghezza è 2600mm. L'altezza massima del sistema installato è 1010mm dal piano stradale.		
Test has been performed in the South West impact zone. The tested device is a crash cushions which total length is equal to 6952mm, the width is 2600mm. The maximum height of the system installed is 1010mm from the road.		
GRUPPO 		

# CSI Test Video



### Installation Picture



### After Damaged



Installation of assembled Cushion Tank System with concrete base.



① Check the installation site



② Mark and cut the road



③ Excavation work



④ Dig up the road



⑤ Complete digging up



⑥ Put the system on the road



⑦ After put it on the road



⑧ Fill up the crack by epoxy



⑨ Assemble the steel back cover



⑩ Attach the reflective on nose plastic tank



⑪ Assemble nose plastic tank



⑫ Complete installation

**Installation of disassembled Cushion Tank System on the concrete.**



① Boring the concrete for nose holding pin



② Fix the holding pin by epoxy



③ Fix the back framework



④ Assemble the iron wire and framework



⑤ Assemble the lower part guardrail beam



⑥ Assemble the upper part guardrail beam



⑦ Put the plastic middle tank



⑧ Put aluminum tube in the plastic tank



⑨ Complete putting aluminum tube



⑩ Assemble back cover



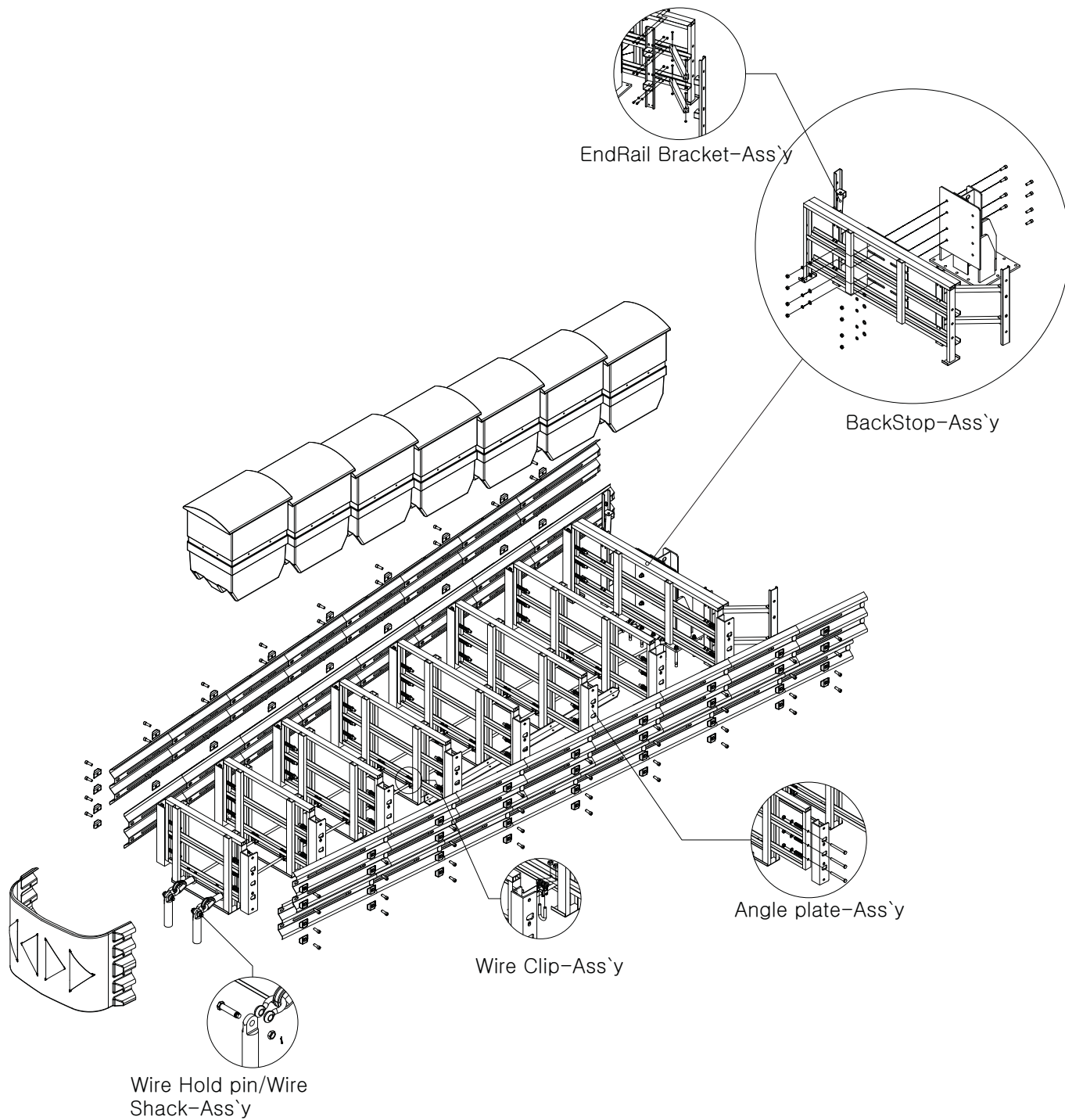
⑪ Assemble back cover



⑫ Complete installation

# Installation and Assemble Manual

## SHINDO Crash Cushion Step By Step Instruction For Nonparallel

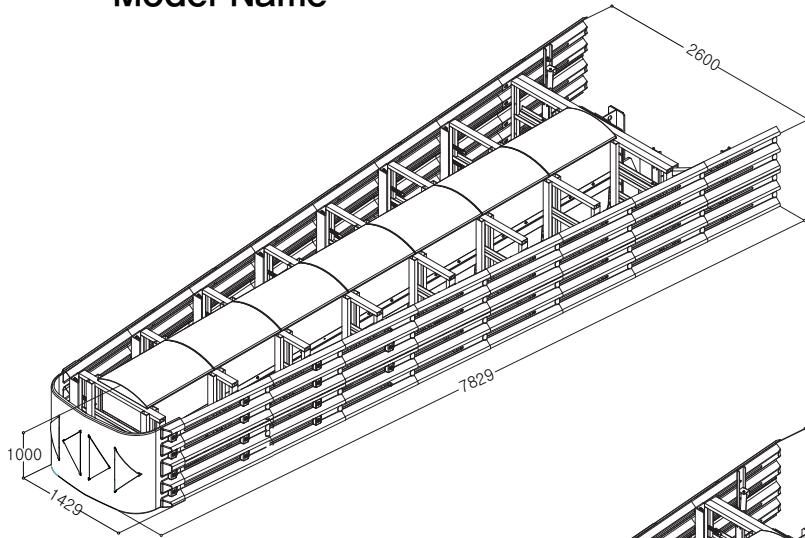




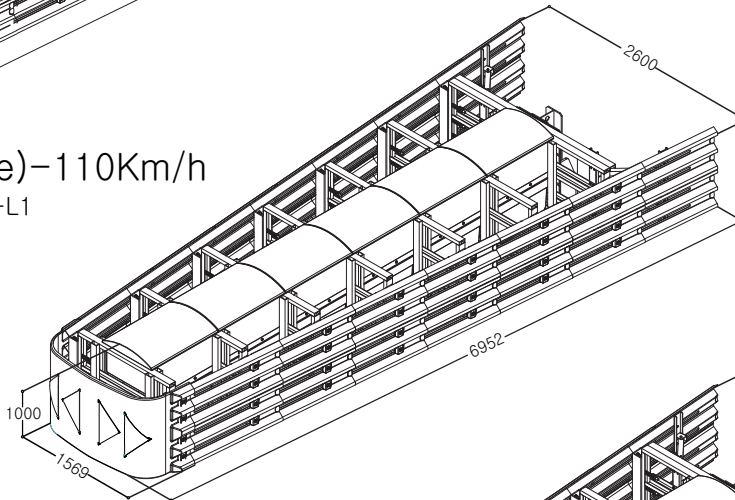
# Installation and Assemble Manual

**SHINDO Crash Cushion – Nonparallel**  
**Model Name**

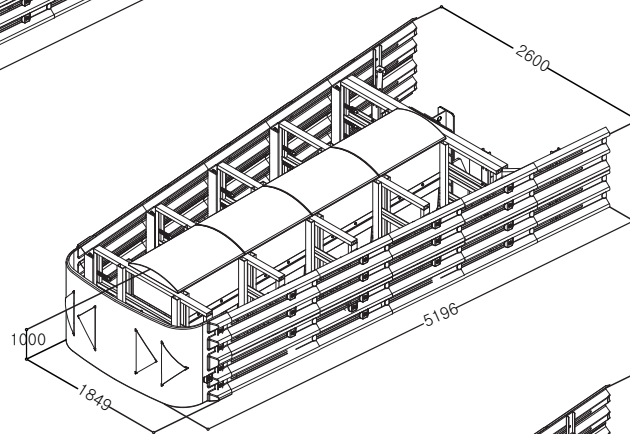
**INTRODUCTION**



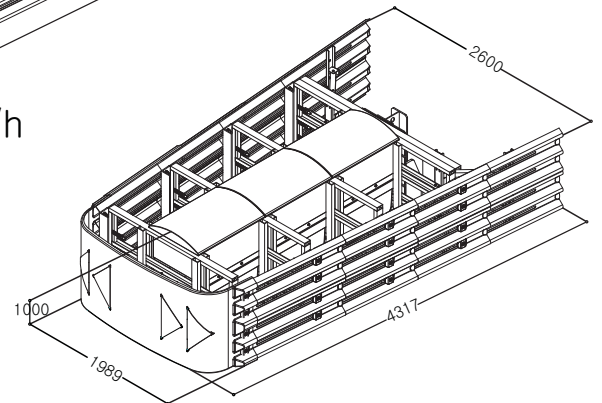
**EU CCS (Large)-110Km/h**  
Model : EU-CCS110-L1



**EU CCS (Large)-100Km/h**  
Model : EU-CCS100-L1



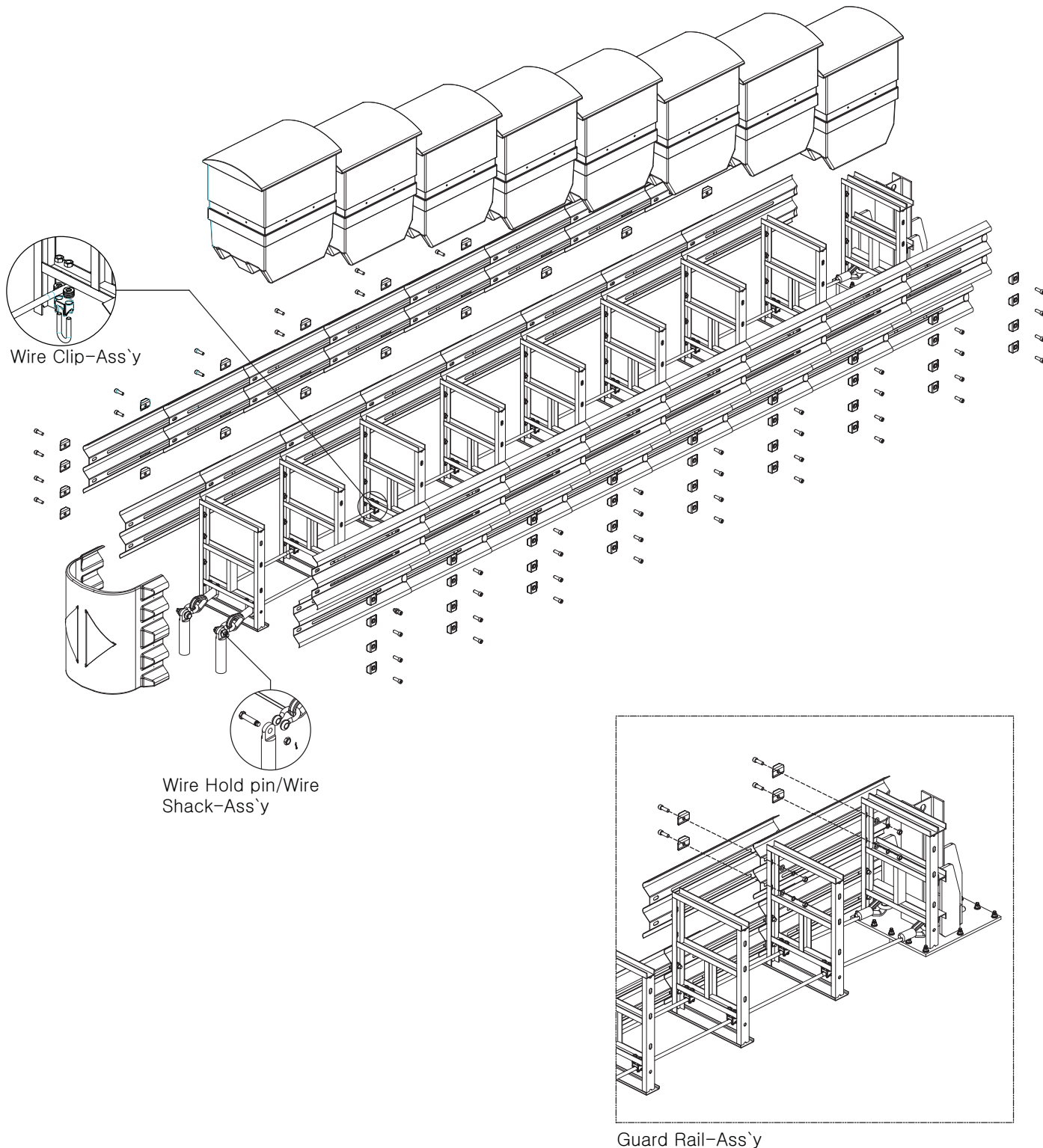
**EU CCS (Large)-80Km/h**  
Model : EU-CCS80-L1



**EU CCS (Large)-50Km/h**  
Model : EU-CCS50-L1

# Installation and Assemble Manual

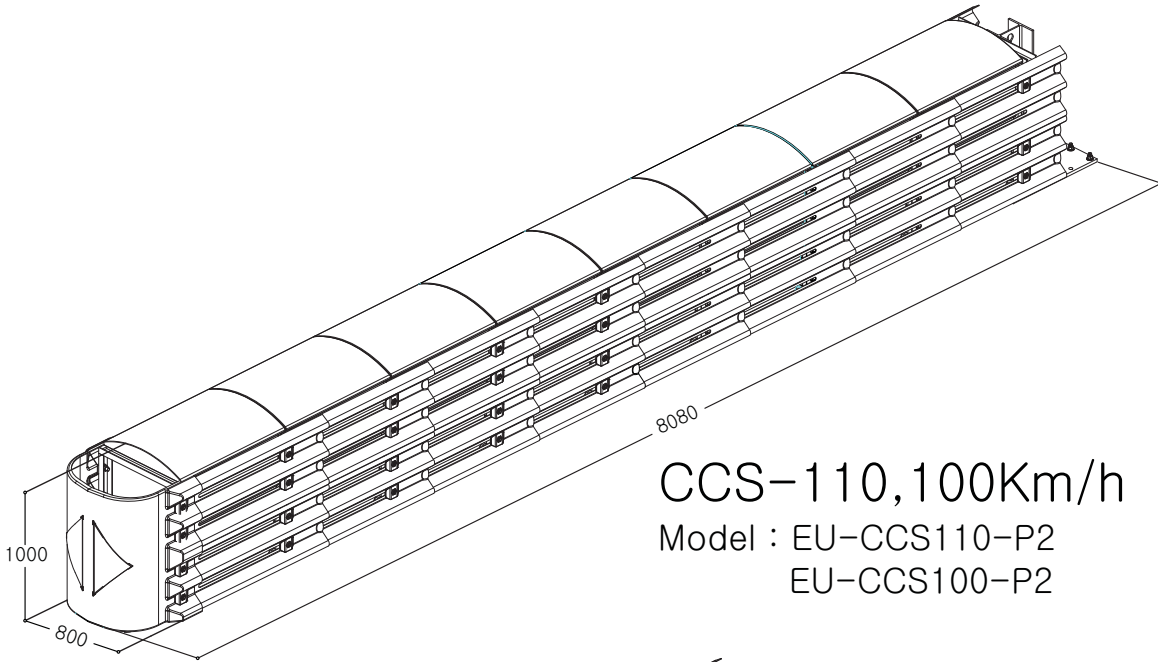
## SHINDO Crash Cushion Step By Step Instruction For parallel



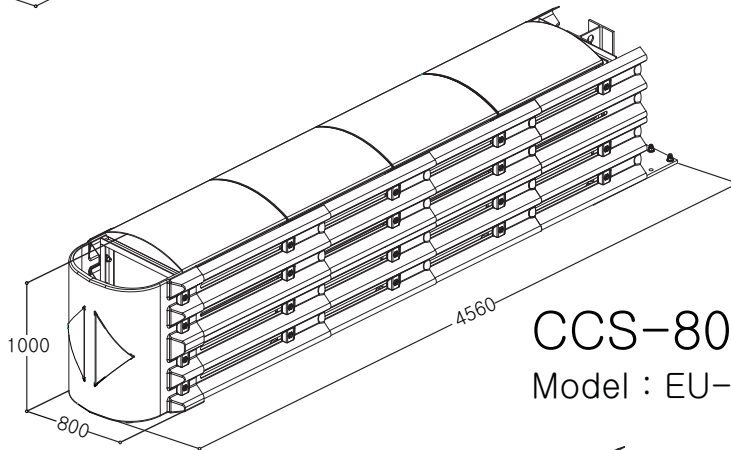
# Installation and Assemble Manual

SHINDO Crash Cushion – parallel  
Model Name

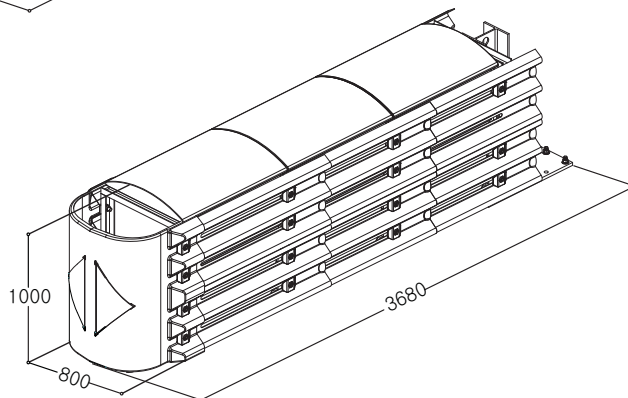
INTRODUCTION



**CCS-110, 100Km/h**  
Model : EU-CCS110-P2  
EU-CCS100-P2



**CCS-80Km/h**  
Model : EU-CCS80-P2



**CCS-50Km/h**  
Model : EU-CCS50-P2

# Installation and Assemble Manual

## SHINDO Crash Cushion Shock absorbing method

## INTRODUCTION

### 1. Frictional shock absorbing

#### 1-1. Frictional force generated between the guardrail and the spacer bar

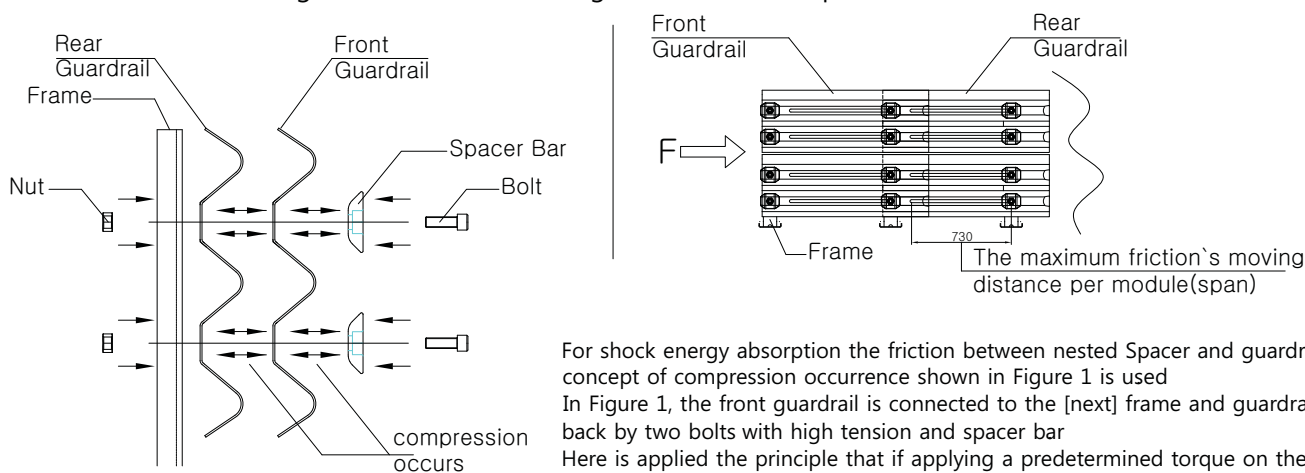


Figure - 1

For shock energy absorption the friction between nested Spacer and guardrail by the concept of compression occurrence shown in Figure 1 is used  
 In Figure 1, the front guardrail is connected to the [next] frame and guardrail in the back by two bolts with high tension and spacer bar  
 Here is applied the principle that if applying a predetermined torque on the bolts with high tension compression occurs between the guardrail and the spacer bar, and this compression, when modules [support frames] are sequentially folded at the collision, causes frictional force to absorb the shock energy

#### 1-2. Frictional force generated between the wire rope and wire clips attached to the support frame

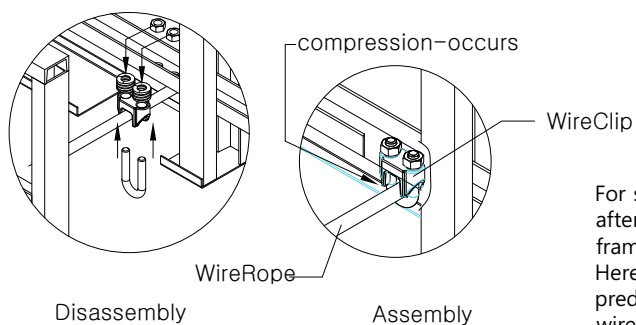


Figure 2

For shock energy absorption the concept of compression occurrence shown in Figure 2, after inserting the wire rope into the wire clips, attaching the wire clips to the support frame, makes use of the frictional force between the wire rope and the wire clips  
 Here is applied the principle that When attaching U-bolt to nut, if applying a predetermined torque, compression occurs between the wire rope and the wire clips, and this compression, when modules [support frames] are sequentially folded at the collision, causes frictional force to absorb the shock energy.

# Installation and Assemble Manual

## SHINDO Crash Cushion Shock absorbing method

## INTRODUCTION

### 2. Absorption of shock energy due to transformation

#### 2-1. Shock-absorbing tank and shock absorption due to transformation of AL Absorber

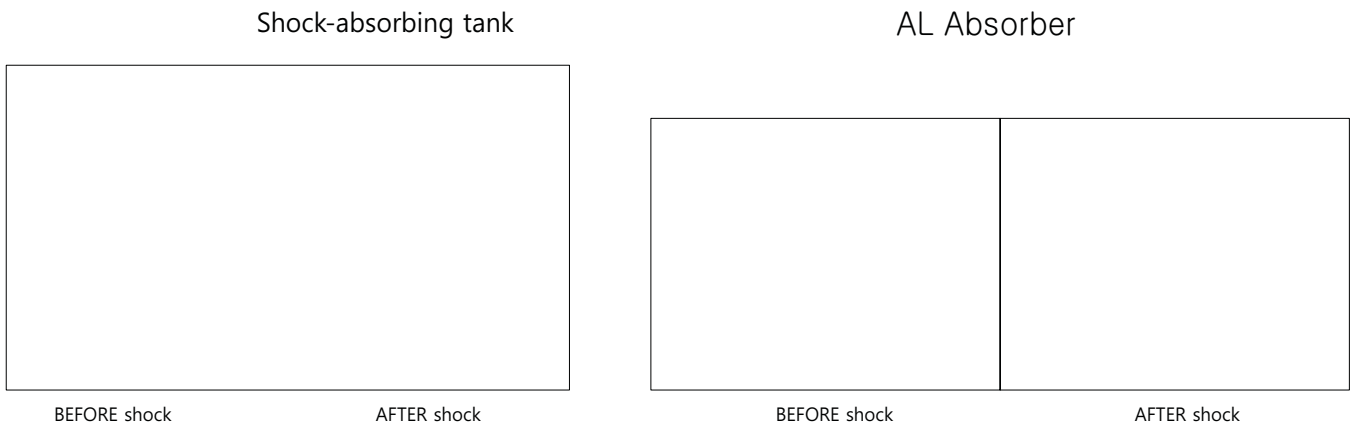


Figure 3

When pressure is applied onto the object (as shown in Figure3) for the shock energy to be absorbed, the energy is absorbed into the internal structure of the object. If the internal stress on the cross section of the object exceeds, the object absorbs the shock energy through transformation or destruction.

### 3. Absorption of shock energy due to inertia

#### 3-1. Absorption of shock energy due to the module's moving distance

The shock absorbing system is a combined part of the component (material) so each module has its own weight. Physical energy is required in order to move each module over a certain distance.

The Law of Conservation of Momentum, a principle in which shock energy is absorbed by moving each module, is applied. The exact amount of shock energy absorbed by moving each module is applied by using the perfect inelastic collision.



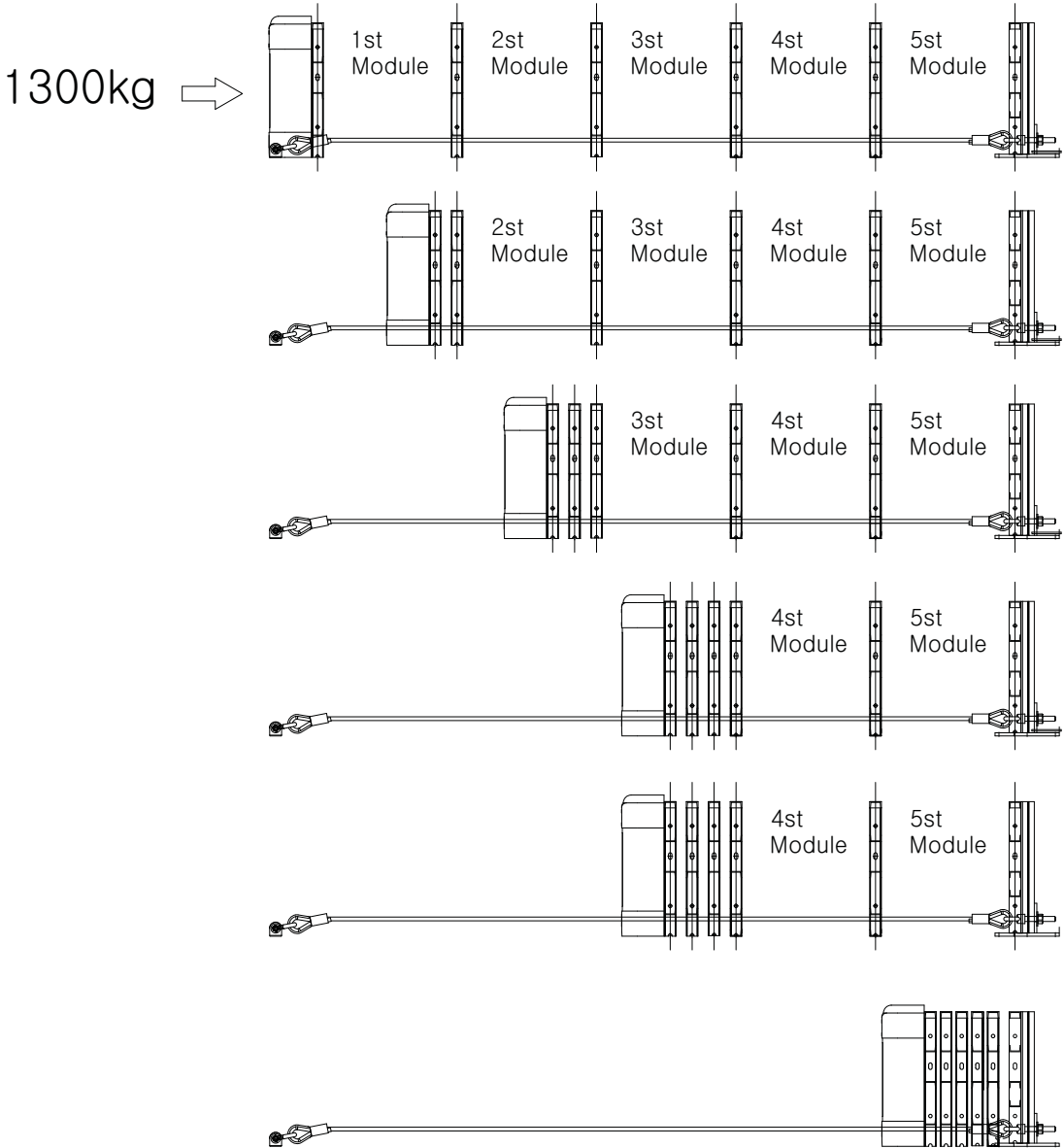
Figure 4 [Perfect inelastic collision]  
 $m_1v_1 + m_2v_2 = (m_1 + m_2)v$

# Installation and Assemble Manual

## SHINDO Crash Cushion Shock absorbing method

## INTRODUCTION

3-2. The order of folding at the time of vehicles' collision and the calculation of energy absorption using completely inelastic collision



Collision Stage	Weight of the Module(kg)	Collision Velocity(km/h)	Collision energy(kj)	Absorberd energy(kj)
Before		80	320	
1st	202	69.2	277	43
2st	178	61.8	248	72
3st	178	55.9	224	96
4st	178	51.0	205	116
5st	165	47.2	189	131

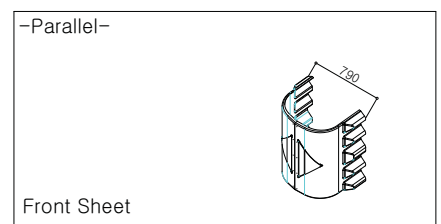
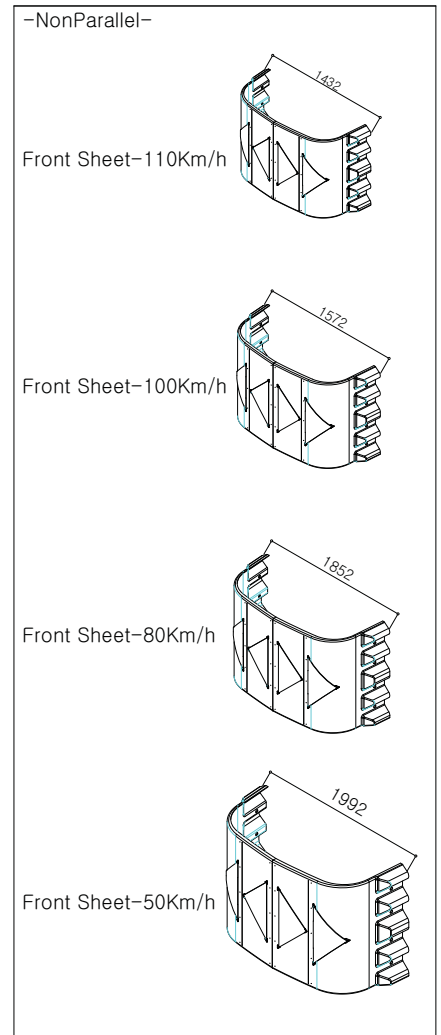
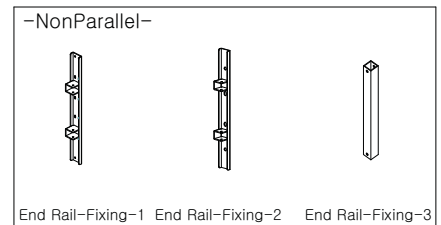
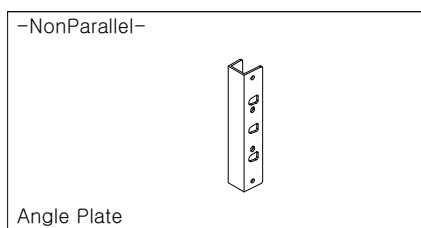
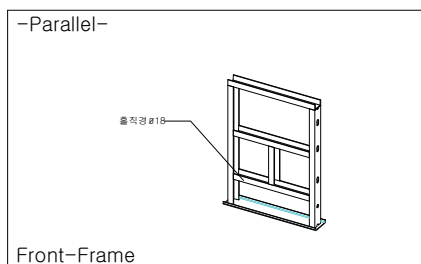
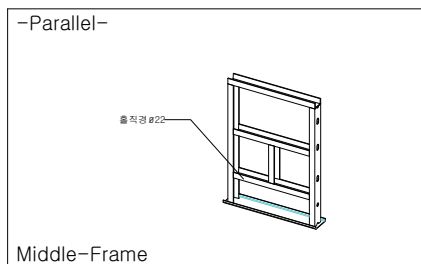
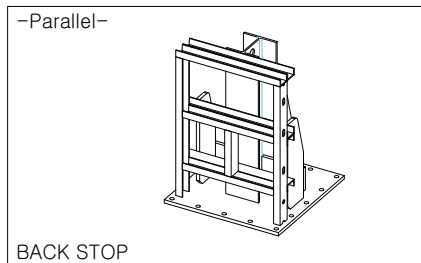
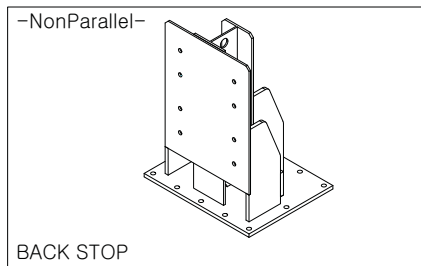
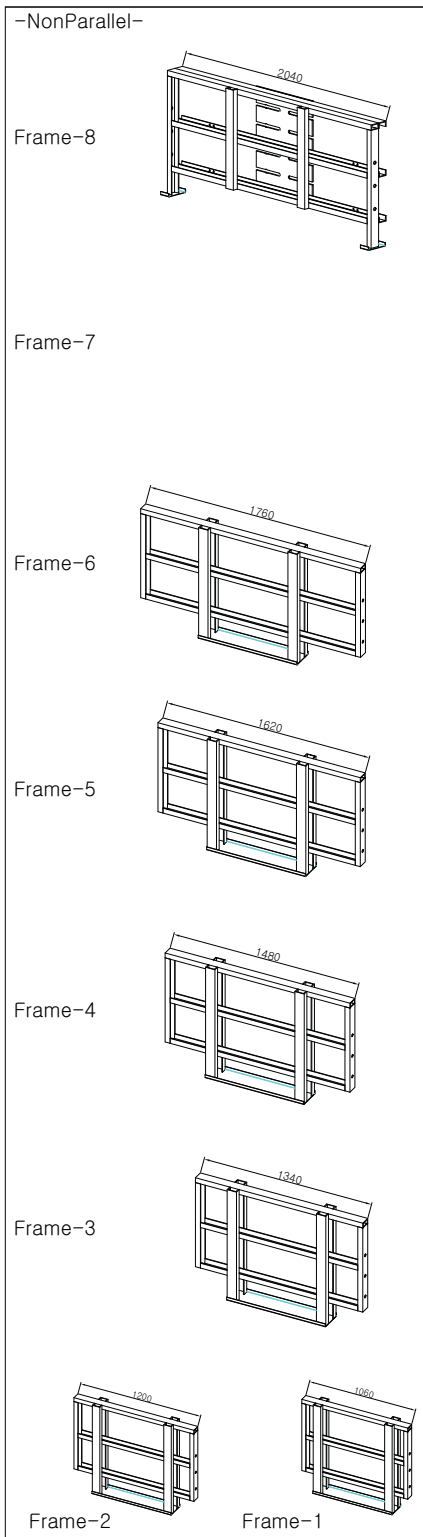
Table-1

Ex.) Table 1 shows the calculation of absorbed energy per each module by completely inelastic collision formula after giving a certain amount of weight on each span [module].

# Installation and Assemble Manual

## SHINDO Crash Cushion Parts List-1

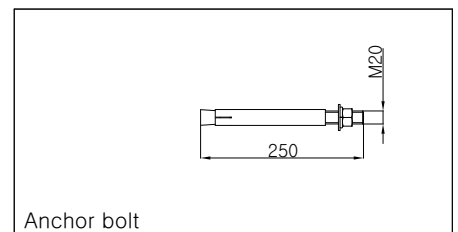
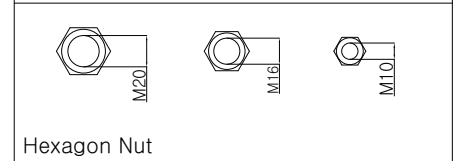
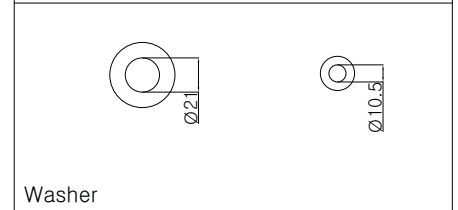
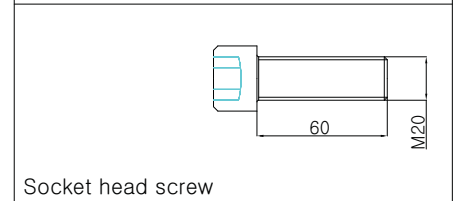
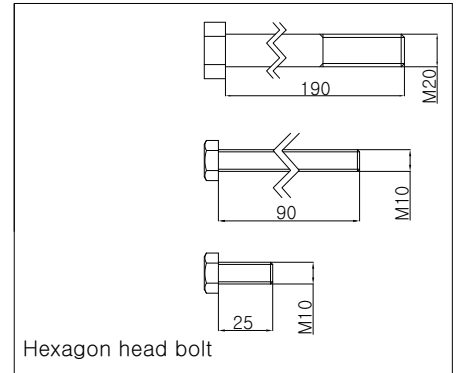
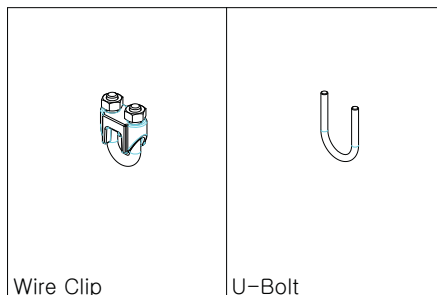
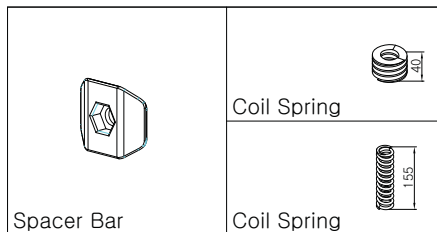
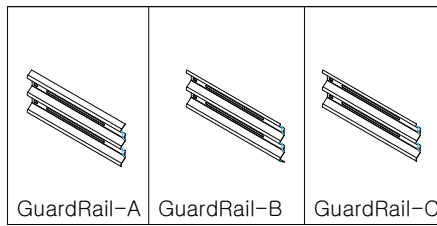
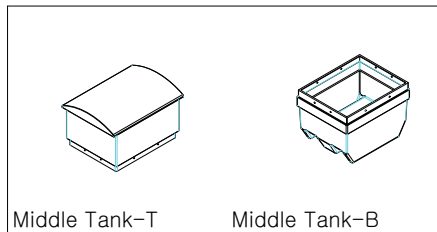
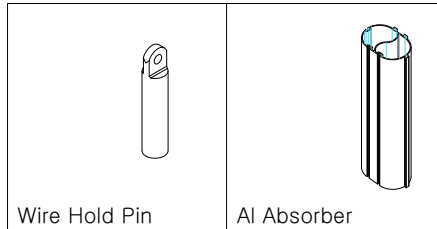
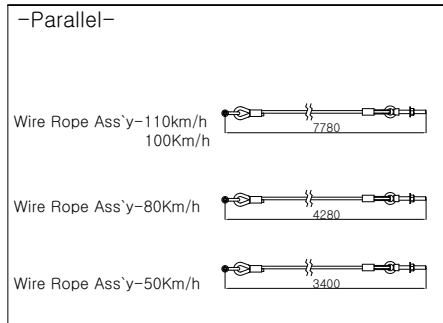
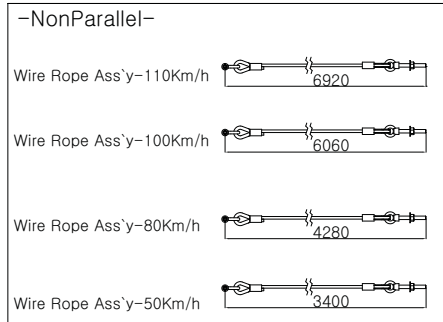
## INTRODUCTION



# Installation and Assemble Manual

## SHINDO Crash Cushion Parts List-2

## INTRODUCTION



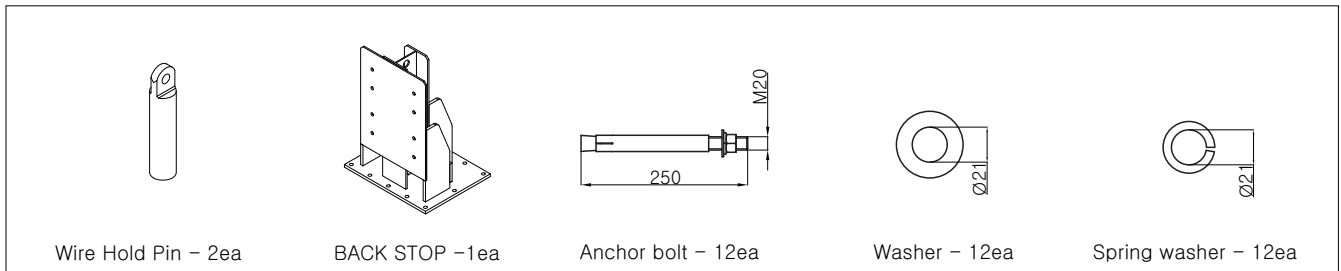


# Installation and Assemble Manual

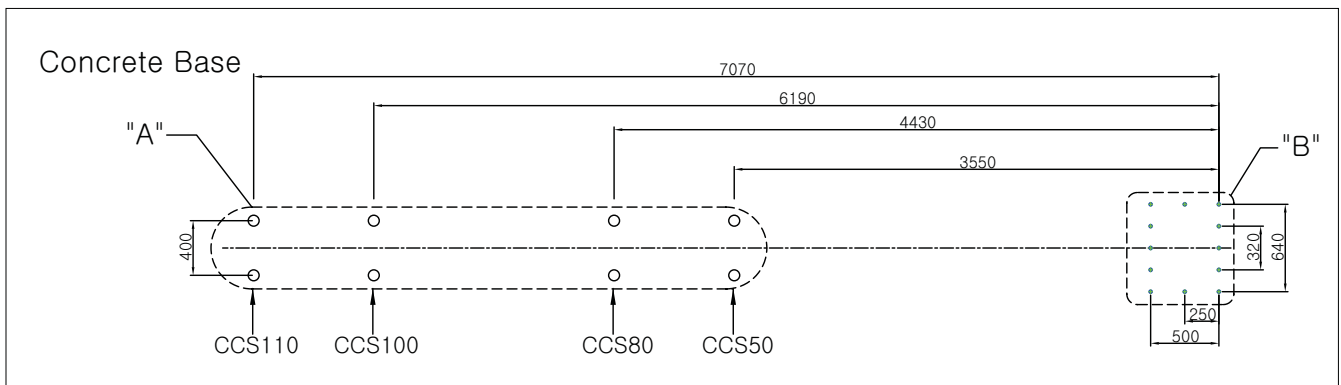
## SHINDO Crash Cushion-Nonparallel Installation

## INTRODUCTION

### ● Parts used

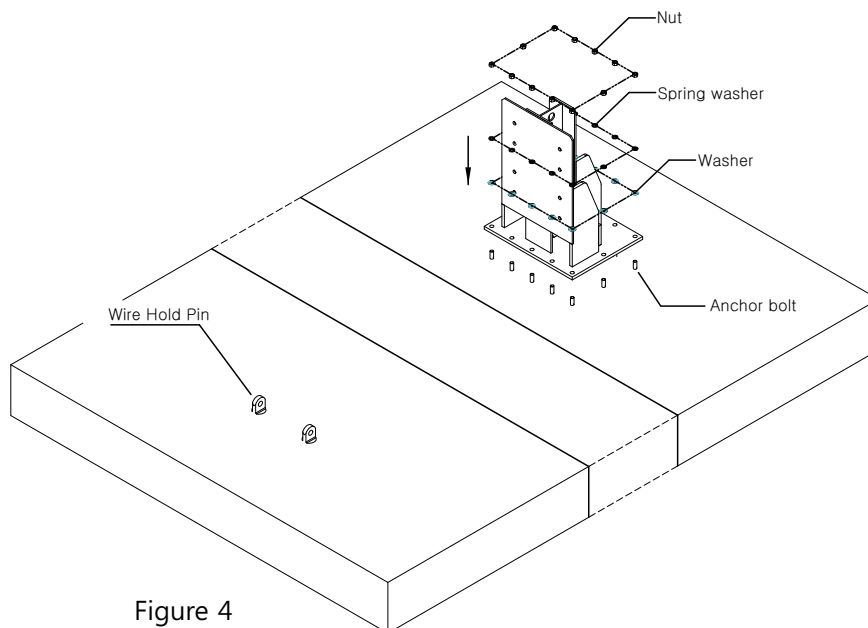


### ● Operation-1 [Back Stop" Fixing]



Select the grade to install and drill the base the one selected in the figure.

1. "A" is for the fixation of Wire hold Pin, so it shall be drilled to hole size  $\varnothing 90 \times 300 \text{mm}$ .
2. "B" is for the Anchor bolt to fix Back Stop, so it shall be drilled to hole size  $\varnothing 25 \times 190 \text{mm}$ .



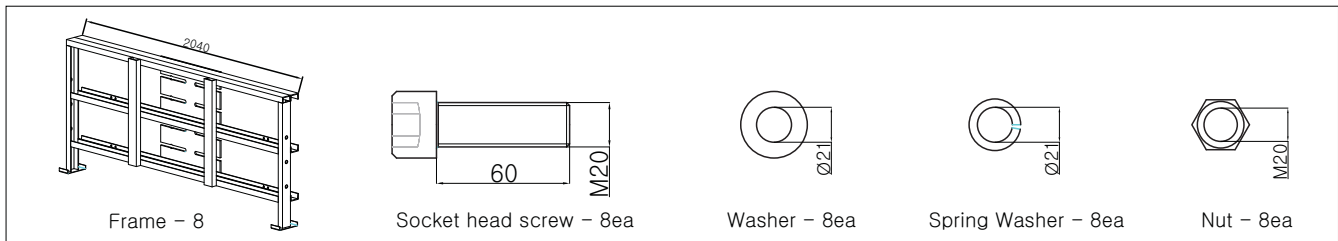
3. Assemble the parts in the order as in Fig.4, and fasten them with fastening tools.

# Installation and Assemble Manual

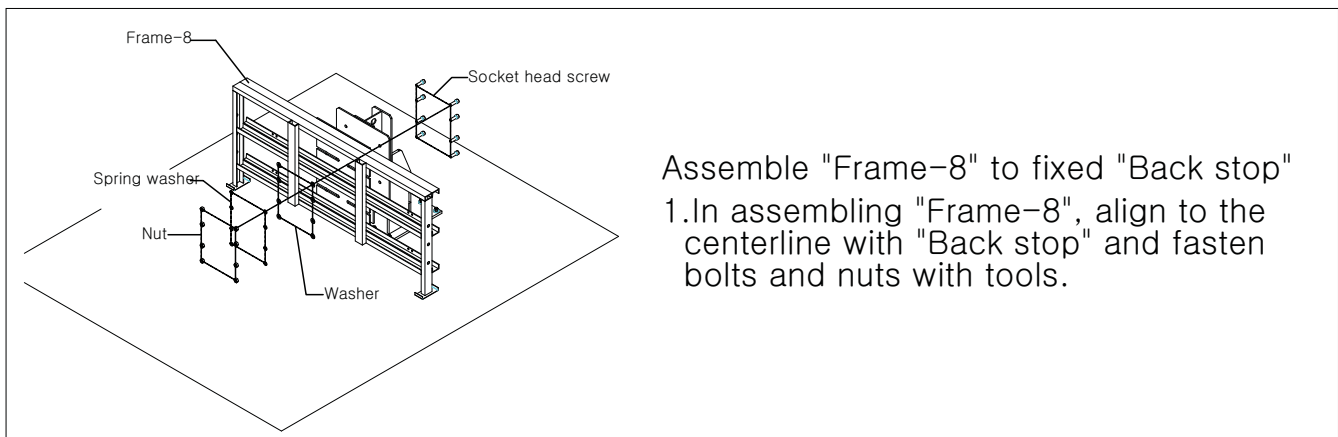
## SHINDO Crash Cushion-Nonparallel Installation

## INTRODUCTION

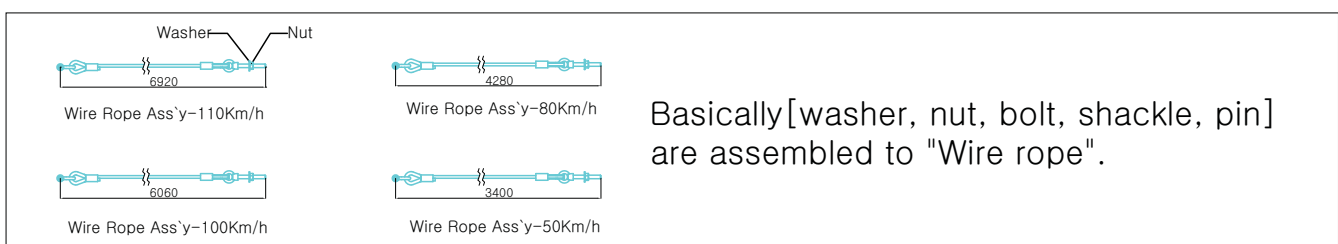
### ● Parts used



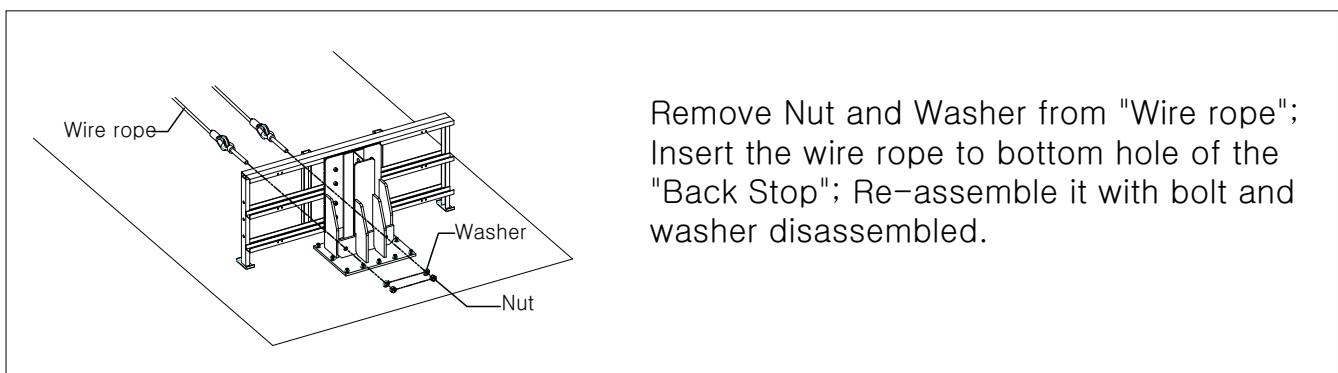
### ● Operation-2 ["Frame-8" Assembly]



### ● Parts used



### ● Operation-3 ["Wire rope" Assembly]

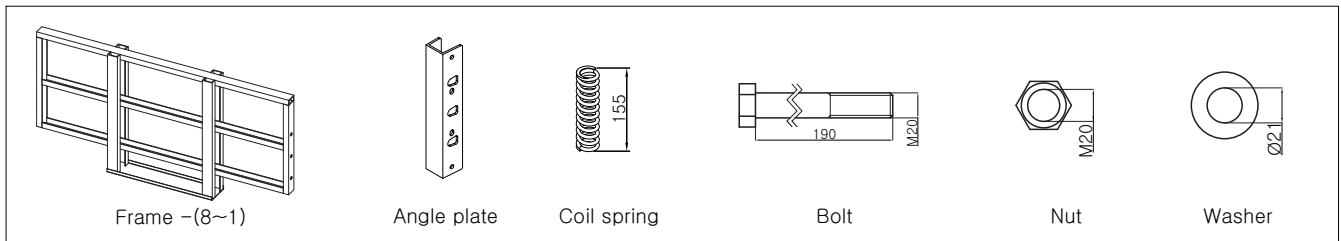


# Installation and Assemble Manual

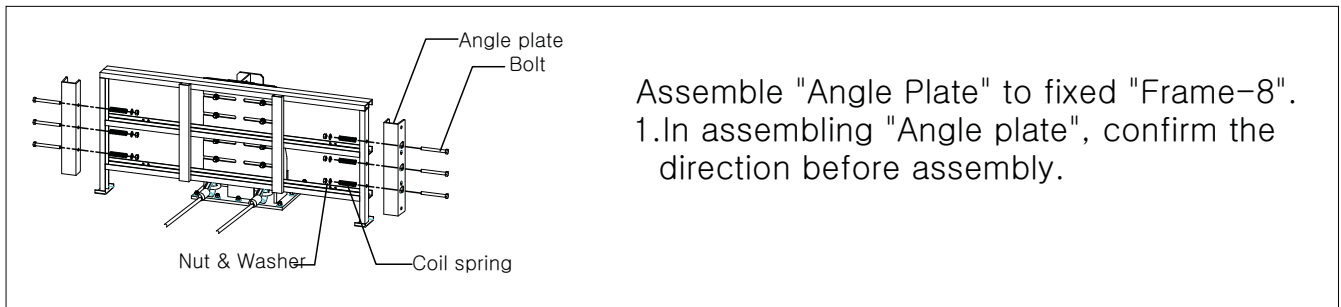
## SHINDO Crash Cushion-Nonparallel Installation

## INTRODUCTION

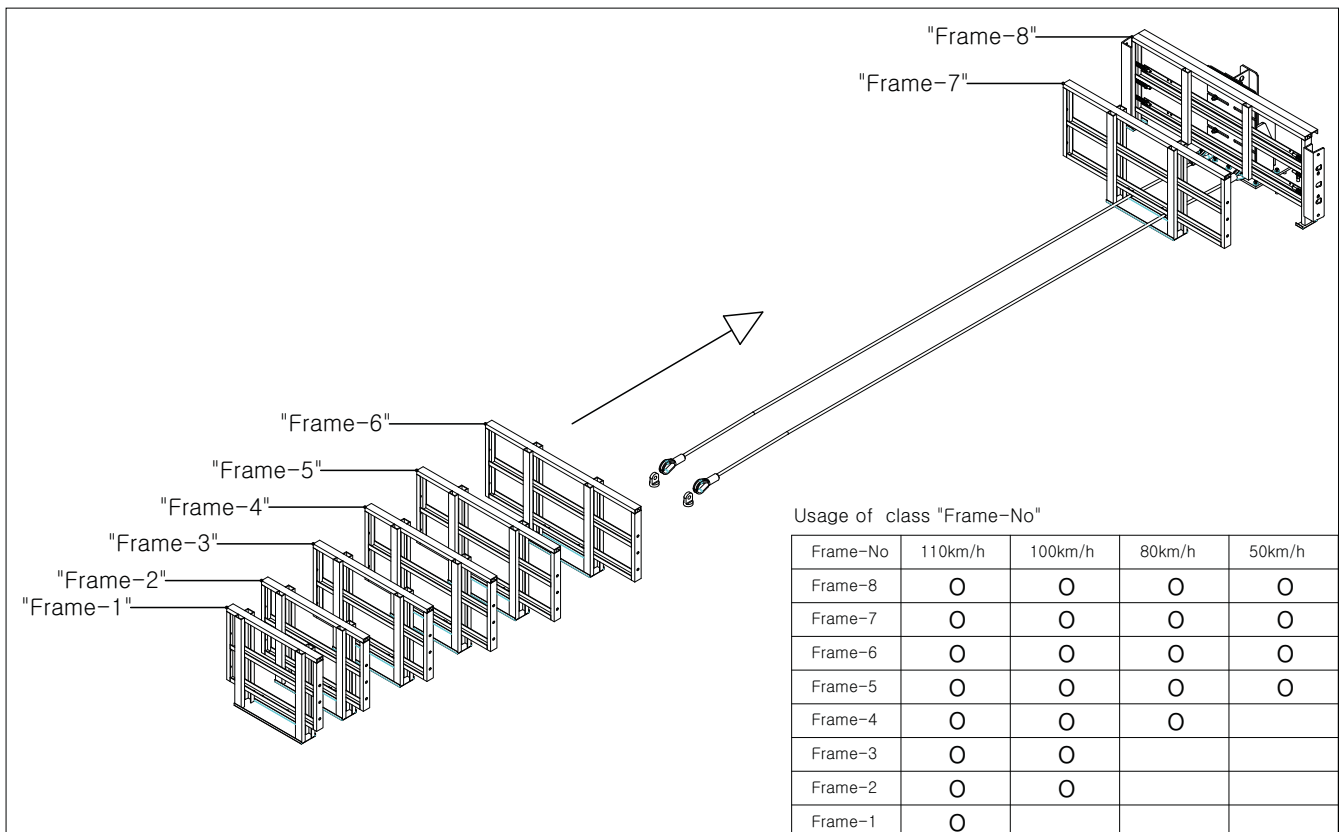
### ● Parts used



### ● Operation-4-1 ["Angle Plate" Assembly]



### ● Operation-4-2 [Inserting "Frame-7~1" to "Wire Rope"]

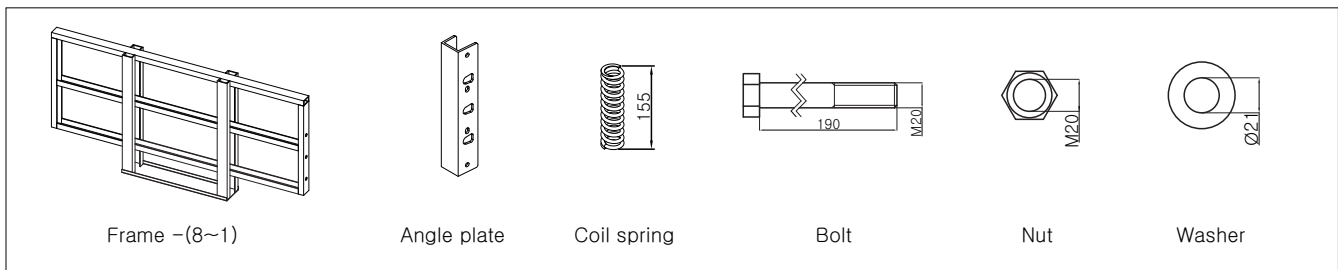


# Installation and Assemble Manual

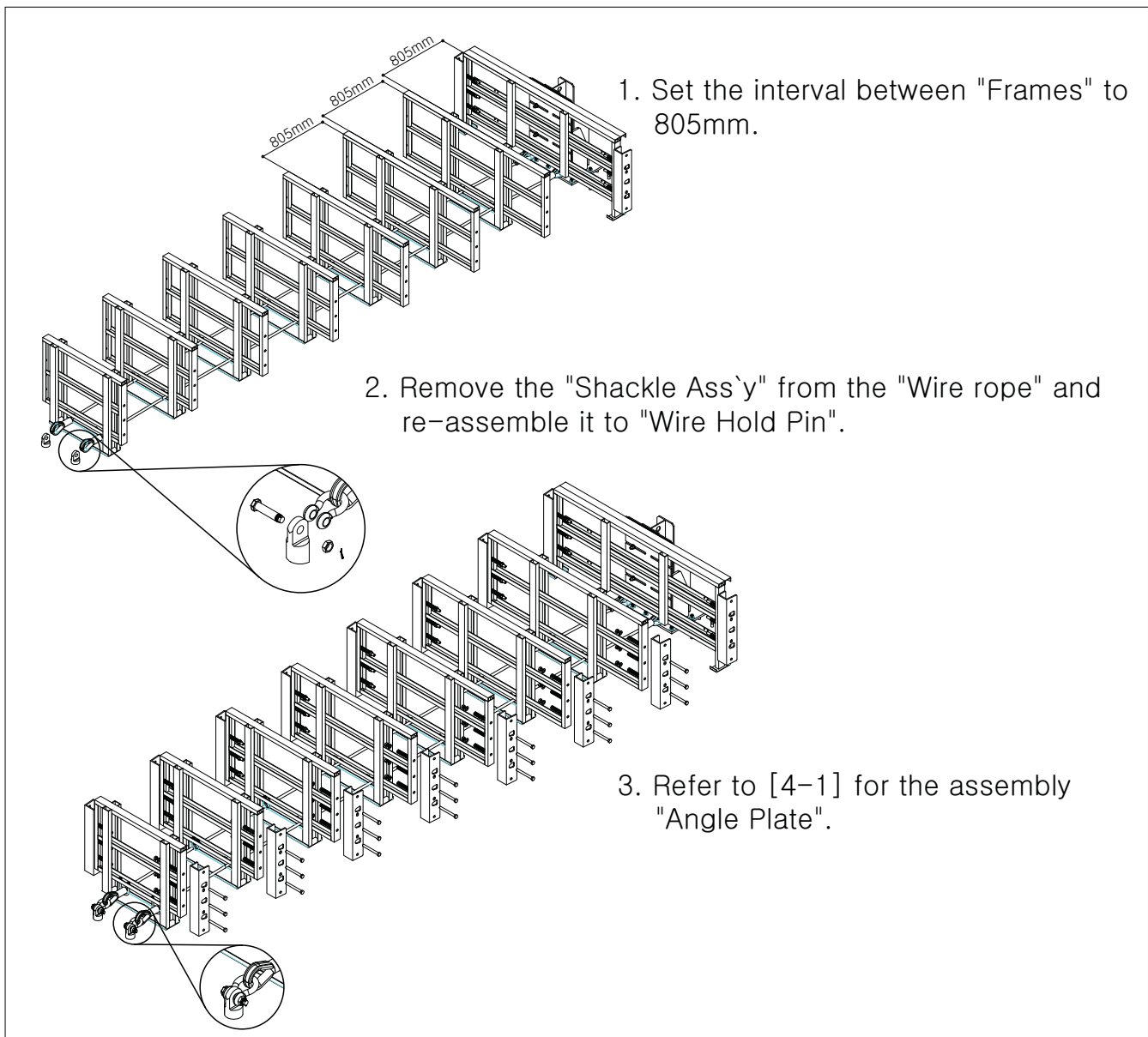
## SHINDO Crash Cushion-Nonparallel Installation

## INTRODUCTION

### ● Parts used



### ● Operation-4-3["Angel plate" Assembly to "Frame-7~1"]



# Installation and Assemble Manual

## SHINDO Crash Cushion–Nonparallel Installation

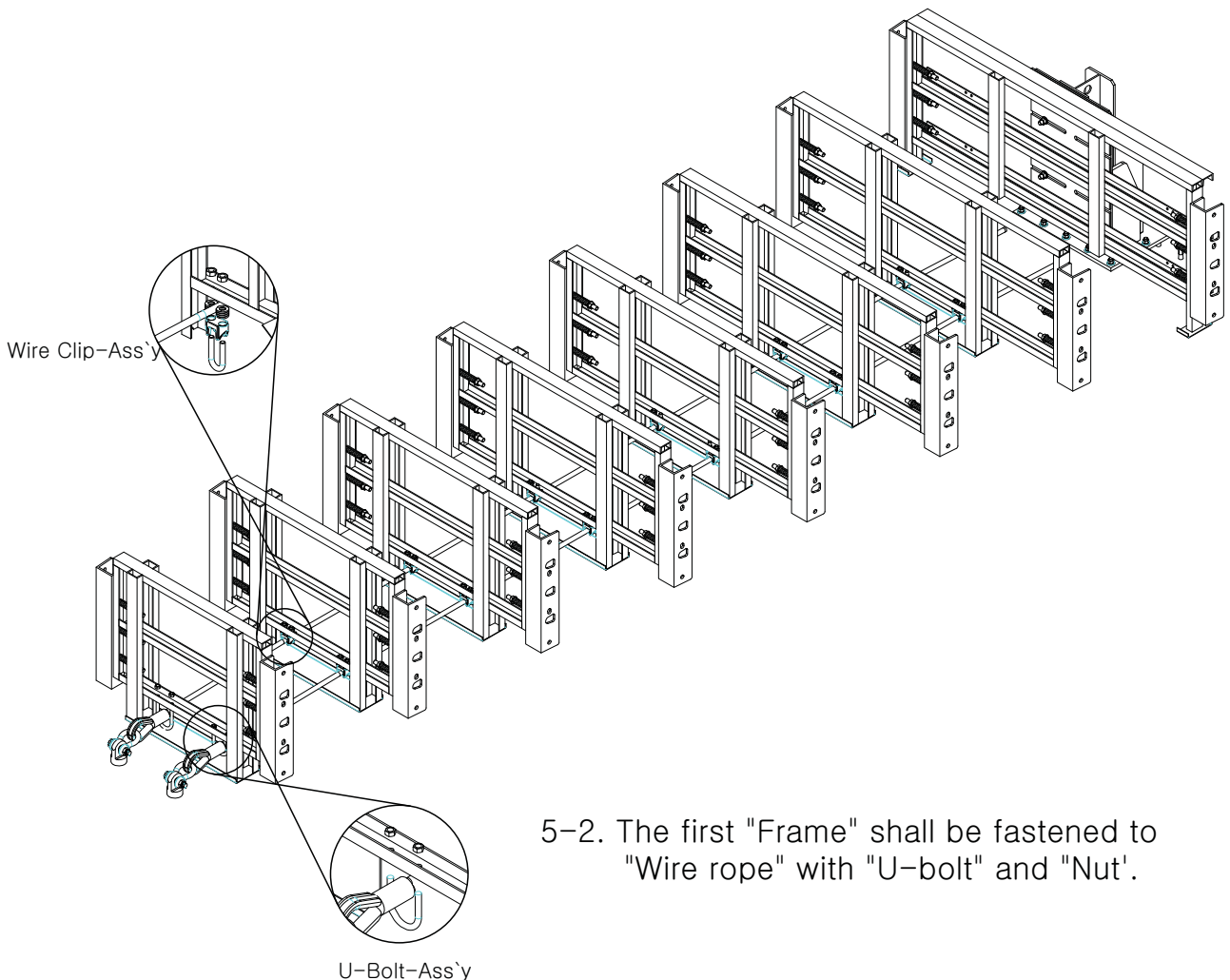
## INTRODUCTION

● Parts used



● Operation-5 [Temporary assembly of (U-Bolt, Wire Clip) to "Frame"]

5-1. Remove "Wire Clip"; insert Coil Spring as in the figure and fasten "Wire rope" and "Frame".  
[However, it does not apply to the first "Frame" and the last "Frame"]

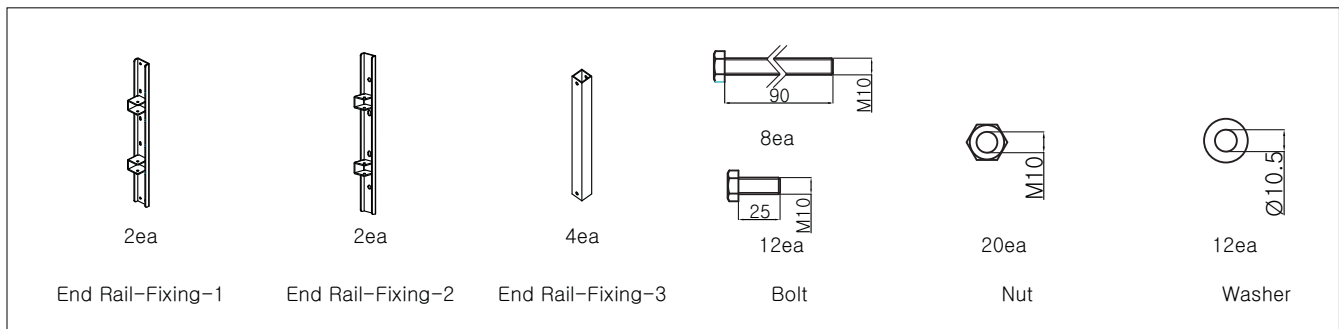


# Installation and Assemble Manual

## SHINDO Crash Cushion-Nonparallel Installation

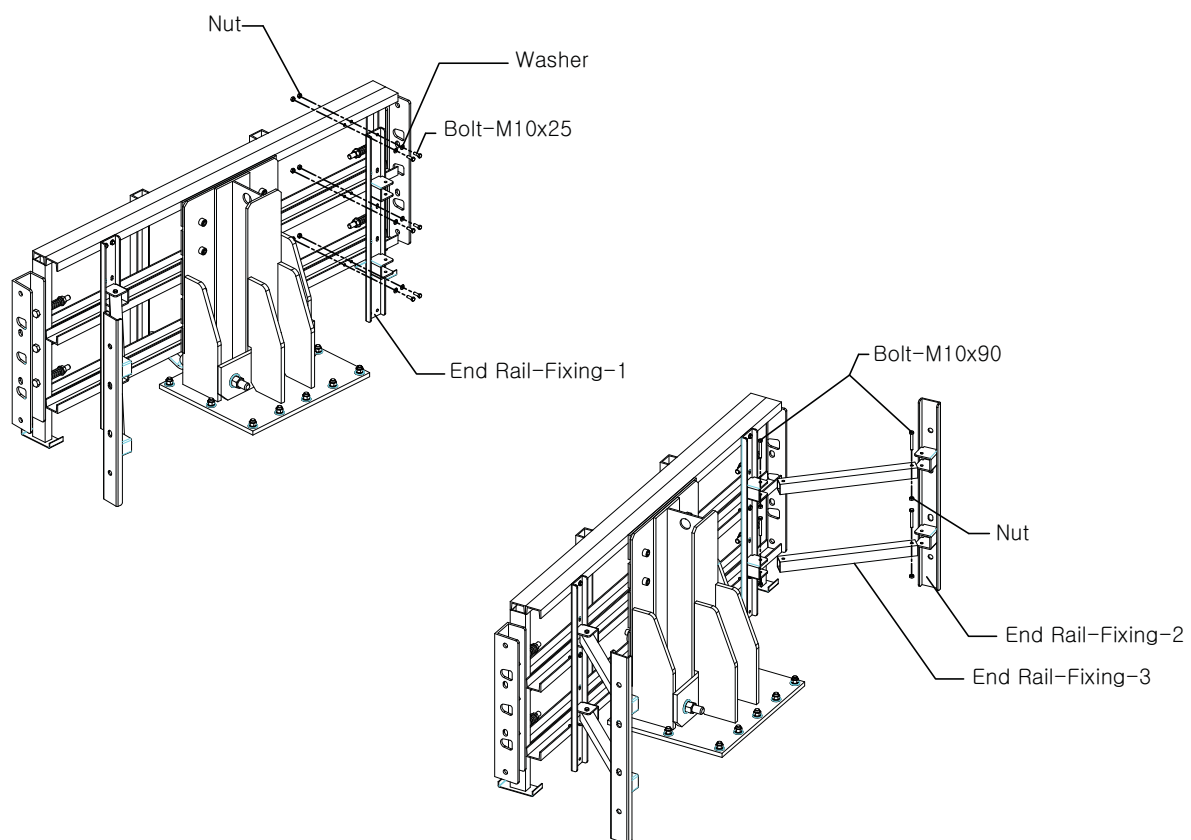
## INTRODUCTION

### ● Parts used



### ● Operation-6["End Rail-Bracket" assembly]

6-1. Fasten "End Rail-Fixing-1" to "Frame-8" with (Bolt, Washer, Nut).



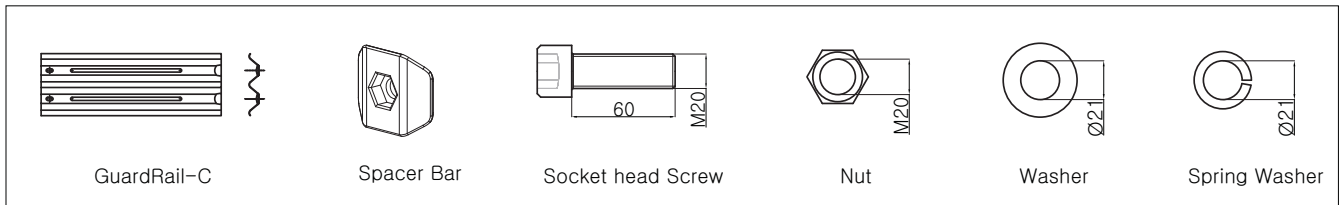
6-2. Fasten "End Rail Fixing-3" to fixed "End Rail Fixing-1" with (Bolt ,Nut).  
Finally assemble "End Rail-Fixing-2" to "End Rail-Fixing-3" with (Bolt, Nut).

# Installation and Assemble Manual

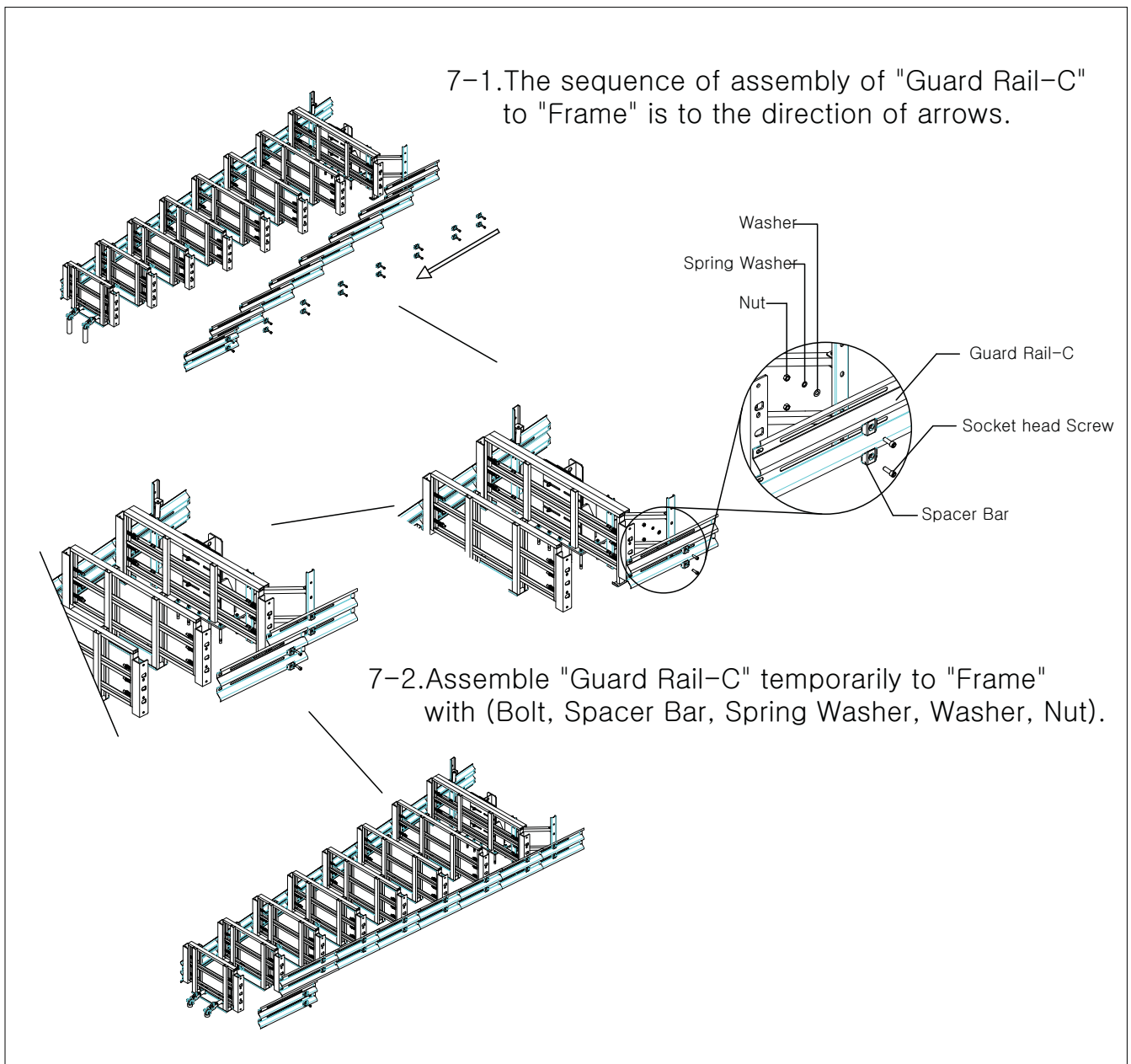
## SHINDO Crash Cushion-Nonparallel Installation

## INTRODUCTION

● Parts used



● Operation-7["Guard Rail-C" assembly]

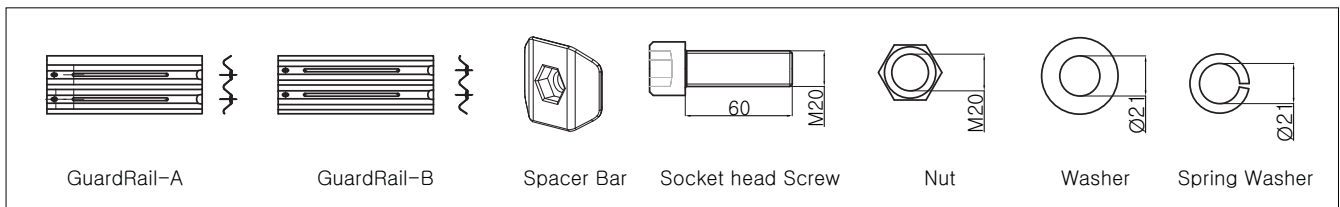


# Installation and Assemble Manual

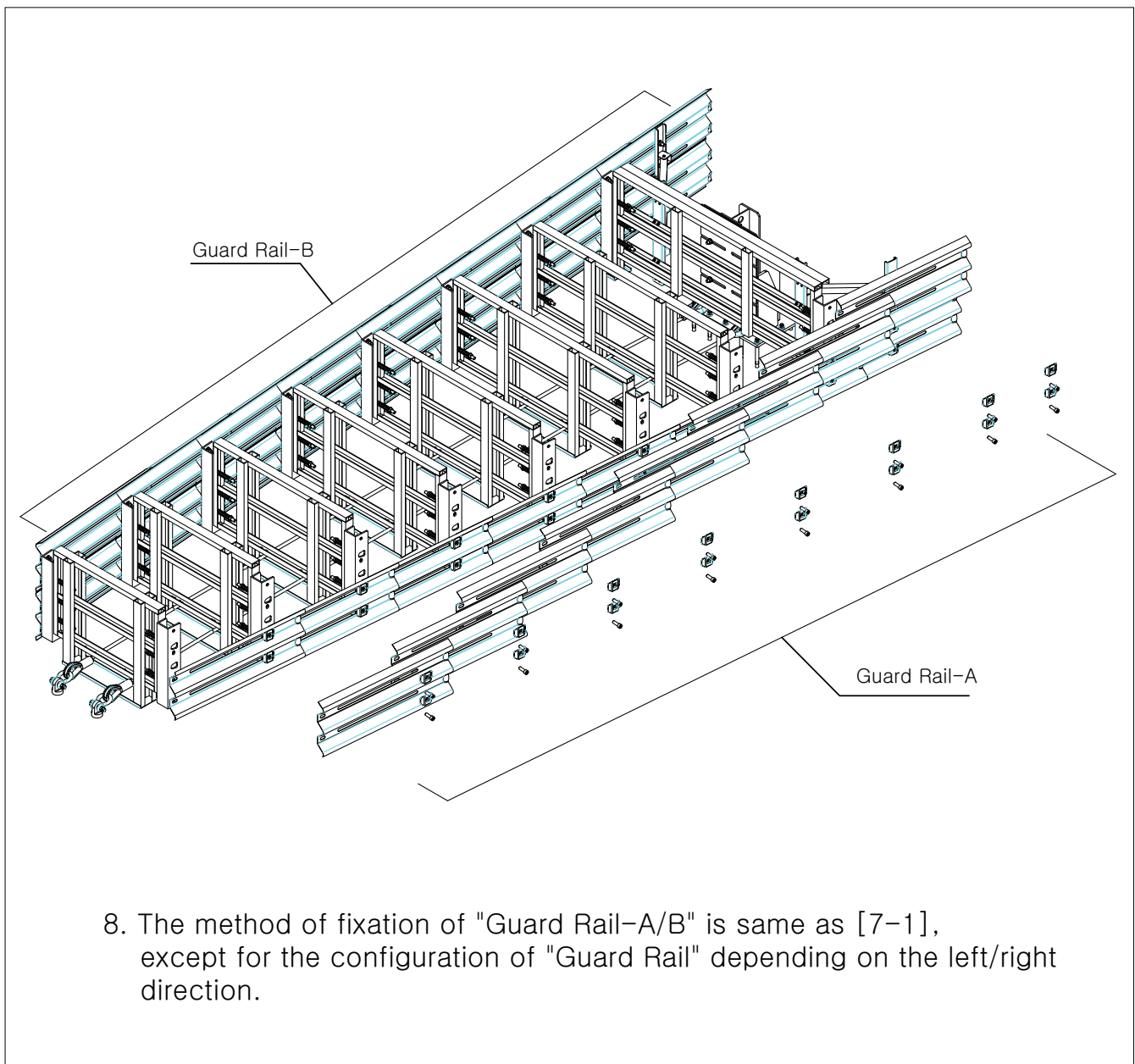
## SHINDO Crash Cushion-Nonparallel Installation

## INTRODUCTION

### ● Parts used



### ● Operation-8["Guar Rail-A/B" assembly]



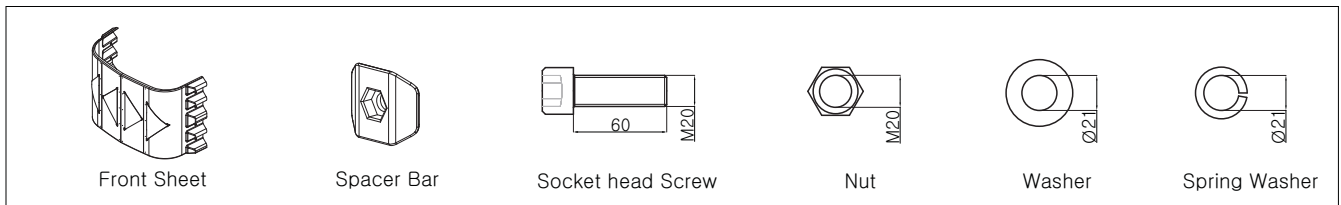


# Installation and Assemble Manual

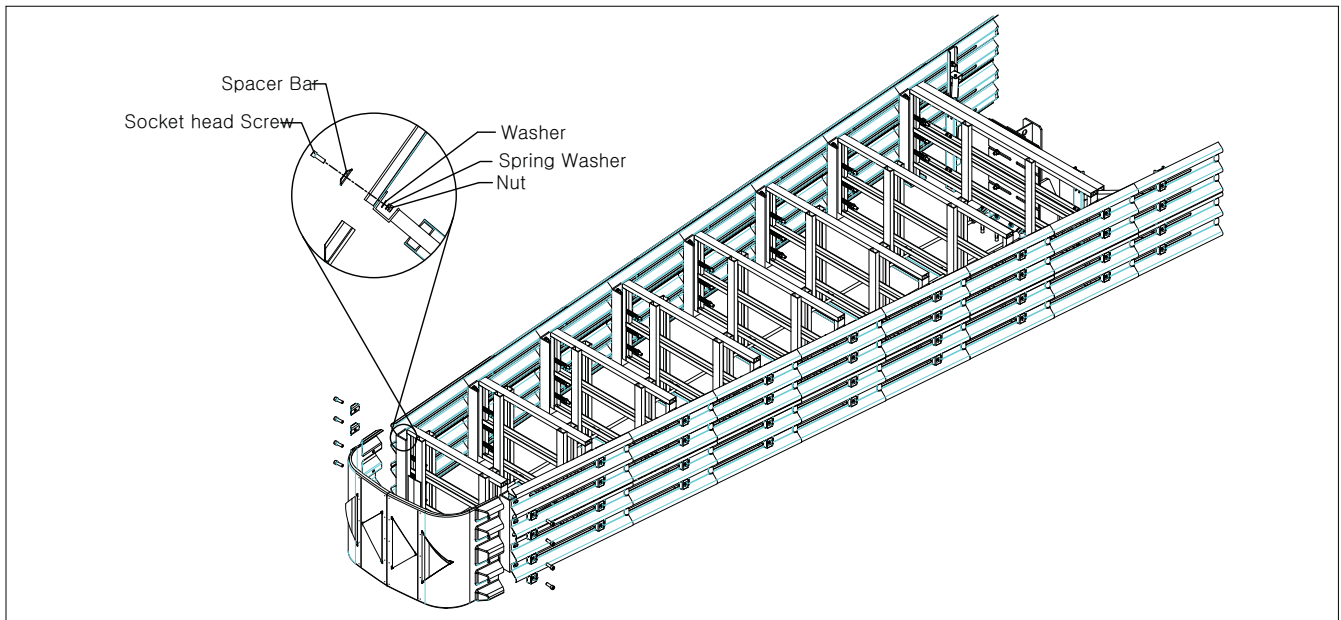
## SHINDO Crash Cushion–Nonparallel Installation

## INTRODUCTION

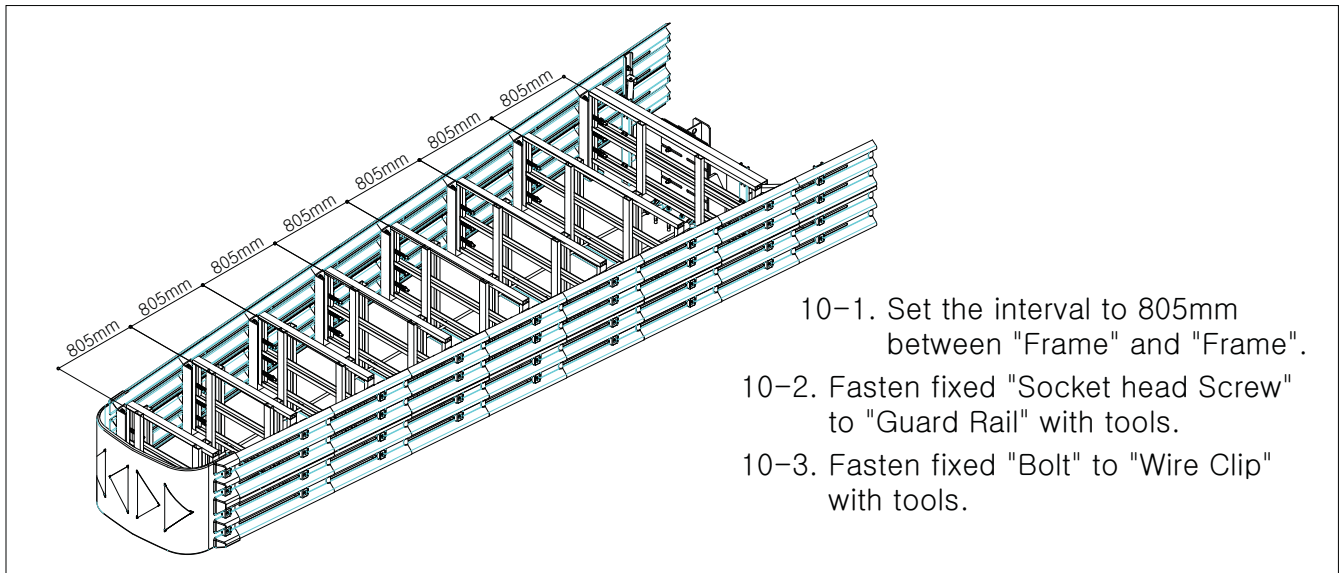
### ● Parts used



### ● Operation-9[Fastening "Front Sheet"]



### ● Operation-10[Adjustment of interval (distance) between "Frame" end "Frame" followed by complete fastening of each Bolt]

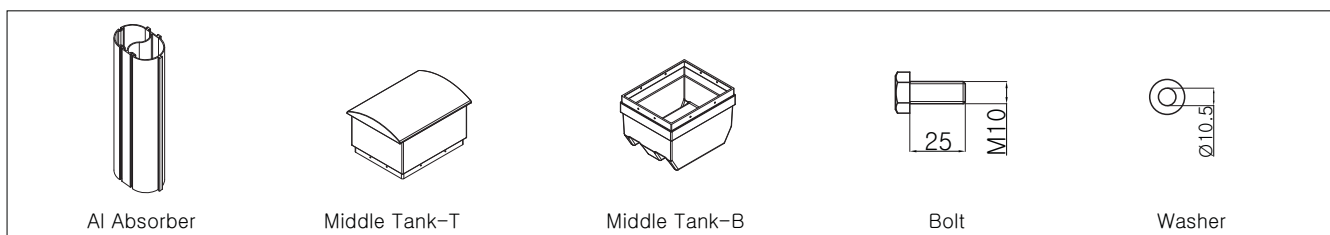


# Installation and Assemble Manual

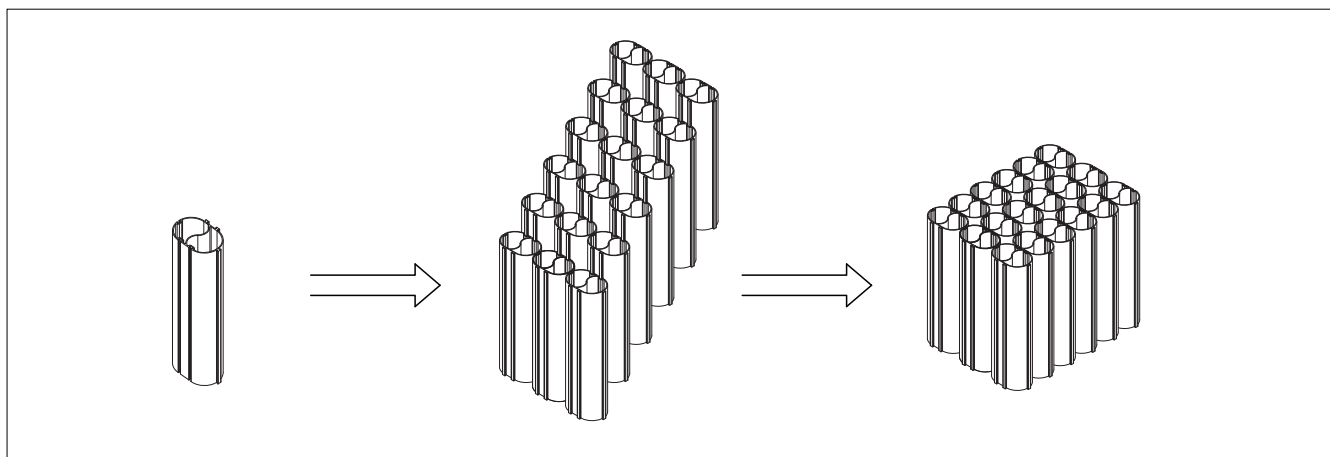
## SHINDO Crash Cushion-Nonparallel Installation

## INTRODUCTION

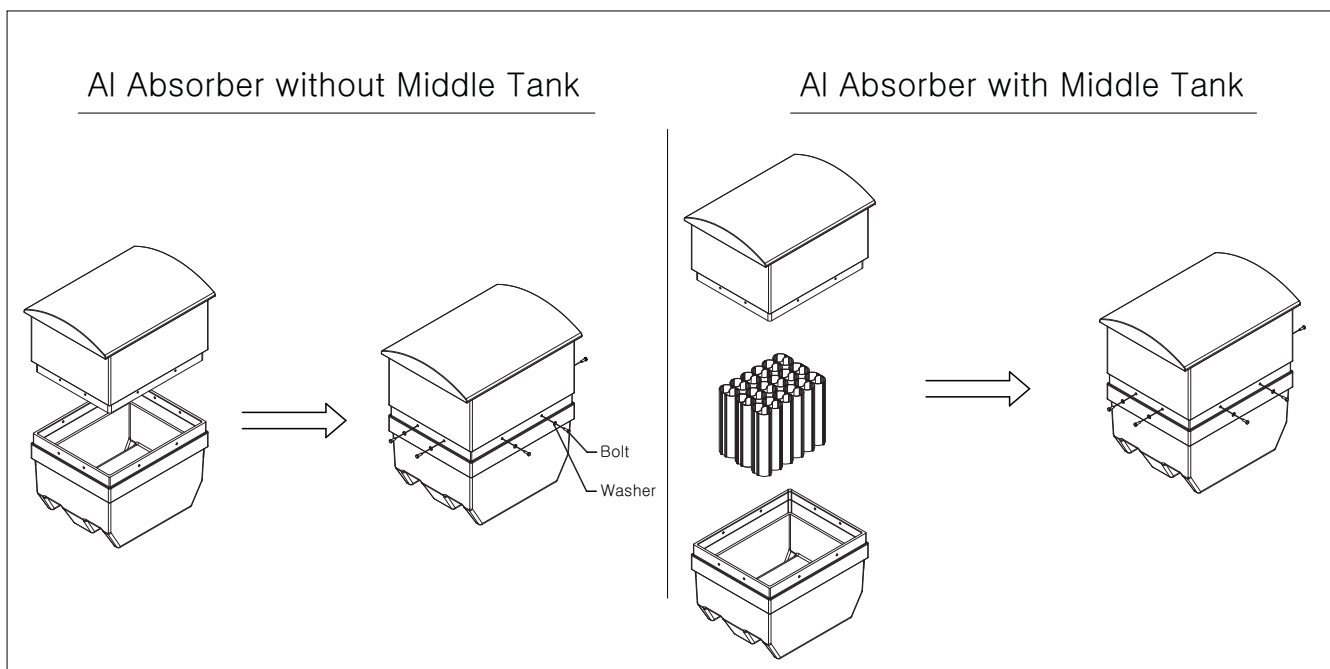
● Parts used



● Operation-11 ["AI Absorber" assembly]



● Operation-12 ["Middle Tank" assembly]

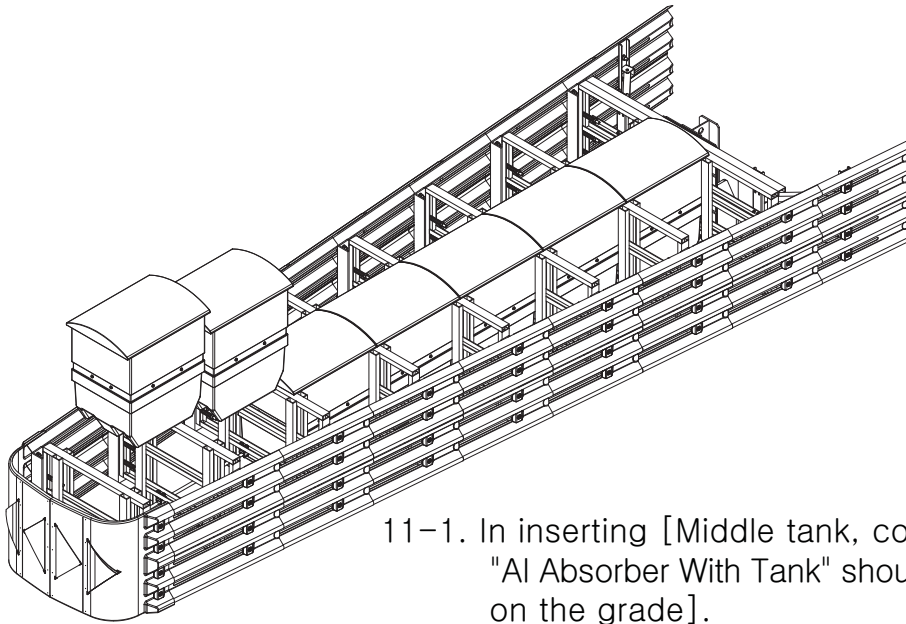


# Installation and Assemble Manual

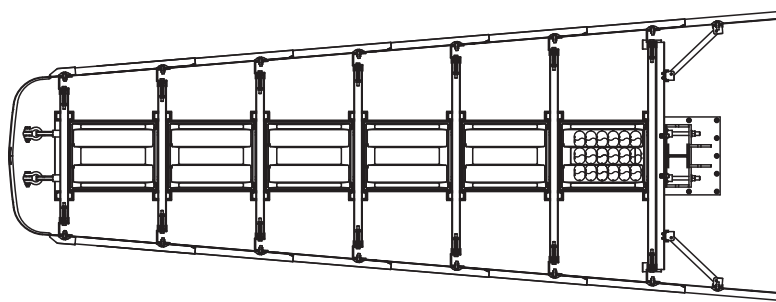
## SHINDO Crash Cushion–Nonparallel Installation

## INTRODUCTION

### ● Operation-13["Middle Tank" Insertion]



### ● ["Middle Tank" insertion–notice according to grade]



\* There are only two(2) models in the left figure among Non-parallel products that contain Al Absorber.

