



SP (Slotted Pipe) Chain

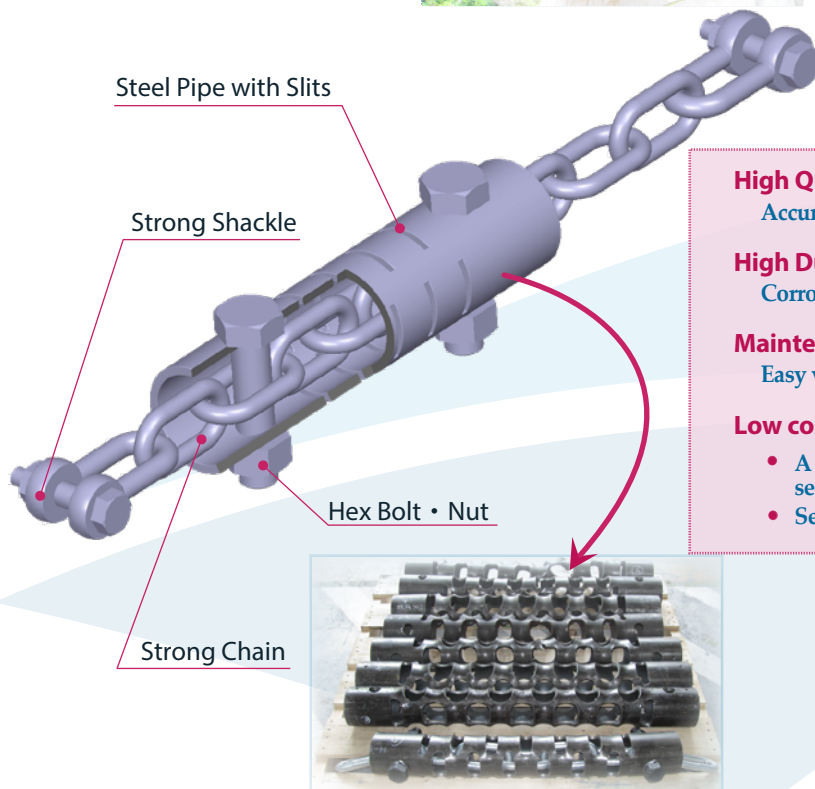
Chain-Type Unseating Prevention Device

Application range

Suitable for a variety of bridges

Function

- Bridge unseating prevention
- Energy absorbing



High Quality

Accurate quality control by rigorous performance tests

High Durability

Corrosion protection by hot-dip galvanizing

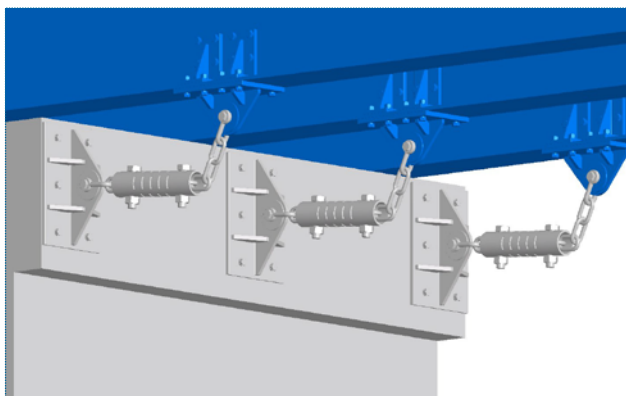
Maintenance

Easy visual inspection and simple replacement

Low cost and Size Line-up

- A broad line-up of devices allowing small to large seismic forces
- Seismic load up to 1,545 kN

Kawakin's SP Chain is a chain-type bridge unseating prevention device that provides improved energy absorption and good cost performance. The device can effectively absorb kinetic energy caused by large earthquakes by the plastic deformation of its slit-processed steel pipe. The demand of unseating prevention devices is now increasing to improve seismic performance for existing constructions and reduce the cost of repairs.



Installation image

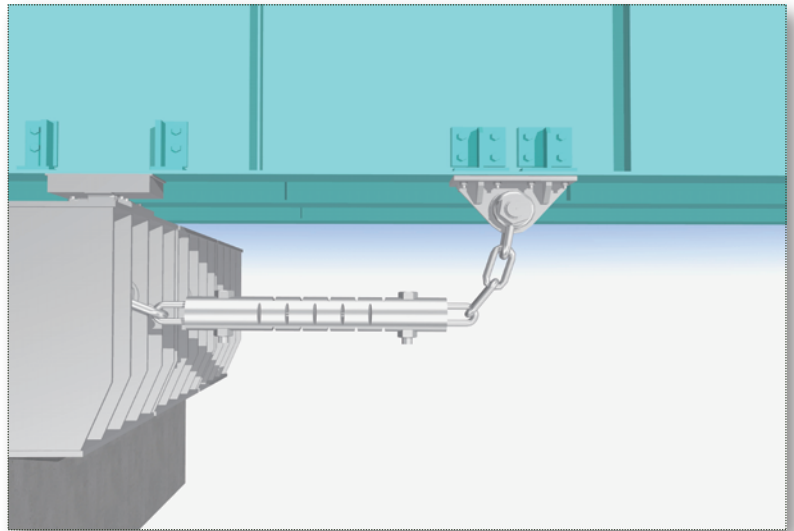


Installation example

Operation Mechanism

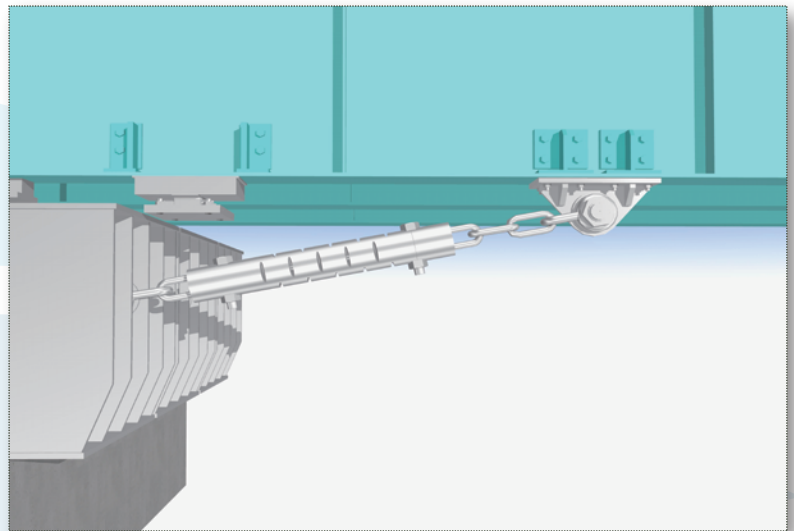
Before operating

Ordinary state



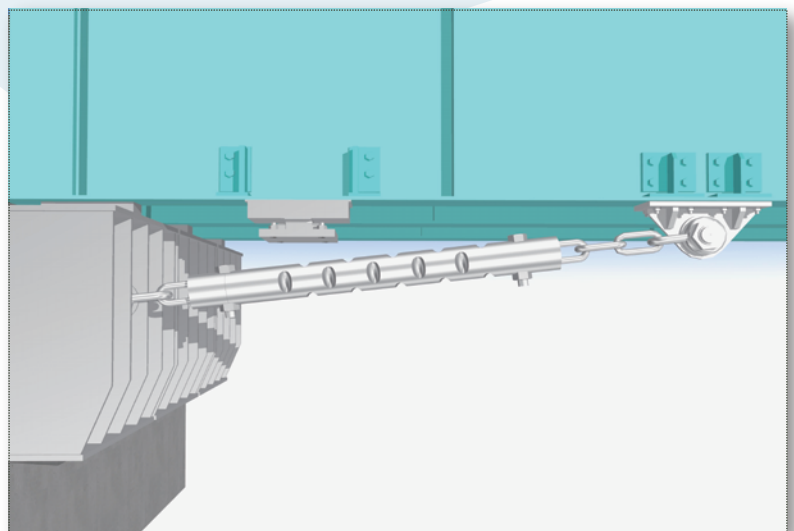
In operation

When bridge bearings fail in an extreme earthquake



Maximum operation

The SP chain is preventing bridge unseating.



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Tomorrow's Technology, Today.

Kawakin Holdings Group

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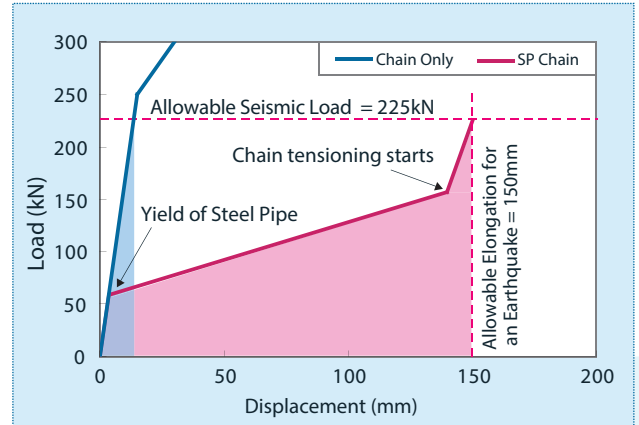
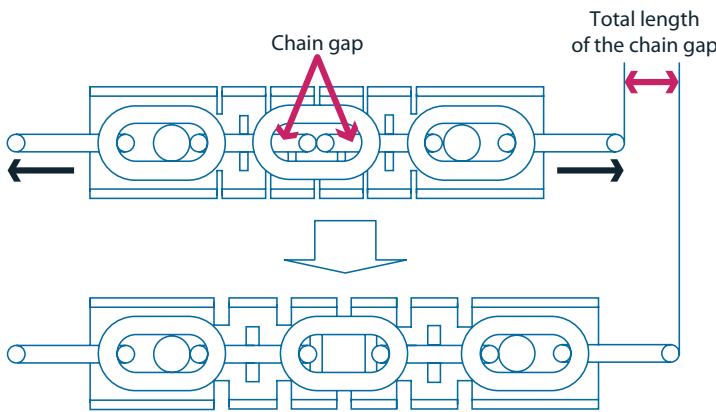
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STRUCTURE



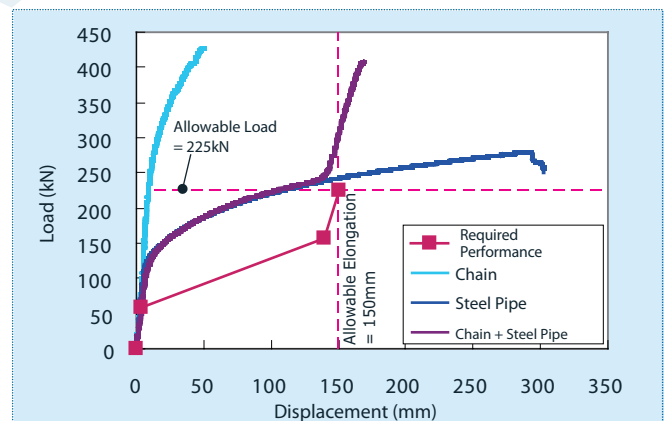
The chain gaps prevent a direct transmission of impact loads to the structure. Loads acting on the chains are transferred through the bolts to the steel pipe, and the steel pipe starts its plastic deformation to absorb seismic energy.

CALCULATION EXAMPLE

Dead Load Reaction Force :	ΣR_d	=2000	(kN/abutment)
Design Load	$H_F = 1.5 \times \Sigma R_d$	=3000	(kN/abutment)
Quantity	N	=6	(Q'ty/substructure)
Design Load per device	$P_H = H_F / N$	=500	(kN)
Allowable Seismic Load (KC250)	P_a	=375	(kN) < P_H ••• NG
Allowable Seismic Load (KC340)	P_a	=510	(kN) > P_H ••• OK

Therefore, **KC340** is selected for this case.

PERFORMANCE TEST



The verification test using a full-size test piece has been completed so as to determine the optimal shape of the SP chain.

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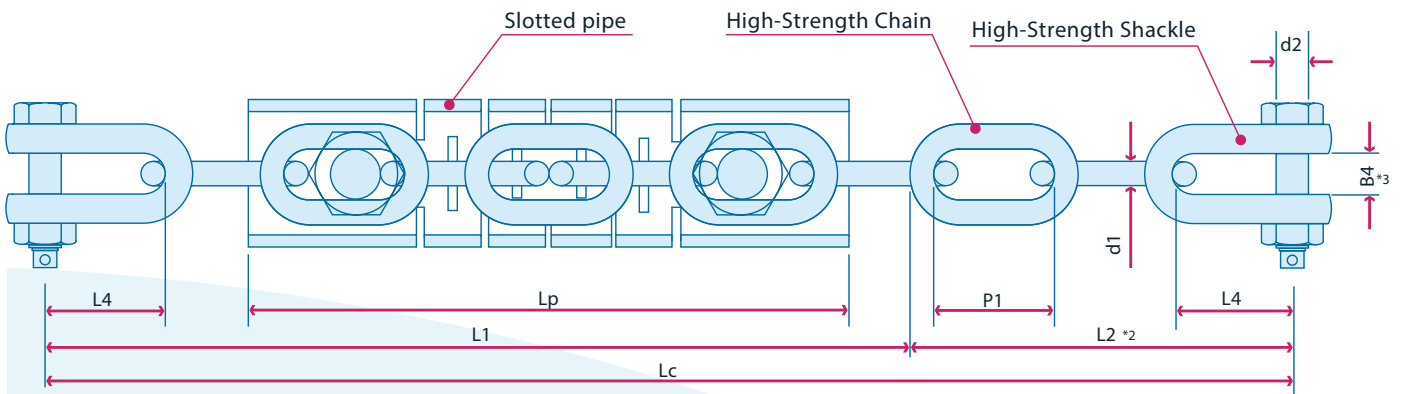
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STANDARD DIMENSIONS

We have 9 standard types to satisfy a wide range of design load conditions.



Type	Seismic Load Capacity Pa (kN)	Allowable Elongation in an EQ ΔLp (mm)	Service Conditions Lc (mm)	Service Conditions L1 (mm)	Service Conditions L2 (mm)	Service Conditions Lp (mm)	P1 (mm)	L4 (mm)	B4 (mm)	d1 (mm)	d2 (mm)	Weight (kg)
KC150	225	150	1432	1055	377	766	120	126	39	22	30	35.5
KC250	375	150	1866	1374	492	990	150	178	50	28	40	74.3
KC340	510	110	1850	1284	556	838	170	210	60	32	48	96.5
KC410	615	130	2185	1526	659	1009	205	230	66	38	54	151.4
KC550	825	150	2413	1678	735	1097	225	264	75	42	60	214.5
KC650	975	150	2870	2015	855	1338	270	290	83	50	65	322.5
KC800	1,200	150	3155	2217.5	937.5	1477	295	320	90	55	70	427.6
KC900	1,350	150	3428	2414	1014	1620	320	344	98	60	77	538.3
KC1030	1,545	150	3540	2470	1070	1620	320	400	112	60	90	634.0

*1 Hot dip galvanizing is the standard corrosion protection method for exposed steel surfaces.

*2 The standard number of of pairs of high-strength chains in L2 section is one.
Additional pairs of chains can be connected as per customer's request.

*3 B4 can be wider depending on bracket shape.