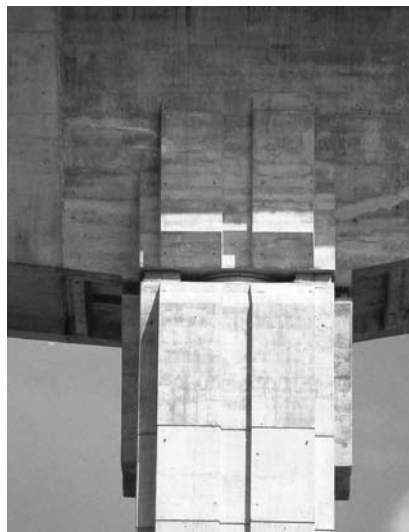


LEŽAJEVI

Elementi konstrukcije preko kojih se prenose opterećenja s elemenata gornjeg na elemente donjeg ustroja.

Sprečavaju ili omogućavaju određene pomake i zakretanje konstrukcije i njezinih dijelova, sukladno projektu.



Podjela: prema pomacima, gradivu, veličini sila ili prema obliku.

Funkcionalna raspodjela:

- nepomični ležajevi
- pomični ležajevi
- deformabilni ležajevi
- ležajevi specijalnih namjena

Prema načinu omogućavanja pomaka:

- klizni ležajevi
- točkasto zakretni ležajevi
- linijski zakretni ležajevi
- deformabilni ležajevi
- deformabilno-klizni ležajevi

Prema gradivu:

- betonski
- čelični
- elastomerni



LEŽAJI - PROJEKTANTSKA NAČELA

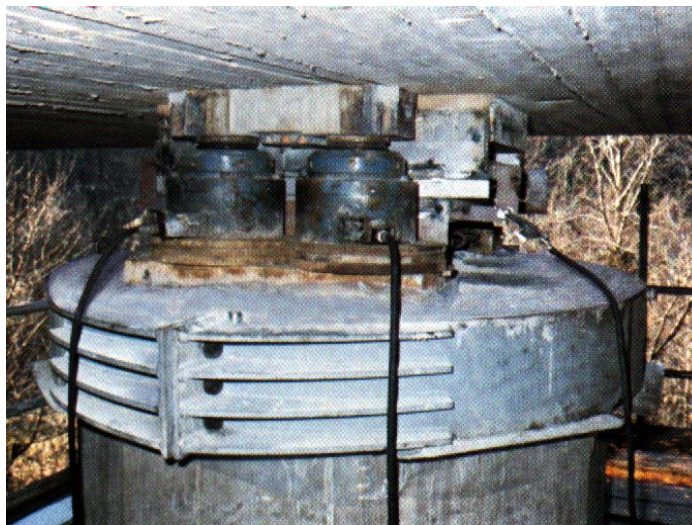
Na jednom mostu prikladno je ugraditi sve ležaje istog tipa

Ležaje treba ugraditi na tvrdi podlogu, npr. AB kvadere

Neovisno o nagibu rasponskog sklopa ležaje treba postaviti vodoravno

Potrebno je osigurati dostatan prostor uz ležaje zbog pristupa i zamjene

*Odizanje sklopa
mosta
hidrauličkim
prešama radi
zamjene ležaja*

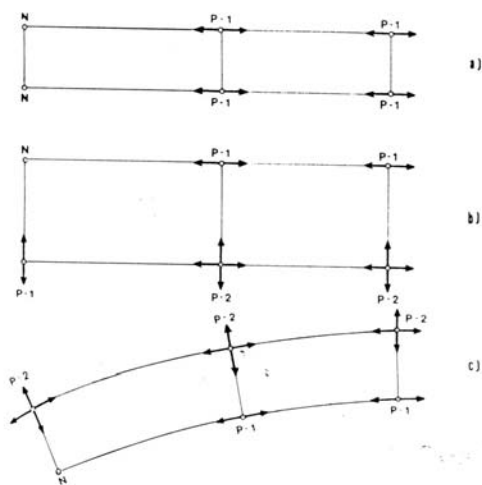


RASPORED LEŽAJA U KONSTRUKCIJI

Kod oslanjanja nastoji se postići optimalna konstruktorske koncepcija i njoj podređen odnos unutarnjih sila i deformacija.

Umetanje ležaja nije jedina mogućnost za omogućavanje pomaka: gipki stupovi to također mogu omogućiti.

I pokretni ležaji zbog trenja preuzimaju određenu horizontalnu silu.



RASPORED LEŽAJA U KONSTRUKCIJI

Nepokretni ležaj: na nekom mjestu oslonca konstrukcije.

Točka nad njim nepokretna u svim smjerovima.

Mjesto preuzimanja horizontalnih sila - kočne i vučne sile, reakcije od utjecaja vjetra, skupljanja i puzanja betona, temperaturnih promjena.

Kod kraćih mostova: nad upornjakom

Kod dužih mostova: bliže sredini mosta

Rješenja s više nepokretnih ležaja: npr. kod vitkih stupova.

Suvremena iskustva građenja a osobito održavanja velikih masivnih mostova usmjeruju prema rješenjima bez naročitih oslonaca!

Zglobna veza - betonski zglobovi.

Zakrivljeni mostovi: složeni odnosi

Betonski zglob pete luka Krčkog mosta



Symbol	Funktion
⊕	allseitig fest, einseitig kippbar
⊕	einseitig beweglich, "
⊕	allseitig " "
○	allseitig fest, allseitig kippbar
○	einseitig beweglich, "
○	allseitig " "

Bild 153

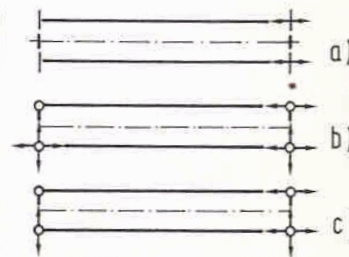


Bild 154

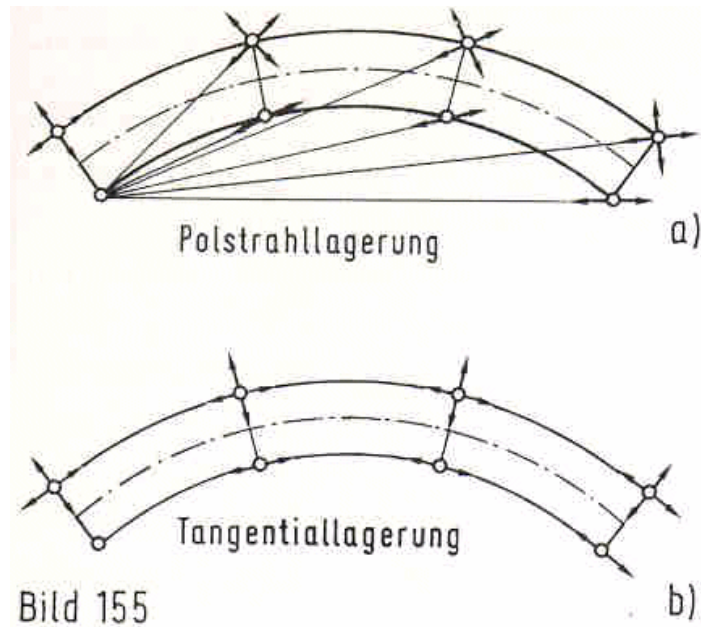


Bild 155

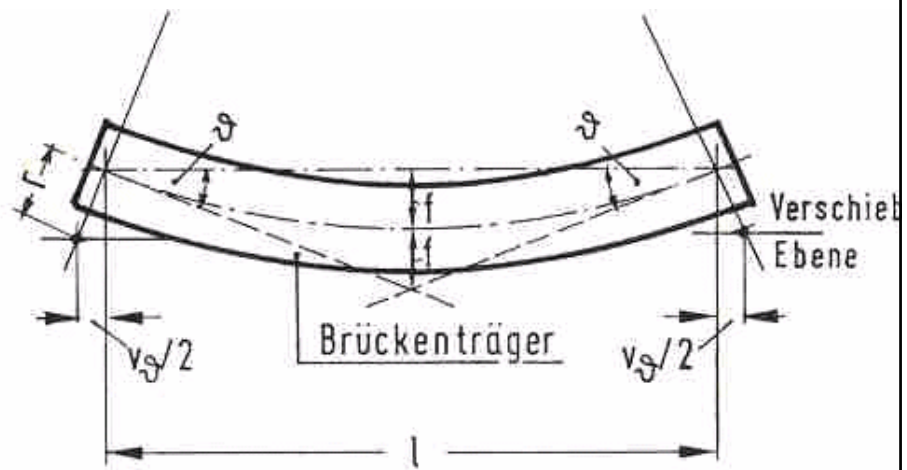
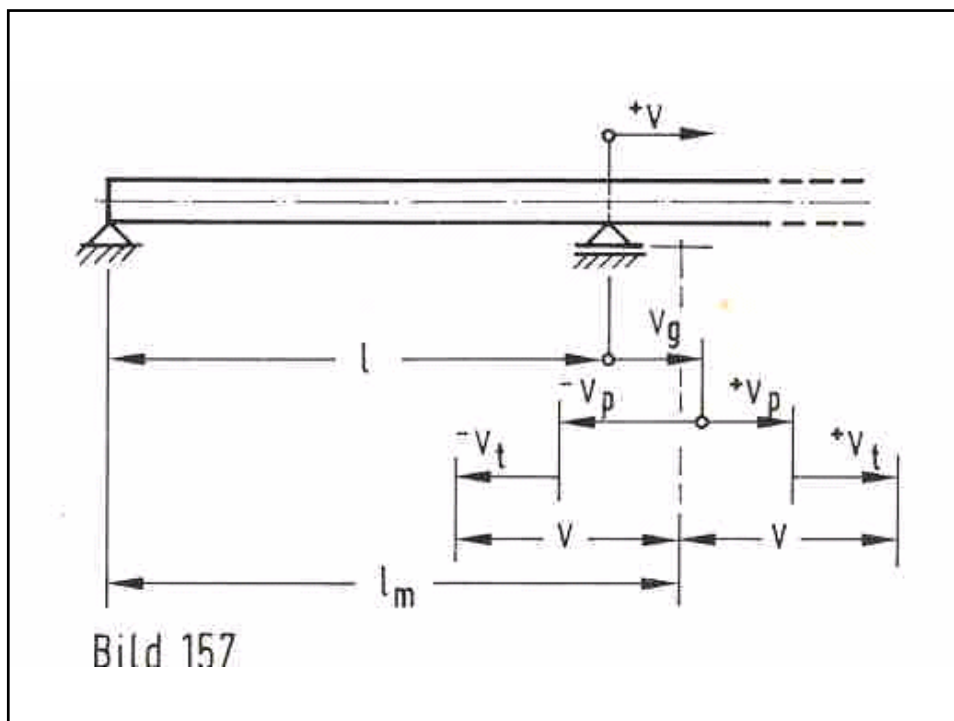


Bild 156

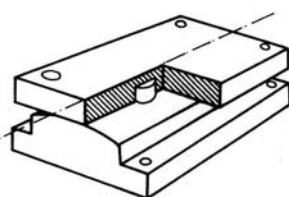


VRSTE LEŽAJEVA

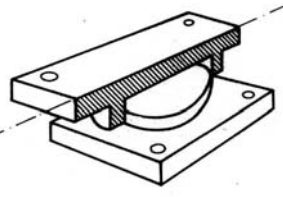
uobičajeni tipovi prema funkcionalnoj podjeli:

NEPOKRETNi LEŽAJI:

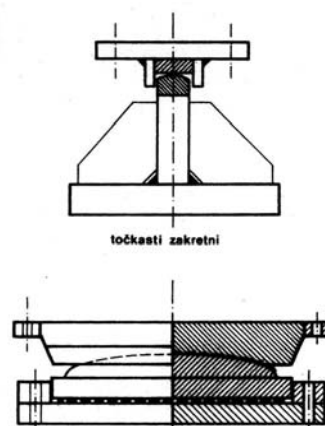
- čelični točkasti zakretni ležaj
- čelični linijski zakretni ležaj
- kalotni ležaj
- betonski ležaj
- lončasti ležaj



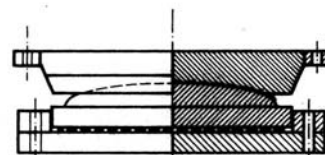
linijski zakretni



lončasti

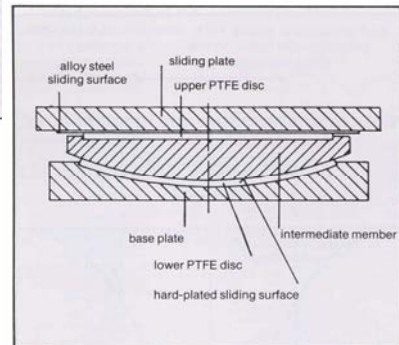
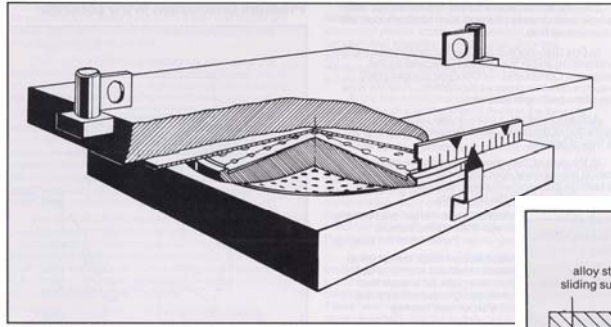


točkasti zakretni

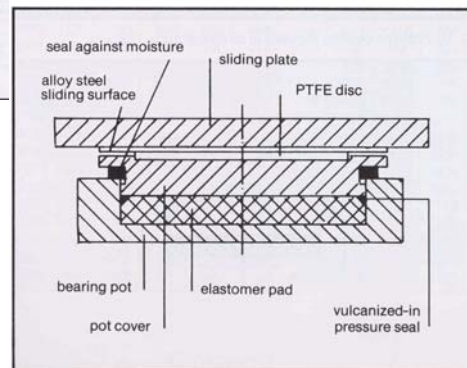
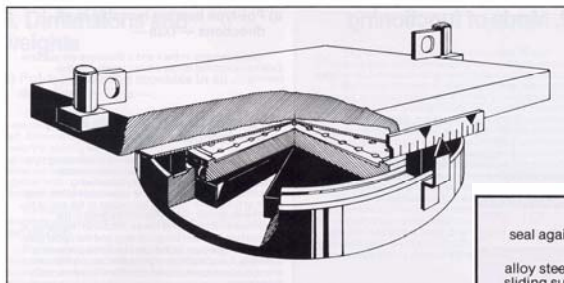


kalotni

III. Spherical bearings



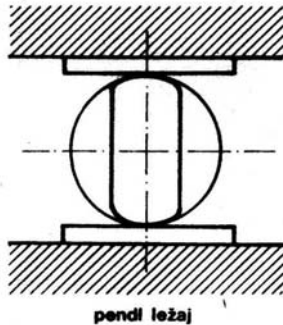
IV. Pot-type bearings



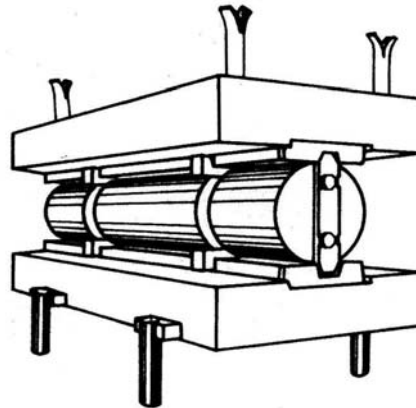
POKRETNI LEŽAJI

Preuzimaju načelno samo verikalna opterećenja

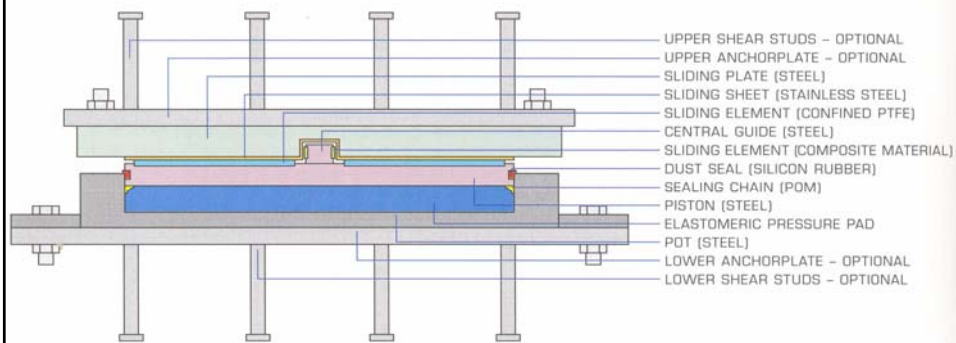
- valjkasti ležaji
- pendl ležaji
- klizni ležaji



pendl ležaj



valjkasti ležaj



Cross-section through a typical guided sliding bearing

25.6.1 Vorbemerkungen

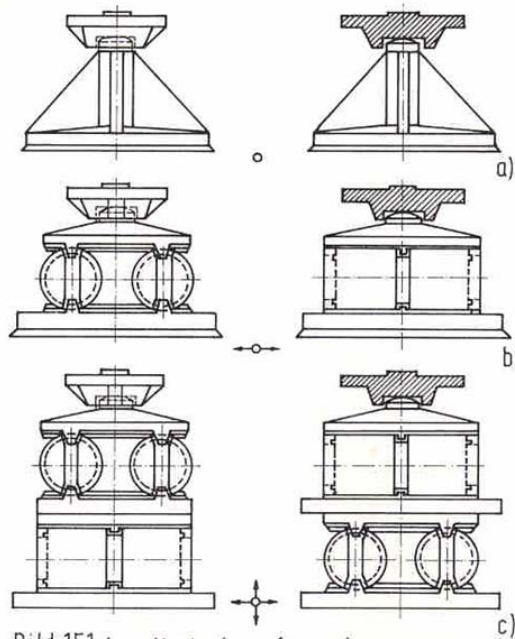
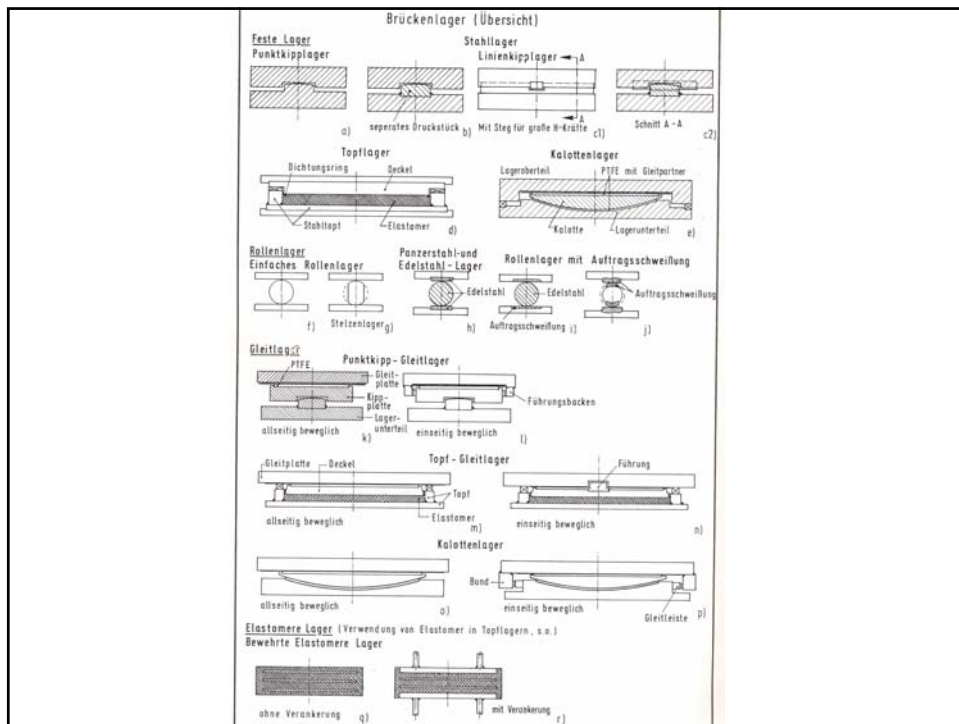


Bild 151 (veraltete Lagerformen)

		a	σ_0	Δ
Kugel/Kugel		$1,109 \cdot \sqrt[3]{\frac{F}{E} \cdot \frac{r_1 \cdot r_2}{r_1 + r_2}}$	$0,388 \cdot \sqrt[3]{\frac{F E^2 (r_1 + r_2)^2}{r_1^2 \cdot r_2^2}}$	$1,23 \cdot \sqrt[3]{\frac{F^2 (r_1 + r_2)}{E^2 \cdot r_1 \cdot r_2}}$
Kugel/Ebene		$1,109 \cdot \sqrt[3]{\frac{F r_1}{E}}$	$0,388 \cdot \sqrt[3]{\frac{F \cdot E^2}{r_1^2}}$	$1,23 \cdot \sqrt[3]{\frac{F^2}{E^2 r_1}}$
Kugel/Hohlkugel		wie Kugel/Kugel : r_2 negativ		
Zylinder/Zylind.		$1,520 \sqrt{\frac{F}{b E} \cdot \frac{r_1 \cdot r_2}{r_1 + r_2}}$	$0,418 \sqrt{\frac{F E}{b} \cdot \frac{r_1 + r_2}{r_1 \cdot r_2}}$	—
Zylinder/Ebene		$1,520 \sqrt{\frac{F r_1}{b E}}$	$0,418 \sqrt{\frac{F E}{b r_1}}$	—
Zylinder/Hohlz.		wie Zylinder/Zylinder : r_2 negativ		

Stahl, Stahlguß: $E = 21000 \text{ kN/cm}^2$, Gußeisen: $E = 10000 \text{ kN/cm}^2$, Aluminium: $E = 7000 \text{ kN/cm}^2$



25.6.5 Lagerung der Lager

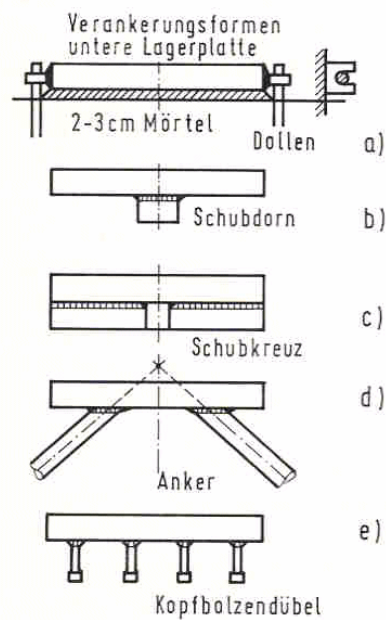
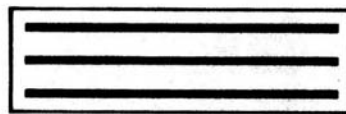


Bild 171

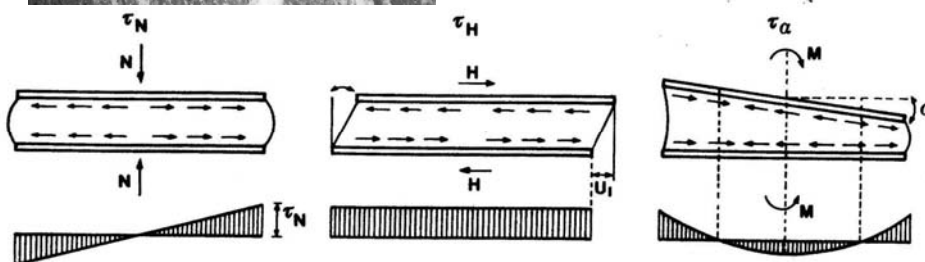
DEFORMABILNI LEŽAJI

Omogućuju pomake svojom velikom posmičom deformabilnošću

Najčešće: elastomerni ležaji

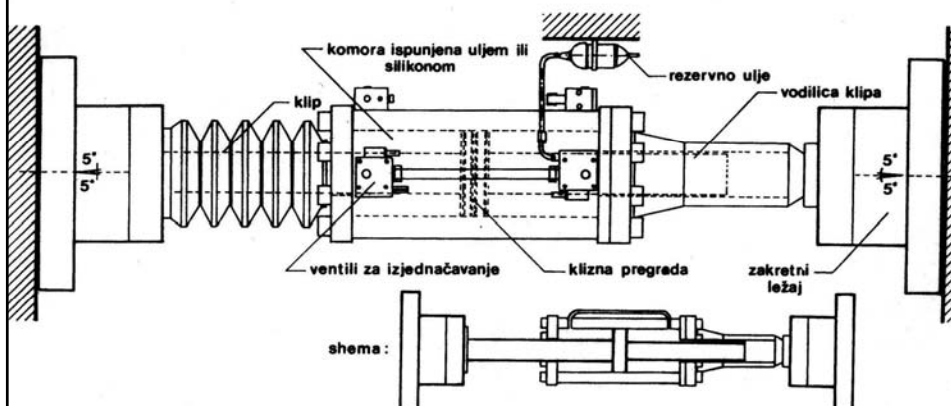


deformabilni ležaj



LEŽAJI SPECIJALNIH NAMJENA

Ponekad se na mostovima koriste i posebni ležaji za preuzimanje određenih dinamičkih udara ili sila, odnosno za poboljšanje dinamičkih svojstava konstrukcije.



Amortizer za preuzimanje dinamičkih udara na mostu.

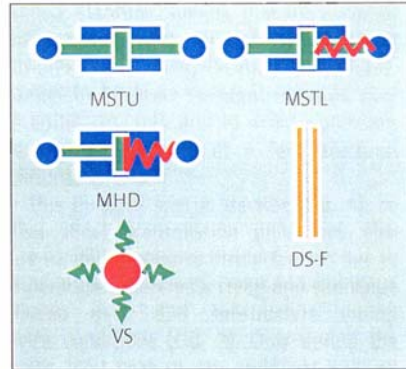


Fig. 1: Devices of a seismic protection system for a bridge

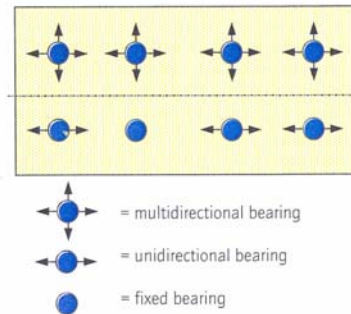


Fig. 2: Normal bearing arrangement like implemented in the below shown bridge

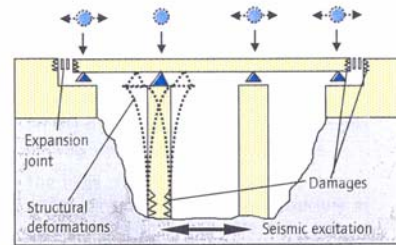


Fig. 3: Pier deformations and damages during seismic energy input into the bridge deck with the bearing arrangement of Fig. 2

5. Technical description of shock transmission units (MSTU/MSTL)

5.1. MSTU - Standard shock transmission unit

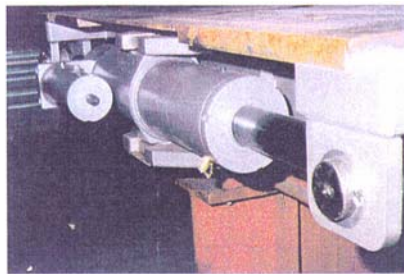


Fig. 21: MSTU integrated into pot bearing installed into Viaduct Stura di Demonte in Italy

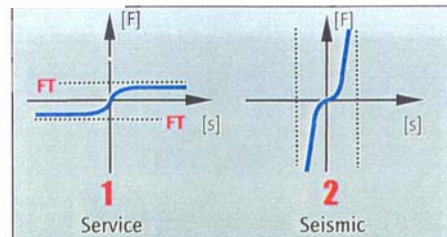


Fig. 22: Force [F] - displacement [s] - plot without force limiter

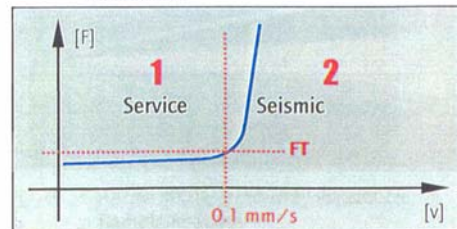


Fig. 23: Force [F] - velocity [v] - plot without force limiter

5.2. MSTL - Shock transmission unit with force limiter

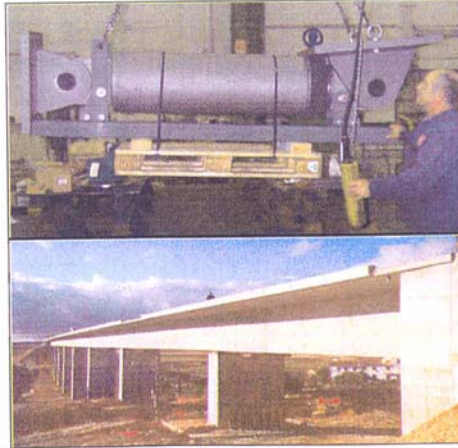


Fig. 26: 2.500 kN MSTL for railway viaduct De La Rambla in Spain

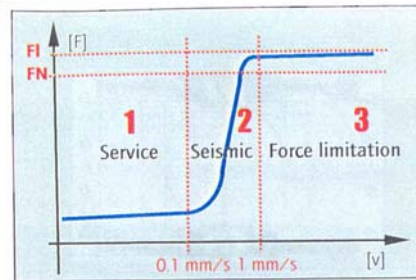


Fig. 24 : Force [F] - velocity [v] - plot with force limiter

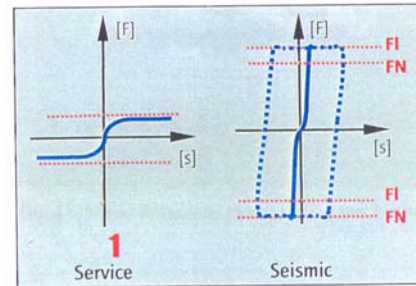


Fig. 25: Force [F] - displacement [s] - plot with force limiter

7. Technical description of seismic isolators (VS)

7.1 VS - seismic isolators (VS)

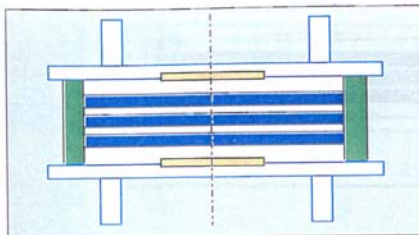


Fig. 38: Cross section of Seismic isolator type V2S

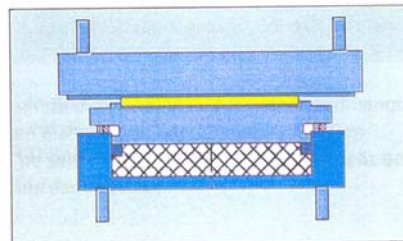


Fig. 40: Cross section of pot bearing free-sliding type TGA

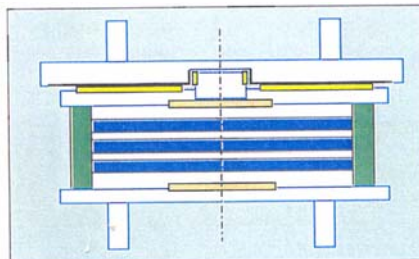


Fig. 39: Cross section of seismic isolator type VE2S

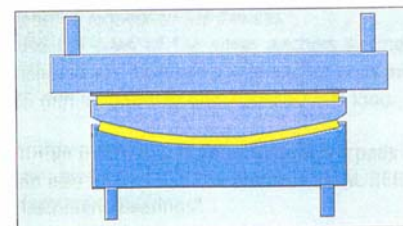
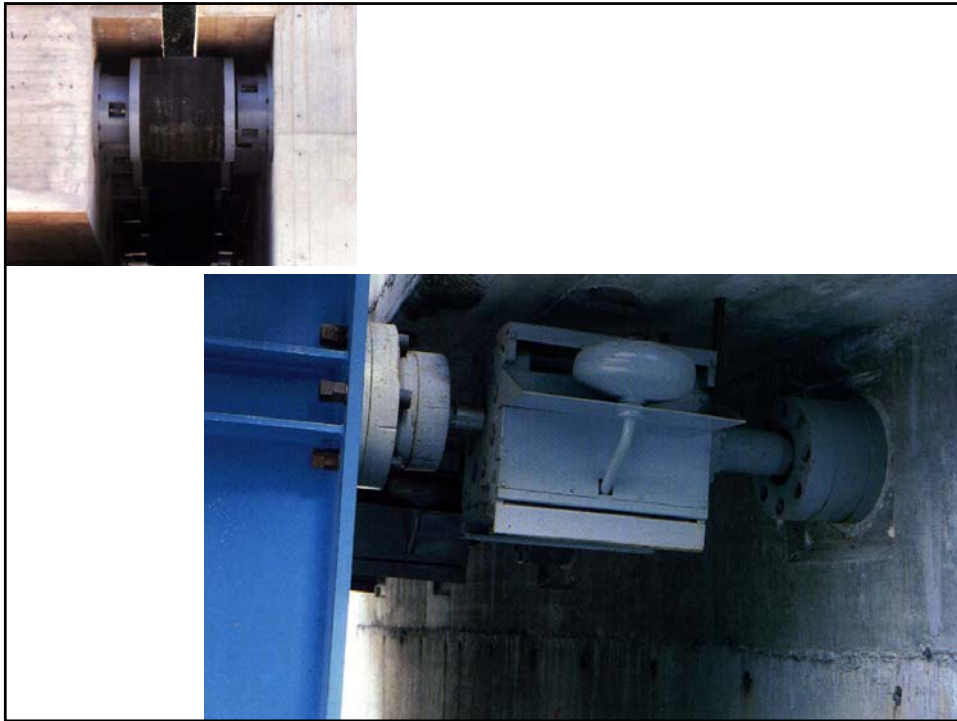
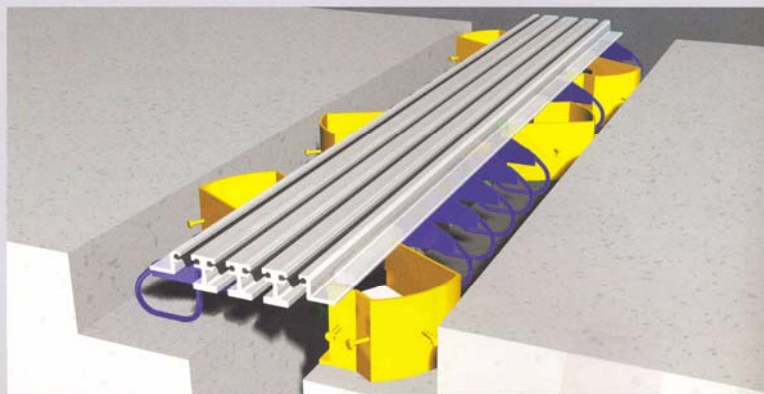


Fig. 41: Cross section of spherical bearing free-sliding type KGA



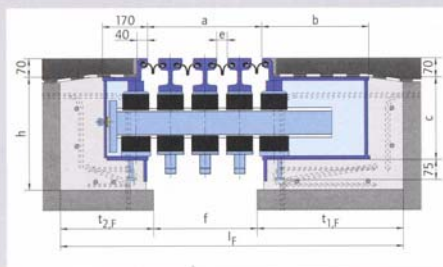
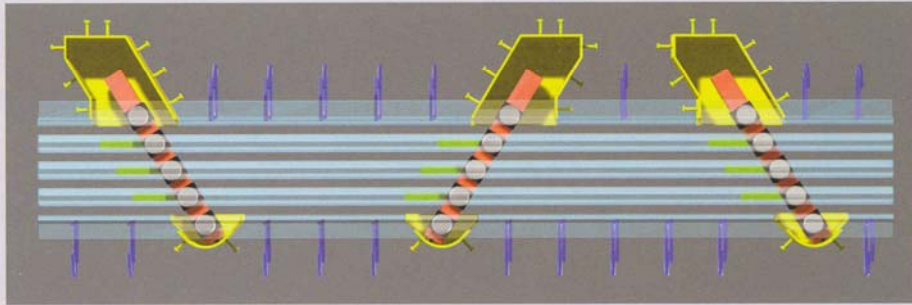
PRIJELAZNE NAPRAVE

Type DS 320
displacement of
the support bar
on both sides

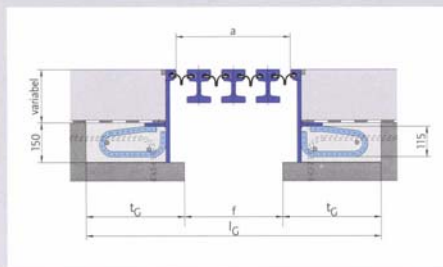


Movement of support bars to one side only

Recess dimensions



cross section through support box at carriageway



footway cross section - version 1

