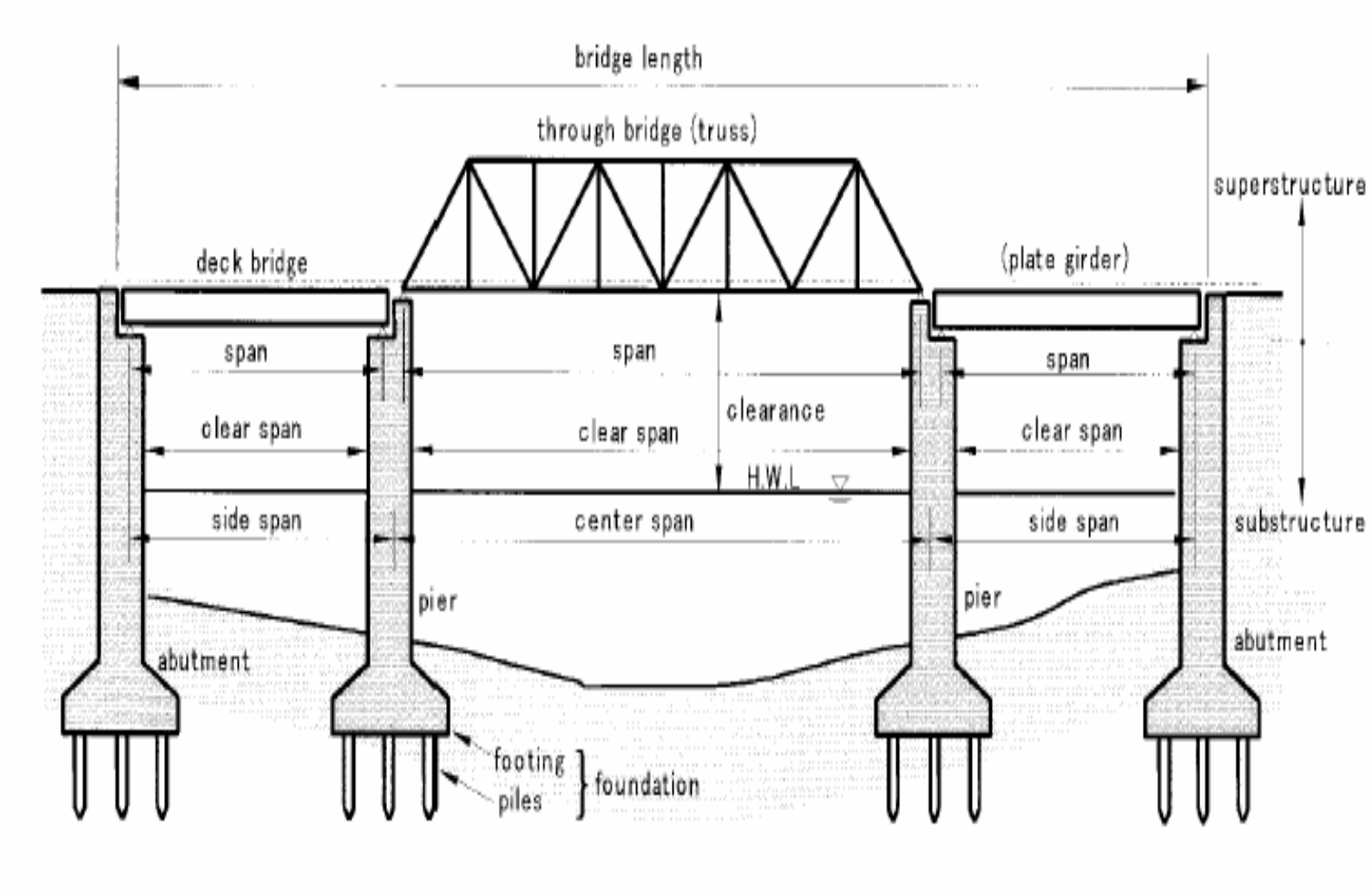
# ANKARA ÜNİVERSİTESİ
# ZİRAAT FAKÜLTESİ
# PEYZAJ MİMARLIĞI BÖLÜMÜ

## PEYZAJ YAPILARI DERSİ

## KONU:KÖPRÜLER


bridge length
through bridge (truss)
superstructure
deck bridge
(plate girder)
span
span
span
clear span
clear span
clear span
clearance
H.W.L
side span
center span
side span
substructure
pier
pier
abutment
abutment
footing
piles
foundation

# Köprülerin sınıflandırılması

**1.Kullanım amacına göre**

- Karayolu köprüleri
- Demiryolu köprüleri
- Yaya köprüleri
- Diğer amaçlar için kullanılan köprüler (örneğin petrol boru hatları)

# Köprülerin sınıflandırılması

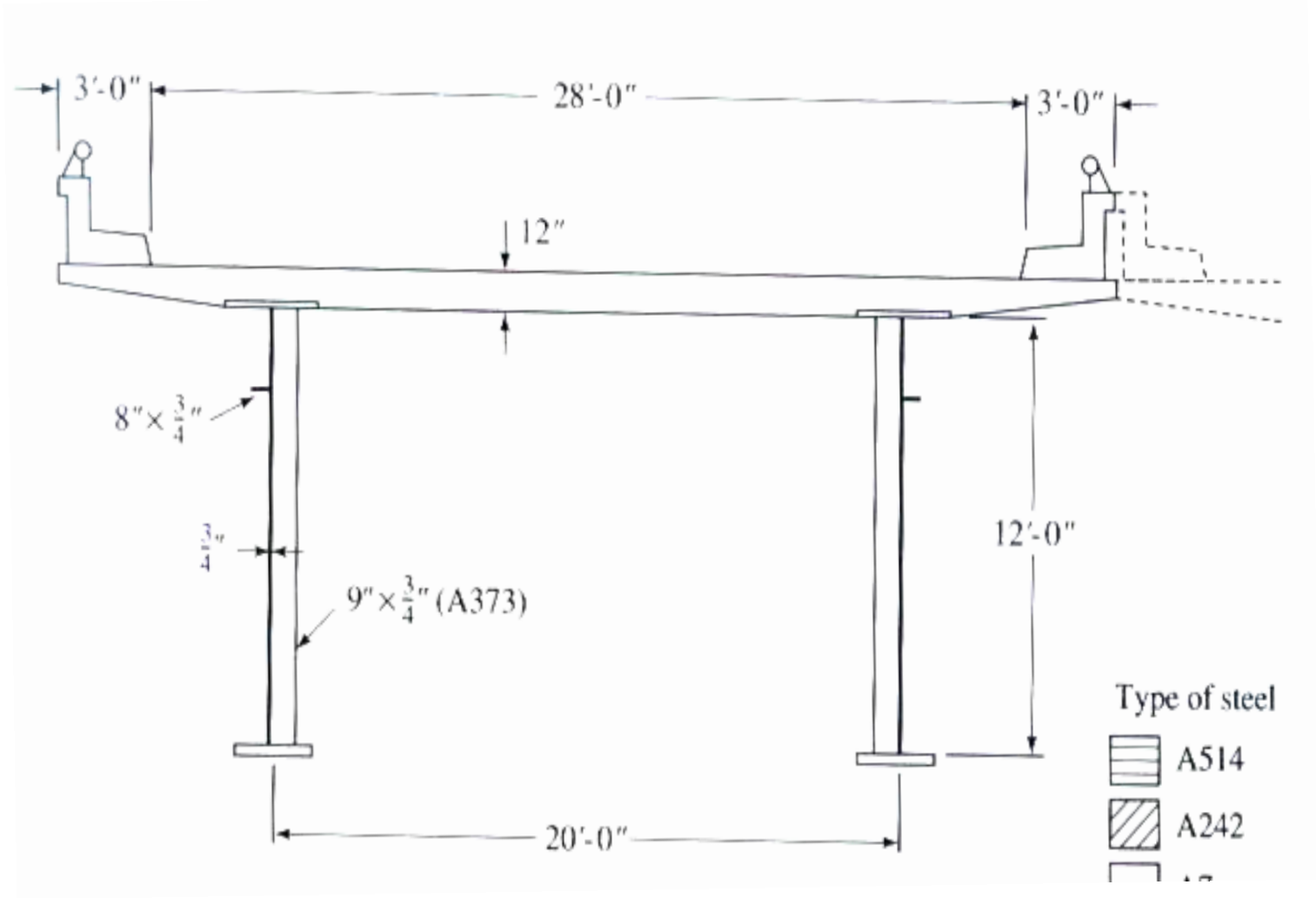
- **2.Açıklığa göre sınıflandırma**

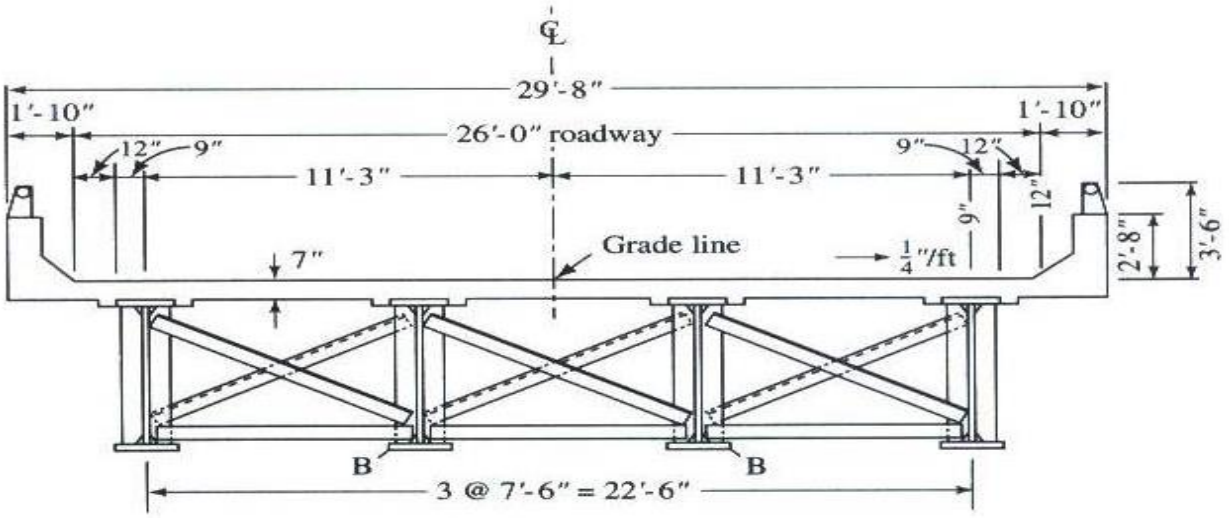
- 2.1 Kısa açıklıklı köprüler: ~6m< L < ~40m
- 2.2 Orta açıklıklı köprüler: ~40m < L < ~125m
- 2.3 Uzun açıklıklı köprüler: 125m < L

# Köprülerin sınıflandırılması

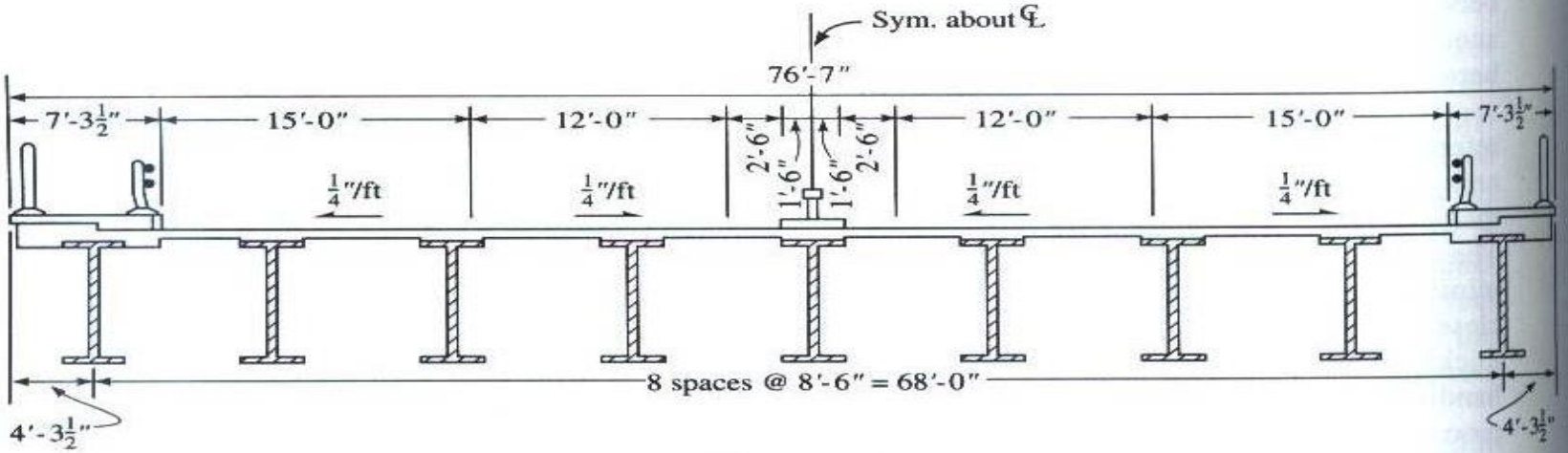
- **3.Malzemeye göre sınıflandırma**
- 3.1 Çelik köprüler

Genelde demiryolu köprüsü olarak kullanılan, dolu gövdeli veya kafes kirişli köprüler tamamıyla çelik kullanılarak tasarlanırlar.

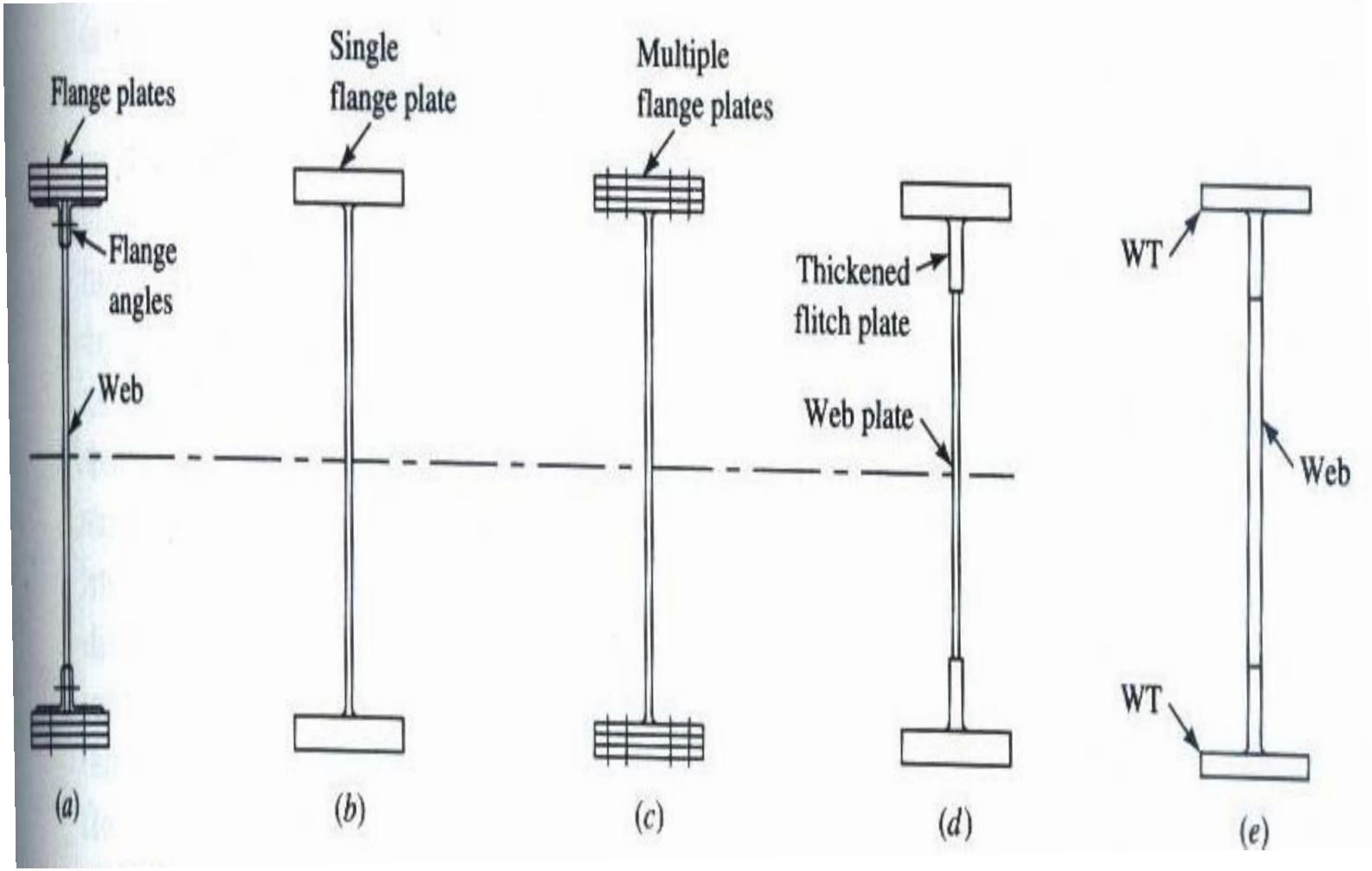

3′-0″
28′-0″
3′-0″
12″
8″ × 3/4″
9″ × 3/4″ (A373)
12′-0″
20′-0″
Type of steel
A514
A242




(*a*) Cross section




(*b*) Cross section


Flange plates
Flange angles
Web
Single flange plate
Multiple flange plates
Thickened flitch plate
Web plate
WT
Web
WT
(a)
(b)
(c)
(d)
(e)

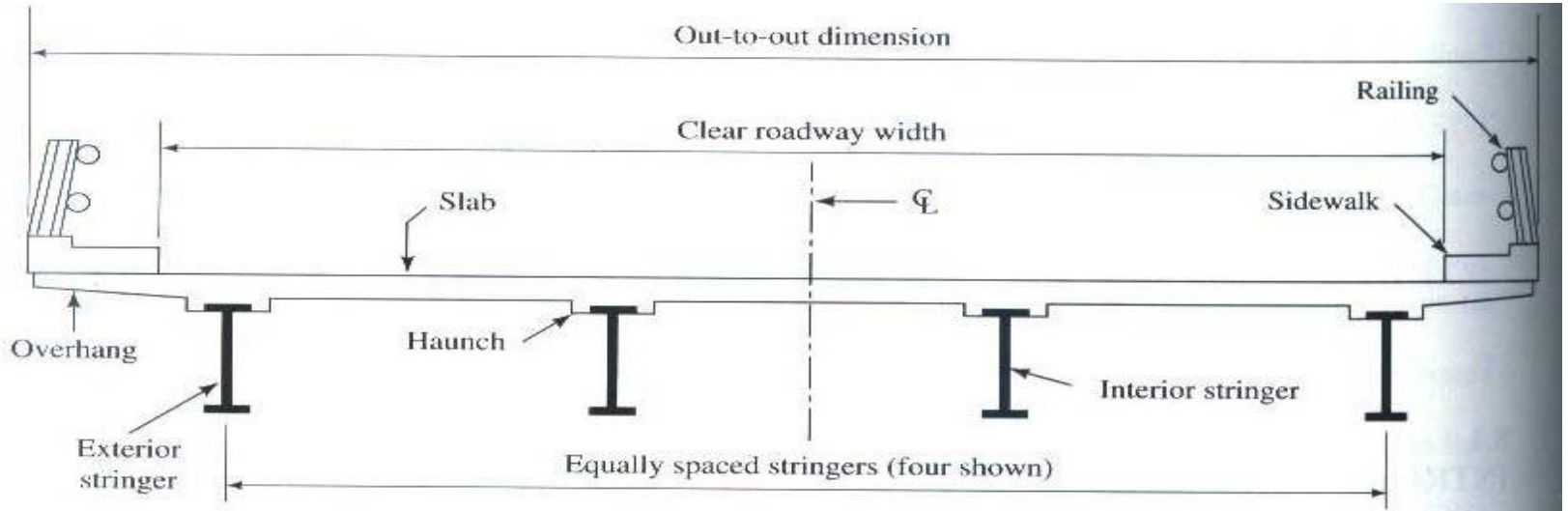
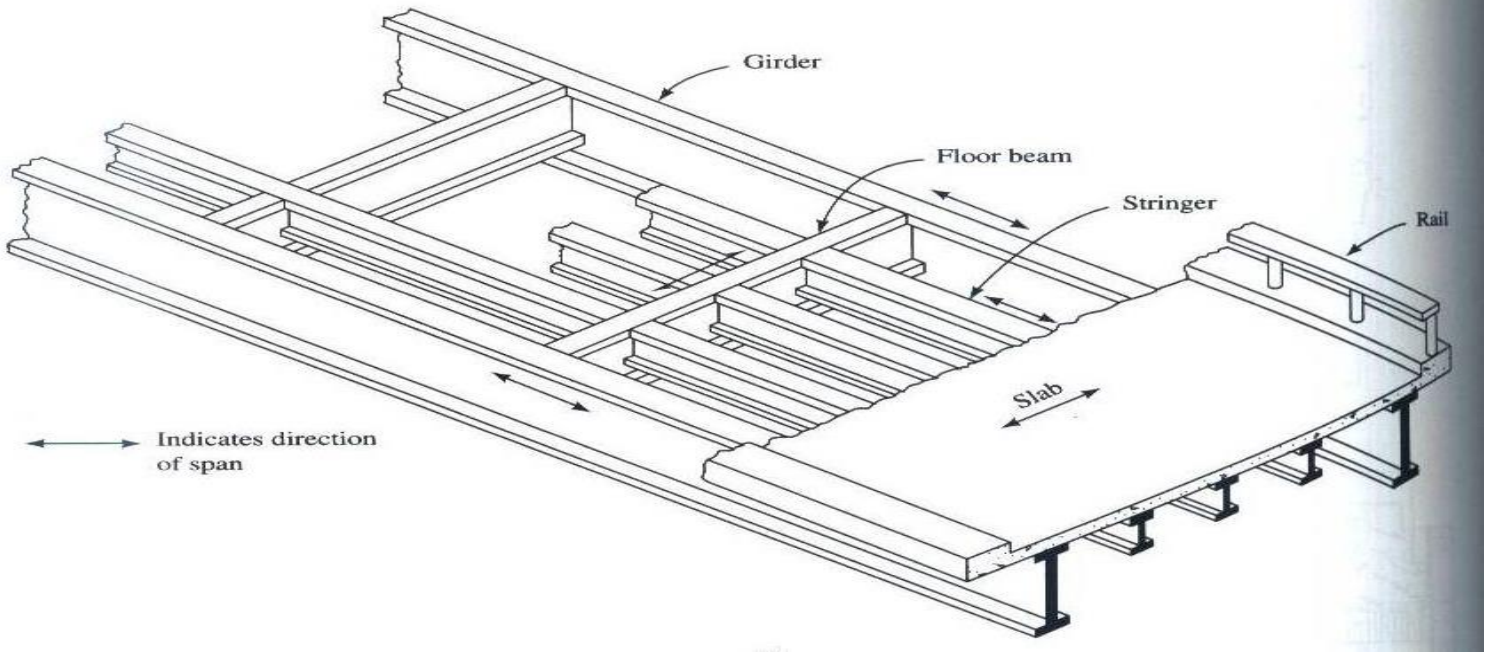



**FIGURE 8.1**
Typical slab–steel beam bridge.



Çelik köprü özellikle monolitik betonarme köprülerle karşılaştırıldığında uzun açıklıklar için daha avantajlı bir seçimdir. Ayrıca, oldukça uzun açıklıkların geçilmesini sağlayan eğik askılı ve asma köprüler de tamamı ile çelik kullanılarak tasarlanabilir.

# Köprülerin sınıflandırılması

## 3.2 Betonarme ve öngerilmeli köprüler

Betonarme köprüler, tüm taşıyıcı sistem elemanları betonarme olarak tasarlanmış köprülerdir. Kısa açıklıklar kirişlerle bir ızgara oluşturmak yerine sadece betonarme bir plakla da geçilebilir.

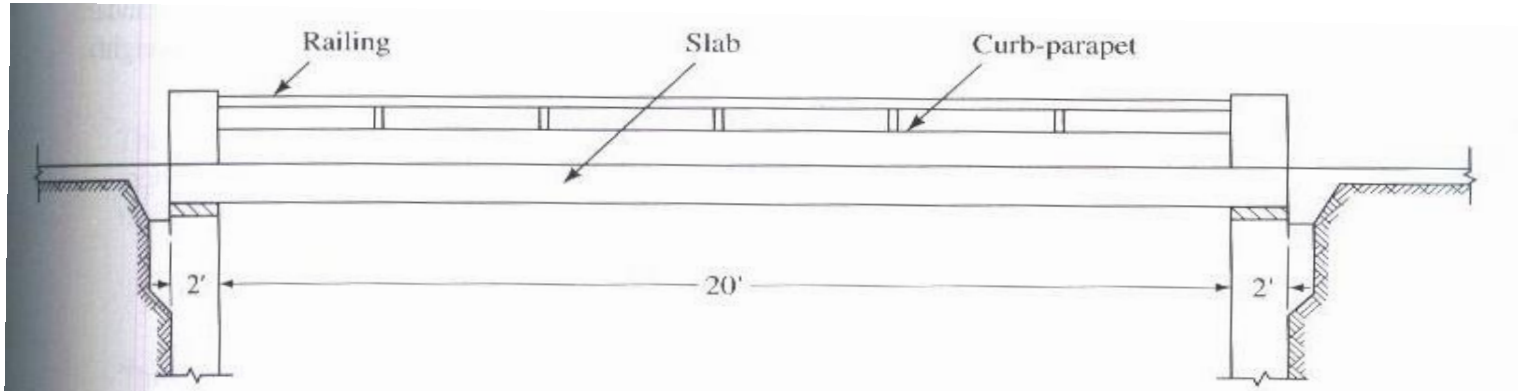



**FIGURE E6.1a**
A reinforced concrete slab bridge.

Açıklıklar arttıkça, tabliyeyi sadece betonarme plakla teşkil etmek olanaklı olmayacağından kirişli köprülerin tasarlanması tercih edilir. Kullanılan kirişler döşemeyle beraber bir T kesit şeklinde çalışırlar.

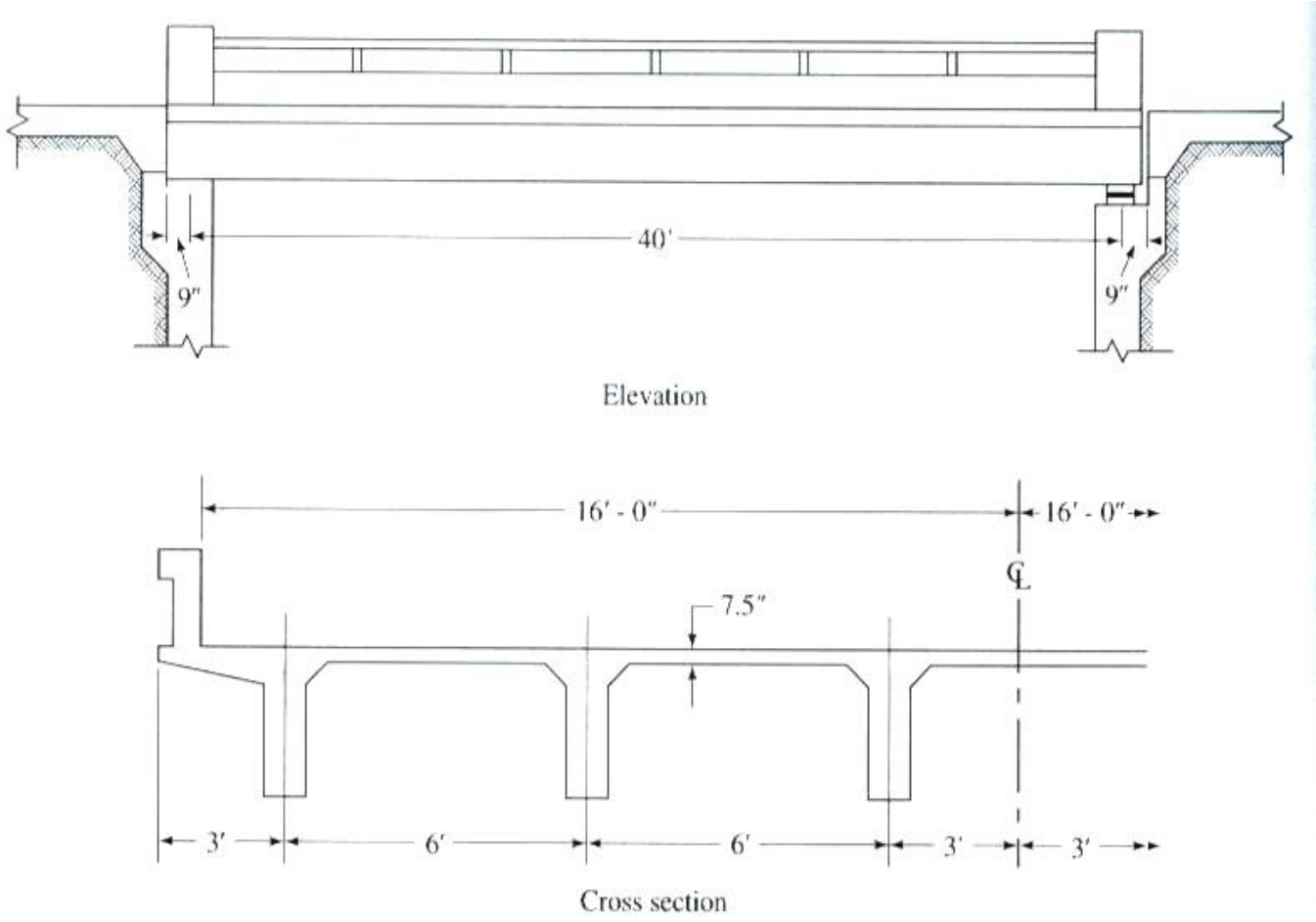
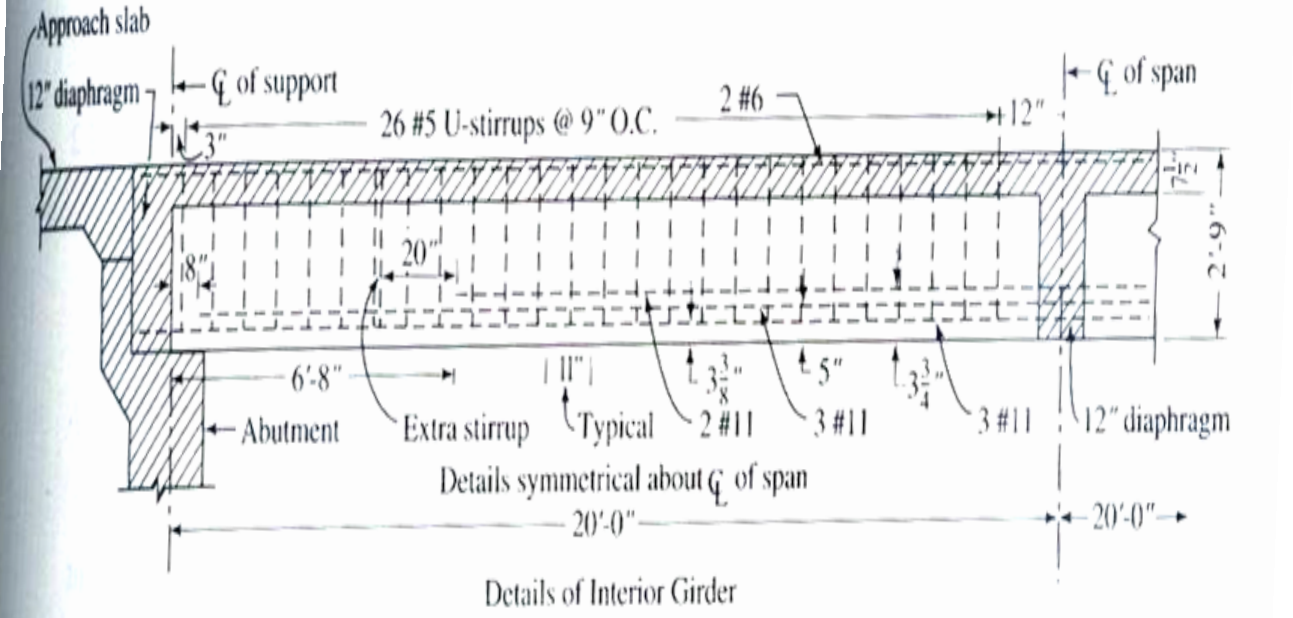
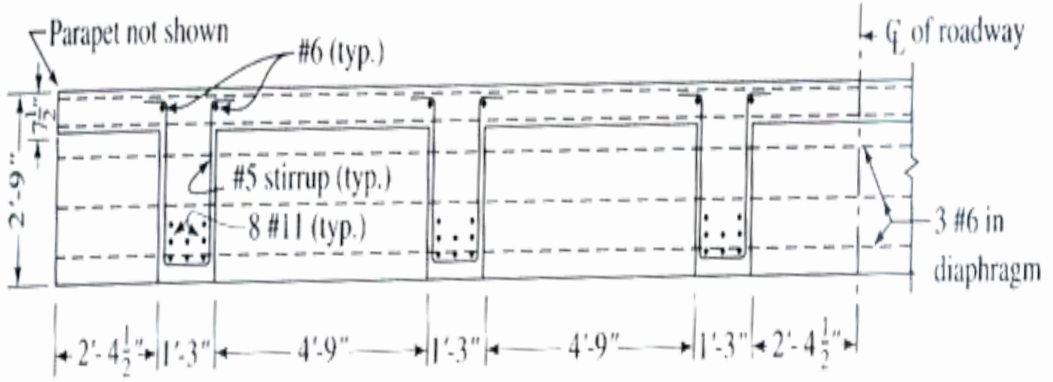


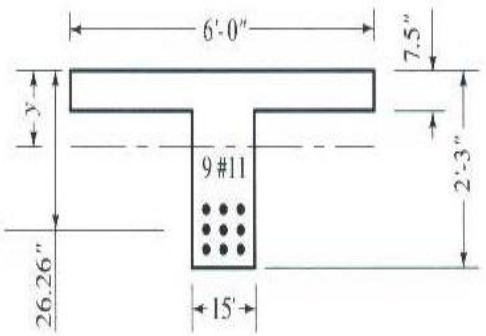

**FIGURE E6.2a**
Bridge cross section.




Details of Interior Girder

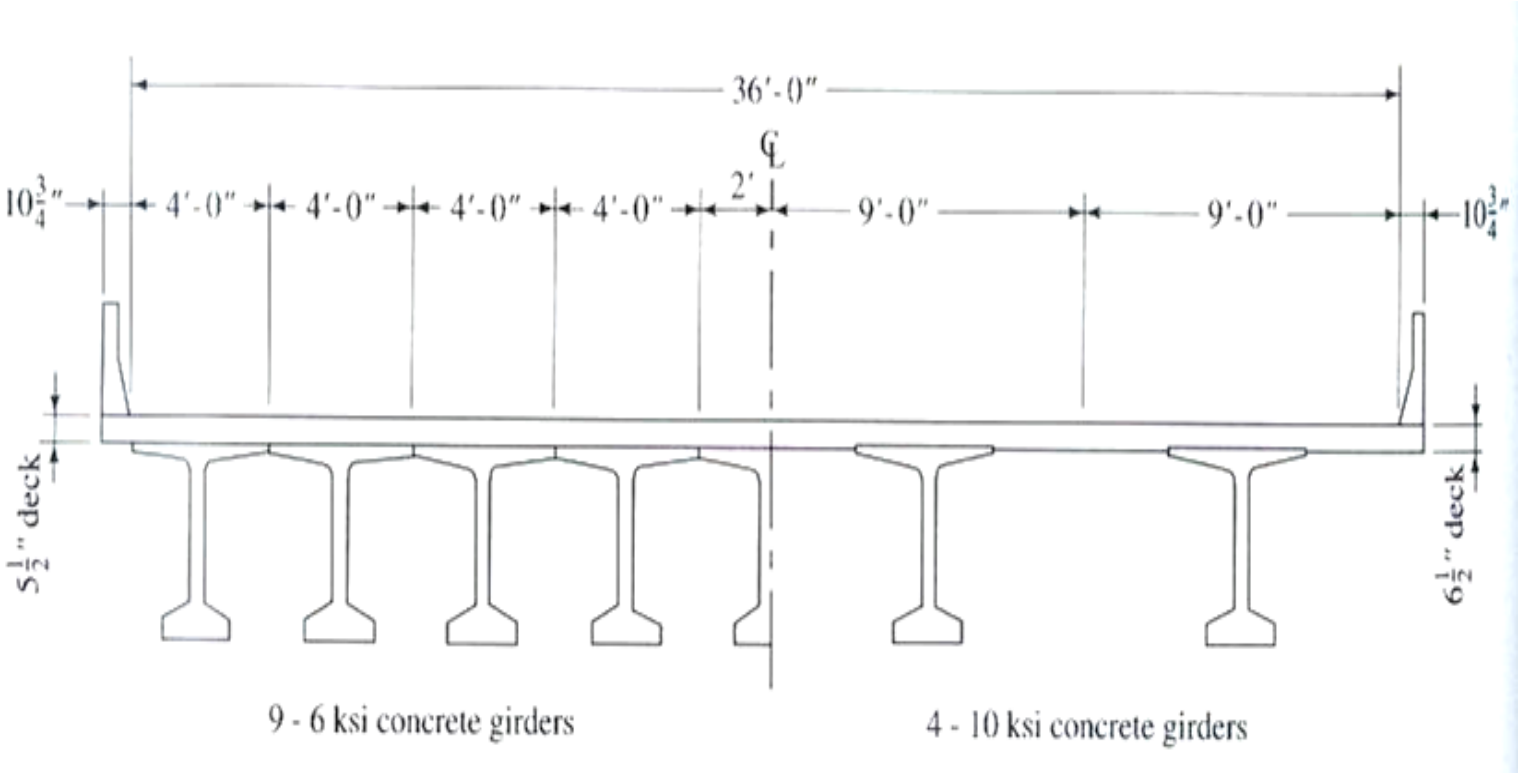


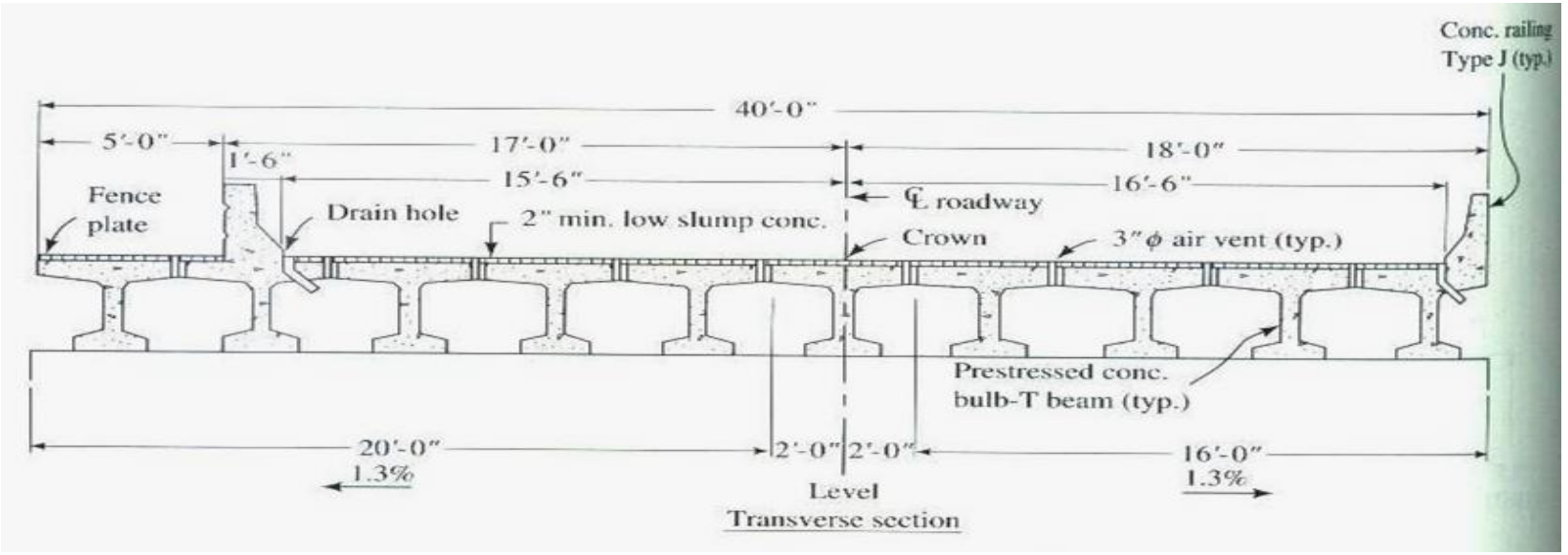

Cross Section



Açıklıklar daha da arttığında, kiriş boyutları çok büyümekte ve betonarme köprüler çelik köprülerle rekabet edememektedirler. Bununla beraber, öngerilme teknolojisindeki ilerleme, önüretimli elemanların kullanımının ve üretiminin yaygınlaşması, daha büyük açıklıkları öngerilmeli köprülerle geçilmesini olanaklı kılmıştır.

Öngerilmeli köprülerde, monolitik betonarme kirişlerin yerini öngerilmeli kirişler almaktadır ve bu öngerilmeli kirişler üzerlerindeki betonarme plaktan gelen yükleri kenar ve orta ayaklara aktarırlar.




Conc. railing
Type J (typ.)
40'-0"
5'-0"
1'-6"
17'-0"
18'-0"
15'-6"
16'-6"
Fence
plate
Drain hole
2" min. low slump conc.
℄ roadway
Crown
3"ϕ air vent (typ.)
Prestressed conc.
bulb-T beam (typ.)
20'-0"
1.3%
2'-0"
2'-0"
16'-0"
1.3%
Level
Transverse section

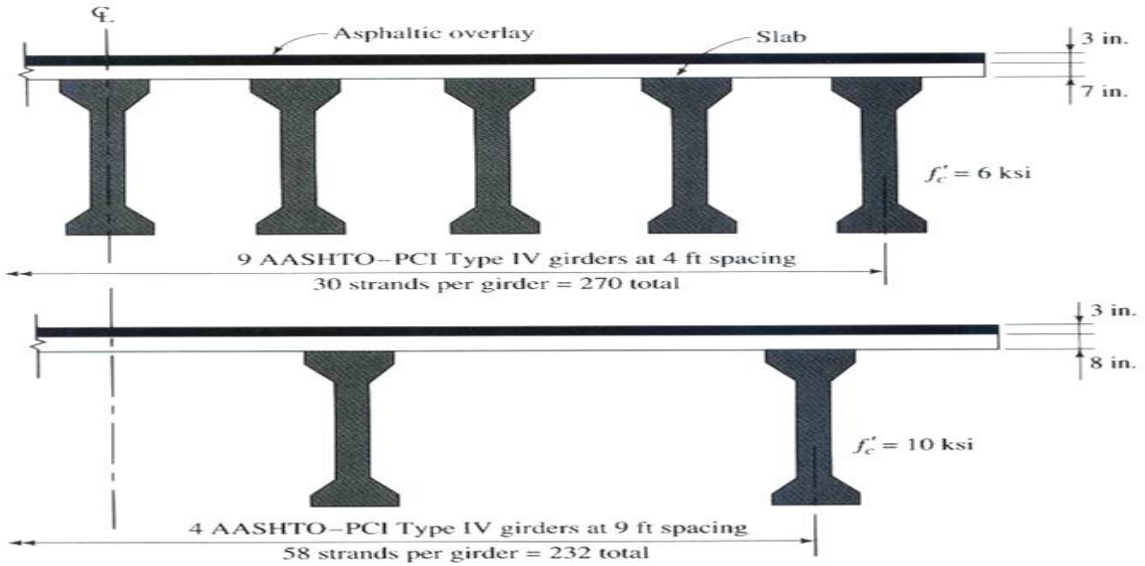
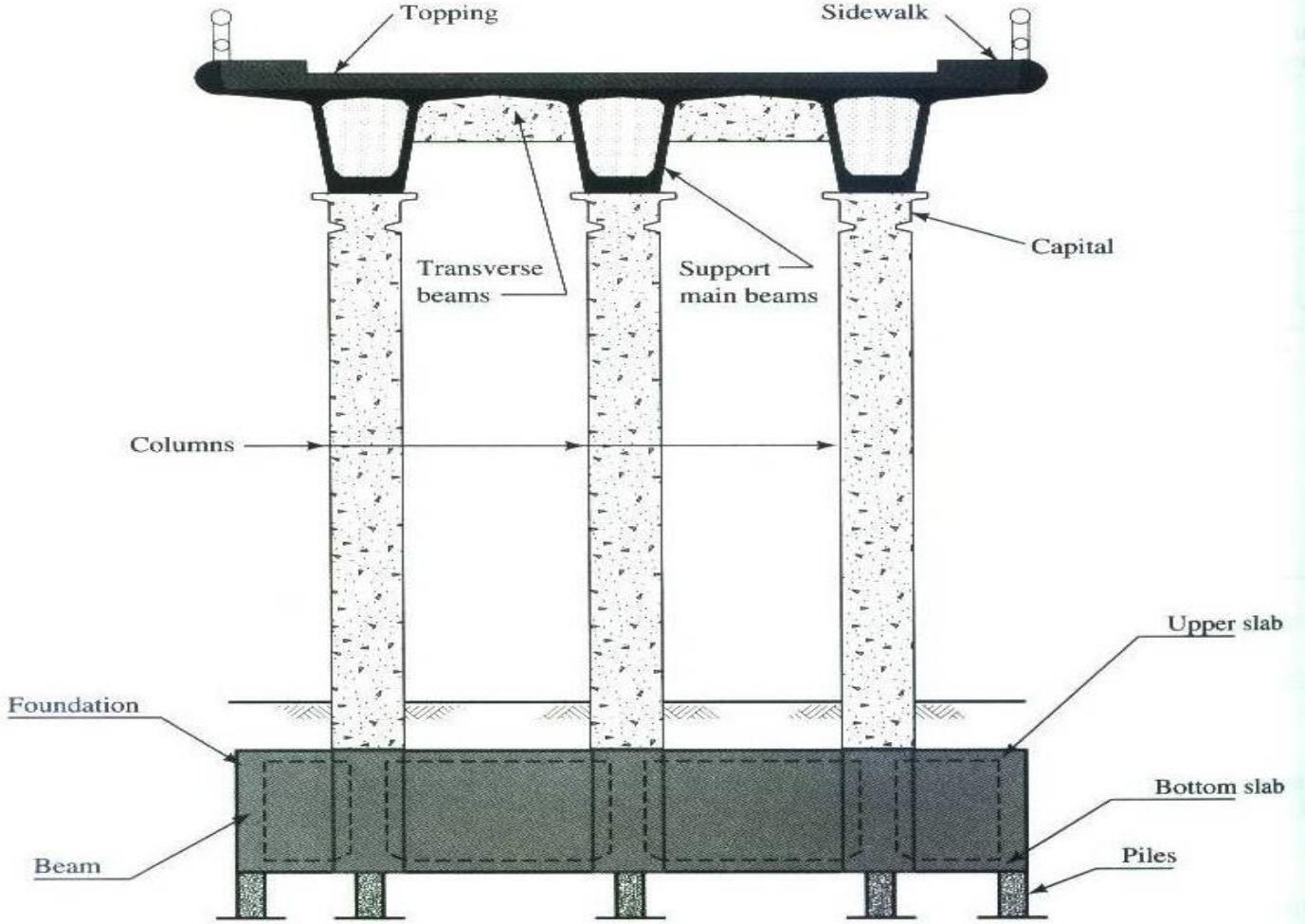

℄
Asphaltic overlay
Slab
3 in.
7 in.
$f_c' = 6$ ksi
9 AASHTO–PCI Type IV girders at 4 ft spacing
30 strands per girder = 270 total
3 in.
8 in.
$f_c' = 10$ ksi
4 AASHTO–PCI Type IV girders at 9 ft spacing
58 strands per girder = 232 total

TABLE 7.4

**Precast pretensioned beam sections used for short-span bridges in the United States [Yamane, Tadros, and Arumugasaamy, 1994]**

| Typical section | | Width mm (in.) | Depth mm (in.) | Span range m (ft) | Cast-in-place to precast concrete weight ratio |
|---|---|---|---|---|---|
|  | Solid slab | 910 to 2440 (36 to 96) | 250 to 460 (10 to 18) | up to 9.1 (up to 30) | 0.0* |
|  | Voided slab | 910 to 1220 (36 to 48) | 380 to 530 (15 to 21) | 7.6 to 15.2 (25 to 50) | 0.0* |
|  | Multistem | 1220 (48) | 410 to 530 (16 to 21) | 7.6 to 16.8 (25 to 55) | 0.0* |
|  | Double stem | 1520 to 2440 (60 to 96) | 410 to 580 (16 to 23) | 6.1 to 18.3 (20 to 60) | 0.0† |
|  | Single stem | 1220 to 1830 (48 to 72) | 610 to 1220 (24 to 48) | 12.2 to 24.4 (40 to 80) | 0.0† |
|  | Box girder | 910 to 1220 (36 to 48) | 690 to 1070 (27 to 42) | 18.3 to 30.5 (60 to 100) | 0.0* |
|  | Deck bulb-T‡ | 1220 to 2130 (48 to 84) | 740 to 1040 (29 to 41) | 18.3 or more (60 or more) | 0.0† |
|  | I-girder‡ | 460 to 660 (18 to 26) | 910 to 1370 (36 to 54) | 12.2 to 30.5 (40 to 100) | 0.6 to 1.2 |
|  | AASHTO–PCI bulb-T‡ | 1070 (42) | 1370 to 1830 (54 to 72) | 24.4 to 42.7 (80 to 140) | 0.6 to 1.2 |
|  | Local standard I-girder‡ | 610 to 1520 (24 to 60) | 710 to 2740 (28 to 108) | up to 50.9 (up to 167) | 0.6 to 1.2 |


Topping
Sidewalk
Transverse beams
Support main beams
Capital
Columns
Upper slab
Foundation
Bottom slab
Beam
Piles

# Köprülerin sınıflandırılması

## 3.3 Kompozit köprüler

Çelik profiller üzerlerindeki betonarme döşemeden gelen yükleri kenar ve orta ayaklara aktarırlar. Çelik köprülerden farkları profillerle üzerlerindeki döşemenin uygun bir detayla birleştirilerek birlikte çalışmalarının sağlanmasıdır.

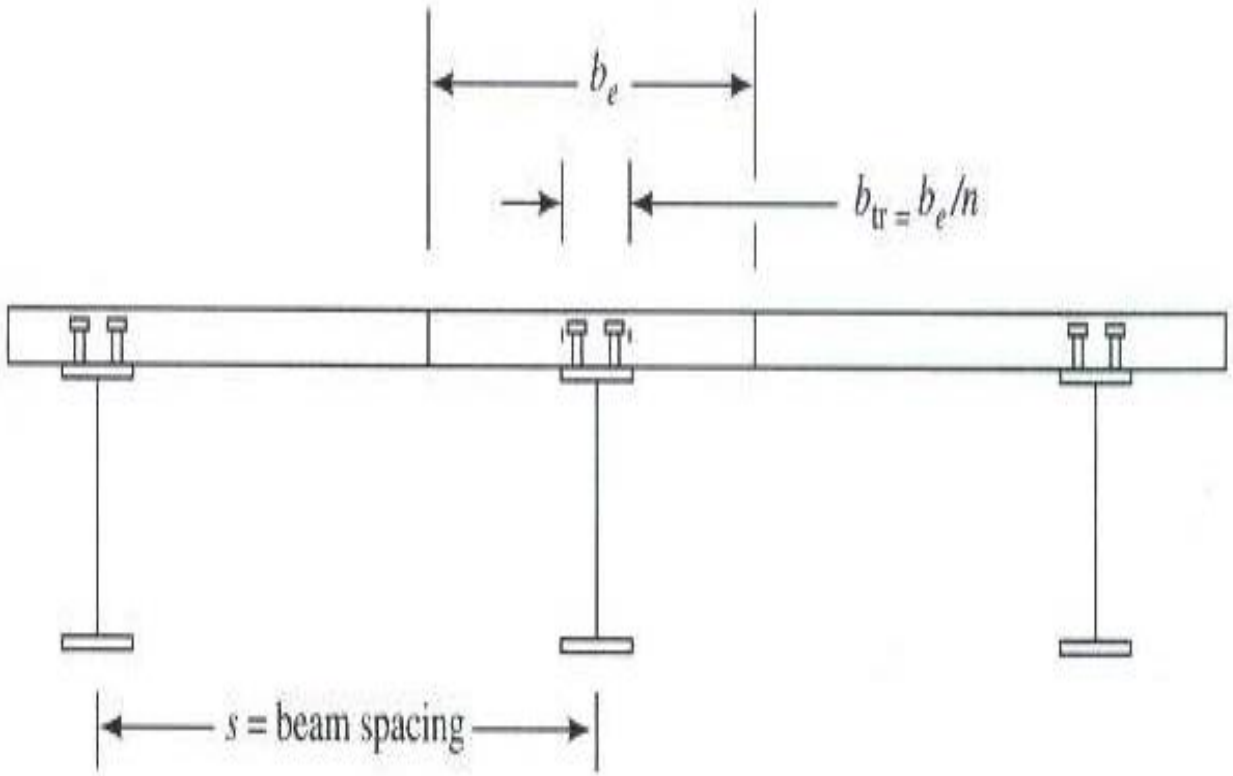
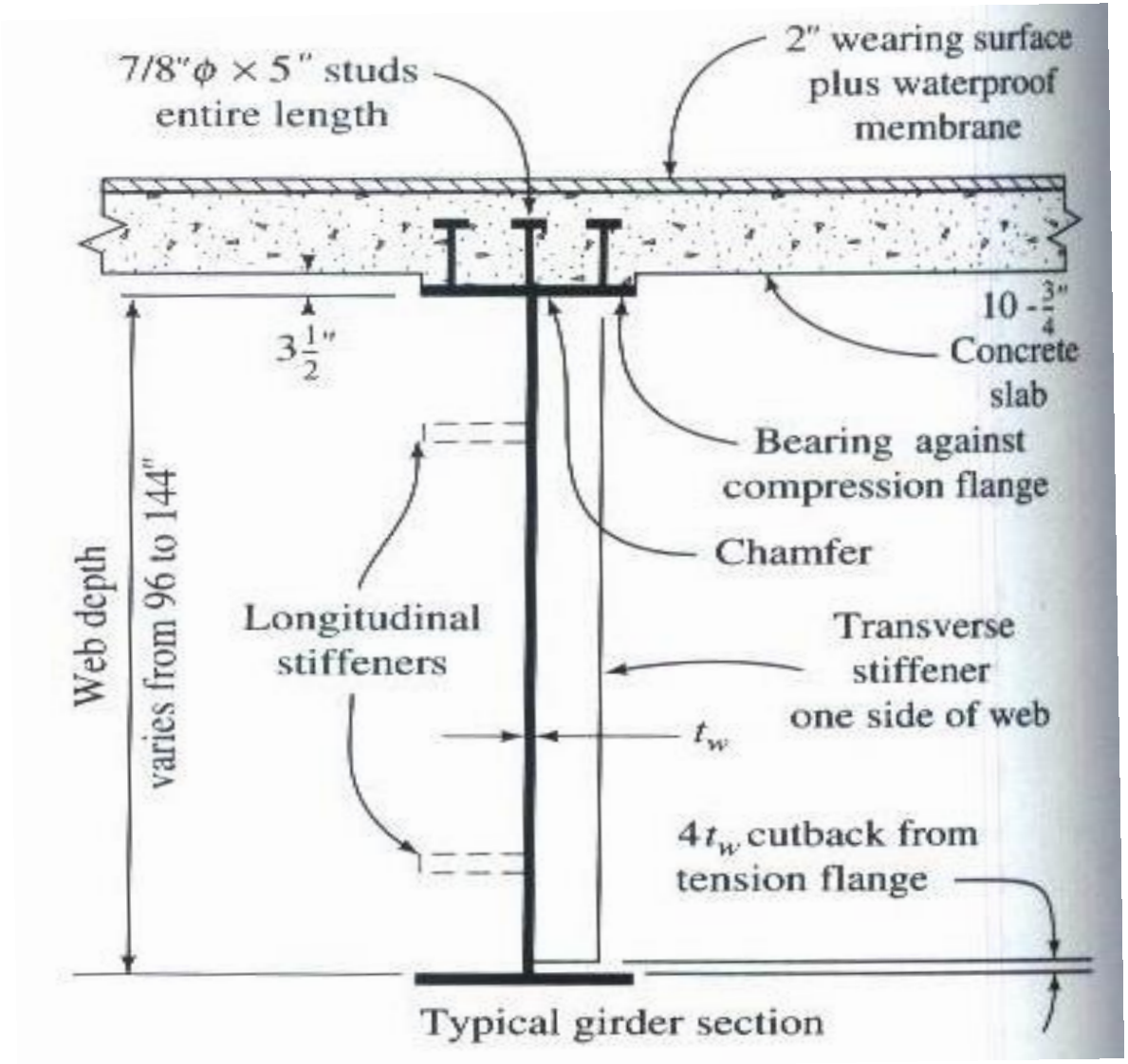



**FIGURE 8.8**

Effective width of composite steel beam and stress distribution.




Typical girder section

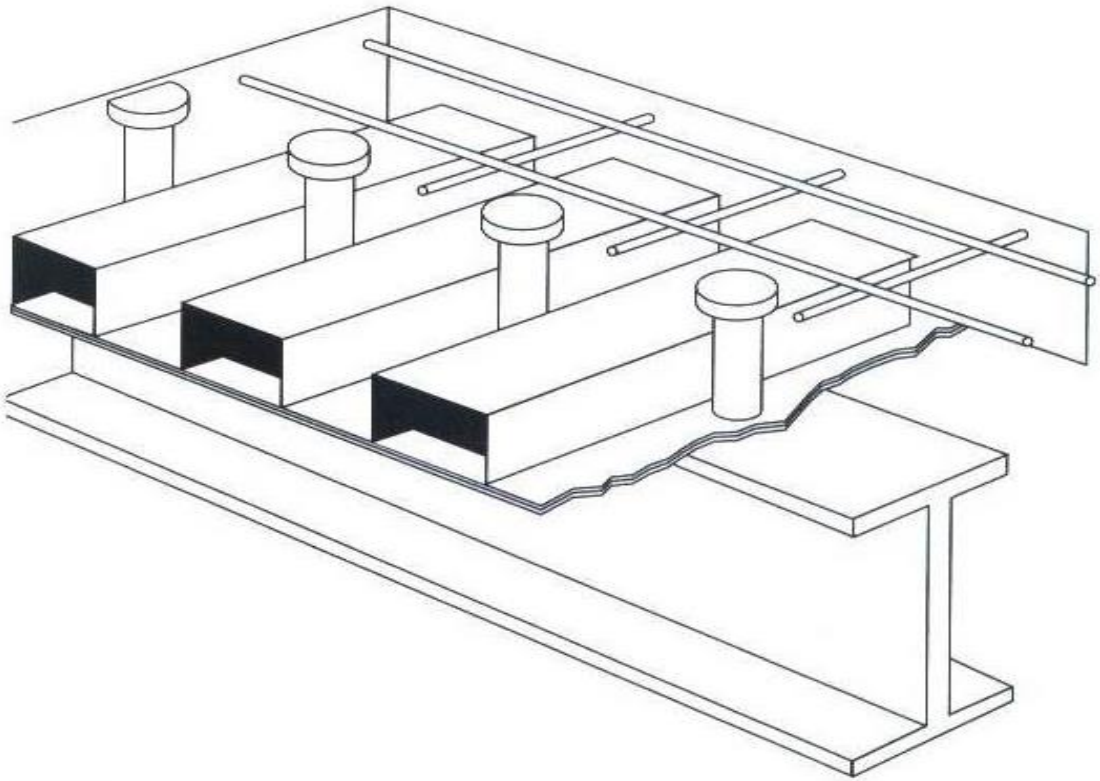


**FIGURE 8.10**
Formed steel deck with shear studs in a composite steel beam.

# Köprülerin sınıflandırılması

3.4 Ahşap köprüler

Genelde rekreasyon alanlarında yaya köprüsü olarak kullanılırlar.

3.5 Alüminyum köprüler

3.6 Diğer malzemeler (fiberglas, ileri kompozit malzemeler)

# Köprülerin sınıflandırılması

**4. Köprü tipine göre sınıflandırma**

4.1 Kirişsiz köprüler

Kısa açıklıklarda kullanılırlar ve tabliyeleri sadece betonarme veya prefabrik plaklardan oluşur.

4.2 Kirişli köprüler

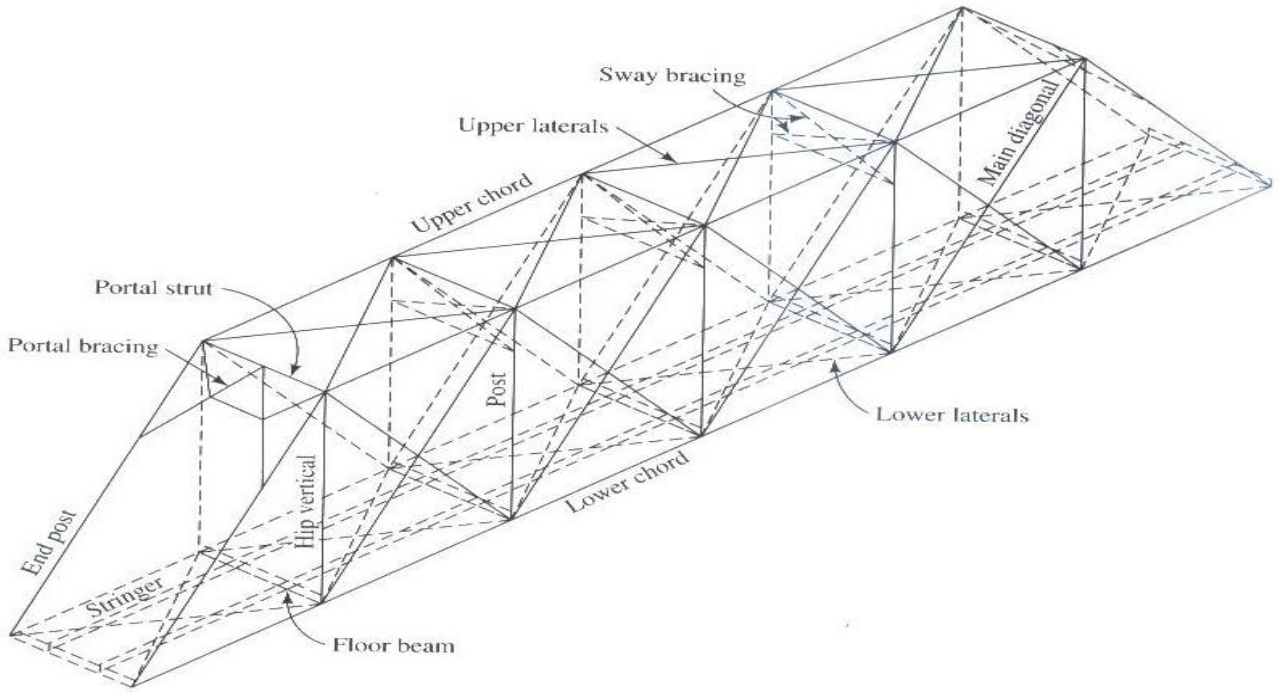
4.2.1 Çelik

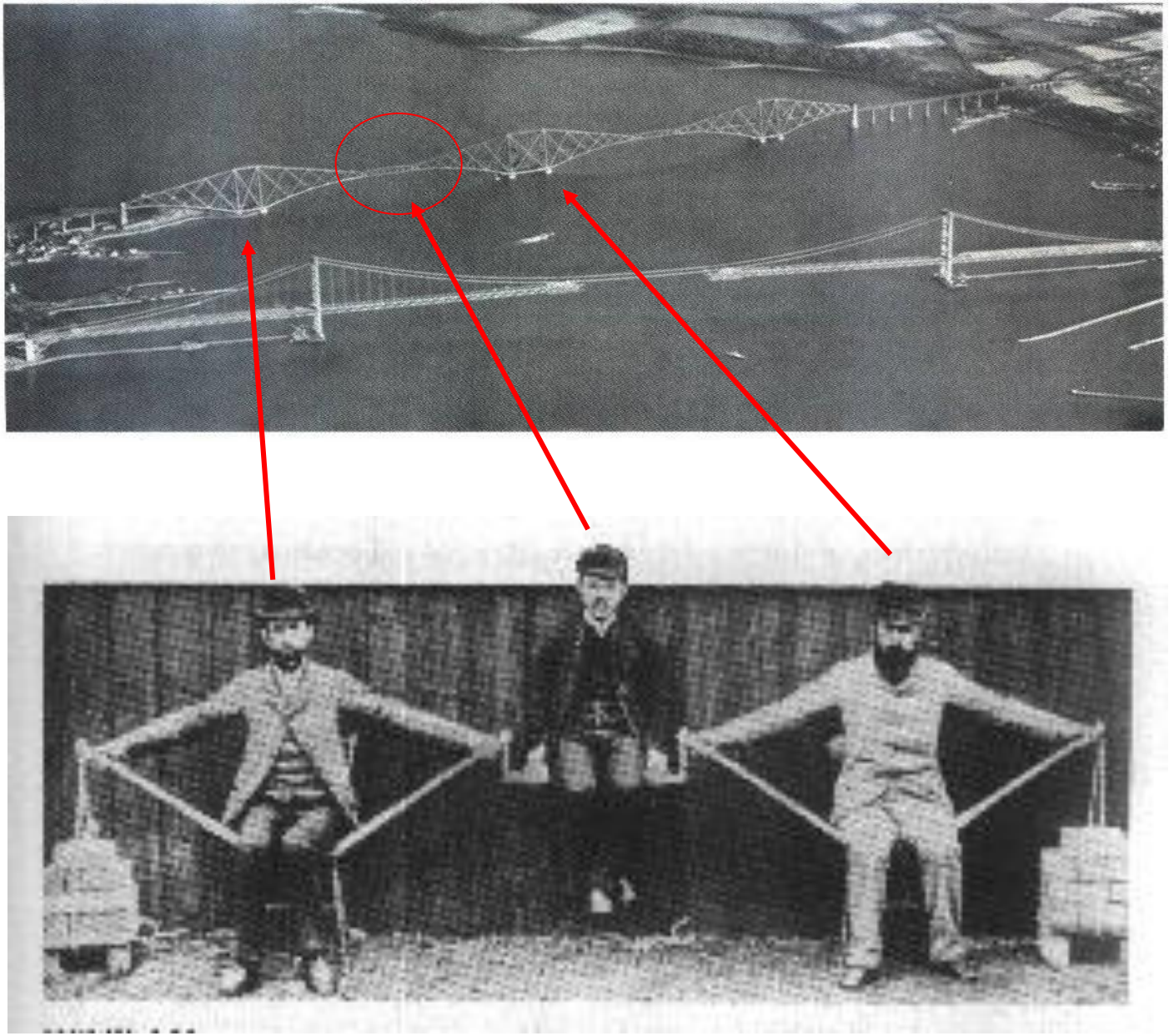
4.2.2 Betonarme ve öngerilmeli

4.2.3 Kompozit

# Köprülerin sınıflandırılması

## 4.3 Kafes köprüler





# Köprülerin sınıflandırılması

## 4.4 Kemer köprüler

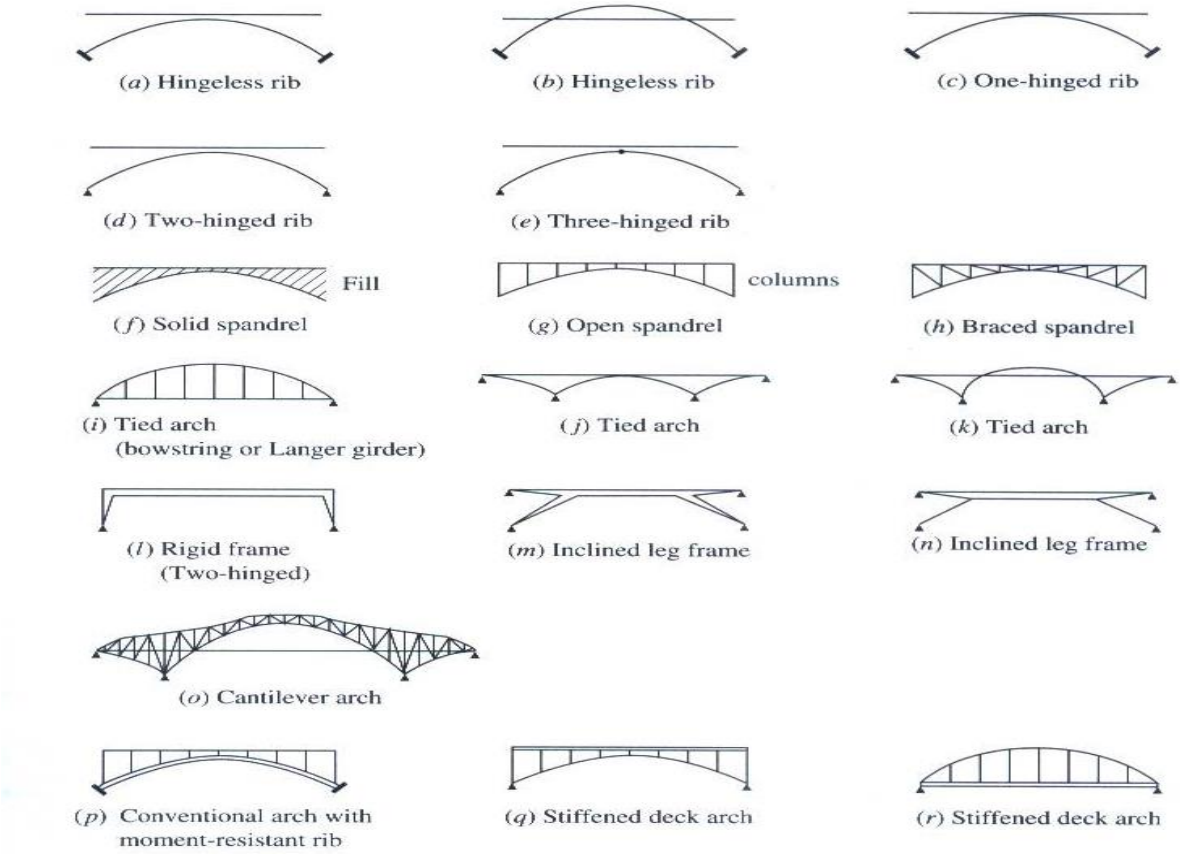
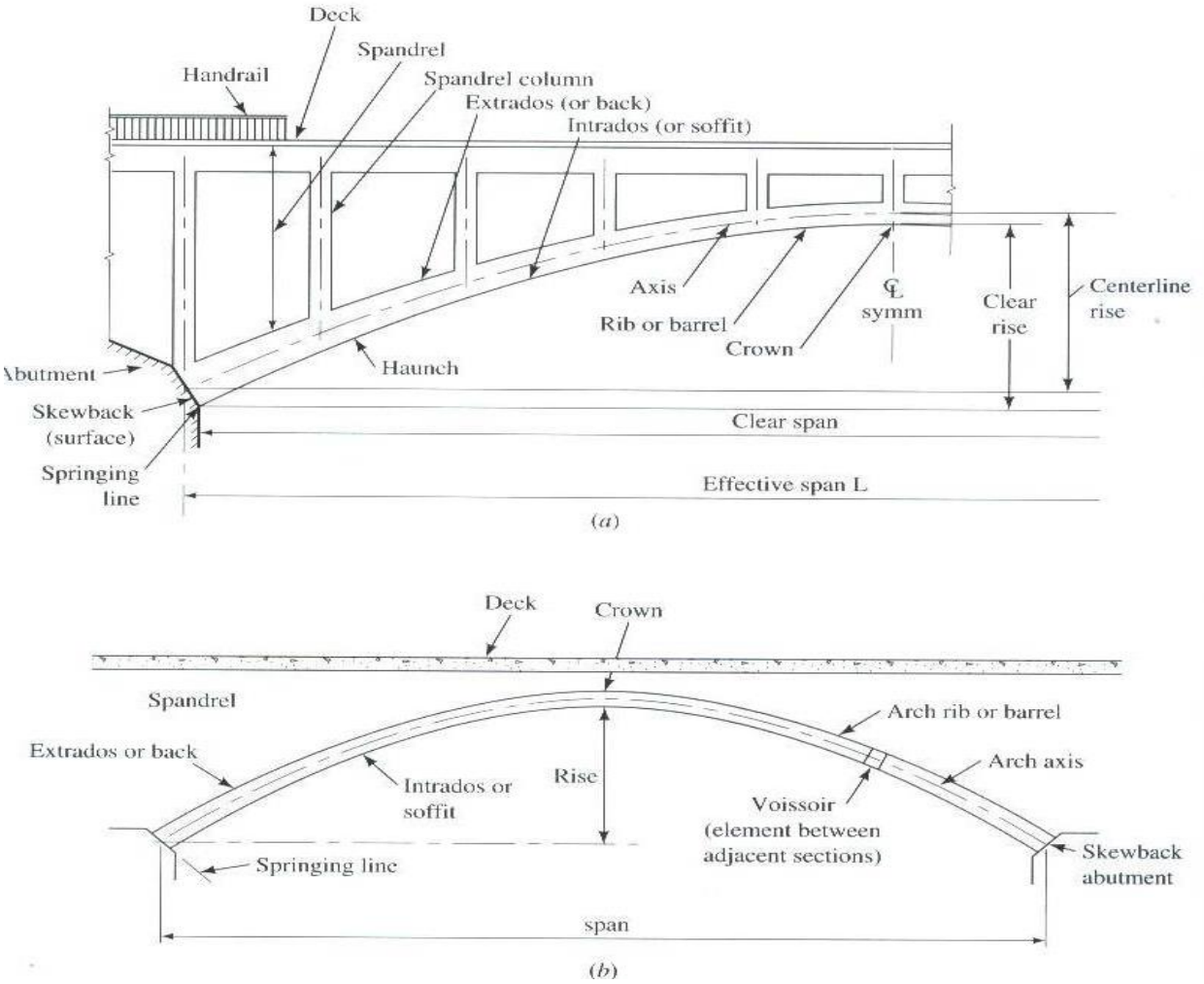



**FIGURE 1.37**
Various types of arch bridges [O'Connor, 1971].


Deck
Spandrel
Handrail
Spandrel column
Extrados (or back)
Intrados (or soffit)
Axis
Rib or barrel
Crown
℄ symm
Clear rise
Centerline rise
Haunch
Abutment
Skewback (surface)
Springing line
Clear span
Effective span L
(a)
Deck
Crown
Spandrel
Arch rib or barrel
Extrados or back
Arch axis
Intrados or soffit
Rise
Voissoir (element between adjacent sections)
Springing line
Skewback abutment
span
(b)

# Köprülerin sınıflandırılması

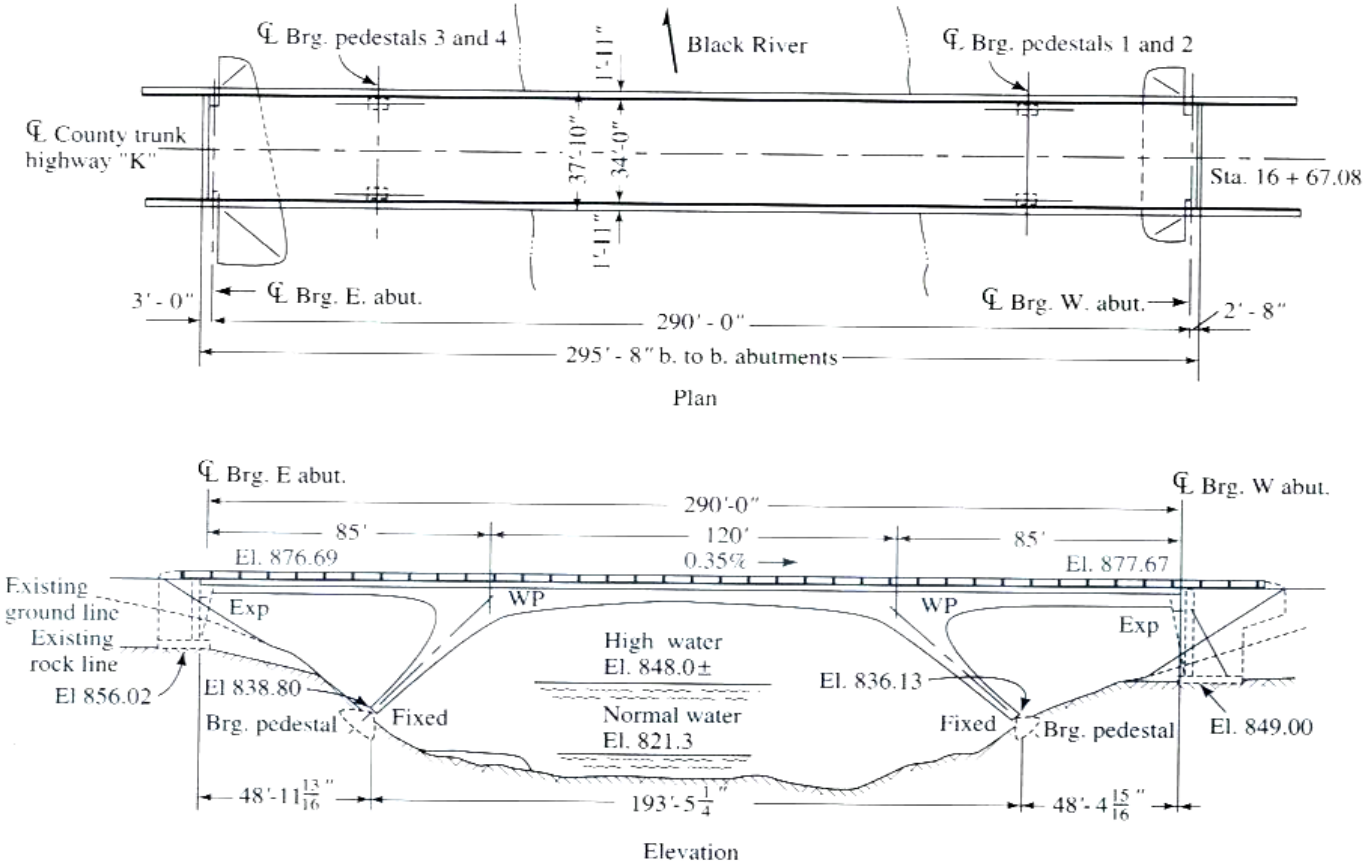
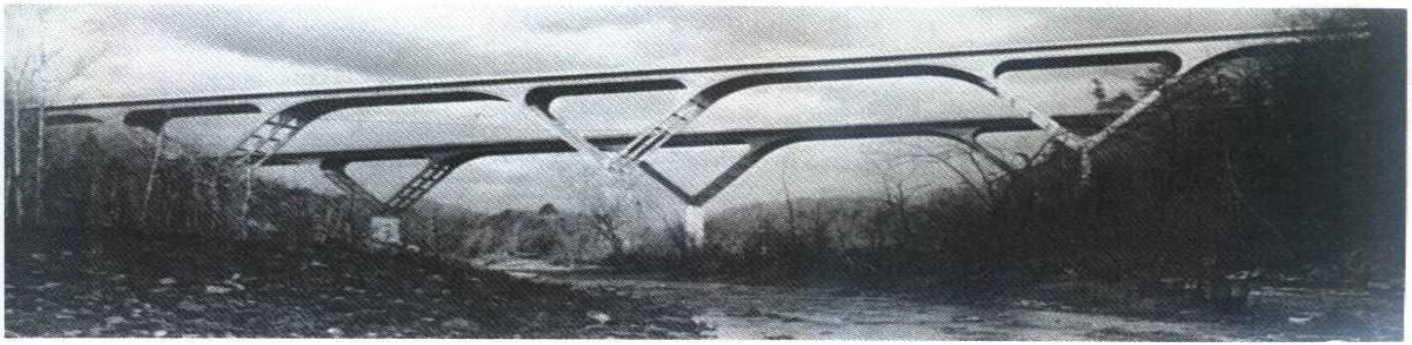
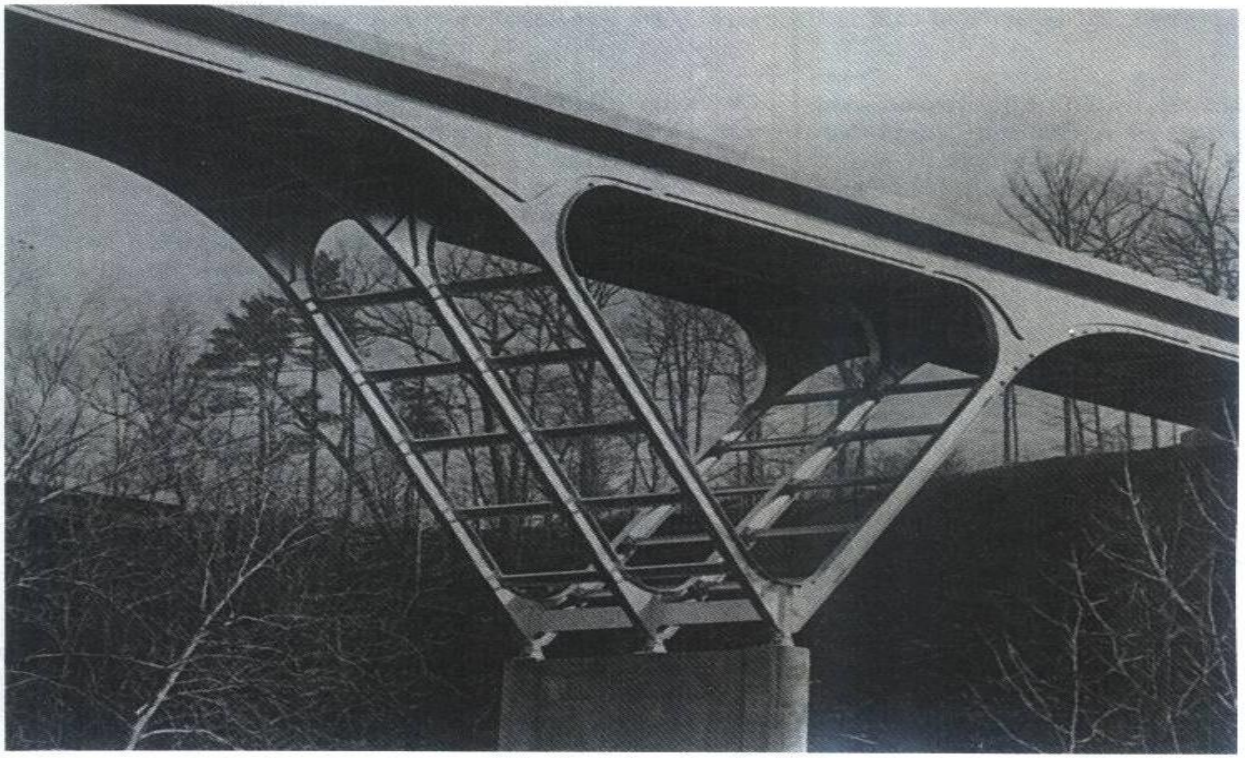


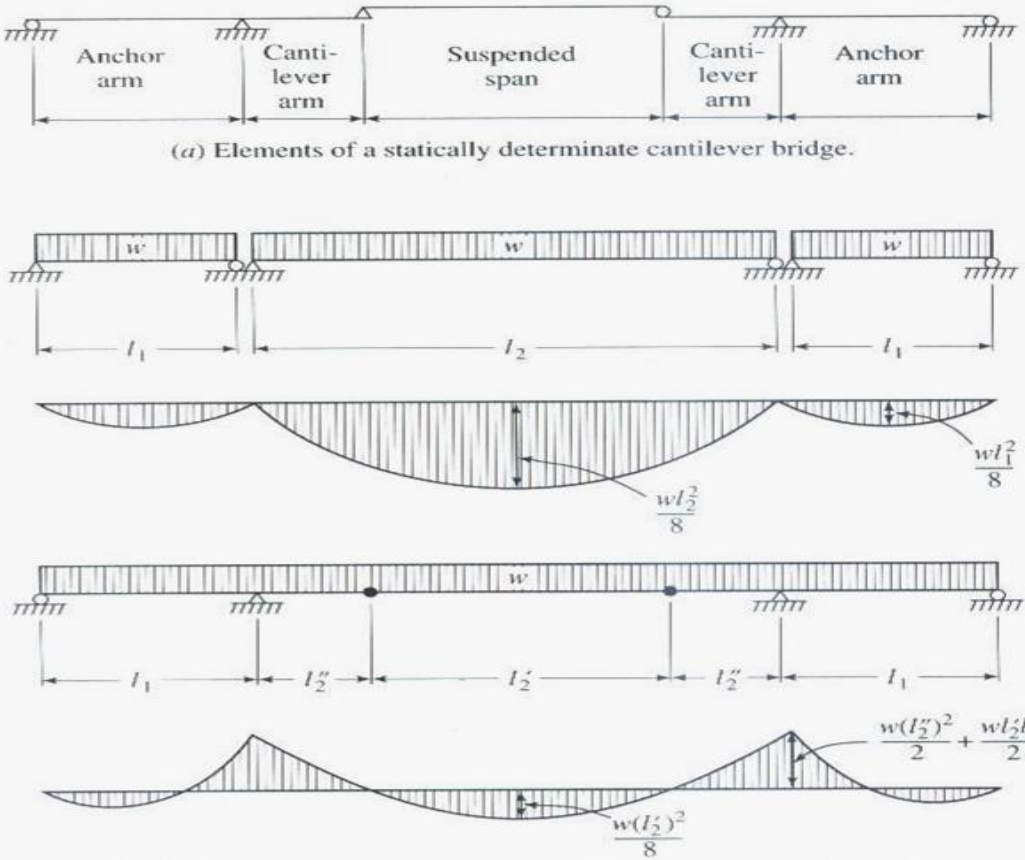

**FIGURE 1.32**
Rigid frame bridge with inclined legs—The Hatfield Bridge over Blake River, Wisconsin [USS, 1974].





# Köprülerin sınıflandırılması

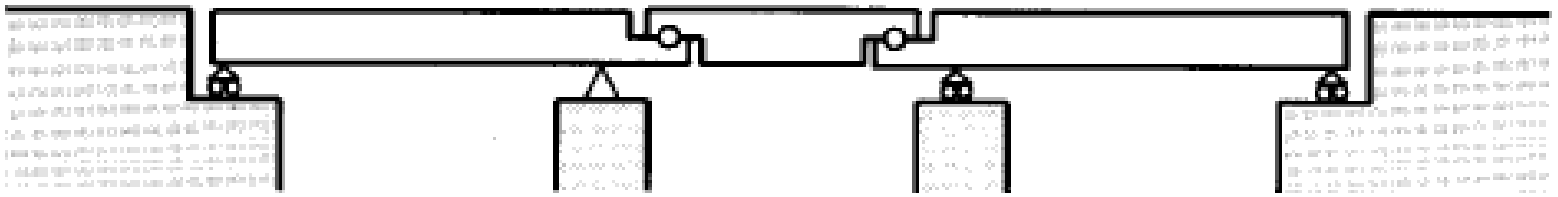
## 4.6 Konsol köprüler ve Gerber köprüler




(*a*) Elements of a statically determinate cantilever bridge.

(*b*) Relative maximum moments—single span versus cantilever span.

**FIGURE 1.40**
Cantilever bridge principles.



(c) Gerber girder

# Köprülerin sınıflandırılması

## 4.7 Eğik askılı köprüler

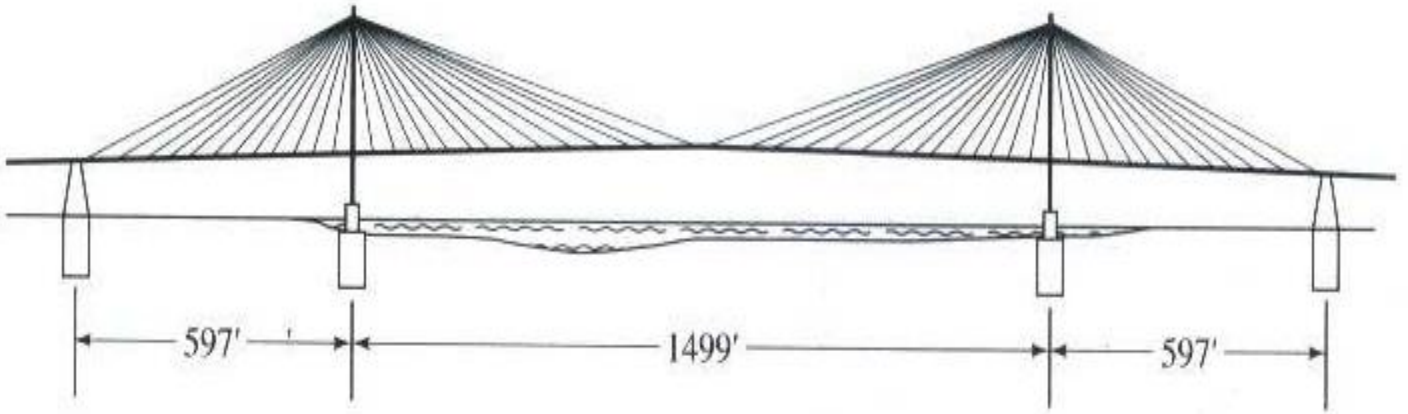



**FIGURE 1.48**
India's longest cable-stayed bridge, over Hoogly River, Calcutta.

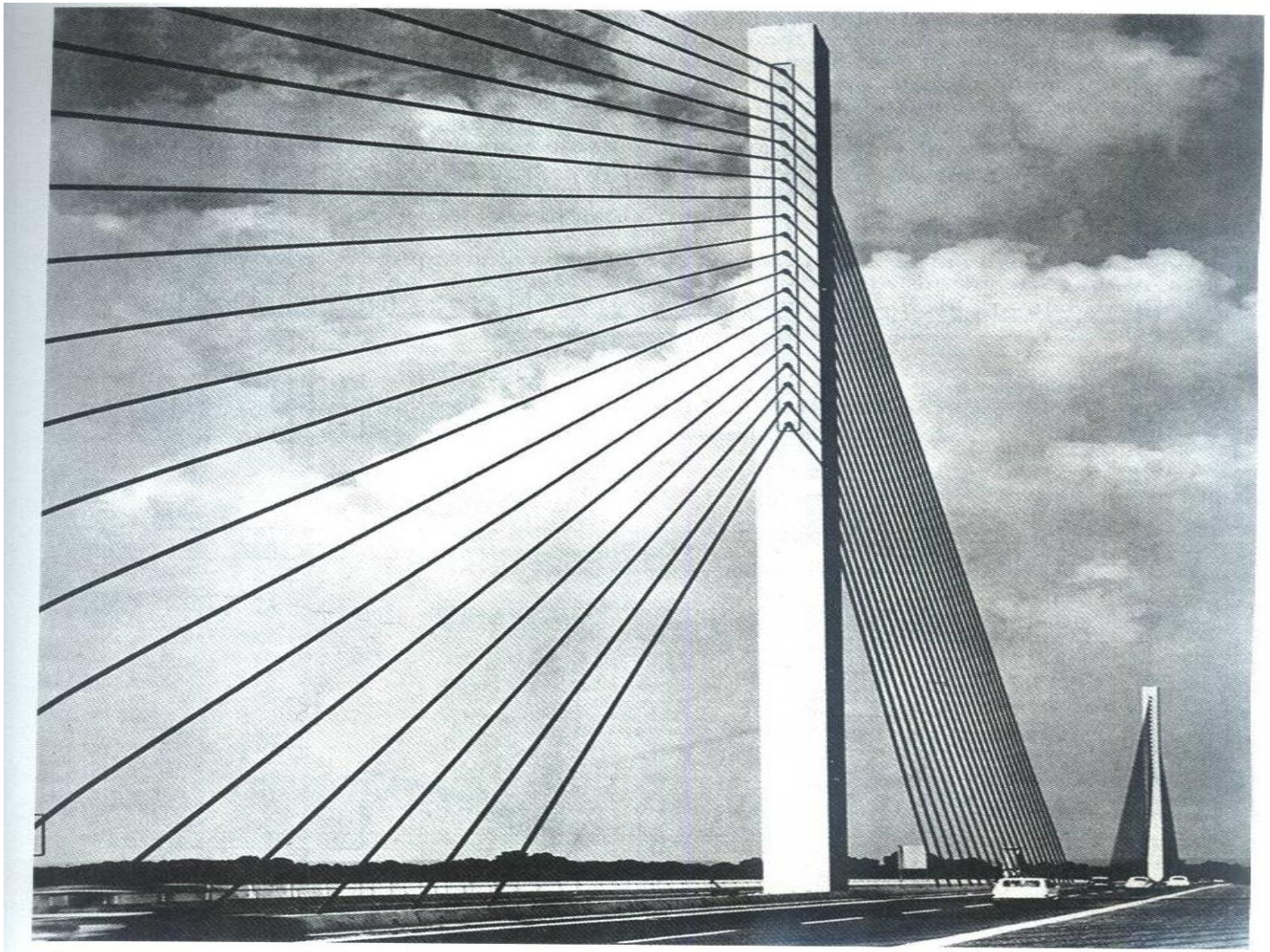
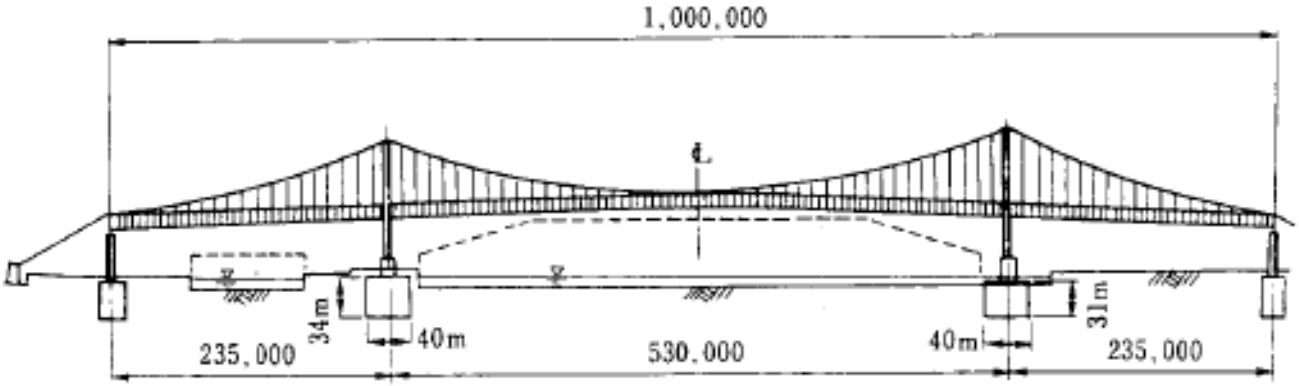


**FIGURE 1.49**
View of stay ropes of the Friedrich Ebert Bridge over the Rhine, at Bonn, Germany [Leonhardt and Zellner, 1970].

# Köprülerin sınıflandırılması

## 4.8 Asma köprüler



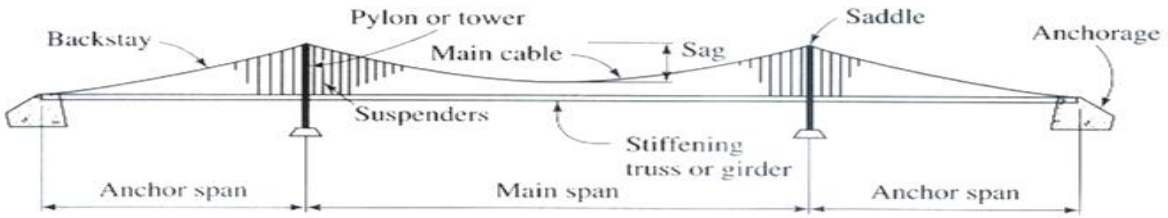




**FIGURE 1.52**
Externally anchored suspension bridge and terminology.

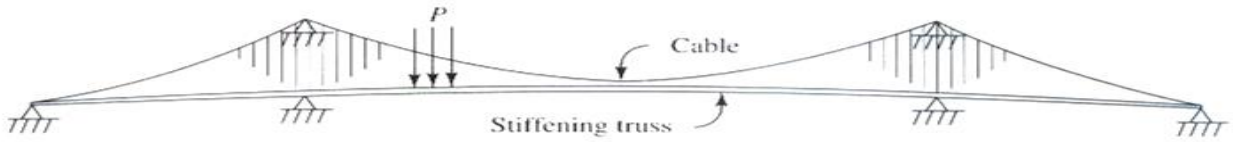



**FIGURE 1.53**
Self-anchored suspension bridge.

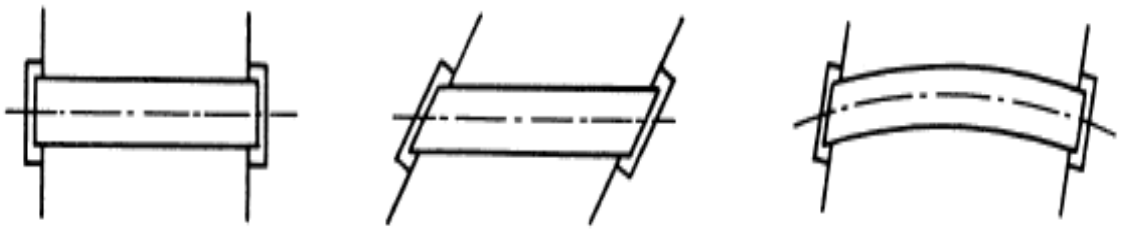
# Köprülerin sınıflandırılması

**5.Plandaki durumuna göre sınıflandırma**

5.1 Dik

5.2 Verev

5.3 Kurb



# Köprülerin sınıflandırılması

**6.Hareket edebilme durumuna göre sınıflandırma**

6.1 Yatay hareketli

6.2 Düşey hareketli

6.2.a Baskül köprü

6.2.b İner-kalkar köprü

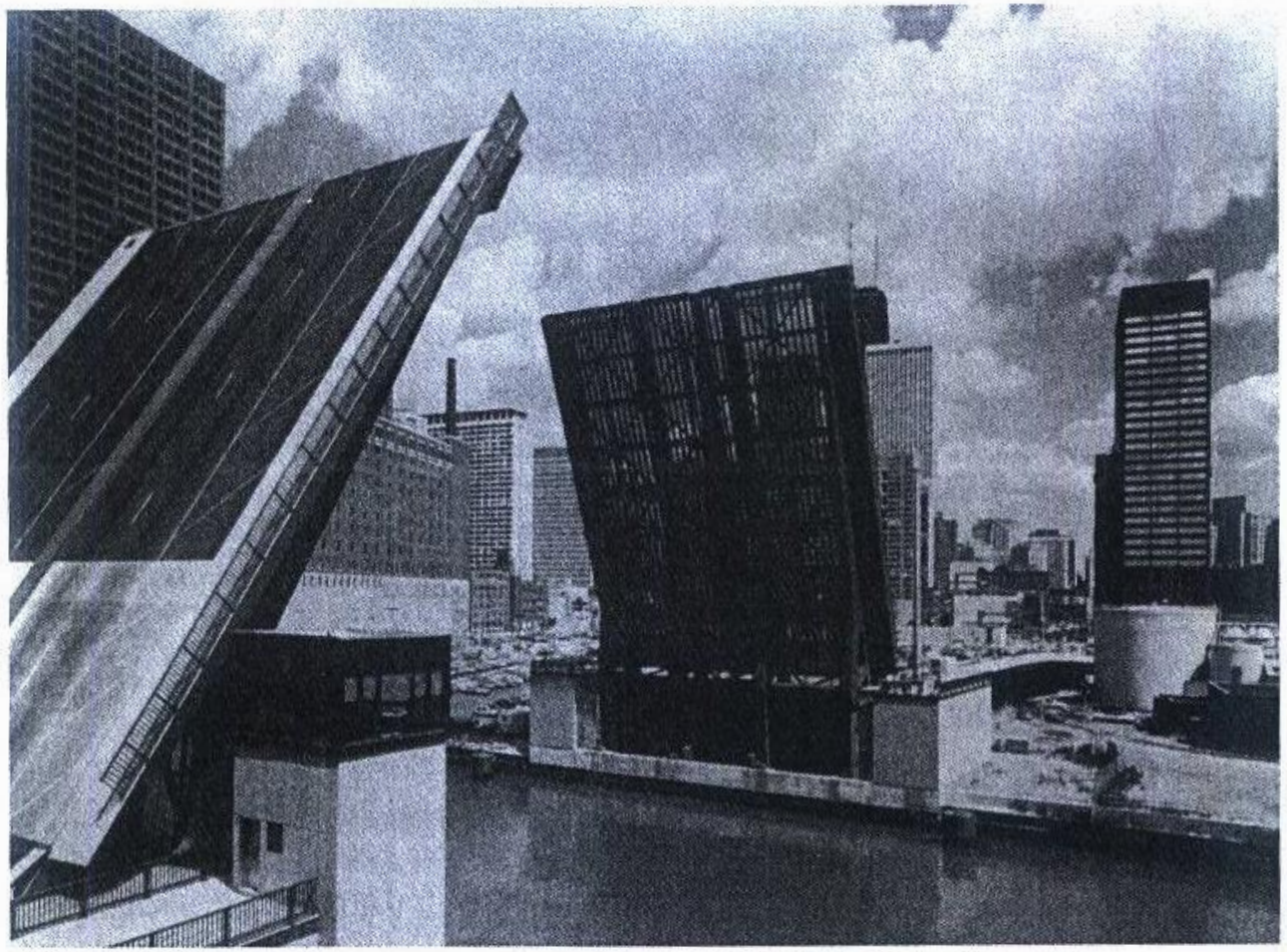


**FIGURE 1.61**
Double-leaf bascule bridge (Columbus Drive Bascule Bridge, Chicago).

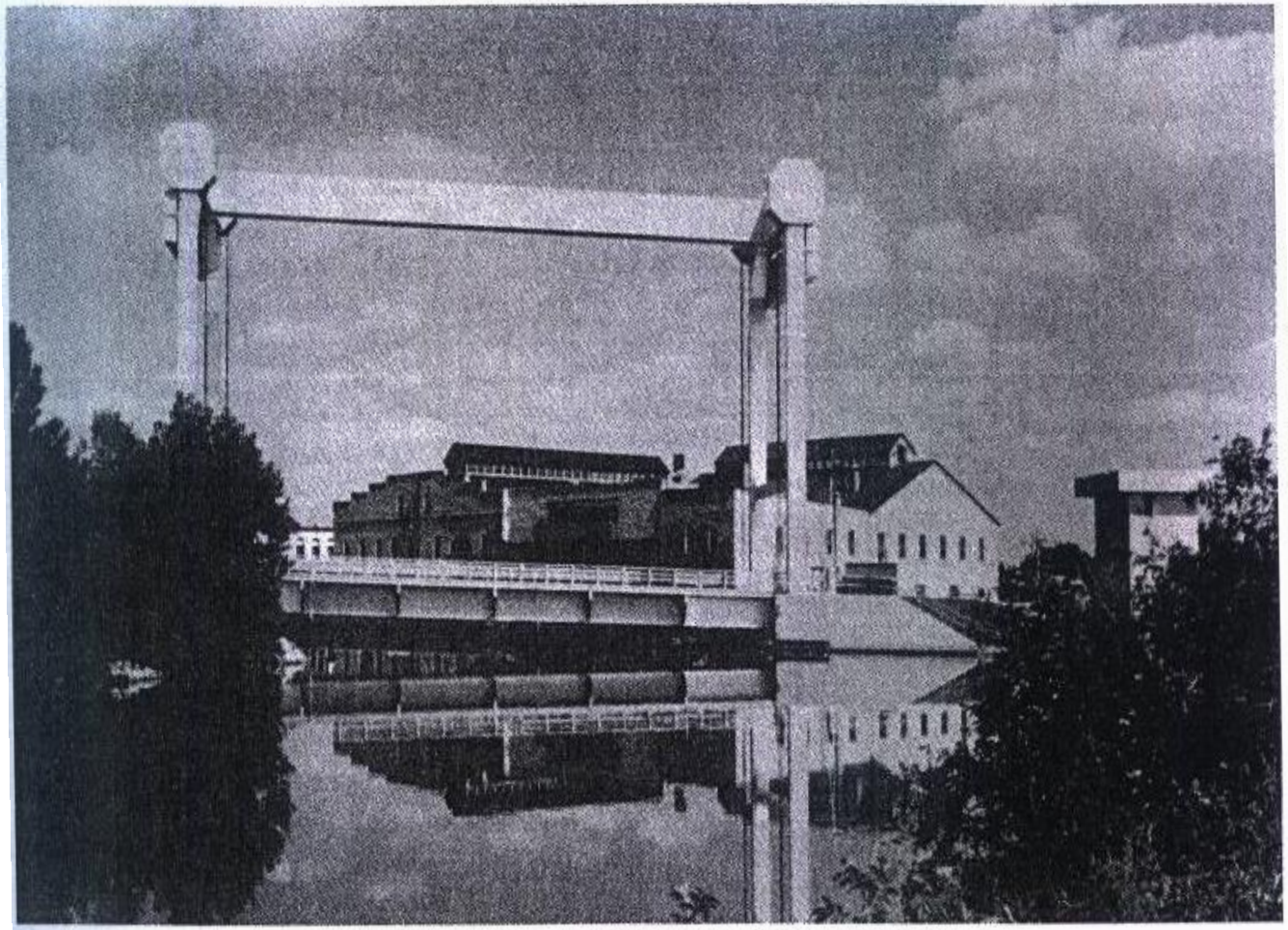
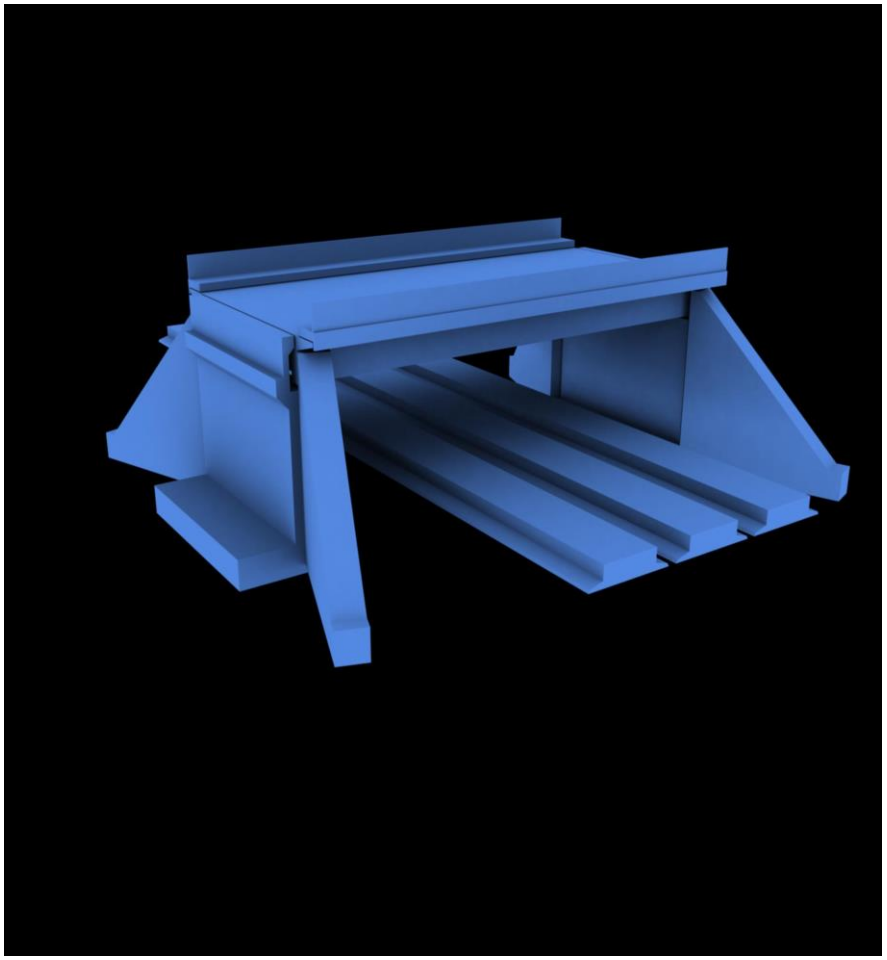
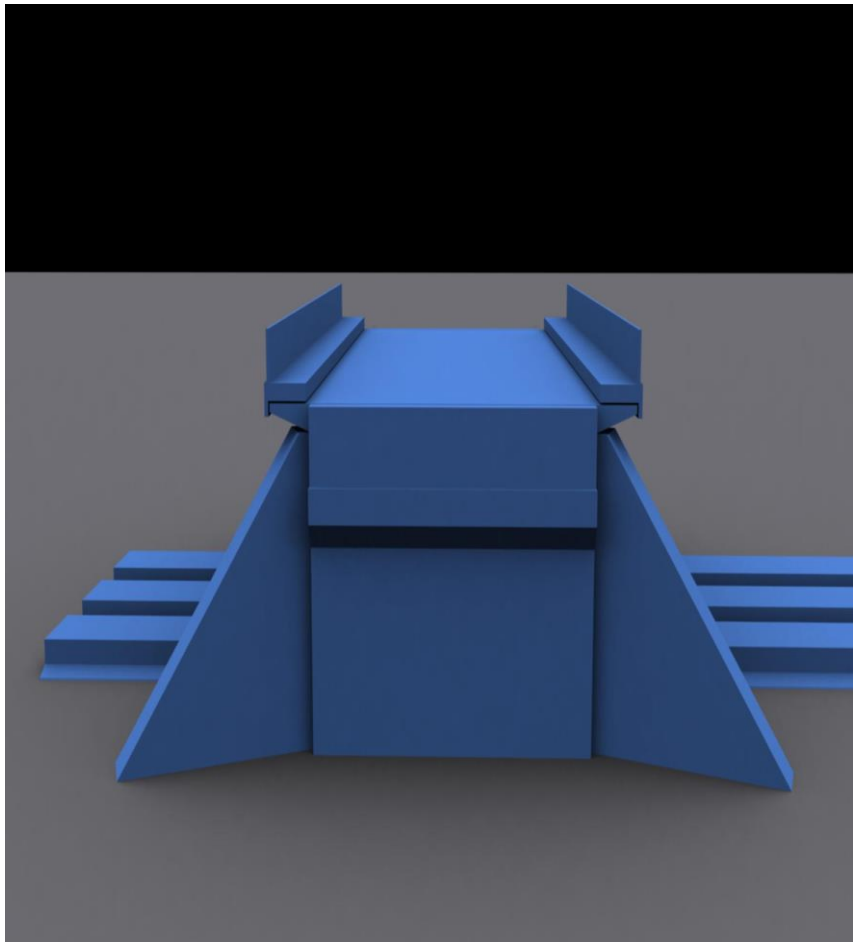
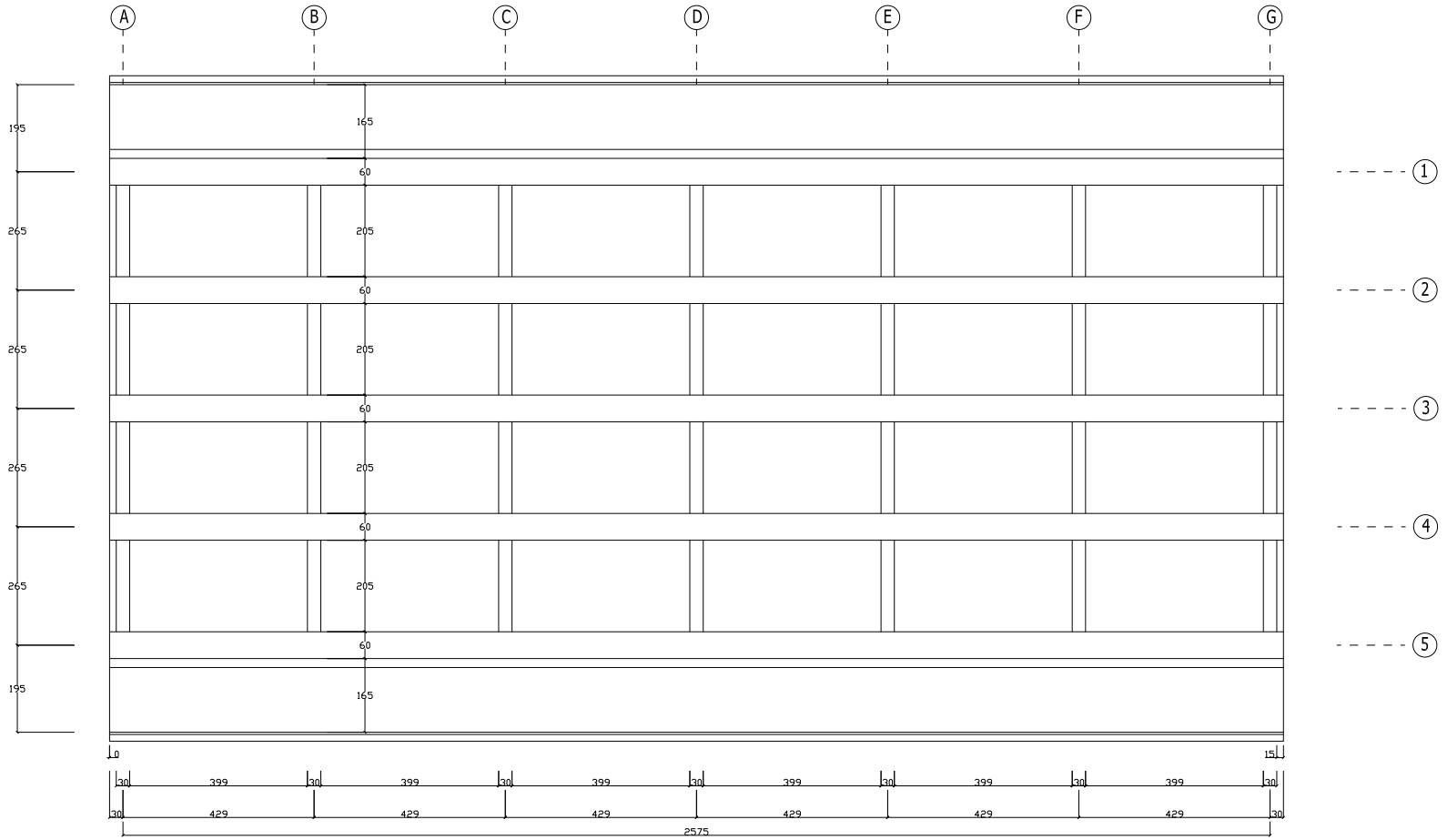


**FIGURE 1.62**
Vertical-lift bridge. (Veterans Memorial Bridge, Kaukauna, Wisconsin.)






A
B
C
D
E
F
G
1
2
3
4
5
195
265
265
265
265
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205
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205
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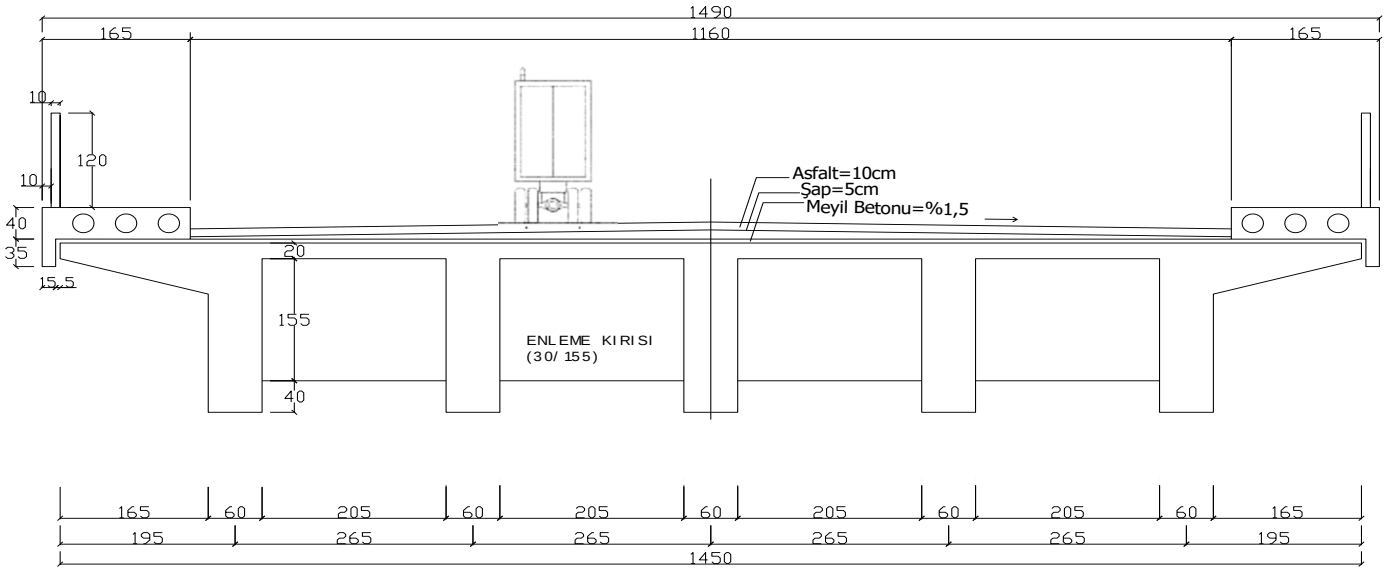
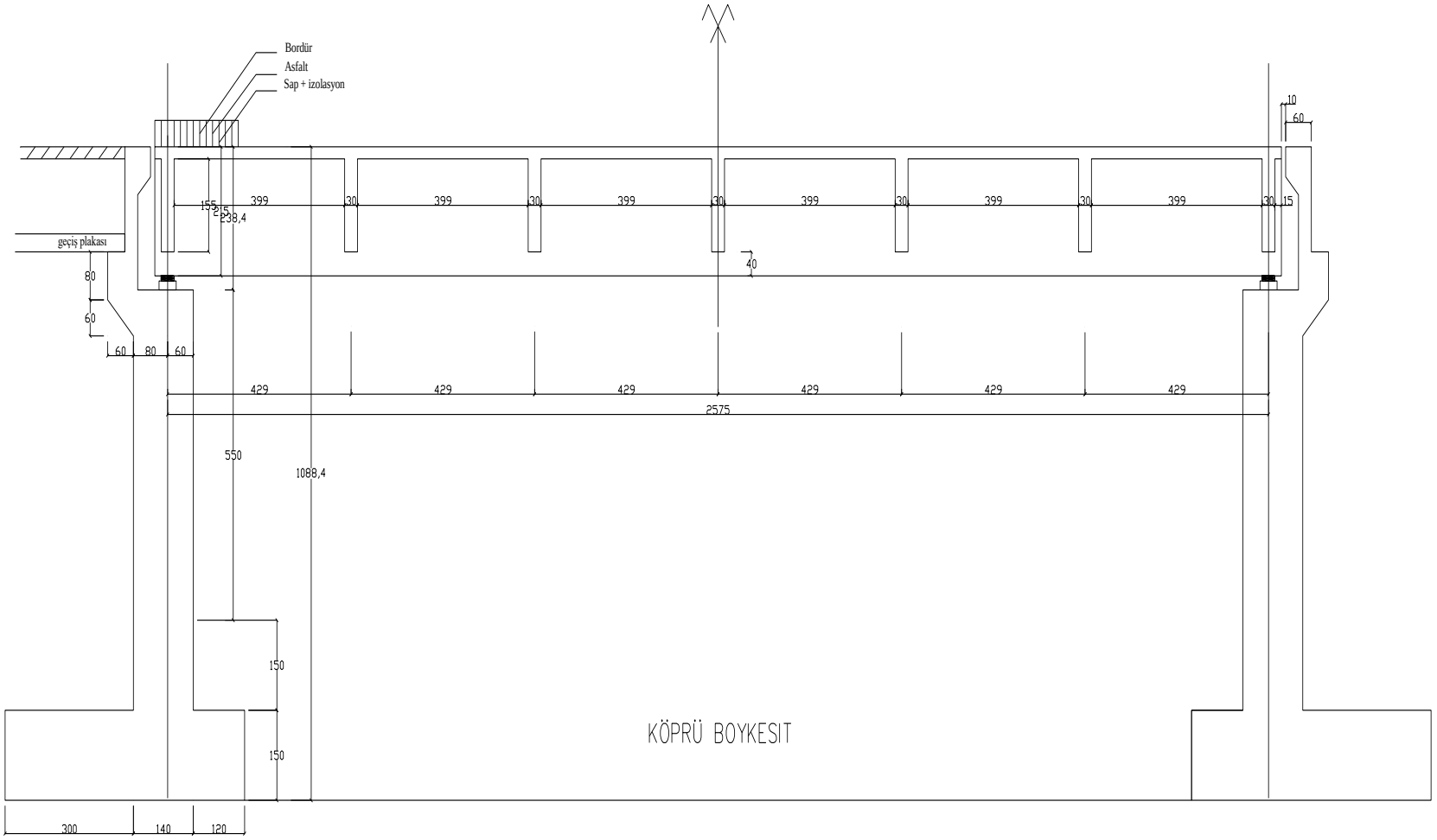
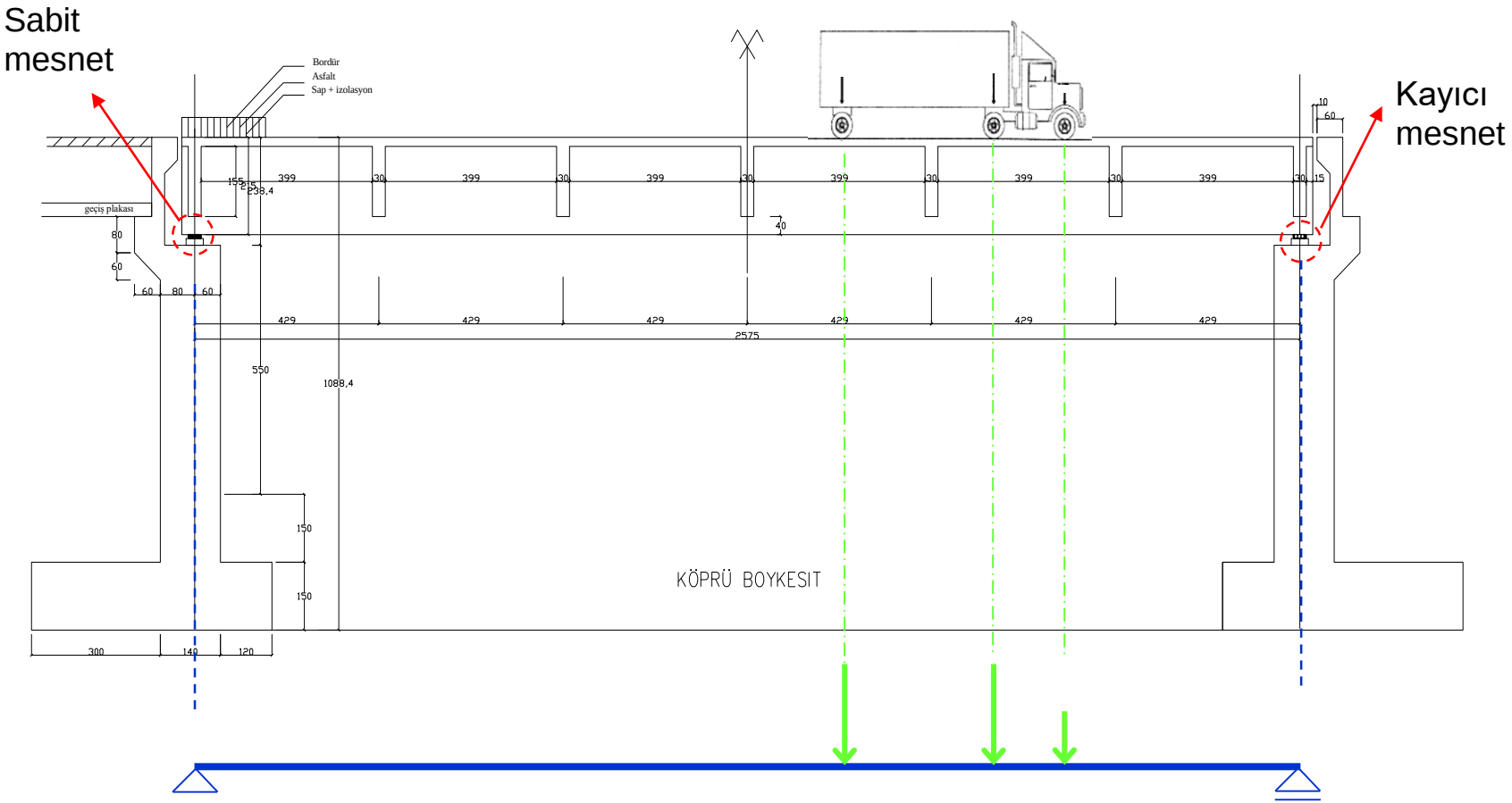
205
60
165
0
15
30
399
429
2575




KÖPRÜ ENKESIT




KÖPRÜ BOYKESIT


Sabit mesnet
Kayıcı mesnet
Bordür
Asfalt
Sap + izolasyon
geçiş plakası
KÖPRÜ BOYKESIT