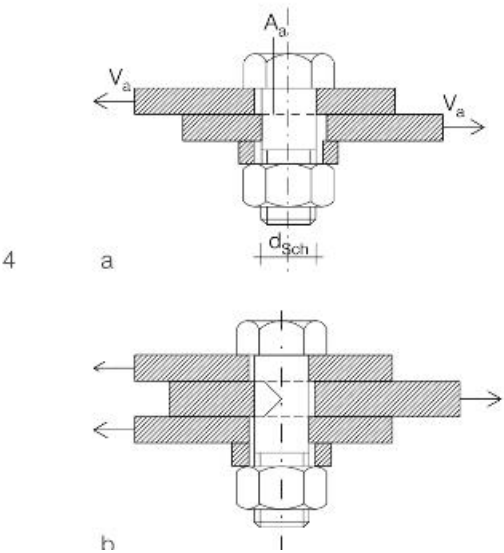
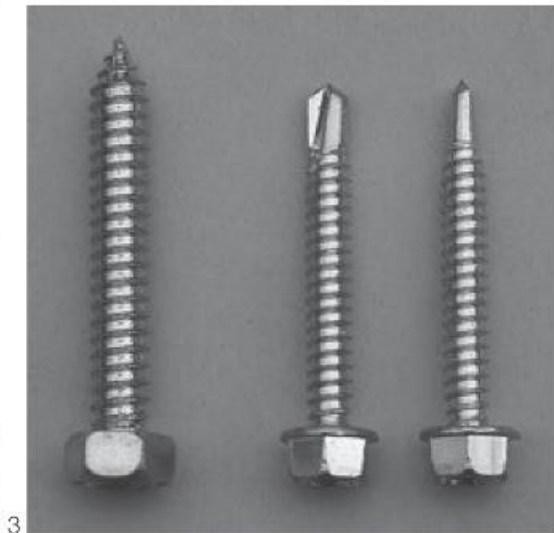
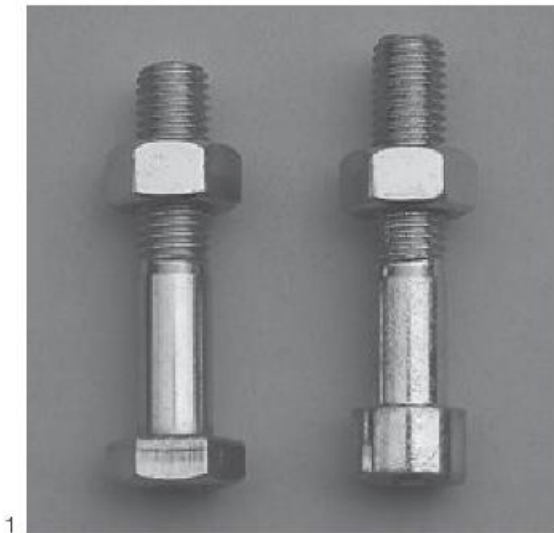




Çelik Yapılar

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Yapı ve Deprem Mühendisliği ÇG



Means of connection

Bolts and screws

Bolts and screws are among the most important types of fasteners used in structural steelwork. The advantages of screwed or bolted connections are:

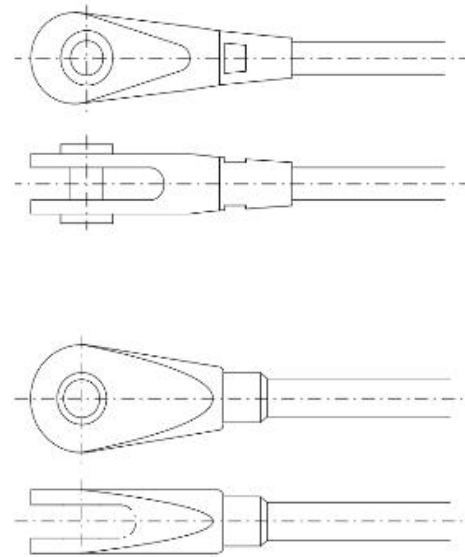
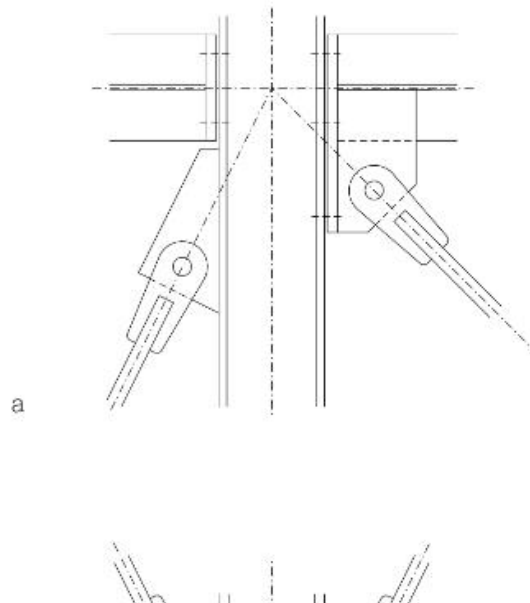
- ease of handling on the building site and in the works,
- excellent availability of bolts and screws in various qualities and strengths,
- easy removal if necessary – an important prerequisite for the dismantling and re-erection of steel components.

The use of screwed or bolted connections

(which drill their own hole) or self-tapping screws (which tap their own thread in a pre-drilled hole) are often employed. Such screws do not require nuts.

Rivets

Riveting creates a non-detachable connection between parts of the structure with the help of an upset fastener, the rivet. Owing to the excessive noise and the labour-intensive hard work, the traditional (solid) rivet has these days been almost exclusively relegated to the repair of (older) riveted constructions. The newer, easy to use non rivets are used in the

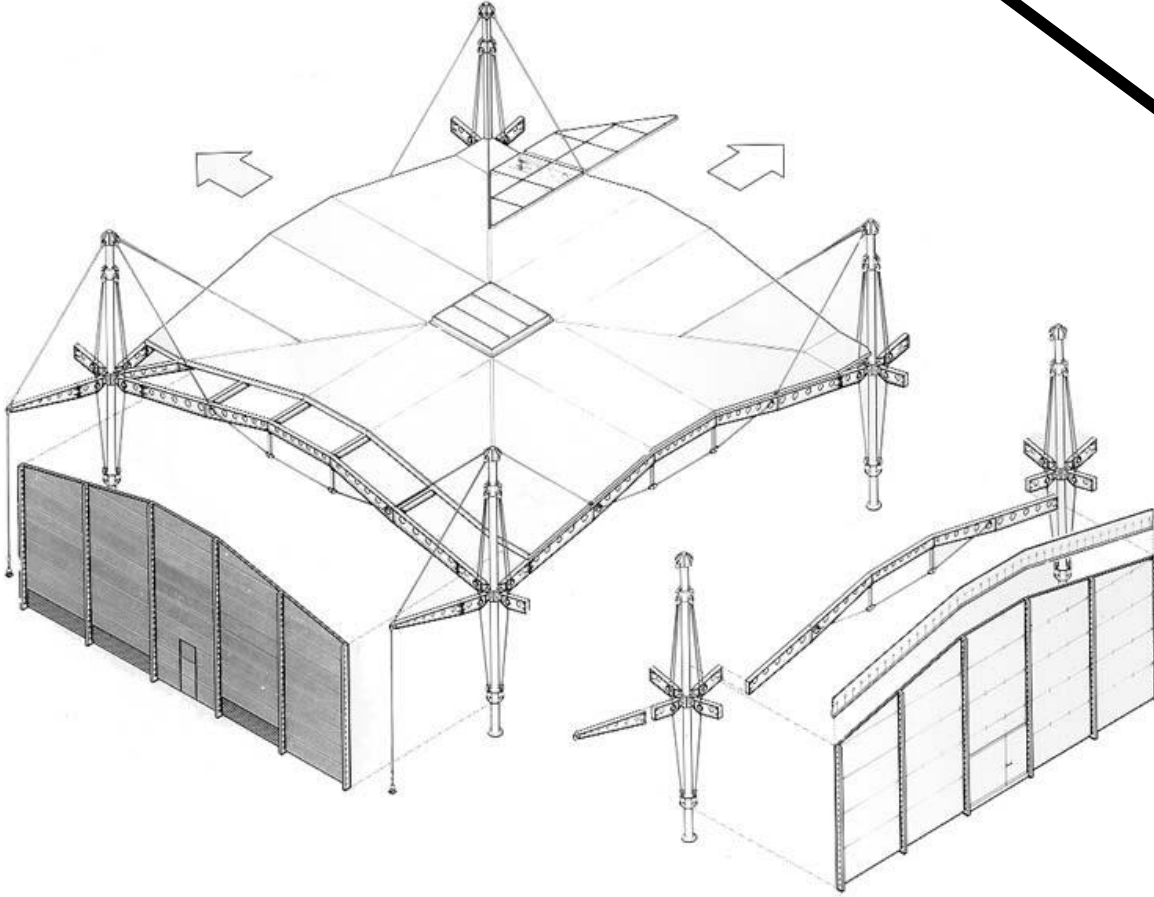


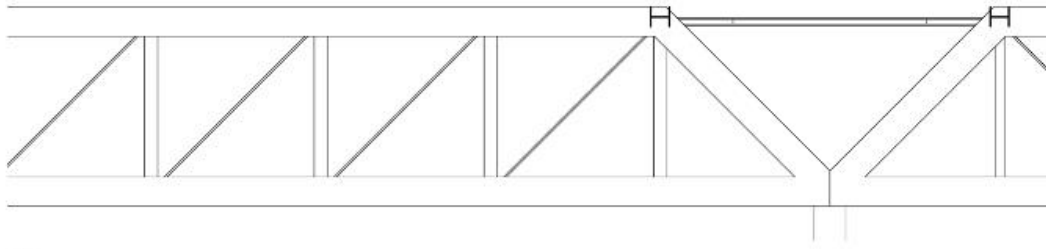
Renault Distribution Centre, Swindon, UK, 1980-1982, Foster+Partners



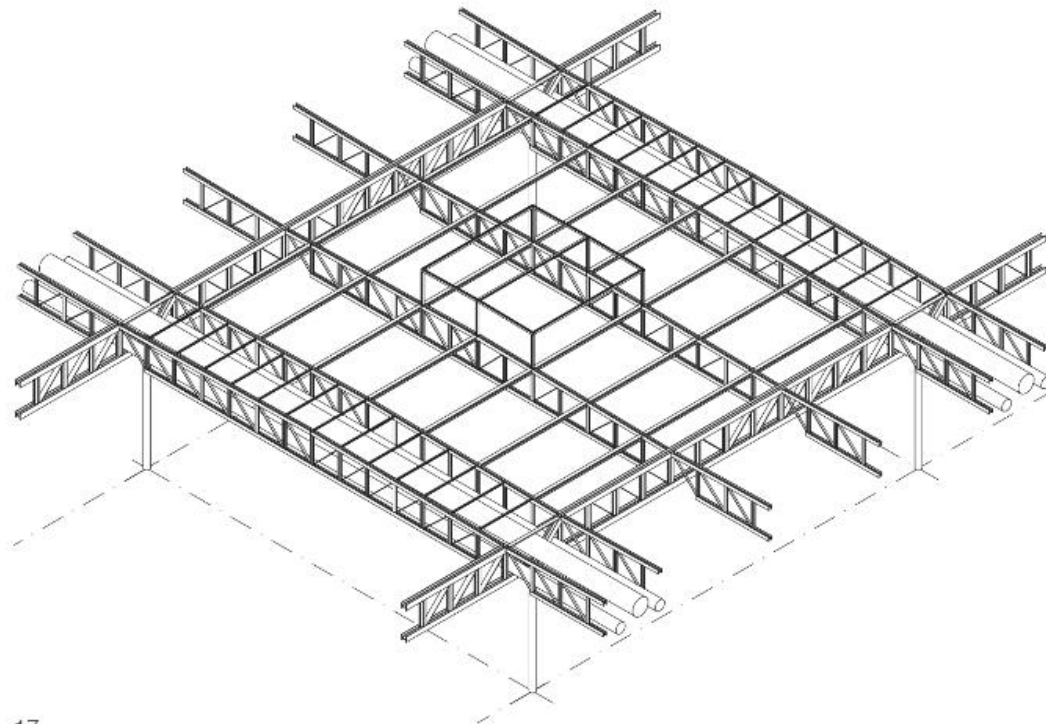


Mafsal (pim)





15

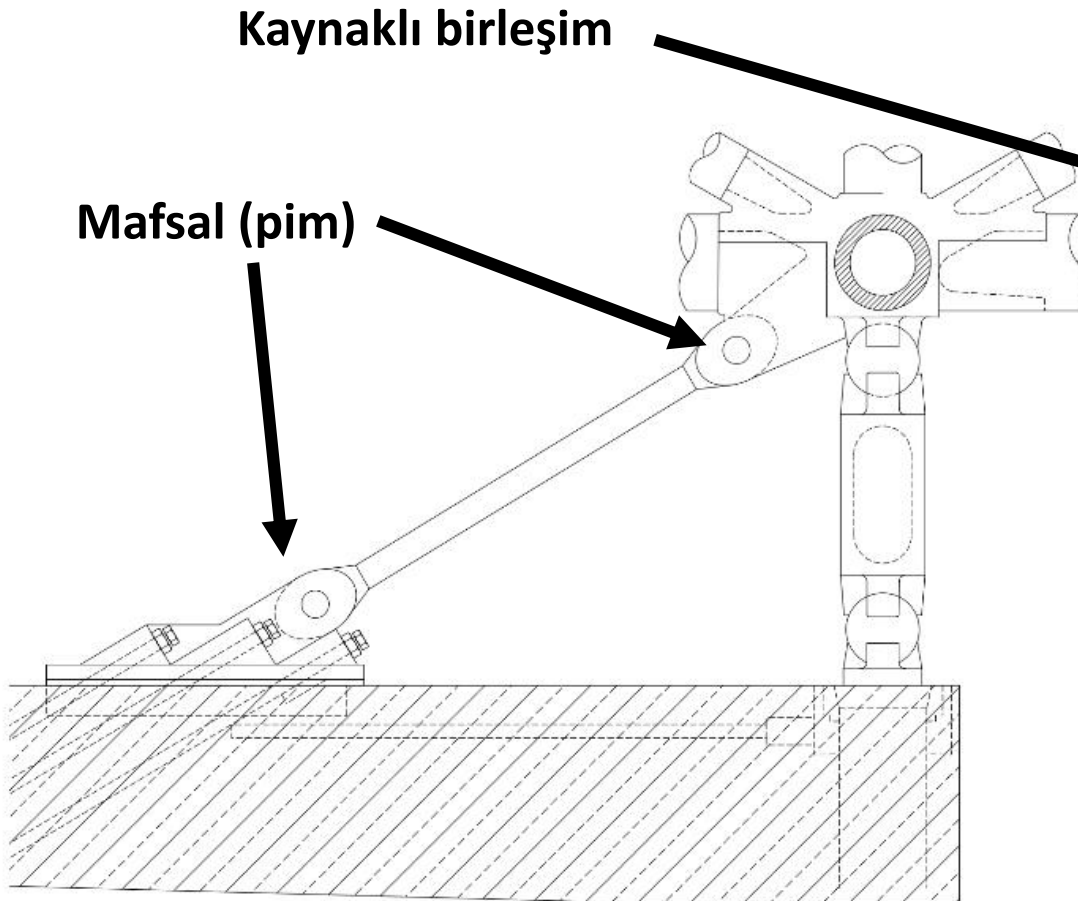


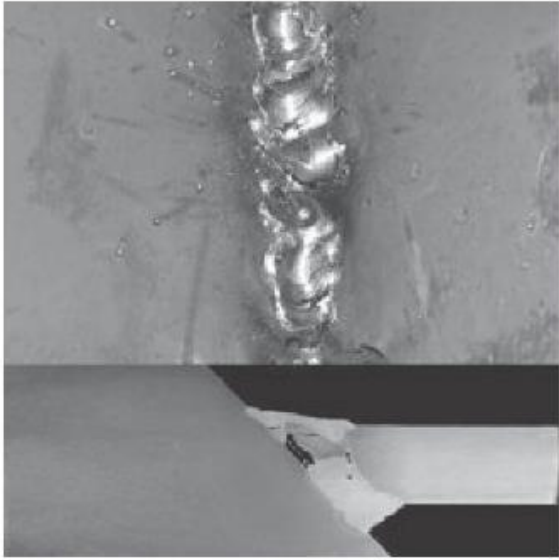
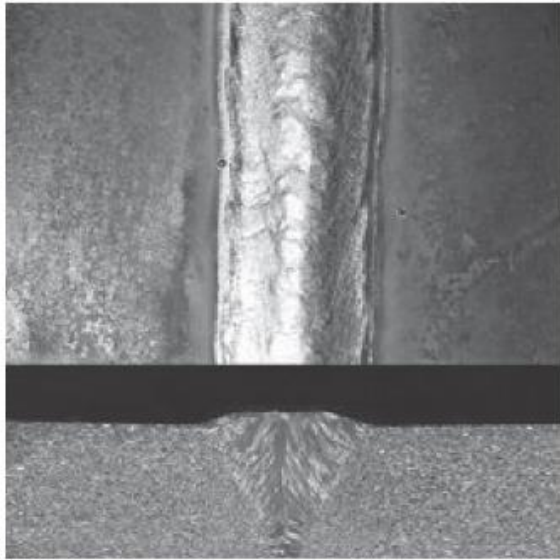
17



16

- 15 Elevation on main beam
- 16 The 24.5 m long main beam segments are spliced at each support. In order to accommodate the high moments in these continuous beams at this point, the top chord slopes down to the bottom chord and at the top the gap is bridged by a flat steel tie, which is easy to fix on site. The secondary beams hung between the main beams must be offset from the line of the columns, but this does create a large space for building services.
- 17 Isometric view of one structural module with rooftop lantern
- 18 Column-beam connection showing erection splice between continuous main beams, scale 1:20



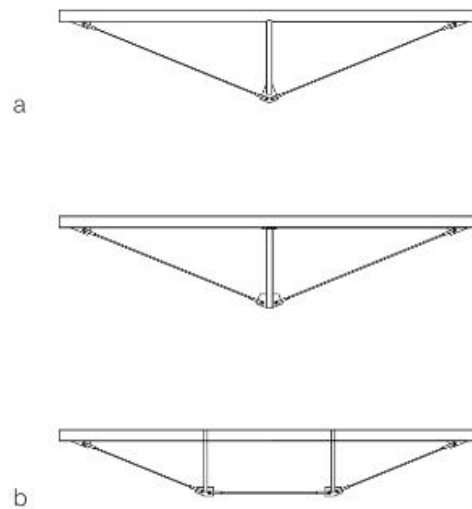
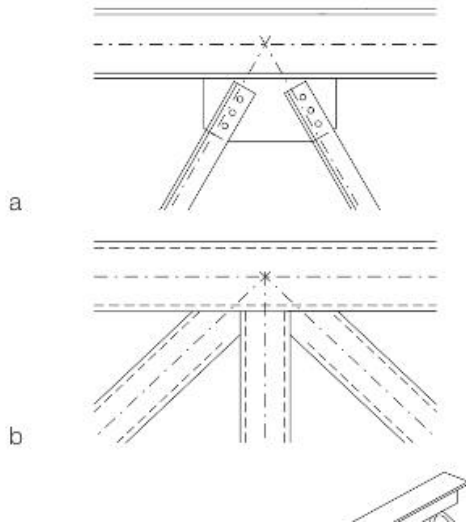


Uygun kaynak (çapaksız)

Uygun olmayan kaynak (çapaklı)

Cross-sectional forms of weld seams

Welds without root penetration	No.	Symbol	Type of seam ¹	Diagram
	1		V-groove butt joint	
	2		Double bevel T-joint	
	3		Bevel T-joint	with backing run
	4		Bevel T-joint	with root penetration



Examples of beams made up of steel sections:

- Lattice beams with chords made from T-sections, halved I-sections or circular hollow sections, diagonals made from solid round sections in the form of individual bars or a continuous vertical "wave".
- Lattice beams made from steel angles with gusset plates: chords made from two angles back to back, diagonals from one or two angles, with bolted or welded connections.
- Lattice beams with chords made from T-sections and diagonals from angles.



Perçinli birleşim



Perçinli birleşim

EMNİYET GERİLMELERİ

	$\sigma_{emn} \text{ (kg/cm}^2\text{)}$		$\tau_{emn} \text{ (kg/cm}^2\text{)}$	
	EY	EIY	EY	EIY
St37	1440	1660	831	956
St52	2160	2484	1247	1434

EY: Esas Yükler (YH1), Yapı zati ağırlığı, kaplama ağırlığı, kar yükü, vb
EIY: Esas İlave Yükler (YH2): Rüzgar, Deprem Yükleri

Örnek: 1cm çapındaki çelik çubuğun(St37) taşıyabileceği çekme kuvveti?
 $P_{emn} = (3.14 * 1^2 / 4) * 1440 = 1130.4 \text{ kg}$

BİRLEŞİM ELEMANLARI (BULON, PERÇİN)

- Kaba Bulon : $d=d_1-1\text{mm}$
- Uygun Bulon: $d=d_1$

d =bulon çapı

d_1 =delik çapı

Kullanılan bulonlar: M10, M12, M16, M20, M24, M26, M30

1 perçinin/bulonun taşıyabileceği kesme kuvveti

$$P_{1emn\tau} = m * (\pi d^2 / 4) * \tau_{a,emn}$$

m : kesme yüzeyi adedi
 $\tau_{a,emn}$: perçinin/bulonun kayma emniyet gerilmesi

1 perçinin/bulonun taşıyabileceği ezilme kuvveti

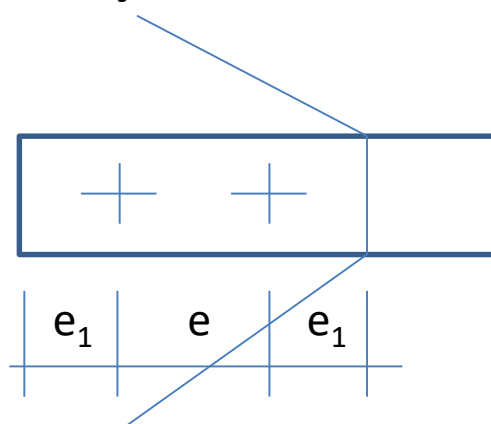
$$P_{1emn\sigma} = d * t_{min} * \sigma_{l,emn}$$

t_{min} : bulonun birleştirdiği elemanlardan min kalınlıkta olanı
 $\sigma_{l,emn}$: perçinin/bulonun kayma emniyet gerilmesi

BULON, PERÇİN EMNİYET GERİLMELERİ

	$\tau_{emn} \text{ (kg/cm}^2\text{)}$		$\sigma_{lemn} \text{ (kg/cm}^2\text{)}$	
	EY	EİY	EY	EİY
Perçin	1400	1600	2800	3200
Kaba	1120	1260	2400	2700
Uygun	1400	1600	2800	3200

Bulon/Perçin Aralıkları



$$e_{\min} = 3d_1 \quad d_1 = \text{delik çapı}$$

$$e_{1\min} = 2d_1$$

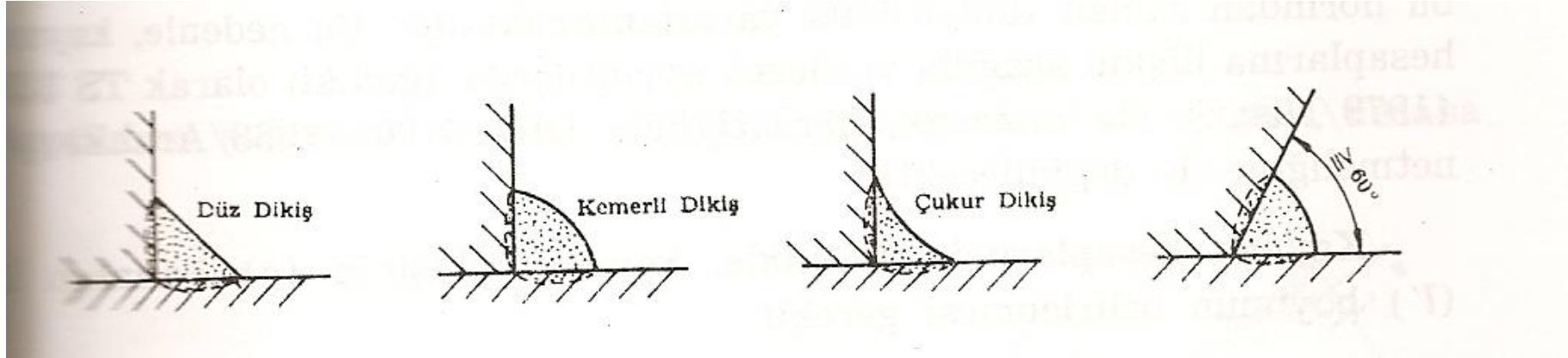
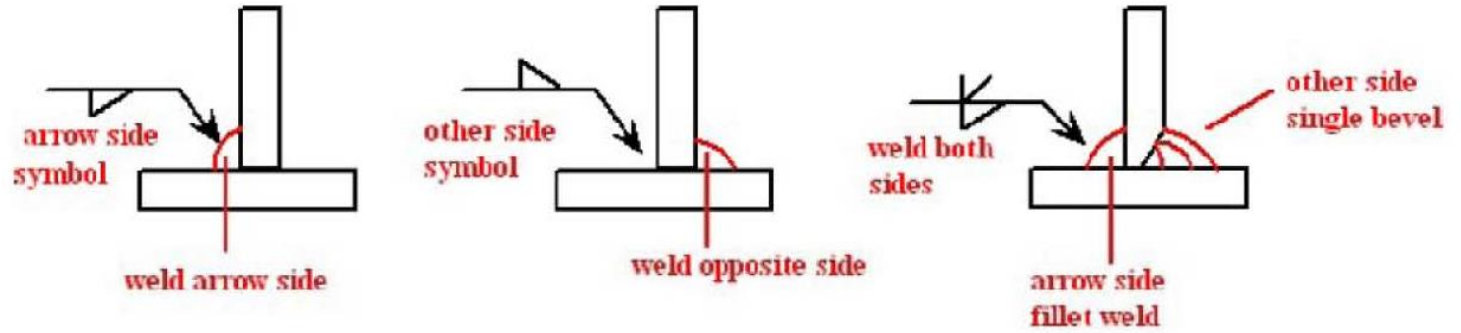
Örneğin M16 bulon için aralıklar:

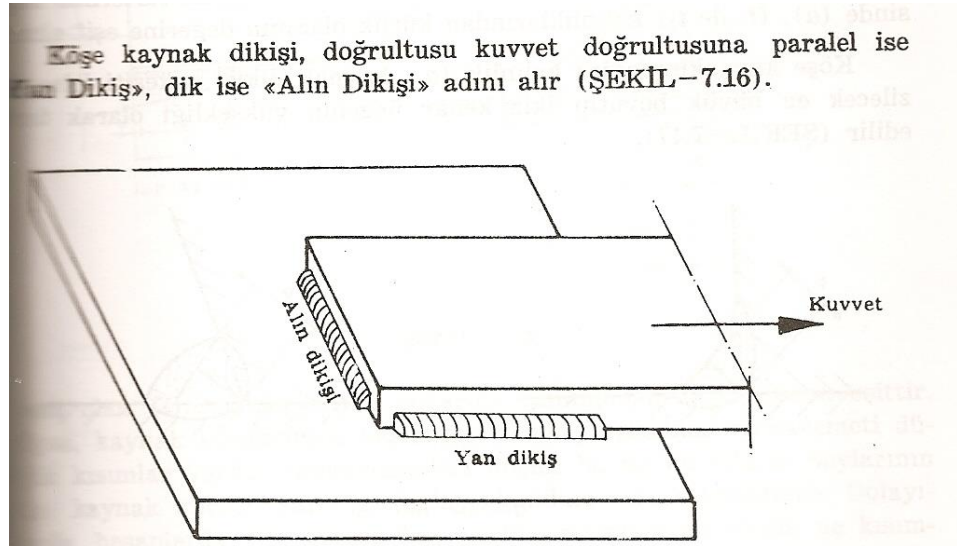
$$e_{\min} = 3 \cdot 17 = 51 \text{ mm (55 mm seçtik)}$$

$$e_{1\min} = 2 \cdot 17 = 34 \text{ mm (35 mm seçtik)}$$

NOT: aralıkları sonu **0 ya da 5** ile bitecek şekilde **minimuma en yakın** değerde seçebiliriz.

– Köşe Kaynakları





KÖŞE KAYNAK EMNİYET GERİLMELERİ

$$\tau_k = \frac{P}{a \cdot l} \leq \tau_{kem} =$$

1100 kg/cm² (YH1/EY)

1250 kg/cm² (YH2/EIY)

a: kaynak kalınlığı

l: kaynak hesap boyu

l': kaynak boyu

a_{min} = 3mm, a_{max} = 0.7t_{min}

l_{min} = 15a, l_{max} = 100a

$$l = l' - 2a$$

t_{min}: kaynağın birleştirdiği kalınlıklardan ince olanı