

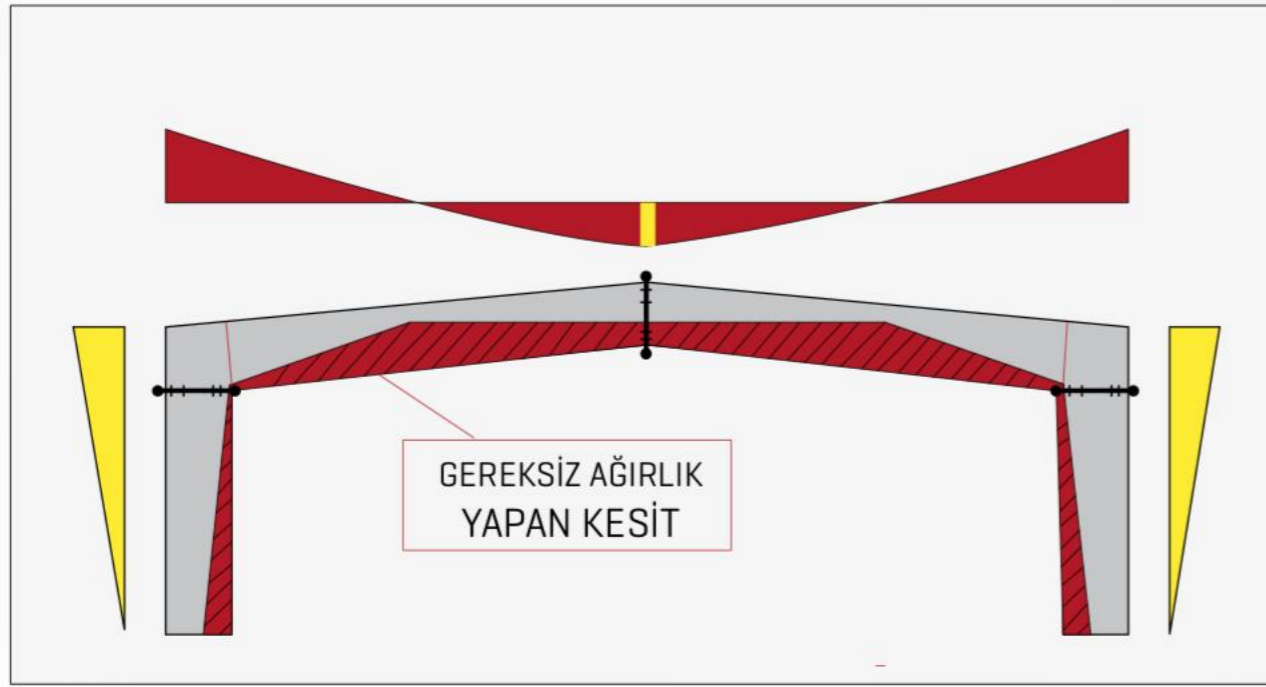


TOLAY
MÜHENDİSLİK VE İNŞAAT

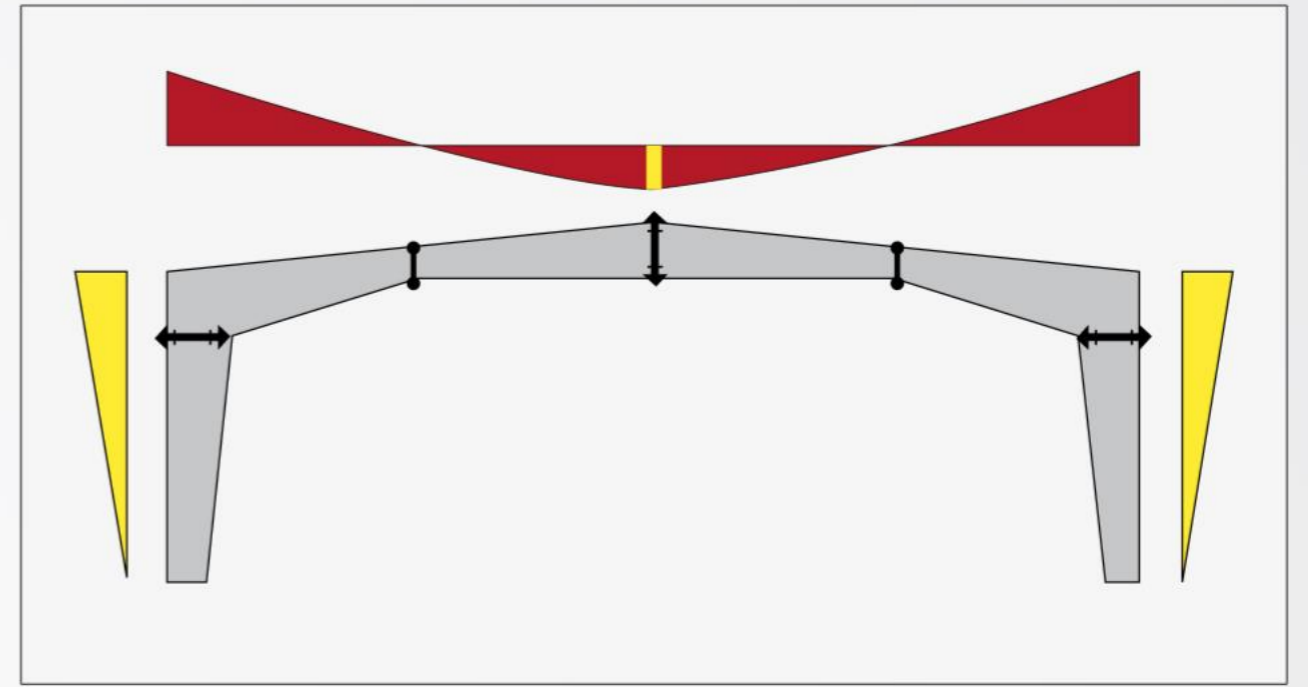


PRATİK EKONOMİK BİNALAR (PEB)
PRE-ENGINEERED METAL BUILDING (PEB)

İSTANBUL - 2019



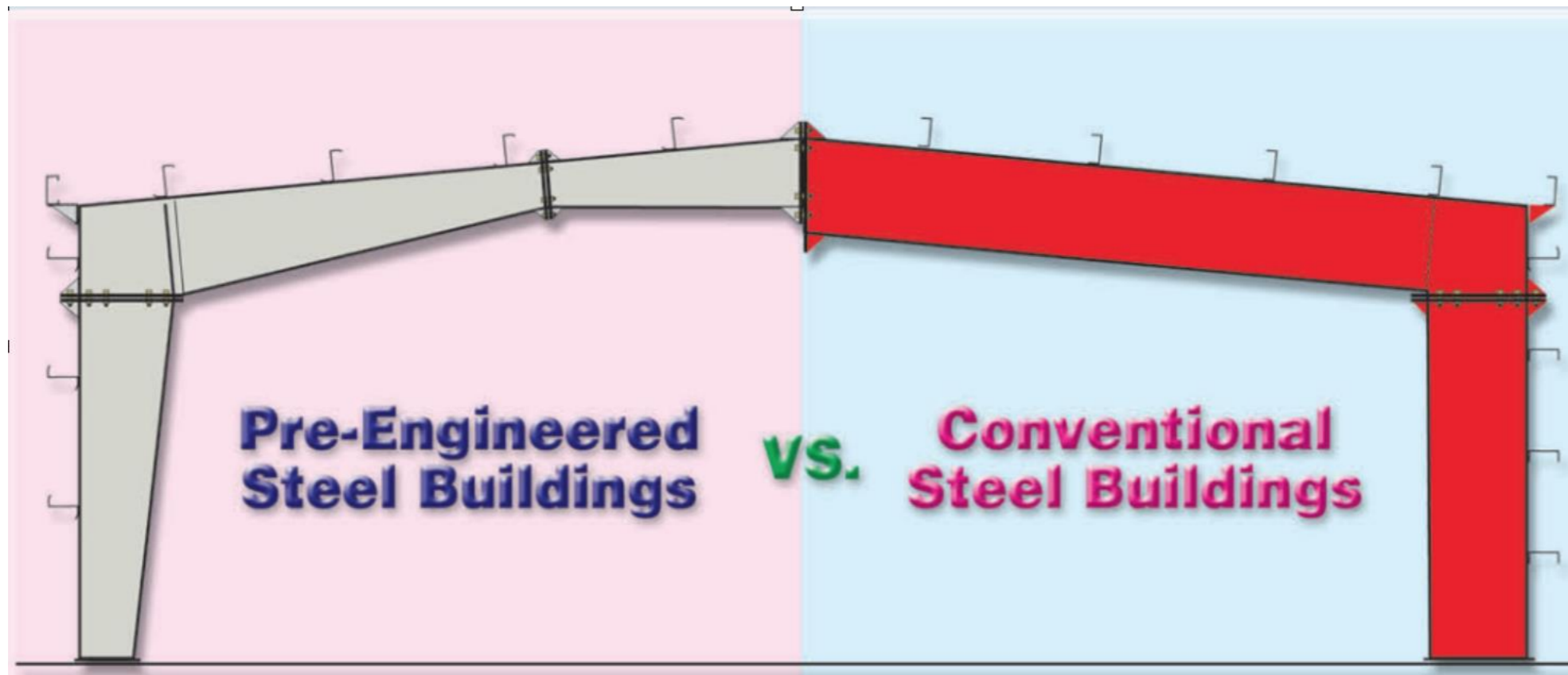
Konvansiyonel Çelik Çerçeve



Peb Çelik Çerçevesi

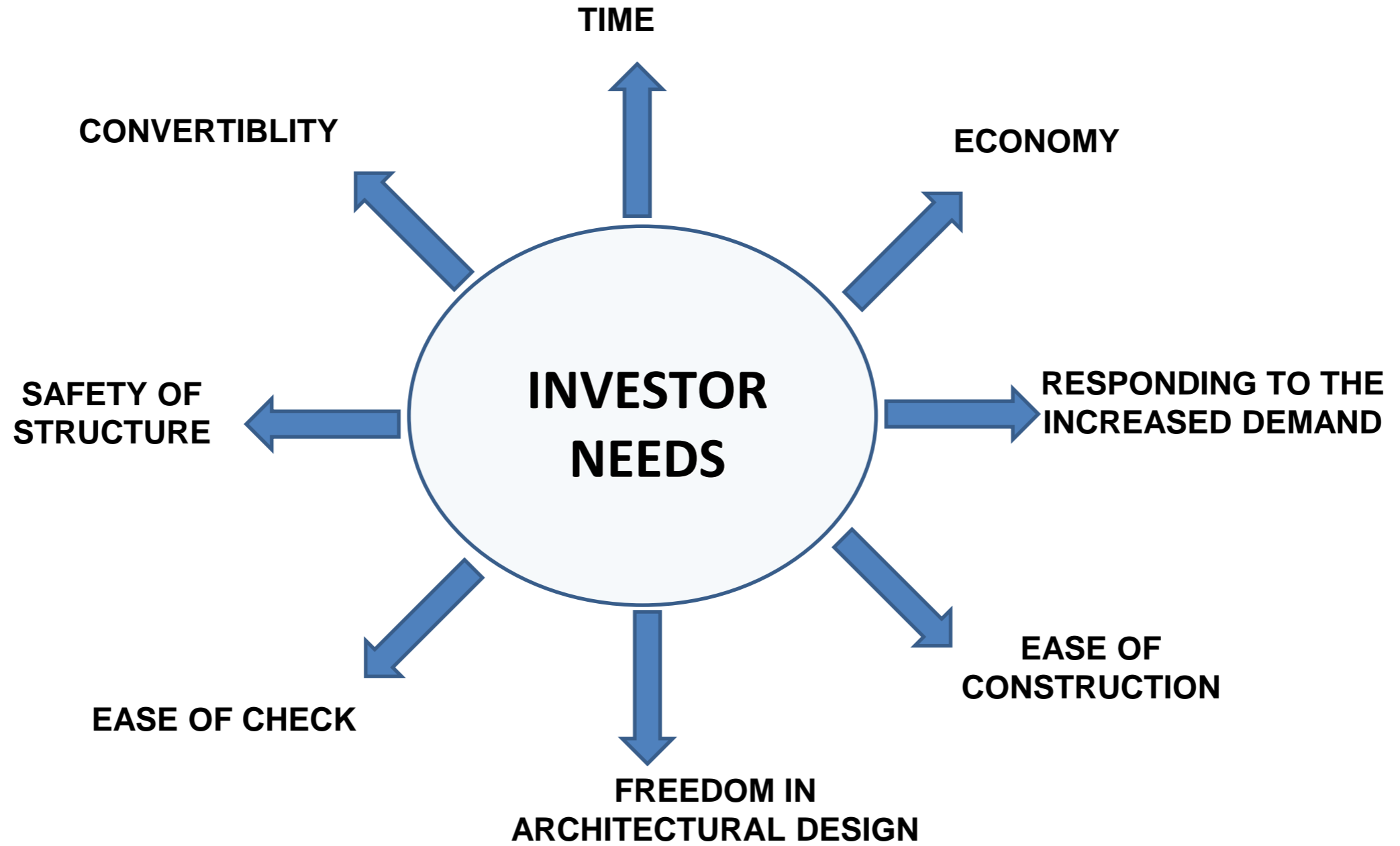
What is PEB?

- In today's conditions, demand for steel structures in market has increased significantly as determinants such as time, economy, storage and shelter, ease of installation and the safety of the building gained increasing significance. However, the expansion of steel buildings in international markets has been restrained because design rules of the conventional methods are not economic, design does not offer features to the structure and there is dependence on ready-made hot material elements.
- The recent developments in information technologies and engineering have brought modern solutions to improvement and building design, and as a result, a revolutionary PEB building design system has emerged.
- This revolutionary design system has made significant contributions to the fulfillment of the demand and increase in market share.



What is PEB?

- In conventional systems, although there are different stresses at each point of the frame of the forming structure, a single section is used to meet the maximum stress. This adds unnecessary weight to the structure, increases earthquake load in ratio to weight and cost and, decreases the elastic mobility of the structure.
- PEB systems have emerged to improve the disadvantages of the conventional system as mentioned above. PEB, based on the variability of stress accumulation in the system forming the structure, is a modern structure system that foresees the production of built-up section in combined sections in accordance to required capacity of the structure elements. The system reduces the weight of the structure and, with this, the structure becomes more elastic and economic and eliminates the dependency on ready profile.



STRUCTURAL SAFETY AND COMPARISON

Conventional Steel System

PEB System

Earthquake loads to the structure are increased in ratio because the structural total steel is heavy.

Earthquake loads to the structure are increased in ratio because the structural total steel is heavy.

Rotation effects in base design must be taken into consideration because basic joint points are rigid joints.

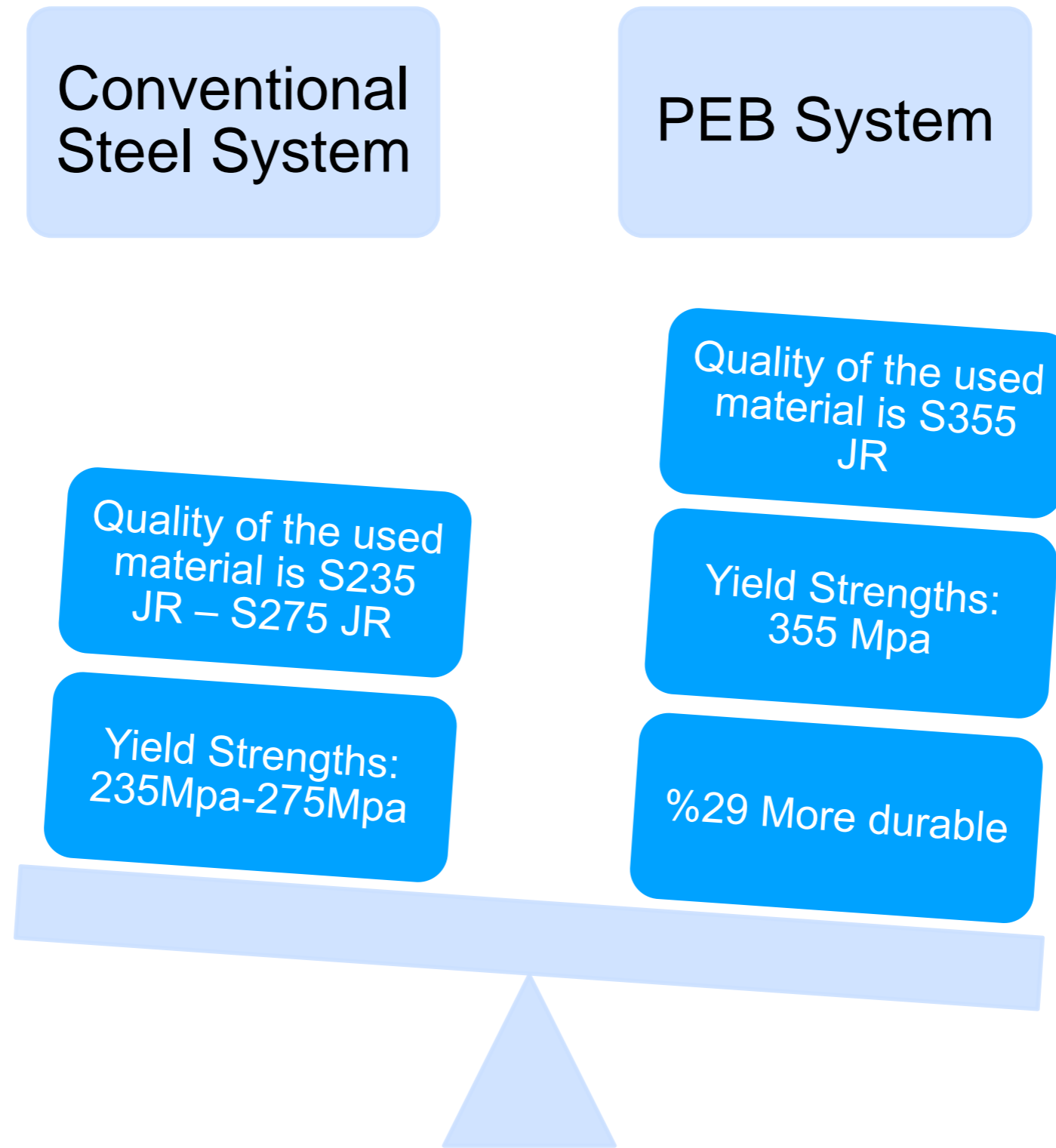
It is %30-%40 lighter than the conventional system, as a result earthquake loads to the structure are lesser in same ratio.

Decreases the tension on ground in ratio with the lightness of the PEB systems.

Rotation effects in base can be overlooked as the joint points are hinged. More economic base dimensions can be designed.

%30-%40 less cost

STRUCTURAL SAFETY AND COMPARISON



Conventional Steel System

PEB System

Quality of the used material is S235 JR – S275 JR

Yield Strengths: 235Mpa-275Mpa

Quality of the used material is S355 JR

Yield Strengths: 355 Mpa

%29 More durable

STRUCTURAL SAFETY AND COMPARISON

HADDE VE SOĞUK PROFİL TAŞIMA KAPASİTELERİNE ÖRNEK

Güvenli tasarım yapıyı ağırlaştırmakla olmaz, mühendislik kurallarına uygun tasarlamakla olur.

Z KESİT

Z20 Kesit Özellikleri [ST52 Çeliği İçin Emniyet Gerilmesi: 2,16 t/cm² dir.

$W_x=47,55 \text{ cm}^3$

$G=5,90 \text{ kg/m}$

$M_{max}=\sigma_{em} \times W_x = [2,16 \text{ t/cm}^2] \times [47,55 \text{ cm}^3]=102,71 \text{ tcm}$

UPE140

ST37 çeliği için emniyet gerilmesi 1,44 t/cm² dir.

$W_x=85,64 \text{ cm}^3$

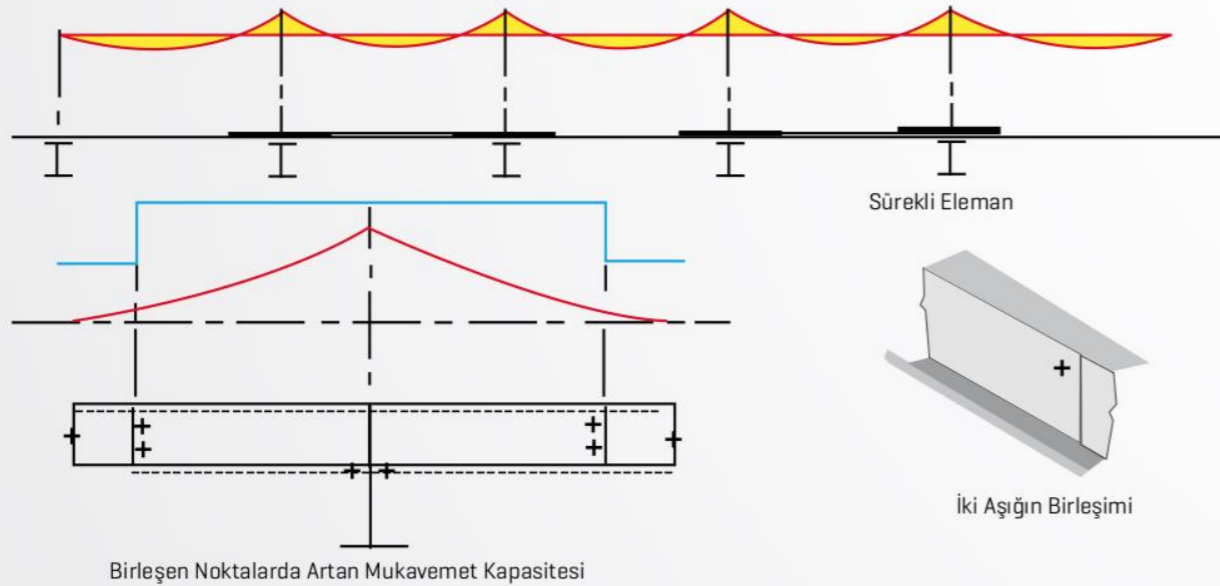
$G=14,5 \text{ kg/m}$

$M_{max}=\sigma_{em} \times W_x = [1,44 \text{ t/cm}^2] \times [85,64 \text{ cm}^3]=123,3 \text{ tcm}$

100tcm bir momenti taşımak için kullanılan hadde ve soğuk form profil arasındaki ağırlık farkları

$UPE 140 = 14.5 \text{ kg} / Z20 = 5.90 \text{ kg}$ arasındaki fark=2.46 kat

Örnek 2



Şekilde görüldüğü gibi Z profiller çerçeve üzerine ek gelen yerlerde birbiri içine sokulup bulon vasıtası ile birleştirilmekte ve çerçeveye klipleri ile sabitlenmektedir. Ayrıca flanş destekleri kullanılarak mesnet daha da rijitleştirilip, mesnetlerin moment alması ve süreklilik sağlanmakta, en elverişsiz olan orta bölgedeki moment değerleri daha makul sınırlara inmektedir.

Conventional Steel System

PEB System

Tolerance is only increased in necessary point because only two elements are used in design connection point.

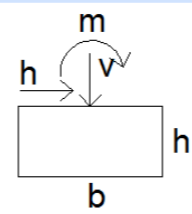
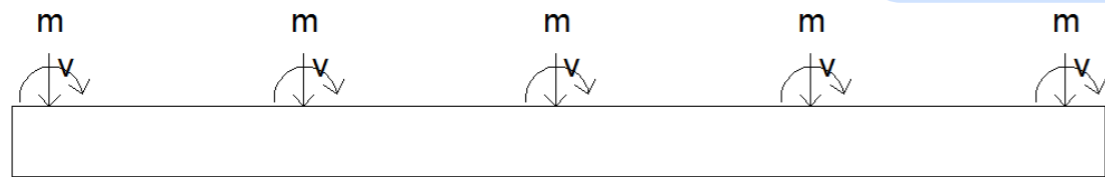
The design is made in accordance to used material because support area continuity is provided by fasteners in Secondary Steel (Purlin-Girt).

In total, %40 lesser material is used.

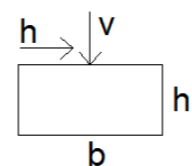
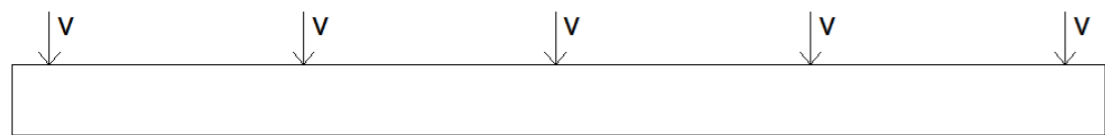
STRUCTURAL SAFETY AND COMPARISON

Conventional Steel System

PEB System



KONVANSİYONEL

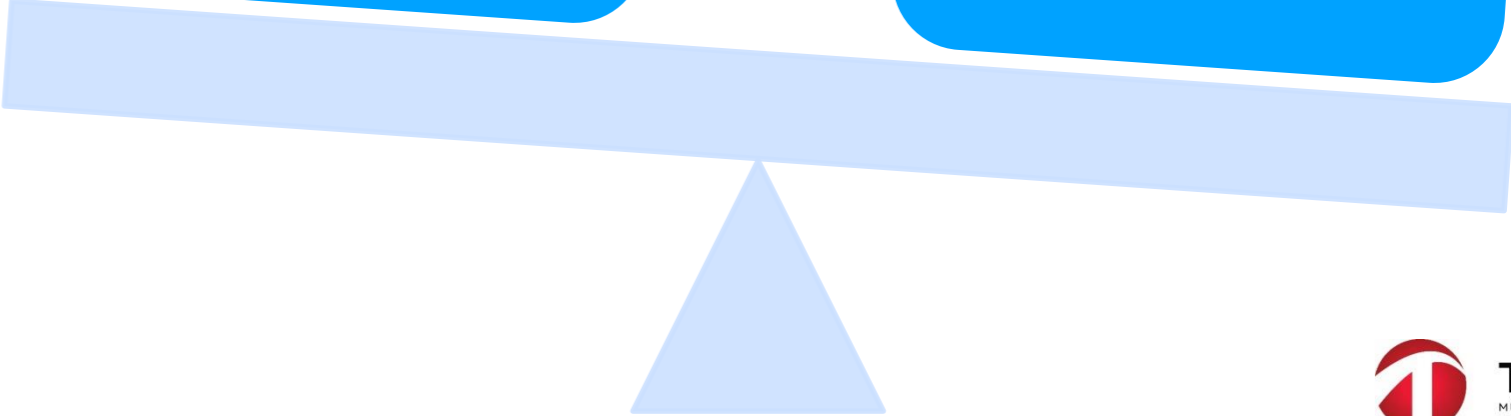


PEB

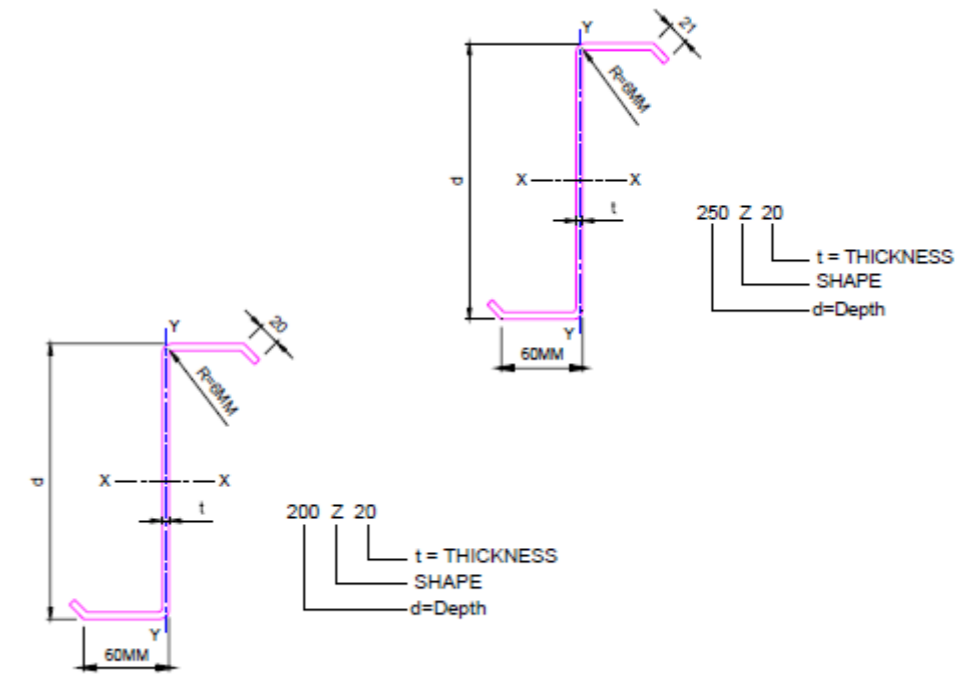
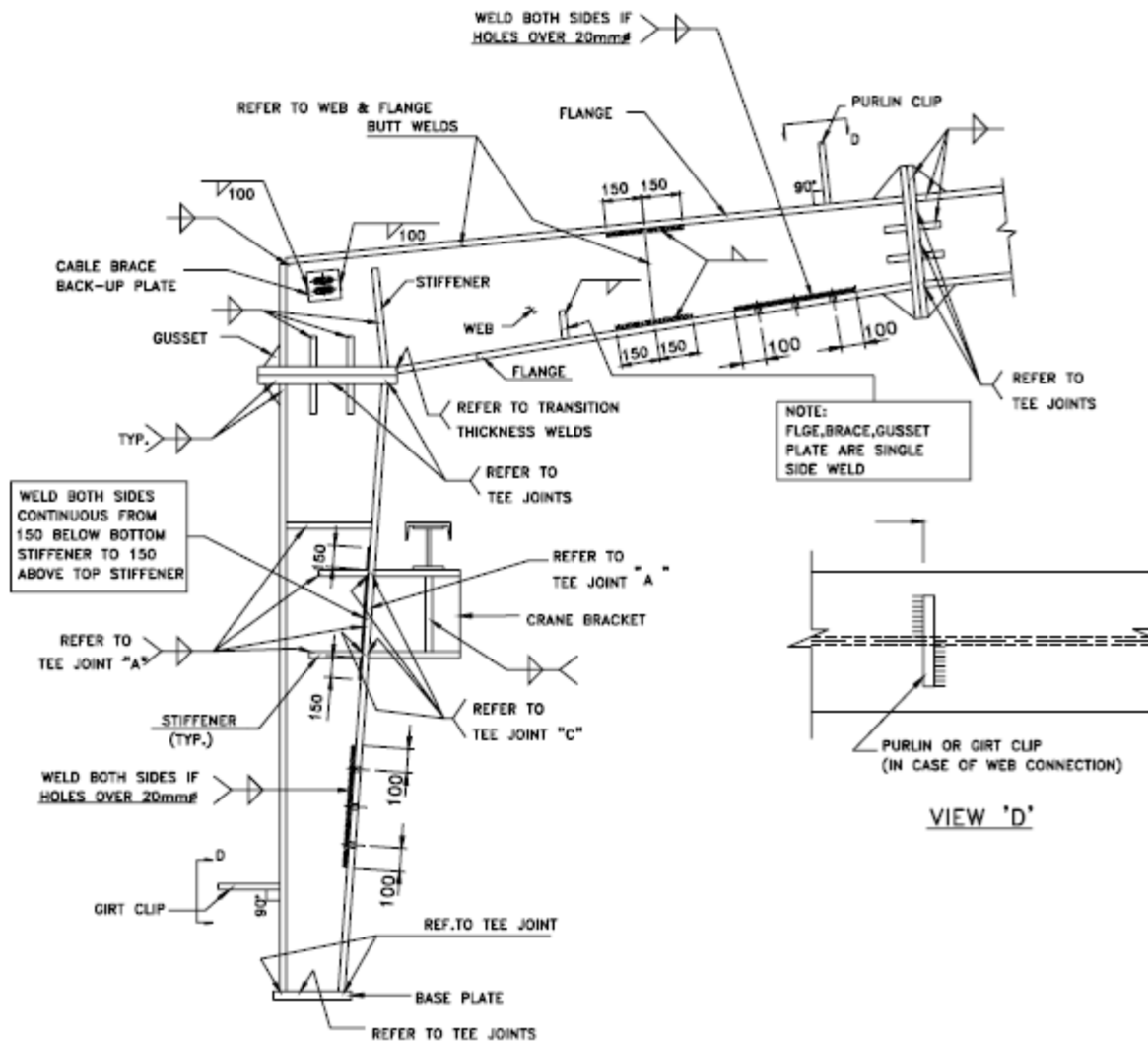
Rotation effects are not taken into consideration as the base connection points are hinged. Much more economic base dimension lead to the solution.

Base dimensions are designed larger because rotation effects in base design are taken into considerations.

An base dimensions, in dig amount, it provides up to %50 savings to the ratio of soil tension.



MAIN COMPONENTS OF THE PEB SYSTEM



PRIMARY STEEL (BUILT UP SECTIONS)

THE WHOLE STEEL FRAME SYSTEM IS FORMED BY VARIABLE AND PSEUDO SECTION MATERIALS.

MAIN SYSTEM MATERIAL QUALITY IS S355JR (ST.52) STEEL. AS A RESULT OF QUALITY MATERIAL, TOTAL OF %50 WEIGHT REDUCTION IS GAINED AS IN ENDURANCE AND IN MATERIAL QUANTITY. AS A RESULT OF QUALITY MATERIAL, TOTAL OF %50 WEIGHT REDUCTION IS GAINED AS IN ENDURANCE AND IN MATERIAL QUANTITY..

SECONDARY STEEL (SECONDARY MEMBERS)

COLD-DORMED MATERIALS ARE USED FOR THE PURLIN AND GIRT ELEMENTS. MATERIAL THICKNESS CHANGES IN BETWEEN 2mm and 4MM. THE HEIGHTS OF PURLIN AND GIRT ELEMENTS VARY AS 200mm and 300mm. %32 WEIGHT REDUCTION IS GAINED AS THE SECONDARY MEMBERS ARE COLD-FORMED.

DESIGN CODES AND STANDARDS

Design Codes

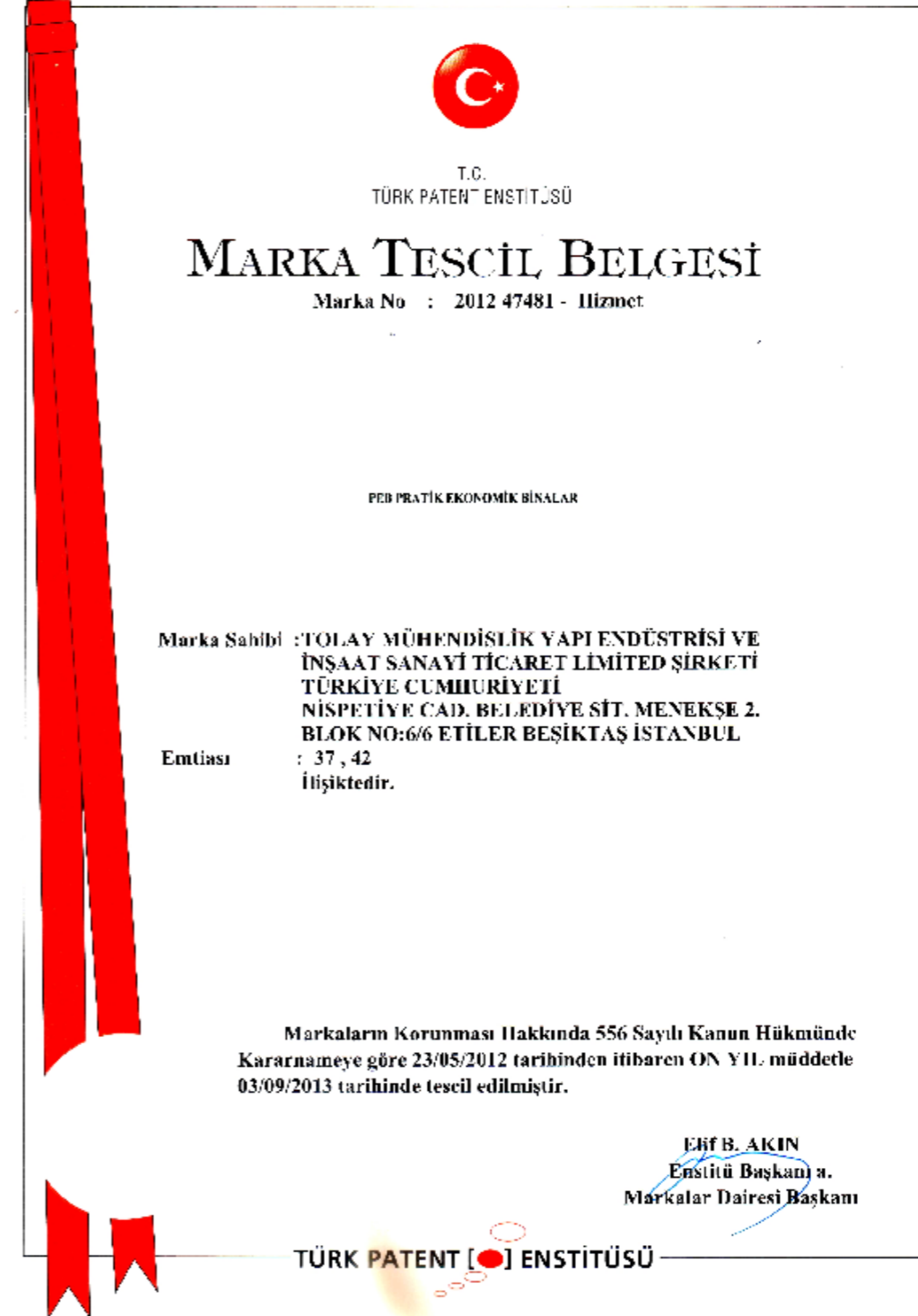
- ➔ TDY Türk Deprem Yönetmeliği – T.C. Çevre ve Şehircilik Bakanlığı
- ➔ MSC Manual of Steel Cons. - American Institute of Steel Construction, Inc. **(AISC)**
- ➔ CFSD Cold Formed Steel Design Manual - American Iron and Steel Institute **(AISI)**
- ➔ AWCSM American Welding Code Steel Manual – American Welding Society **(AWS)**

Standards

- ➔ UBC Uniform Building Code - International Building Code, Inc. **(IBC)**
- ➔ MBSM Metal Building Systems Manual – Metal Building Manufacturers Association, Inc. **(MBMA)**
- ➔ TS498 Yapı Elemanlarının Boyut. Alınacak Yüklerin Hesap Değ. – Türk Standartları Enstitüsü **(TSE)**
- ➔ TS648 Çelik Yapıların Hesap ve Yapım Kuralları - Türk Standartları Enstitüsü **(TSE)**



BRAND AND QUALITY CERTIFICATES



FİRMAMIZ PEB (PRATİK EKONOMİK BİNALAR) ADINDA
2013 YILINDA SİSTEM İLE İLGİLİ PATENT ALMIŞTIR.

PROJECT REFERENCES



PINALDI
ŞANLIURFA
TÜRKİYE

PROJECT REFERENCES



GIAD LLC

HARTUM
SUDAN

PROJECT REFERENCES



NCF LLC
SALALAH
UMMAN

PROJECT REFERENCES



OLAM LLC

AKRA
GANA

PROJECT REFERENCES



TAVANBOGD

**DARKHAN
MOĞOLİSTAN**

PROJECT REFERENCES



UFRA
TÜRKMENBAŞI
TÜRKMENİSTAN

PROJECT REFERENCES



AVCI TEK.

ADIYAMAN
TÜRKİYE

PROJECT REFERENCES



TAVANNUUR

DARKHAN
MOĞOLİSTAN

PROJECT REFERENCES



FAYCIM
TURKMENBAŞI
TÜRKMENİSTAN

EXAMPLES OF LOADING AND ASSEMBLY



QUALITY CONTROL

KAYNAK YÖNTEM ŞARTNAMESİ (KYS)		WELDING PROCEDURE SPECIFICATION (WPS)																															
İmalatçı KYS / Manufacturer's WPS No	KMWP5-24	Bağlama ve Kaynak Tipi / Joint and Weld Type	İP39 Makina - Kırp Kesim																														
İmalatçı KYSK / Manufacturer's WPSK No	KMWPQR-01	Makine Kalınlığı / Material Thickness	3.2-5 mm ağız																														
İmalatçı / Manufacturer	KÜNYE METAL	Birer Üst Çapı / Outside Pipe Diameter	114.3 mm																														
Makine Standartı ve Kaliteli / Current material standard and qualification	TS EN ISO 14343	Kaynak ağız hazırlama metodu / Method of joint preparation	Tan Makine - Tef. Façe																														
Makine Grubu / Material group	1.2.1.2	Saldırıma mensuk / Method of joint	Pahtalama Kaynağı																														
Kaynak Yöntemi / Welding Process	İS (GMAW)	Kaynak pozisyonu / Welding Position	PA																														
Design mühendisi / Design Engineer	MSKAYNAR-002	Soğutma hızı / Cooling rate	150000																														
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Bağlama Üzayını / Joint Design																																	
Kaynak Soruları / Welding Questions																																	
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KÜNYE METAL	20.09.2018	[Signature]																															

KAYNAK GÖZLE MUAYENE FORMU		WELDING VISUAL INSPECTION REPORT	
İMALATÇI / MANUFACTURER	Künye Metal Gem. Mak. İnş. Nak. San. Tic. Ltd. Şti		
PARÇA NO / PART NO NO	13.PB.04.30K (KM-WPQR02) t 30 mm		
MALZEME / MATERIAL	1.2 - 1.2		
TEST STANDARDI / TEST STANDARD	ISO 17637		
TARİH VE YER / DATE AND PLACE	Gebze / KOCAELİ -30.04.2013		
KAYNAK ÖNCESİ / PRIOR WELDING	ÖLÇÜ DIAMETER	400 mm.	KAYNAK NO WELD NO 13.PB.04.30K
Kesim Hatası / Cutting Defect	<input checked="" type="checkbox"/> Yok / No <input type="checkbox"/> Var / Yes		
Kaynak Ağız / Weld Bevel	<input checked="" type="checkbox"/> Uygun / Accepted <input type="checkbox"/> Uygun değil / Not Accepted		
Kaynak Aralığı / Thickness Range	<input checked="" type="checkbox"/> Uygun / Accepted <input type="checkbox"/> Uygun değil / Not Accepted		
Kaynak İşlemi / Welding Process	<input type="checkbox"/> Elektrod / SMAW <input type="checkbox"/> GTAW / TIG <input checked="" type="checkbox"/> Gaz altı / GMAW <input type="checkbox"/> Tozaltı / SAW <input type="checkbox"/> Argon+ Elektrod / GTAW-SMAW <input type="checkbox"/> Elektrod + Tozaltı / SMAW-SAW <input type="checkbox"/> Argon+Tozaltı / GTAW-SAW <input type="checkbox"/> Gazaltı + Tozaltı / GMAW-SAW <input type="checkbox"/> Diğer / Other		
WPS No	KM-WPQR-03 / 04		
WPQR No	KM-WPQR 02		
Kaynak Pasoları / Welding Passes	Kaynak Malzemesi / Welding Material	Tipi / Type	Kaynakçı No / Welder's No
Kök Pasarı / Root Metal	<input type="checkbox"/> Elektrod / Electrode <input checked="" type="checkbox"/> Wire/Tel	SG 2	Yasin ESEN
Doğru Pasoları / Filler Metal	<input type="checkbox"/> Elektrod / Electrode <input checked="" type="checkbox"/> Wire/Tel	SG 2	
Kapak Pasosu / Cover Metal	<input type="checkbox"/> Elektrod / Electrode <input checked="" type="checkbox"/> Wire/Tel	SG 2	
KAYNAK SONRASI / AFTER WELDING			
Kaynak Temizliği / Weld Cleaning	<input checked="" type="checkbox"/> Uygun / Accepted <input type="checkbox"/> Uygun Değil / Not Accepted		
Kaynak Düzgünlüğü / Weld appearance	<input checked="" type="checkbox"/> Uygun / Accepted <input type="checkbox"/> Uygun Değil / Not Accepted		
Yanma Olukları / Undercuts	<input checked="" type="checkbox"/> Yok / No <input type="checkbox"/> Var / Yes		
Gözenek-Curuf kalıntısı / Porosity-Slag Inc.	<input checked="" type="checkbox"/> Yok / No <input type="checkbox"/> Var / Yes		
GÖRÜŞLER / REMARKS			
PF ve PC pozisyonlarında yapılan kaynakçı parçaların, kaynak ve haz bölgesinde TS EN ISO 5817 Class B ve C 'ye göre yapılan muayenede her hangi bir sursuzluğa rastlanmamıştır. Sonuç: UYGUN 'dur.			
Muayeneyi Yapan / Inspector By	Onay / Approval By		
NAME/ADI	Turan ÇANACIK	NAME/ADI	S Bülent YILMAZ
DATE/TARİH	30.04.2013	DATE/TARİH	30.04.2013
SİGİNİMZA	[Signature]	SİGİNİMZA	[Signature]

Boya Muayene Raporu		Paint Examination Report	
FORM NO / KNY-FR-16	REV.00	Sayfa / Page	01
Proje No / Project no	226	Rapor no / Report no	SA-RPR-01
Proje Adı / Project Name	KAHTA DEPO		
POZ No / Post No	37 (72 ADET) / 38/39/40/41/42/43/44/45/46/47 (2 ADY)48 (2 ADY)49 (2 ADY)50(2AD) 51/52 (3AD)53 (2AD)54/55/52 (5 ADY)93 (3 ADY)95 (3 ADY)96 (8 ADY) 97 (3 ADY)98 (3 ADY)99 (2ADY)100 (2 ADY)101 (2 ADY)102 (2 ADY)103 (2ADY)104 (2 ADY) 105 (2 ADY) / 106 (2 ADY)107 (2 ADY)144 /145/146/147/148/149/150/151/152/153/154	Revizyon no / Rev. No	01
YAPISAL ÇELİK İMALAT VE MONTAJ TEKNİK ŞARTNAMESİ			
Yüzey Hazırlığı / Surface preparation	KUMLAMA / Surface quality	Sa2 1/2	Pürüzlülük Ölçüm Metodu / Roughness measuring method
Boya sistemi spesifikasyonu / Paint system specifications	Tarih-Saat / Date-Time	Ortam Şartları / Conditions	Ölçümler / Measurements
1. Kat / 1st coat			
Boya Tipi / Paint type	MUKI EPOKSI SHOPPRIMER	Ortam Sic. / Temp.	15
Ticari Adı / Trade name	JOTUN	Yüzey Sic. / Surface	14
Tiner Malz / Thinner mat.	JOTUN TİNER	Nem Oranı / Humidity	%50
Kuru Film Kalınlığı / DFT	25	Çiğl. Sic. / Dew Point	10°C
2. Kat / 2nd coat		Ortalama / Average	25
Boya Tipi / Paint type	CORROGUARD RAL 7016	Ortam Sic. / Temp.	15
Ticari Adı / Trade name	JOTUN	Yüzey Sic. / Surface	14
Tiner Malz / Thinner mat.	TİNER	Nem Oranı / Humidity	%50
Kuru Film Kalınlığı / DFT	100	Çiğl. Sic. / Dew Point	10°C
Ortalama / Average			140
3. Kat / 3rd coat		Ortam Sic. / Temp.	
Boya Tipi / Paint type		Yüzey Sic. / Surface	
Ticari Adı / Trade name		Nem Oranı / Humidity	
Tiner Malz / Thinner mat.		Çiğl. Sic. / Dew Point	
Ortalama / Average			
4. Kat / 4th coat		Ortam Sic. / Temp.	
Boya Tipi / Paint type		Yüzey Sic. / Surface	
Ticari Adı / Trade name		Nem Oranı / Humidity	
Tiner Malz / Thinner mat.		Çiğl. Sic. / Dew Point	
Ortalama / Average			

The entire production stage is controlled and reported by 3rd Party Companies (Türk Loydu - PGM - TUV SUD).

- Materials Certificates - Malzeme Sertifikaları - Mill's Certificate
- Materials Act of Acceptance Reports - Malzeme Giriş ve Kontrol Raporları
- CE Label - CE Etiket
- WPS - Welding Procedure Specifications - Kaynak Prosedür Şartnamesi
- WPQR - Welding Procedure Qualification Record - Kaynak Yöntem Testi Onay Raporu
- Welder Certificates - Kaynakçı Sertifikaları
- Welding Visual Inspection Report - Kaynak Gözlemsel Muayene Raporu
- NDT (Non-Destruction Test) - Hasarsız Muayene Raporları
- Paint Examination Report - Boya Muayene Raporu
- Calibration Reports - Kalibrasyon Raporları

TÜRK LOYDU		BELGE	
CERTIFICATE			
Belge No / Certificate No : 07746-18			
TL No: 10396			
Türk Loydu hereby certifies that,			
KÜNYE METAL GEMİCİLİK MAKİNA İNŞAAT NAKLİYE SAN. TİC. LTD. ŞTİ.			
Şeker Pınar Mah. Beste Sk. No:16 Çayırova KOCAELİ			
firmasında Türk Loydu tarafından gerçekleştirilen denetim sonucunda			
ISO 3834-2:2005			
kaynak için kalite şartlarını sağlayan kalite sisteminin tarif edilen geçerlilik alanı* için has implemented and operates a quality system satisfying the quality requirements for welding for the defined scope of activity*			
İlgili standart gereklerine uygun olarak kurulmuş ve işletilmekte olduğu belgelenmiştir. in compliance with the requirements of the quality standard mentioned above by an audit performed by Türk Loydu.			
Bu belge hakkında her türlü bilgiyi +90 216 581 37 00 no.lu telefondan teyit edebilirsiniz. All kind of information about this certificate can be confirmed from the phone no. +90 216 581 37 00			
Bu belge belge geçerlilik süresince gerçekleştirilecek periyodik denetimler sonucunda sistemin başarılı bulunması şartı ile aşağıda belirtilen belge geçerlilik tarihine kadar geçerlidir. This certificate is valid until the date of certificate expires only provided that the system is found successful as a result of periodic audits			
Belgelendirme tarihi / Date of certification		: 18.11.2018	
Belge geçerlilik tarihi / Date of certificate expiry		: 18.11.2021	
Hasan MÜFTÜOĞLU Ürün Belgelendirme Komitesi Başkanı Head of Product Certification Committee		Murat DEVRİZ Teknik Yönetici Technical Manager	
* Arka sayfaya bakınız. See back page			
TÜRK LOYDU - Tersaneler Cad. No.26 - 34944 Tuzla/İstanbul - Tel: 9216 581 37 00 - e-mail: tl@turkloydu.com.tr			

THANK YOU