


KHANSAR

Pre-tension Industries Co.

www.kh-pti.com

About Company:

Khansar Pre-tension Ind. Co.is the only manufacturerof prestressed steel wires andstrandsandaccessoriessupplierin the form ofdomestic productionandimports in Iranandis one ofthe leaders of this industryinthe Middle East.The companywas launchedin 2001 and with a focus ontoday's science andtechnology,continued itsresearchactivities inthe specialtyfield ofprestressed steelwireand strandproductionforpre-stressed concrete. In these years, the evolution which occurred in the concrete and construction industry considering the demand for these products, also domestic and foreign customers' interest in high quality, reasonable price, conformity with international standards, short delivery time and customer satisfaction, made us to gain dramatic achievements and optimal capacity to meet the specific needs of our consumers to increase the diversity of products and also production from 10,000 tons per year to more than 40,000 tons per year and by looking at the horizon, consistently tryto achieve the following goals:

- Customer andclientsatisfactionby improvingproductionefficiency, costreductionandcustomer-orientedprinciples
- Specialistand dedicatedhuman resources, and up to datetraining system in orderto increase theefficiency of thepersonnel.
- providehighquality raw materialsfor productionfromJapaneseNippon SteelandSouthKorean(Posco-KISWIRE)companies.
- Factory equipment withmodern, exclusiveandreferencelaboratories approvedby standards organizationof Iran.
- Regular contact withleading prestressingindustryexpertsinIranand a broad.
- OwningmodernproductionequipmentfromBritain, GermanyandItaly.
- Obtainingrequiredapprovalsintheprestressingindustryfrom prestigious domestic and international institutions.
- Obtaining representationof theSouth KoreanKiswire Company,one ofthe worldleadersinthe production ofPC Strands.

KHANSAR PRE-TENSION INDUSTRIES CO.

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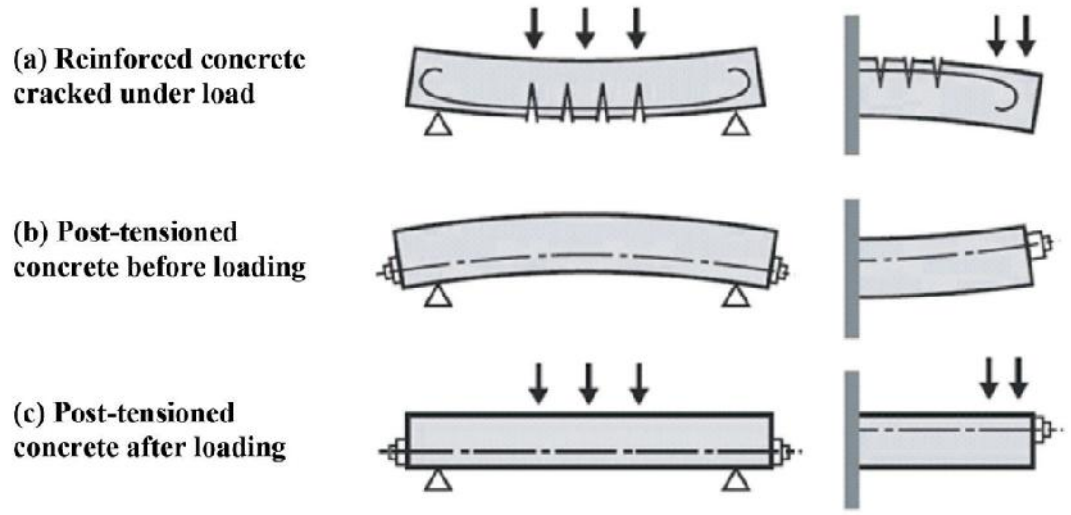
What is prestressing?

Concrete is amongst durable construction materials with high compressive strength and good ductility, but is weak and brittle against tensile forces. Concretes tensile strength is less than 0.1 of its compressive strength; also the concrete member, shows very low deformation before failure under tensile force, indicating the poor performance of concrete against tensile forces.

Using longitudinal reinforcement in concrete members and benefiting from the tensile strength of steel, the tensile behavior of concrete members is improved and instead of failure upon crack initiation in the member, the reinforcement crossing the cracks until now, it is capable of bearing but the points under stress due to cracking practically lose their performance, only supporting the reinforcement and contributing to structure weight without bearing.

Prestressing technology can be used to increase concrete member's resistance against applied loads. Prestressing includes applying permanent compressive stress in concrete members, before applying the operation loads and to the extent that reduces or eliminates tensile stresses and cracks resulting from bending moment due to applied forces in the member and thus The maximum capacity of the concrete section is used and the dimensions of concrete members decreases.

To create a compressive stress in concrete members, high strength PC wire and PC strand is used; so that the Pre-stressed steel wire or cable is drawn before applying external load and is restrained on both sides of the concrete member. Stretching in the steel wire or strand pre-compresses the concrete around it and causes the concrete member to bear a greater load before cracking.



Khansar Pre-tension Industries Company history

1999 to 2001, factory construction on a 45000 m2 field with more than 14000 m2 Infrastructure
2001, setting up Production Line of ACSR cables
2002, setting up acid pickling and cold drawing line
Since 2003, startup of PC wire line for production of pre-stressed wires with different sizes in two types round & ribbed, purchase and Installation of 40 ton tensile test machine for tensile testing of wire rods, wire, PC wire, PC strand and also purchase and Installation of two 10 ton relaxation test units for relaxation test on produced PC wires.
2005, launch of second cold drawing line
2006, startup of PC strand (bonded) cables Production Line including knitting and relaxation, purchase and Installation of 60 ton tensile test unit for tensile testing of PC strands and two 40 ton relaxation units for PC strands relaxation tests
2007, Production Line of PC wires
2008, startup of two galvanized Sheath production Lines
2009, startup of polyethylene Sheath (HDPE) production Line
2010, startup of unbonded pre-stressed cables production Line
2011, received ISO IEC 17025 certificate from The National Accreditation Center of Iran (NACI) as a reference laboratory for testing pre-stressed steel wires and strands

Pretensioning History

Jackson was the first person who successfully increased tensile strength in concrete structures using compressive tension; this invention was patented in 1886. Afterwards, in 1888, Dühring produced first pre-stressed concrete slabs by putting a tensioned steel bar inside a pre-stressed concrete slab.

At the beginning of the twentieth century, a French engineer named Yu-Jin Frisian invented pre-stressed concrete technique by using High strength steel, which is being used nowadays. He suggested using high strength steel and concrete to reduce creeping and shrinkage in concrete and to create high levels of prestressing.

In 1936, in an exhibition on pre-stressed concrete in London, by conducting internal pressure to a full of water pre-stressed concrete pipe, Frisian showed that the pipe is able to undergo pressures 10 times higher than same concrete pipe made from best quality reinforced concrete. After that, pre-stressed concrete was commonly used in Europe and North America; As until 1951 that first pre-stressed concrete conference was held at America, approximately 175 bridges and 50 structural frames in Europe and about 700 water reservoirs in North America were constructed using pre-stressed concrete. Afterwards, pre-stressed concrete was commonly used all over the world.

Seied Khandan (Tehran) bridge under Construction by using pre-stressed steel cables to join the prefabricated pieces
(Date of construction: 1973)

What is prestressing?

In this method to provide adhesion between the pre-tensioned steel cables and concrete, cables are passed through Galvanized or PE sheath and end to a final restraint. These sheaths are installed in the appropriate place on the form, after concreting and sufficient setting of the concrete, steel cable pulling operation and grouting the sheaths is done. Thus providing the necessary adhesion between the steel and the concrete around the cable, more protection against corrosion of steel cable is provided. Treads on the sheath wall are designed to create a suitable conflict with concrete. Thus, the required link is created between the cable and concrete. This system is mostly used in cases that require a large force for prestressing, such as prestressed beams and bridges, residential projects roof slabs and parkings and prestressed foundations.

Unbonded system

In this system the steel cable has no link with the adjacent concrete along its length and compressive force is transmitted to the concrete through end anchors. In this method, each coated steel cable is completely greased and separated into a plastic sheath made of dense polyethylene and thus while protecting the cable against corrosion, by reducing friction, free movement of steel in concrete cable is provided. Each coated steel cable, kept separately and directly by an anchor, is placed under tension.

The unbonded method is mostly used when concrete members are thick.

For pre-stressing construction slabs and ground slabs, this method is used.

Prestressing Methods

Application of pre-stressed concrete is conducted in two different ways. If steel cables are tensioned before concrete curing, this method is called pre-stressing by pre-tensioning, and if steel cables are tensioned after concrete curing the method is called pre-stressing by post-tensioning. There are two systems for post-tensioned method as well; if sufficient bonding is available between steel cables and surrounding concrete, the system is "bonded" and if not, it is "un-bonded".

1.Pre-tensioning Method

In this method, cable tensioning is done before concrete curing. First, cables are tensioned between to ends fitted in the hydraulic jacks on prefabricated substrates, and then concrete is poured. When concrete gains enough strength to undergo the pre-stressing pressure, jacks are released. Thus, the tensile force in the cables is transferred compressively to the concrete. This pre-stressed concrete member is cut to required sizes and transferred to the workshop. This method is commonly used for constructing precast structures like slabs, beams & joists, railroad sleepers and high-pressure water pipes.




2.Post-tensioning Method

In this method cables are tensioned after concrete curing, when concrete strength reaches the required amount, and there is no need for any firm bearing in tensioning. When a prestressed member needs post tensioning, it is necessary to avoid bonding between post-tensioned steel to the concrete before applying the tension. In post-tensioning method, "bonded" and "unbonded" systems are utilized.

PC wire

Wires produced at Khansar Pre-tension Ind. Co. are highly stretchable, have low relaxation and are in accordance with international standards ASTMA421, EN10138 & BS5896. This product is manufactured in different sizes and with mechanical properties based on costumers needs from 4 to 10 mm diameter in flat or ribbed shape.
PC wires are also used in high-pressure water concrete tubes, railway concrete traverses, power transmission concrete beams, prestressed beams etc.

BS 5896

Nominal Diameter	Nominal Tensile Strength	Nominal Steel Area	Nominal Mass	Breaking Load	0.1% Proof Load	Load at 1%Elon gation	Min Elongation at Max Load	Max %Relaxation After1,000hrs From 60% Initial Load	70% Initial Load	80% Initial Load
mm	N/mm^2	mm^2	g/m	KN	KN	KN	%			
4	1,670	12.6	98.9	21.0	17.5	17.9	3.5	1.0	2.5	4.5
	1,770	12.6	98.9	22.3	18.5	19.0	3.5	1.0	2.5	4.5
4.5	1,620	15.9	125	25.8	21.4	21.9	3.5	1.0	2.5	4.5
5	1,670	19.6	154	32.7	27.2	21.8	3.5	1.0	2.5	4.5
	1,770	19.6	154	34.7	28.8	29.5	3.5	1.0	2.5	4.5
6	1,670	28.3	222	47.3	39.3	40.2	3.5	1.0	2.5	4.5
	1,770	28.3	222	50.1	41.6	42.6	3.5	1.0	2.5	4.5
7	1,570	38.5	302	60.4	50.1	51.3	3.5	1.0	2.5	4.5
	1,670	38.5	302	64.3	53.4	54.7	3.5	1.0	2.5	4.5

ASTM A 421

Grade	Nominal Diameter	Nominl Steel Area	Nominl Weight	Min Tensile Strength	Min Stress at 1% Extension	Min Stress Elongation at Max Load	Max %Relaxation After1,000hrs From 70% Initial Load	80% Initial Load
	in mm	sq. in mm^2	1bf/1,000ft kg/1,000m	psi MPa	psi MPa	%		
Grade WA	0.192	0.0290	98.4	250,000 1,725	212,500 1,465	4.0	2.5	3.5
	0.196	0.0302	103.4	250,000 1,725	212,500 1,465	4.0	2.5	3.5
	0.250	0.0491	166.8	240,000 1,655	204,000 1,407	4.0	2.5	3.5
	0.276	0.0598	203.4	235,000 1,620	199,750 1,377	4.0	2.5	3.5
Grade BA	0.196	0.0302	103.4	240,000 1,655	204,000 1,407	4.0	2.5	3.5
	0.250	0.0491	166.8	240,000 1,655	204,750 1,407	4.0	2.5	3.5
	0.276	0.0598	203.4	235,000 1,620	199,750 1,377	4.0	2.5	3.5

Raw materials

Raw materials for pre-stressed products include high carbon steel SWRH 82B wire rods with 10 to 13 cm diameter that must always have the highest quality in order to achieve a high quality product. These high carbon steel cable rods are supplied in the form of coil.
Raw materials are purchased in different sizes according to the products. Raw materials are controlled by foreign inspectors before shipment and are qualified by quality control department and laboratory at the workshop. After sampling, dimensional control, bending, tension, spectroscopy and Metallographic tests are utilized for quality insurance of the raw materials, and also to design production process according to the raw materials. Most important features influencing the quality of these materials are: tensile strength, ductility and chemical analysis which includes percentage of constituent elements.

Thus according to the raw material quality importance, this company always supplies its raw materials from two Japanese and Korean companies, Nippon Steel and Posco respectively, which are among the most prestigious manufacturers of these materials in the word.

Pre-stressed steel cable production process

Unbonded PC strands or PE coated PC strands

When there is no bonding between pre-stressing strands and concrete, i.e. when grouting is not necessary after prestressing operation, these strands are called coated or unbounded. Unbonded pre-stressed concrete is different from bonded post-tensioned concrete due to existence of separate stands, each having free movement in the concrete. To achieve this, each strand is coated separately with grease and a plastic layer produced by extrusion. Transmission of tension to concrete is done by means of the interaction between steel strands and anchors embedded inside the slab.

PE Coated PC STRAND(Unbonded)				
1. Diameter without PE coating	mm	12.7	15.2	15.7
2. Dia. Tolerance	mm	+0.4-0.2	+0.4-0.2	+0.4-0.2
3. Weight4. Breaking Strength	kg/km	774	1102	1130
4. Breaking Strength	kN	183.7	261	265
5. Yield Strength	kN	165.3(1%Ext)	234.6(1%Ext)	255.0(1%Proof Load)
6. Elongation	%	3.5	4.0	4.0
7. Relaxation at 1,000hr 70% of B.S.	%	Max.2.5	Max. 2.5	Max. 2.5
8. Elasticity Modulus	kN/mm²	192-208	192-208	192-208
9. Diameter with PE coating	mm	14.9	17.4	18.9

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Pre-tension Industries Co.

Pre-stressed Concrete Steel Strand

Pre-stressed concrete steel strand includes strings knitted in one direction with similar step. Pre-stressed concrete steel strand with low relaxation is suitable for pre-stressed concrete structures, and is mostly used in railroad sleepers, hollow core slabs, T shape beams and slabs in residential buildings, offices and industrial buildings. Conventional pre-stressed projects include bridges, silos, naval structures, oil, gas, and water reservoirs, buildings, concrete water pipes, etc.Pre-stressed concrete steel strands, are generally produced with galvanized coating or high density Polyethylene coating or technical features indicated by the client. Required properties of pre-stressed concrete steel strands include elongation, modulus of elasticity, step length and diameter and are produced according to ASTM A416, BS5896 and EN10138 standards.

BS 5896

Grade	Nominal Diameter	Nominal Tensile Strength	Nominal Steel Area	Nominal Mass	Breaking Load	0.1% Proof Load	Load at 1%Elongation	Min Elongation at Max Load	Max %Relaxation After1,000hrs From 60% Initial Load	70% Initial Load	80% Initial Load
	mm	N/mm^2	mm^2	g/m	KN	KN	KN	%			
7-Wire Standard	9.3	1,770	52	408	92	78	81	3.5	1.0	2.5	4.5
	11.0	1,770	71	557	125	106	110	3.5	1.0	2.5	4.5
	12.5	1,770	93	730	164	139	144	3.5	1.0	2.5	4.5
	15.2	1,670	139	1,090	232	197	204	3.5	1.0	2.5	4.5
7-Wire Super	8.0	1,860	38	298	70	59	61	3.5	1.0	2.5	4.5
	9.6	1,860	55	432	102	87	90	3.5	1.0	2.5	4.5
	11.3	1,860	75	590	139	118	122	3.5	1.0	2.5	4.5
	12.9	1,860	100	785	186	158	163	3.5	1.0	2.5	4.5
	15.7	1,770	150	1,180	265	225	233	3.5	1.0	2.5	4.5

ASTM A 416

Grade	Nominal Diameter	Nominal Steel Area	Nominal Weight	Min Breaking Strength	Min Load at 1% Extension	Min Elongation at Max Load	Max %Relaxation After1,000hrs From 70% Initial Load	80% Initial Load
	in	sq. in mm^2	1bf/1,000ft kg/1,000m	1bf KN	1bf KN	%		
Grade 250	1/4	0.036	122	9,000	8,100	3.5	2.5	3.5
	0.250	23.22	182	40.0	36.0			
	5/16	0.058	197	14,500	13,050	3.5	2.5	3.5
	0.313	37.42	294	64.5	58.1			
	3/8	0.080	272	20,000	18,000	3.5	2.5	3.5
	0.375	51.61	405	89.0	80.1			
	7/16	0.108	367	27,000	24,300	3.5	2.5	3.5
	0.438	69.68	548	120.1	108.1			
	1/2	0.144	490	36,000	32,400	3.5	2.5	3.5
	0.500	92.90	730	160.1	144.1			
		0.216	735	54,000	48,600	3.5	2.5	3.5
	0.600	139.35	1094	240.2	216.1			
Grade 270	3/8	0.086	290	23,000	20,700	3.5	2.5	3.5
	0.375	55.48	432	102.3	92.1			
	7/16	0.105	390	31,000	27,900	3.5	2.5	3.5
	0.438	67.74	582	137.9	124.1			
	1/2	0.153	520	41,000	37,170	3.5	2.5	3.5
	0.500	98.71	775	183.7	165.3			
		0.217	740	58,600	52,740	3.5	2.5	3.5
	0.600	140.00	1102	260.7	234.6			

Galvanized steel cables as safety protection for highways, streets etc.

Mechanical features of the galvanized steel cables are according to the below table. These cables are used as an innovation in European and American countries due to their advantages.

Mechanical features:

Title	Description
Diameter	Cables diameter is 19 millimeter and has (1*7)*3 structure and each sting diameter is 3 (±0.05) milimeter
Cross sectional area	150.5 millimeter
Wire strength	1100-1300 Newton per square milimeter
Maximum tensile strength	165.5 kilo Newton per square milimeter
Cable weight	1.21 kilogram per meter
Galvanization	Wires forming the cables based on ASTM A741-90 Class B standard having at least 488g Zinc per square meter
Tensile strength	150 kilo Newton per square millimeter

Advantages of cable safety shields

1. Fatalities reduction: According to the tests in Europe EN 1317 and United State NCRP 350 standards performed on these cable shields hit by a car, casualties and injuries were significantly reduced.
2. Economic damage reduction: According to the fact that cable shields absorb all the impact energy, it prevents vehicle rollover or returning to the road and further accidents.
3. Reduction of maintenance costs

6- Hollow Core Slabs production

These slabs are amongst known systems in the world and are produced in factory using prestressed concrete and transferred to the site. In order to reduce dead loads at the roof, cavities are embedded in the longitudinal section of these slabs. Having the benefits of prefabricated roofs including lower setup time and higher progress rate, this system has the advantages of prestressing such as increased bearing-span length or reduced section height in equal spans and optimum use of concrete section. This type of slab is practicable in concrete and steel structures.

7- Prestressed concrete joist production

Prefabricated joists are prestressed at the factory by pretensioning method and while being similar to prefabricated joists in terms of performance and setup, they have benefits such as savings in the consumption of concrete, negative moment bars, executive scaffolds and low final cost, also application of high quality concrete and quality steel with high tensile strength, so that these advantages result in structure lightness and higher life time.

8- Prestressed concrete traverse production

In Iran's railway network wooden, concrete and steel traverses are used which among them, Prestressed concrete traverse is more attractive because of higher life time, lower production cost and other advantages.

9- Special functions

In addition to above fields, advantages of post tensioning are often used in strengthening available structures (especially in earthquake-prone areas) for Heavy Lifting and special structures e.g. piers etc.

Implementation of post-tensioned concrete slabs by the unbonded method:

Unbonded post-tensioned method for performing pre-stressed concrete slabs is as follows:

1. Formwork

In this system, forming of the roof is similar to the reinforced slab. For easy installation of end anchors in formworks besides the slab, appropriate material such as wood is used.

2. Reinforcement

Reinforcements including reinforcement on columns and walls, punch shear reinforcement, reinforcement near the openings etc. are installed on the floor at this stage. Reinforcements used in this method are significantly less than reinforcement slabs.

3. Installation of pre-stressed cables and end bearings

Cables are installed according to the structural details and end anchors are connected to edge of the form. Cables are usually fixed in perpendicular manner on slabs. In conventional situations, cables are centered on column bars in one direction and are set at uniform distance of 1.5 meter in the other direction.

4. Spacer installation and pre-stressed cable profiling

For optimum usage of pre-stressed forces, cable position should change relating to the neutral axis along the slabs. Generally, pre-stressed cables are near the top axis on anchor points, and in the middle of the span they are near the bottom axis. The way that cables arrange in the slab is called cable profile. To satisfy a suitable profile, spacers of different sizes are placed with known distances and cables are set on them. Then pocket formers and clamps get laid at the cable ends around the slabs.

5. Concrete curing

After reinforcing and placing the cables on the floor, formwork of the floor walls and then concrete curing is performed; at this stage, vibrating around the end anchors should be done carefully.

6. Drawing

When concrete reaches the required strength, drawing of the cables begins. First, formwork and pocket formers are removed from the slab and the wedges are replaced around the slab. Afterwards, each cable is drawn from one end or from both ends if necessary. Rate of elongation is calculated according to its length and profile, and is also measured after drawing. Thus, validity of the operation process is controlled.

After drawing, the cables' ends are cut and the cavity around them is filled with cement grout and the grease caps are placed.

Anchorage systems for soil and rock (pit consolidation) using prestressing method

To strengthen the soil, two methods named anchoring and nailing are commonly used. In these systems, in-situ soil reinforcement of pit walls or slopes is done by installing steel bars or cables, with close distance in the walls. Reinforcement elements which include rebars or steel tubes in nailing method, and steel cables in anchoring method, are placed inside boreholes drilled in pit walls. And then to transfer forces between the soil and reinforcement elements, cement slurry is injected into the boreholes. After installing bars or cables, the pit surface is covered with a thin wall made of shotcrete with light reinforcement. Thus, a stable reinforced section is created to hold pit soil walls or slopes.

The system is an affordable and secure way to sustain vertical and inclined trenches and also excavation walls, especially deep excavations in the vicinity of other structures. Also, unlike some other stabilizing methods such as retaining structure, has no space limit for construction. In this method tension of the cable walls minimizes the deformation of excavation walls. Thus, it is suitable for stabilization in deep excavations and cases where the construction is located in the vicinity of the pit. The following are other applications of prestressing in anchoring.

- Concrete dam anchorage, is used to compact or strengthen the existing dams, e.g. to increase the height of the dam.
- Anchoring and post-tensioning for temporary and permanent stabilization of the tunnel walls against soil and rock masses as well as ground motion during earthquakes.
- Sustaining unstable natural slopes or artificial trenches along highways
- Anchoring tall structures such as oil rigs and power transmission towers
- Anchoring concentrated tensile forces in cable structures such as suspended bridges and cable cars

Khansar Pre-tension Ind. laboratories

One of the major aims of every manufacturing is continuous production with fixed and stable quality standards. To do so, everyone involved in the quality of products, should do their best in order to achieve highest quality level.
By experiencing for more than a decade in quality management system, Khansar Pre-tension Ind. Company was able to establish a stable quality management system for control, inspection and testing throughout all the production process including input cables, production & tensile equipment, heat treatment and packing according to the world standards.
In addition, this company for supplying and build trust for all internal and external costumer needs usesprofessionalpersonnel and modern equipment. Hence, our company became as a legal authorityfrom official state authorities and get ISO IEC 17025 license from The National Accreditation Center of Iran (NACI). Our laboratories also are the only laboratories that have Permissions from governmental authorities, which are able to work as experts in pre-stressed concrete products test in Iran.

Dimensional Control

One of the major controls performed in production process and also on final products is diameter and ovality control of wires utilized by accurate calibrated devices. In addition, tendon pace control is done in accordance withASTM A416 –EN10138-BS5896 standards. Calculation of actual crosssectionalarea in strands and alsoribbed and grooved wires fortensile strengthcalculation, and conformity of obtained force with the considering grade are among necessary dimensional Controls.

Reverse Bending Test

PC wires should be flexible; this parameter is determined by bendingtests done with bending equipment according to ISO15630-DIN51211 –BS4545 standard. This test has high priority in high-pressure pre-stressed water pipes.

implementation of post tensioned concrete slabs by the bonded method:

All steps in this method are similar to the previous, except that after performing all the above steps, to provide the necessary bonding between steel cables and concrete, grouting is done within the Sheaths.

Compariing steel and pre-stressed concrete structures

Duc to the large dimensions of concrete members and reducing useful system space compared to steel structures, reinforced concrete systems have less compatibility with some architectural designs. by using pre-stressed concrete systems, in addition to reducing the dimensions of concrete members compared to reinforced concrete system, by removing beams and hangers, increasing the spans, the possibility of laying irregular columns and large openings and other advantages of this system, an appropriate space for versatile and beautiful architectural designs is created.

Also, by reducing the thickness of the roof, which ultimately leads to final height reduction of the building, seismic code requirements are provided. This feature makes the prestressed concrete system to be very popular amongst creative and innovative engineers and architects.

In the construction of steel columns, since all floors are set up together, weekly costs are to be done all at once. The difficulty and high cost of steel framing, has made the steel structures to be more expensive than concrete structures.

Meanwhile architectural advantages of prestressed concrete structures result in an economical benefit in the system. The following table presents the comparison of structural steel and concrete.

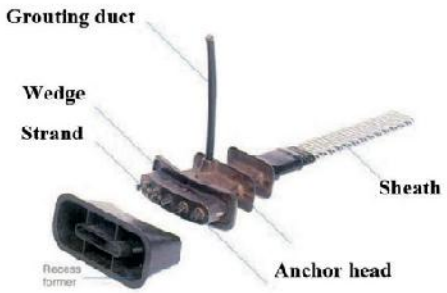
By using pre-stressed concrete structures, due to reduced consumption of materials and ease of implementation Including Reinforcement, framing and concreting, the ultimate cost is reduced compared to reinforced concrete.

Comparing Parameter	Steel structures		Concrete structures	
	Bolts	welded	reinforced	prestressed
Span length	average		lowest	Highest
Useful space area	average		lowest	Highest
Beam hangers	average		highest	lowest
Roof thickness	average		highest	lowest
Structure weight	average		highest	lowest
Implementation difficulty	highest	higher	average	lowest
Architectural compatibility	higher		lower	highest
Seismic performance	better	good	average	best
Risk of corosion	highest		lower	lowest
Fire Damage	highest		lower	lowest
Structure life time	lower		higher	highest
Implementation	highest	higher	average	lowest

Prestressing requirements

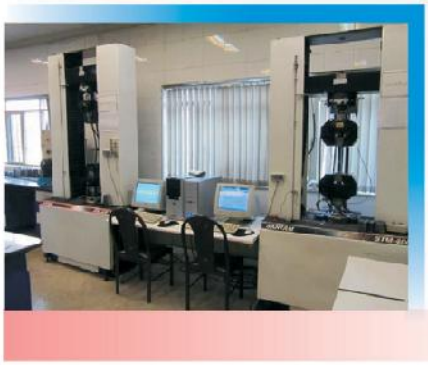
In order to perform prestressing, equipments is required which is briefly mentioned.

Anchorage & pre-stressing wedge



threadbar

Tensile Test



Produced cables and wires must have mechanical properties desired standards ASTMA416, ISO 15630, EN10138 and BS5896. Therefore, to determine the properties, including ultimate strength, yield strength at different points, elastic modulus, and elongation percentage, tensile test must be performed on the produced cords and wires, in accordance with the ASTMA416, ISO 15630, EN10138 and BS5896 standards. It should be noted that testing various Strands, due to their structure which has a torsional mode, requires precision and high experience. This test is performed using a tensile testing machine which is calibrated regularly and periodically by reliable calibration companies. After this test, the amount of force at any point of the stress - strain graph, elastic modulus, and percentage elongation are available.

Relaxation Test

For steel under constant load and over time, a deformation takes place called relaxation which its amount depends on time, temperature and stress level. In standardized relaxation testing in accordance with ISO 15630 and ASTM E328 standards, the amount of relaxation after 1000 h at 20oC and relaxation sample changes with time are determined.

Khansar Pre-tension Ind. laboratory, as the only owner of precision equipment and required environmental conditions in the country in accordance with the above standards, has the capability of performing the required tests on prestressing wires and strands.

Product Certification by International Inspection Co. SGS


Product Certificate


Product Certificate


Product Certificate

Quality Management Certificate from ISOQAR Company


ISOQAR
Certificate of Registration
ISO 9001:2008

Product Certification by Bodycote Lab.


TEST CERTIFICATE


TEST CERTIFICATE

Product Certification by Loyd GL Inspection Co.


Inspection Certificate


Inspection Certificate

Khansar Pre-tension Ind. Laboratory Accreditation Certificate (ISO/IEC 17025) from National Accreditation Center of Iran (NACI)


NACI
Accreditation Certificate


NACI
Accreditation Certificate


NACI
Accreditation Certificate

Types ofhydraulicpumps andjacksused in theprestressingoperation

Galvanized & polyethyleneSheaths

Suggested Technical Data

Strand No.	4	7	9	12	15	19	22	27	31	37
Internal Ø mm	45	65	75	80	85	95	100	110	115	130
Grout Requirement										
[l/m]	1.2	2.6	3.1	3.6	3.8	4.7	5.2	6.2	6.9	8.6
Cement [kg/m]	1.9	4.1	4.9	5.8	6.1	7.5	8.4	9.9	10.8	13.8

KHANSAR

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