



PIPE & DUCT - HANGERS AND SUPPORTS SPECIFICATIONS

A. SCOPE AND PURPOSE

All products and services in this section cover the hanger and support works of the mechanical pipes and ducts of the project.

All products and services to be provided will be supplied by one manufacturer.

The material manufacturer is responsible for reporting as a result of field inspection, projecting services and checks with the supervision services during implementation, together with product supply and selection.

The calculations and documentation during the project design works will be made and signed by the expert engineer of the pipe hanger and support material manufacturer firm.

B. STANDARDS

Pipe & Duct hanger and support works should be made according to the following standards.

- MSS SP58 : Pipe Hangers and Supports - Materials, Design, and Manufacture
- MSS SP69 : Pipe Hangers and Supports – Selection and Application
- NFPA-13 : Standard for the Installation of Sprinkler Systems
- SMACNA : Hvac Duct Construction Standard
- ASCE 7 : American Society of Civil Engineers
- IBC : International Building Code

C. SUBMITTALS

Approval documents must include the following.

- All the data sheets of all materials to be used for hanging&supports, including materials and performance design data will be presented for approval.
- Samples of selected pipe hanger materials will be submitted for approval.

- Design Calculations : Manufacturer company will check strength calculations of its support designs according to International Standards by 3D analysis software such as RSTAB , SAP2000 , STAAD PRO etc..and submit as reports. Calculations wont be made with not only static loads on supports ; Depending on the design, calculations should be made by affecting dynamic loads such as earthquake, friction, wind, pressure force.

Not only profile sections but also connection fittings and anchors must be checked within the safety limits. The calculations and documentation during the project design works will be made and signed by the expert engineer of the pipe hanger and support material manufacturer firm.

- Show Drawings : Detail drawings will be submitted for each different system and condition.

D. INSTALLATION

- Welded manufacturing won't be allowed on site; all connections will be bolted connections.
- The material manufacturer is responsible for reporting as a result of field inspection, projecting services and checks with the supervision services during implementation, together with product supply and selection.
- All products will be pre-fabricated type.
- All products , in the indoor (where air conditioning is provided and isolated from open air conditions) will be electro galvanized ,In the outdoor (exposed to open air) will be hot dip galvanized.

D.1) Pipe Hanger and Support

- Multiple pipes will be supported by G section and box section perforated profiles. Strength calculation of these supporting profiles and anchorage system will be made and submitted by manufacturer company.
- Single pipes will be hanged with rod. The minimum rod diameters given in Table 1.1 will be used. Rods may be reduced one size for double rod henagers. Minimum rod dimater shall be M10.

Pipe Size (DN)	Min. Rod Dia. (mm)
15-100	M10
125-200	M12
250-300	M16
350-400	M20

Table 1.1

- Maximum horizontal pipe hanger and support spacing will be complied with following table 1.2.
Hanger spacing for trapeze type hanging of multiple pipes will be determined according to smallest pipe size.

Maximum Horizontal Pipe Hanger and Support Spacing (m) (Pls.see Additional Notes)							
Pipe Size (DN)	Steel Pipe		Copper Pipe		Fire Pipe	Cast Iron Pipe	Plastic Pipe
	Water Service	Vapor Service	Water Service	Vapor Service			
15	2,0	2,0	1,5	1,5		3,0 (Pls.see Add. Note- 4)	Pls.see Add. Note-5
20	2,0	2,5	1,5	2,0			
25	2,0	2,5	1,5	2,0	3,5		
32	2,0	2,5	2,0	2,5	3,5		
40	2,5	3,5	2,0	3,0	4,5		
50	3,0	4,0	2,0	3,0	4,5		
65	3,0	4,0	2,5	4,0	4,5		
80	3,5	4,5	3,0	4,0	4,5		
100	4,0	5,0	3,5	4,5	4,5		
125	4,5	5,5	4,0	5,5	4,5		
150	5,0	6,0	4,0	6,0	4,5		
200	5,5	7,0	4,5	7,0	4,5		
250	6,0	7,0	5,5	7,0			
300	7,0	7,0	5,5	7,0			
350	7,0	7,0					
400	7,0	7,0					

Table 1.2

Additional Notes :

- 1- If some items which can generate concentrated load between two support points such as flange , valve etc..exist , Additional support needs to be added close to these items.

- 2- Change in directions and branch connections requiring additional supports.
 - 3- If flex joint exists in the system , it can effect support point loacations ; flex joint supplier will advice in this case.
 - 4- Minimum of two hanger per pipe section close to joint within 0,75 mt shall be made.
 - 5- Follow pipe manufacturer's recommendations.
- Maximum vertical pipe hanger and support spacing will be complied with following table 1.3.
Hanger spacing for trapeze type hanging of multiple pipes will be determined according to smallest pipe size.

Maximum Vertical Pipe Hanger and Support Spacing (m) (Pls.see Additional Notes)							
Pipe Size (DN)	Steel Pipe		Copper Pipe		Fire Pipe	Cast Iron Pipe	Plastic Pipe
	Water Service	Vapor Service	Water Service	Vapor Service			
15	2,0	2,0	1,5	1,5	7,5 (Pls.see Add. Note-3)	3,0 (Pls.see Add. Note- 4)	Pls.see Add. Note-5
20	3,0	3,0	1,5	2,0			
25	3,0	3,0	1,5	2,0			
32	3,0	3,0	2,0	2,5			
40	3,5	3,5	3,0	3,0			
50	3,5	3,5	3,0	3,0			
65	4,5	4,5	3,5	4,0			
80	4,5	4,5	3,5	4,0			
100	4,5	4,5	3,5	4,5			
125	5,5	5,5	4,0	5,5			
150	5,5	5,5	4,0	6,0			
200	8,0	8,0	4,5	7,0			
250	8,0	8,0	5,5	7,0			
300	8,0	8,0	5,5	7,0			
350	8,0	8,0					
400	8,0	8,0					

Table 1.3

Additional Notes :

- 1- Change in directions and branch connections requiring additional supports.

- 2- If flex joint exists in the system , it can effect support point loacations ; flex joint supplier will advice in this case.
 - 3- Follow additional rules given in NFPA-13
 - 4- Minimum of two hanger per pipe section close to joint within 0,75 mt shall be made.
 - 5- Follow pipe manufacturer's recommendations.
- Clamps to be used in the pipelines that have condensation risk (cooling lines) and heat loss risk (heating lines) will be used with polyurethane insulation insert.
 - Sliding frames or roller support will be used in pipelines exposed to thermal expansion / contraction. These sliding frames / roller supports will be compatable with calculated amount of expansion / contraction. Sliding frames will be used for pipe diameters DN450 and below, and roller supports will be used for pipe diameters DN500 and above.
 - If exist , fix point support calculation for vertical pipelines will be made and submitted to contractor along with anchorage loads for relevant floor.
 - In support systems designed under earthquake loads, ETA Approved C1-C2 seismic anchors which is also compatable with cracked concrete will be used for the anchorage of the support to concrete structure.
 - At the points where the support system needs to be connected to the steel structure, drilling and / or welding processes will not be applied to the steel structure, all connections will be made with beam clamps.

D.2) Duct Hanger and Support

- Rectengular ducts will be supported by C and G section perforated profiles. Strength calculation of these supporting profiles and anchorage system will be made and submitted by manufacturer company.
- Allowable load on upper attachments such as anhor and beam clamp is $\frac{1}{4}$ of failure load.
- Duct will be restrained against vertical movement in duct hangers and supports where the earthquake forces are taken into account.
- Rectengular duct risers should be supported by angles or channels secured to the sides of the duct with welds , bolts , sheet metal screws , or blind rivets. Another method is to support the riser by its reinforcing.

- Maximum hanger spacing , minimum rod size and minimum supporting profile sections for rectangular ducts will be complied with following table 1.4.

Rectengular Duct – Maximum Hanger Spacing , Minimum Rod Sizes ve Profile Sections (Pls.See Additional Notes)				
Maximum Half of Duct Perimeter (mm)	Minimum Horizontal Support Profile Section (mm)	Minimum Rod Size	Maximum Horizontal Hanger Spacing (m)	Maximum Vertical Hanger Spacing (m)
760	35x35x0,9 Prolink C	M8	2,5	3,5 – 7,0 (according to system load)
1830	35x35x1,2 Prolink C	M10		
2440	45x45x2,5 Prolink G	M10		
3050	45x45x2,5 Prolink G	M12		
4270	45x60x2,5 Prolink G	M12		
4880	60x70x3,0 Prolink G	M12		
>4880	Special calculation required.			

Table 1.4

Additional Notes :

- 1- Horizontal ducts shall have additional support within 0,6m. of each elbow and within 1,2m. of each branch intersection.

E. PRODUCTS

Pipe Clamps

Clamps must be manufactured in ISO 9001 quality assurance and TSEK standard by cold forming method. Sheet metals to be used as raw materials should be in DIN EN 10111 / DIN EN 10025 / DIN EN 10130 standard. All of the sheet metals are material certified, and both their chemical composition and physical properties must be guaranteed by the manufacturer and these certificates must be delivered to the contractor when requested.

- Clamps must be selected in the clamping range suitable for the pipe type and outer diameter, and must be suitable for the application loads.

- Sprinkler clamps to be used in the fire installation must be UL / FM approved.
- The material type of rubber used in the split clamps and heavy duty clamps should be EPDM (ethylene propylene rubber).
- The clamps must be coated with a minimum of 8 µm Cr 6 free environmentally friendly electro galvanization method in accordance with the DIN 50961 / EN ISO 2081 standard against corrosion. In addition, products should be coated with hot dip galvanization method (HDG) according to the EN ISO 1461 standard depending on the place which they used in.
- In solutions requiring stainless steel clamp, material certified AISI 304 stainless steel product must be used.
- Clamping range of split and heavy duty clamps must be on product legibly.

Reference Models

Brand : LINK

SP Sprinkler Clamp

DB Clevis Clamp

DN5 Split Clamp

SDNA Heavy Duty Clamp

PLGS Pipe Strap

UKP U-Bolt Clamp

SYK Riser Clamp

Sliding Frames

Tension and compression load capacities must be specified and TSE approved test reports must be submitted that sliding mechanism operates smoothly under these values.

Sliding capacity must be complied with calculated amount of thermal expansion / contraction in the system.

Reference Models

Brand : LINK

LKYM Sliding Frame

MKYM Sliding Frame

KYM4 Sliding Frame

Roller Supports :

Roller supports, which will be selected in accordance with the amount of expansion / contraction and load of the system , should be able to allow movement in a single or double axis in the horizontal plane depending on the design.

Due to the point contact between the pipe and the roller, the protection shield will be used to reduce the tension to the pipe wall.

Reference Models

Brand : LINK

CRH Roller Hanger

RYAM Roller Support

LSR1A Single Axis Free Roller Support

LSR2A Two Axis Free Roller Support

LSRS Roller Support Protection Shield

Polyurethane Insulation Insert

Polyurethane insulation inserts should be made of closed-cell polyurethane rigid foam with a specific weight of 80 kg / m³, thermal conductivity of 0.038 W / Mk, thermal resistance range should be from -45 C to +105 C and compressive strength 600 kPa..

Reference Models

Brand : LINK

PAT A Polyurethane Insulation Insert

Perforated G Section Profiles

TSEK approved cold formed G section perforated profiles and its fittings that provide fast installation on site will be used in light and medium load pipe supports (pls.see Image 1.1). The thickness of these fittings will be minimum 6mm. Main corner and base connection fittings will be TUV approved regards of their force and moment capacities. Welded manufacturing won't be allowed on site; all connections will be bolted connections. Cold formed G section perforated profiles and fittings must be coated with 8-10 µm thick electro galvanized method (if exposed to open air , will be hot dip galvanized in this case) and the holes on the profile must be

burr-free. Net section properties and load capacities under concentrated and distributed loads for different lengths of profile must be specified at manufacturer's standard catalogue. Profile-fitting connection and clamp-profile connection must be done with easy-lock nut which can allow connection from open-side of profile. Minimum tension and slip resistance of these easy-lock nuts must be 500 kg. Additionally, bolt tightening values must be indicated at manufacturer's standard catalogue.

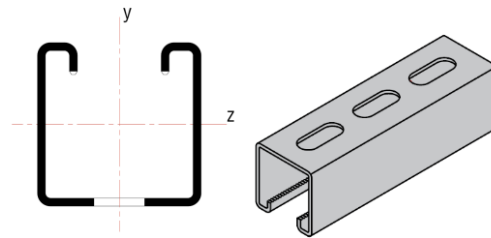


Image 1.1 - G Section Perforated Profile

Reference Models

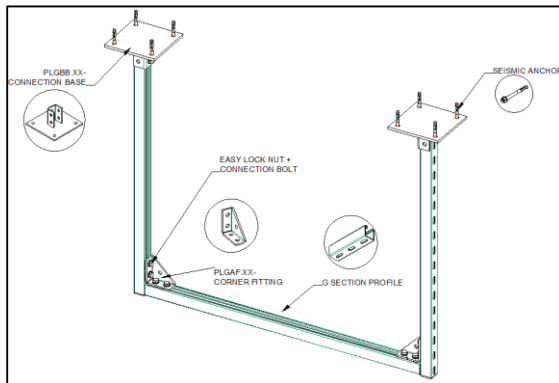
Brand : LINK

PROLINK G Section Profiles

PLGAF.XX Corner Connection Fittings

PLGBB.XX Connection Base

Reference Support Detail



Perforated Box Section Profiles

TSEK approved perforated box section profiles and its fittings that provide fast installation on site will be used in heavy duty load pipe supports (pls.see Image 1.2). The thickness of these fittings will be minimum 6mm (thickness of fittings which will be threaded by self-threading bolts will be minimum 4mm.) Main corner and base connection fittings will be TUV approved regards of their force and moment capacities. Welded manufacturing won't be allowed on site; all connections will be bolted connections. Perforated Box Section Profiles must be hot dip galvanized and perforated in a certain pattern to allow bolted connection on all four

surfaces. Profile - fitting connection will be made with self-threading bolt by using of bolt tightening machine (pls.see Image 1.3). Net section properties and load capacities under concantrated and distributed loads for different lengths of profile must be specified at manufacturer's standard catalogue.

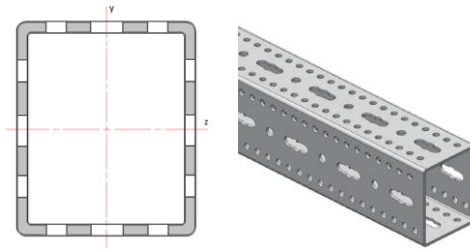


Image 1.2 – Perforated Box Section Profile

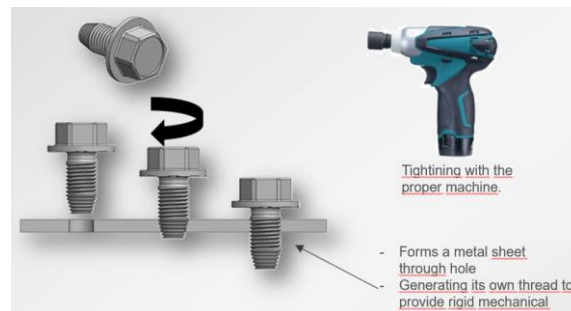


Image 1.3 – Bolt Tightening Process on Perforated Box Section Profile

Reference Models

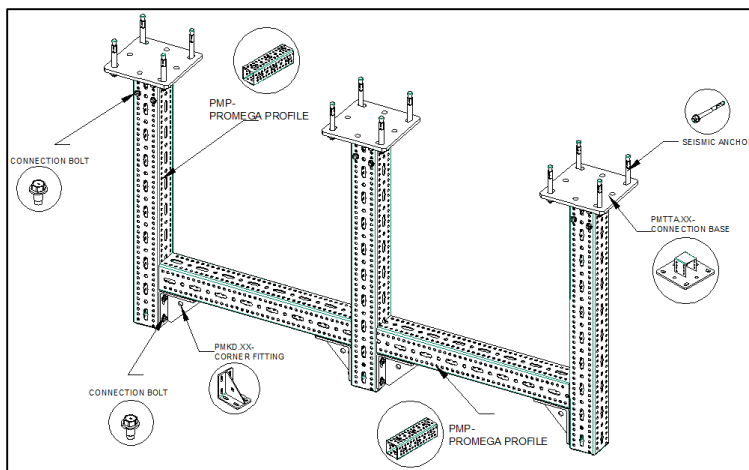
Brand : LINK

PMP Promega Profiles

PMKD.XX Corner Connection Fittings

PMTTA.XX Connection Base

Reference Support Detail



Perforated C Section Profiles

Due to its cross-section structure, TSEK approved C-section perforated profiles which has high load carrying capacity with a relatively low wall thickness will be used in light load duct hangers (Pls.see image 1.4). Cold formed C section perforated profiles and fittings must be coated with 8-10 μm thick electro galvanized method and the holes on the profile must be burr-free. Net section properties and load capacities under concentrated and distributed loads for different lengths of profile must be specified at manufacturer's standard catalogue.

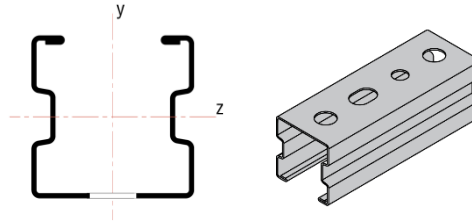


Image 1.4 - C Section Perforated Profile

Reference Models

Brand : LINK

PROLINK C Section Profiles

Anchors

- In addition to tension and shear capacities, the minimum substrate thickness, minimum edge distance and min.spacing dimensions for the application must be specified in the manufacturer's catalog. In support systems designed under earthquake loads, ETA Approved C1-C2 seismic anchors which is also compatible with cracked concrete will be used for the anchorage of the support to concrete structure.

Reference Models

Brand : LINK

LTS Seismic Throughbolt Anchor

LT Throughbolt Anchor

LC Drop-in Anchor

Beam Clamps

Load capacities must be specified at manufacturer's standard catalogue.

Beam clamps to be used in the fire installation must be UL / FM approved.

Reference Models

Brand : LINK

LBC Beam Clamp

MZL Beam Clamp