

<b>KLM Technology Group</b>  Project Engineering Standard	  <a href="http://www.klmtechgroup.com">www.klmtechgroup.com</a>	Page : 1 of 13
		Rev: 01
		April 2011
KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	<b>SPECIFICATION FOR          PIPE HANGING AND SUPPORTS          (PROJECT STANDARDS AND SPECIFICATIONS)</b>	

## TABLE OF CONTENT

<b>SCOPE</b>	<b>2</b>
<b>REFERENCES</b>	<b>2</b>
<b>UNITS</b>	<b>2</b>
<b>DESIGN AND SELECTION</b>	<b>2</b>
General	2
Loads	4
Materials	4
Connections	5
Support Span	5
Support Type	11
Support Marking	11
Foundation and Insert Plate for Pipe Supports	12
Drawing Symbol	12
<b>EXECUTION AND ERECTION OF SUPPORTS</b>	<b>12</b>
General	12
Spring Hangers	13
Prefabricated Pipe Support	13

<b>KLM Technology Group</b>  Project Engineering Standard	<b>SPECIFICATION FOR PIPE HANGING AND SUPPORTS</b>  <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	Page 2 of 13
		Rev: 01
		April 2011

## SCOPE

This Project Standard and Specification covers general and detailed requirements for the design, selection, spacing and installation of pipe supports for the above ground piping to be designed and/or constructed.

## REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

1. American society of Mechanical Engineers (ASME)

ASME B31.1	Power Piping
ASME B31.3	Process Piping
2. MSS

MSS SP-58	Pipe Hangers and Supports – Materials, Design, and Manufacture
MSS SP-69	Pipe Hangers and Supports – Selection and Application
MSS SP-89	Pipe Hangers and Supports – Fabrication and Installation Practices

## UNITS

This Standard is based on International System of Units (SI) except where otherwise specified. However, nominal size of piping components shall be shown in inch (“).

## DESIGN AND SELECTION

### General

1. Piping shall be supported, anchored, or guided to prevent undue line deflection, excessive vibration and to protect piping and connected equipment from excessive loading and expansion stress.
2. Pipe support identification numbers may be used in combination with miscellaneous detail.

<b>KLM Technology Group</b>  Project Engineering Standard	<b>SPECIFICATION FOR PIPE HANGING AND SUPPORTS</b>	Page 3 of 13
	<b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	Rev: 01
		April 2011

3. Pipe support location and identification numbers for the lines 2" and larger shall be marked on the piping plan drawings.
4. All lines shall be supported so that spans do not exceed the allowable limits given in this Project Standard and Specification.
5. All lines 1-1/2" and smaller shall be supported by field adjustment.
6. All lines shall be guided base on the table given below.
7. All guides, anchors and springs in piping stress analysis report shall be considered, and shall not be added or eliminated without permission of the stress engineer.
8. Individual lines may be suspended on hanger rods with adjustable clevises or pipe clamps only when no other support is practical. But if either line is in vibrating service, do not support one line from another.
9. Adjustable support shall be provided for piping connected pumps, turbines and compressors.
10. Support shall be located as near as practicable to changes in direction (lateral and vertical).
11. The design and selection of support shall ensure that bare lines do not rest on concrete, so as to avoid accelerated corrosion of piping at the point of contact.
12. Clamp type attachments may be used wherever possible on alloy piping. If a welded attachment is necessary, an alloy plate shall be welded to pipe before adding any carbon steel attachment.
13. Field welding is not permitted to stress relieved piping. Clamp type attachment must be used.
14. If any special welded attachment is required on either alloy or stress relieved piping, it must be installed in the fabricator's shop. If field welding is done, it shall be stress relieved as required.
15. When the atmospheric discharge lines for a relief valve exceed a height of 1800 mm, the valve body shall be reinforced by support. This discharge line shall be guided as near to the top as possible.
16. For the fabrication of shoe, structural steel (H-beam, T-bar etc.) may be used instead of plate.
17. Spring support shall only be marked on Piping Plan drawing and the detailed information of spring support such as size, attachment etc. is indicated on data sheet of spring support.
18. All 1/2" lines for chemical injection shall be installed within carbon steel channel iron for support and protection for both horizontal and vertical runs where the distance between support is >1500 mm. On horizontal runs the channel iron shall be installed with the open side facing downward. The pipe shall be held within the channel iron by metal supports.

<b>KLM Technology Group</b>  Project Engineering Standard	<b>SPECIFICATION FOR PIPE HANGING AND SUPPORTS</b>  <b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	Page 4 of 13
		Rev: 01
		April 2011

## Loads

The following shall be considered as a design basis for pipe supports:

1. Expansion forces  
Consider the thrust by temperature changes in lines
2. Dead loads
  - Consider the weight of water or service fluid, whichever is larger.
  - Weight of insulation and heat tracing where provided shall be included in dead loads.
3. Wind and earthquake  
Wind and earthquake loads shall be considered as a local condition. The design shall be governed by maximum wind or maximum earthquake load, whichever is greater.

## Materials

ASTM A283 Gr.C or equivalent shall be used for structural steel support material. Support material which is welded directly to piping shall be chosen with the following table.

**Table 1 – Material Selection**

Piping Material	Limit of Temp.	Support Material	
		Pipe	Others
Carbon steel	-29 ~ 350 -29 ~ 530	ASTM A53 Gr.B	ASTM A283 Gr.C ASTM A515 Gr.60
Stainless steel	-198 ~ 530 -254 ~ 530	ASTM A312 Gr. TP304 ASTM A312 Gr. TP321	ASTM A240-304 ASTM A240-321
ASTM A335 Gr. P5	550°C	ASTM A335 Gr. P5	ASTM A387 Gr.5
ASTM A335 Gr. P11	555°C	ASTM A335 Gr. P11	ASTM A387 Gr.11

Wall thickness of pipe for support shall be as follows:

<u>Pipe material</u>	<u>Pipe size</u>	<u>Wall thickness</u>
All materials except stainless steel	Up to 1-1/2"	Sch.80
Stainless steel	2" and over	STD
Stainless steel	Up to 1-1/2"	Sch.40S
	2" and over	Sch.10S

<b>KLM Technology Group</b>  Project Engineering Standard	<b>SPECIFICATION FOR PIPE HANGING AND SUPPORTS</b>	Page 5 of 13
	<b>(PROJECT STANDARDS AND SPECIFICATIONS)</b>	Rev: 01
		April 2011

## Connections

The connection of steel supports members can be bolted or welded

1. Welds shall conform to the American Welding Society "Standard Code for Welding in Building Construction".
2. All bolts and nuts shall be hexagon type conforming to ISO 272, with the threads specified as follows:

<u>Item</u>	<u>Size Range</u>	<u>Code; metric</u>
Thread standard	Up to M64 M72 to M100	ISO 261 (normal) ISO 261 (pitch 6)
Bolt/nut	All	ISO 272

3. Bolt holes shall be punched or drilled. Flame cut holes are not acceptable.

## Support Span

1. Support span or pipe rack span shall be approximately 6 meters and pick-up supports for smaller line are allowed only where unavoidable.
2. The maximum span shall be determined by calculating stresses and deflections as following equations:

a. By stress

- Bending Moment (a semi-restrained continuous beam)

$$M = \frac{wl^2}{10}$$

- Bending Stress

$$\sigma = \frac{M}{Z} = \frac{wl^2}{10Z}$$

$$*) \text{ Span length } l = \sqrt{\frac{10Z\sigma_0}{w}}$$

Where:

- w = uniform load
- l = pipe span
- Z = section modulus (I/c)
- I = moment of inertia
- C = D/2
- D = outside diameter of pipe
- $\sigma_h$  = allowable hot stress/2 (ASME B31.3)