

KLM Technology Group Project Engineering Standard	 www.klmtechgroup.com	Page : 1 of 20
		Rev: 01
		April 2011
KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	

TABLE OF CONTENT

SCOPE	2
REFERENCES	2
UNITS	3
SERVICE CONDITIONS	3
BASIC DESIGN, CONSTRUCTION AND RATING	3
General	3
PIG Trap System Component	4
Materials	6
Fabrication	7
Inspection and Testing	8
Surface Preparation	8
Pipeline Pig Passage Detector	9
Electrical Signals	10
Nameplates and Labeling	10
Tools and Testing Equipment	11
Provision for Handling and Erection Equipment	11
INSPECTION DURING MANUFACTURING	11
TESTS AND CERTIFICATES	11
FINISH	12
INFORMATION FOR MANUFACTURER/SUPPLIER	12
REJECT CLAUSE	12
PACKING AND SHIPMENT	13
GUARANTEES AND WARRANTIES	13
SPARE PARTS	13
LANGUAGE	13
DOCUMENTATION LITERATURE TO BE SUBMITTED BY MANUFACTURER/SUPPLIER (INFORMATIVE)	14
APPENDIX A	16
APPENDIX B	17
APPENDIX C	18
APPENDIX D	19
ATTACHMENT 1	20

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 2 of 20
		Rev: 01
		April 2011

SCOPE

This Project Standards and Specifications covers minimum technical requirements for design, manufacture, quality control, testing and finishing of pig launching and receiving traps which shall be installed in oil, gas and petrochemical industries under the service conditions

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. ASME (American Society of Mechanical Engineers)
 - Section VIII "Rules for Construction of Pressure Vessels"
 - Section V "Non-Destructive Examination"
 - Section IX "Qualification STD. for Welding and Brazing Procedures"
 - Section II "Material Specification"
2. ANSI (American National Standard Institute)
 - B16.5 "Steel Pipe Flanges and Flanged Fittings"
 - B16.25 "Butt Welding Ends"
 - B31.8 "Gas Transmission & Distribution Systems"
 - B31.4 "Liquid Transportation Systems for Hydrocarbons"
3. ASTM (American Society for Testing And Material)
 - A193 /A193M "Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Services"
 - A194 /A194M "Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service"
 - E92 "Test Method for Vickers Hardness of Metallic Materials"
4. API (American Petroleum Institute)
 - 5L "Specification for Line Pipe"
 - 1104 "Welding of Pipelines and Related Facilities"

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 3 of 20
		Rev: 01
		April 2011

5. BSI (British Standard Institution)
 - BS 5500 "Specification for Unfired Fusion Welded Pressure Vessel"
 - BS 1133 "Packaging Code"
6. IP (Institute of Petroleum)
 - Part 15 "Model Code of Safe Practice Electrical Part 1"
7. NACE (National Association of Corrosion Engineers)
 - MR-0175 "Sulphide Stress Cracking Resistant Metallic Materials for Oil Field Equipment"

UNITS

This Standard is based on International System of Units (SI) except where otherwise specified.

SERVICE CONDITIONS

1. Fluid Properties and Environmental Conditions
 - See Appendices A&B.
2. Enclosures
 - The enclosures shall be Flameproof or explosion proof.
3. Location and type of control
 - The location and type of control shall be suitable for one or more of the requirements as indicated in Attachment 1.

BASIC DESIGN, CONSTRUCTION AND RATING

General

1. The following description is intended to indicate the general and minimum requirement of pig launching and receiving traps and does not relieve the supplier of his full responsibility for design, fabrication performance and safety of the equipment.
2. Trap assemblies shall be suitable for launching or receiving pigs for the purpose of gaging, cleaning and removing liquids from a pipeline which may contain water and/or liquid hydrocarbons and impurities such as sand and scale. Electronic and inspection pigs, batching corrosion inhibition service and

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 4 of 20
		Rev: 01
		April 2011

special pigs may require different trap assemblies that should be checked with manufacturers before purchase or rental.

3. Pig traps with a nominal diameter of 20 inch and above should normally be provided with pig lifting facilities, such as runway beam, unless it can be easily accessed by cranes. Provision of a trolley with a push rod and pulling line should be considered to assist loading or removal of pigs from the trap. The use of these facilities, including the possible use of internal trays, shall be agreed with the company.
4. The corrosion allowance if specified, shall be as indicated on Appendix "A".

PIG Trap System Component

1. Barrel, Reducer and Spool
 - a. The spool piece shall have the same nominal size as the connecting pipeline, flanged or beveled end, as specified in requisition.
 - b. The barrel shall have a sufficient length to accommodate three pipeline cleaning pigs.
 - c. Barrels for use in gas transmission system shall be designed in accordance with ANSI B 31.8 and those for use in liquid hydrocarbon transmission shall be in accordance with ANSI B 31.4.
 - d. A thermal relief line shall be provided at locations where shut-in pressure of trapped fluid could exceed the design pressure.
 - e. The reducer should be eccentric for launcher and be concentric for receiver.
2. Supports
 - a. Permanent supports shall be used to support and restrain the pig traps and these shall be designed to carry the weight of the pig trap system filled with water (or other fluids if their density is greater than that of water) together with the weight of pigs. The support under the barrel should normally be of the sliding/clamp type to compensate for expansion of the unrestrained part of the pipeline. The frictional force should be reduced to minimum by appropriate means. The height of the saddle should be such that the bottom of the barrel located 800 mm. above ground level. Supports should be positioned such that the pig trap valves can be removed for maintenance or replacement without removal of barrel.
 - b. Design of supports shall comply with the requirements of BS-5500.

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 5 of 20
		Rev: 01
		April 2011

- c. If specified by the purchaser, base plate, anchor bolts, etc. required for foundations should be supplied by the manufacturer and all the applied forces and moments on the saddles shall be specified by the manufacturer.

Note:

Where there would be a possibility of corrosion occurring under clamps then welded clamps should be used with no direct welding on to the pipeline except for circumferential welds.

3. Connections

- a. The trap shall be completed with the connections as shown in Appendices C & D.
- b. Weldolet and Threadolet are only allowed for connections equal or smaller than 2 inch. Connections larger than 2 inch shall be extruded outlets or sweepolets.

4. End Closure

- a. The end closure shall conform to the general requirements of ASME VIII division 1 section UG-35(b) (quick actuating closures). Attention is drawn to the requirements for a fail-safe design of the opening mechanism, specifically, the failure of any part of the opening mechanism shall leave the closure closed rather than open.
- b. The end closure shall be of the quick acting type, lever or hand wheel operated, and hinged vertically.
- c. The quick acting design should allow opening and closing by one man in approximately one minute, without the use of additional devices.
- d. The design of the end closure shall be suitable for permanent location in open environment.
- e. Closure 18" and larger shall be hand wheel operated.
- f. The activation of the seals shall be such that the fluid within the pig trap at any pressure between 1 bar (abs) and the pig trap design pressure be sufficient for this purpose.
- g. End closures with exposed screw expanders or captive ratchet braces should not be used, because of the high maintenance requirements and the non fail-safe aspects of some opening mechanism designs.
- h. The end closure shall have the following safety devices:
- A pressure locking device to prevent opening of the door when the pig trap is pressurized.

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 6 of 20
		Rev: 01
		April 2011

- A safety bleeder that when released will alert the operator to a possible hazard unless pressure in the pig trap is relieved completely. Opening of the door shall not be possible unless the bleeder is released. Engaging the bleeder shall only be possible when the closure is closed. The bleeder shall be designed such that there is no risk of blockage.

Materials

1. The selected non-metallic material shall be suitable for the long-term exposure to the transported fluid at the design pressure and temperature conditions. Elastomeric material shall resist explosive decompression.
2. Studs and nuts shall be aluminum coated or electroless nickel plated. The preferred materials for standards applications are ASTM A193/A193M grade B7 and ASTM A194/A194M grade 2H for non sour service conditions, and ASTM A193/193M grade B7M and ASTM A194/A194M grade 2HM for sour service conditions.
3. All components in sour service shall conform to the requirements of NACE MR 0175. In addition seamless pipe shall have a maximum sulphur content of 0.010 wt%. The base material and welds shall have a maximum hardness of 248 HV10.
4. Spool pipe shall be compatible with the line pipe with respect to weldability, wall thickness/material grade transitions and dimensions. Dimensional considerations include actual internal diameter, ovality and wall thickness transition taper angles.
5. The carbon equivalent of the steel shall be less than or equal to 0.43 percent calculated by the following formula:

$$CE-c + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$$

The carbon content shall not exceed 0.23% for forgings. The base material and welds shall have a maximum hardness of 325 HV10 for non-sour and 248 HV10 for sour conditions. Base metal hardness readings shall be made in accordance with ASTM E92 on each heat at 5 random locations. The actual yield to tensile strength ratio shall not exceed 0.90 for non-sour and 0.85 for sour services.

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 7 of 20
		Rev: 01
		April 2011

Fabrication

1. Welding processes, welding procedures, welder qualifications, weld repairs, welding electrodes, thermal stress relief and heat treatment, etc. shall conform to ASME VIII Division 1 and ASME Section IX. Only welders and welding operators who are qualified in accordance with Section IX of ASME shall be employed in production.
2. Weld repairs if required, shall not be permitted after heat treatment without approval by the purchaser. Repaired welds shall be heat treated according to the codes stated above.
3. Welding shall be carried out using procedures and welders/welding operators qualified in accordance with ASME IX. Welding procedure qualification shall include hardness testing of the weld, HAZ and base metal. The hardness shall be measured in accordance with ASTM E 92. for pipe butt welds, the hardness traverses shall be carried out on Lines 2 mm from the pipe surfaces on a weld cross-section. Each traverse shall have at least three hardness measurements taken in each of the weld metal, the HAZ each side of the weld, and the base metal for each HAZ, one of the hardness measurements shall be within 0.5 mm. of weld fusion line. The hardness shall not exceed 325 HV10 under non-sour conditions and 248 HV10 under sour conditions.
4. All main seam welds shall be full penetration and where possible double sided. All nozzle to body welds shall be full penetrant.
5. The inside of the trap shall be free from obstructions which could prevent the free rolling of spheres, or travel of pigs or carriers.
6. Wall thickness transitions shall meet the welding configuration requirements as specified in the design code ANSI B31.4 and ANSI B31.8.

Notes:

- 1) tD , the maximum thickness for design pressure, shall not be greater than $1.5t$, where t is the nominal thickness of thinner plate.
- 2) Pipe with a wall thickness less than 4.8 mm. shall not be used.
7. The seam welds of trap shall not interfere or coincide with outlets welded to it.
8. End profiles of the pipes to be butt-welded shall be in accordance with ANSI/ASME B16.25.
9. The requirement for heat treatment shall be determined in accordance with ASME VIII, division 1, subsection C. procedures to be applied shall be in accordance with ASME VIII, division 1, part UW-40.

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 8 of 20
		Rev: 01
		April 2011

Inspection and Testing

1. Inspection and testing shall be performed before any coating or paint is applied.
2. All components shall be visually examined in accordance with ASME VIII division 1, part UG93.
3. Each weld on the trap and pig signaler shall be examined by 100% radiography (RT). In addition, carbon steel welds shall receive 100% magnetic particle examination (MT) and stainless steel welds shall receive 100% liquid penetrant examination (PT). RT shall be in accordance with ASME V articles 2 and 22, with acceptance criteria in accordance with ASME VIII, division 1, part UW-51. MT shall be in accordance with ASME V, article 7 and 25, with acceptance criteria in accordance with ASME VIII, Appendix 6. PT shall be in accordance with ASME V, articles 6 and 24, with acceptance criteria in accordance with ASME VIII, Appendix 8.
4. Surface examination of the trap shall be by wet magnetic particles unless agreed otherwise by the Company.
5. For the end closure, all mating clamp and flange machined surfaces, door hinge, hinge attachments and locking mechanisms shall be subject to magnetic particle inspection. Any defects shall constitute a basis for rejection.
6. The trap shall be hydrostatically tested to 1.5 times the design pressure. The test pressure shall be held for a period of at least 4 hours. The acceptance criteria are no leakage or loss in pressure.
7. A functional test shall be performed to demonstrate that closure door, pig signaler, loading and unloading devices function satisfactorily.
8. Chemical analysis and mechanical and impact tests are required for the barrel, reducer and neck pipe (when furnished) for each trap in accordance with the design codes. These items shall be tested ultrasonically to the satisfaction of purchaser in accordance with Appendix 12 of ASME code Sec. VIII Div.1.

Surface Preparation

After acceptance of hydrostatic test, all external surfaces shall be prepared and prime coated. The suppliers' proposed method of surface preparation shall be approved by the purchaser.

KLM Technology Group Project Engineering Standard	MATERIAL AND EQUIPMENT STANDARD FOR PIG LAUNCHING AND RECEIVING TRAPS (PROJECT STANDARDS AND SPECIFICATIONS)	Page 9 of 20
		Rev: 01
		April 2011

Pipeline Pig Passage Detector

1. The signaler shall be intrusive type and mounted on the trap/pipeline via a DN 50 branch connection.
2. For pipelines which cannot be depressurized for pig signaler maintenance, the signalers shall be complete with a ball valve to isolate the pig signaler from the pipeline and a portable jacking tool for safe lifting of the transfer mechanism.
3. After the pig has passed the pig signaler, the internal mechanism shall be re-set automatically to the position required for indicating the passage of the next pig. The resetting of the signal mechanical indicator shall be undertaken manually only. Resetting of the electrical switch shall be automatic.
4. The mechanical signal flag or the electrical switch shall not triggered by the flow or pressure of the pipeline fluid.
5. The trigger shall not obstruct or damage a passing pig and the trigger shall not be damaged by a passing pig.
6. The penetration of the trigger into the main pipe shall be kept to a minimum to avoid unnecessary obstruction of fluid flow.
7. The design methodology as described in ASME VIII division 1 shall be used for the design calculation of the pig signaler pressure housing. The design pressure of the pig signaler pressure housing shall comply with the pressure/temperature rating classes for flanges as stated in ANSI/ASME B 16.5, based on material group 1.1 unless otherwise stated in the requisition, for limited temperature range of -20°C to + 120°C.
8. The minimum wall thickness of the pig signaler pressure housing and any extension shall be 4.8 mm.
9. The indicator shall withstand all specified weather and climatic conditions and be of robust construction.
10. With the exception of mild steel mounting base, all metal parts shall be corrosion resistance material.
11. The indicator shall be bidirectional and function equally well in either direction.
12. Visual signals shall be clearly visible from a distance of 50 meters and should be manually reset table.
13. If carbon steel and stainless steel components are used in combination, the risk of galvanic corrosion at the contact areas shall be minimized.